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CELLFLEX® Foam and HELIFLEX® Air Cables

Introduction

	Cable Type	Jacket Options	Nominal Size Inch	Diameter Over Jacket mm (in)	Cable Weight kg/m (lb/ft)	Minimum Bending Radius[1] mm (in)	Attenuation at 1000MHz[2] dB/100 m (dB/100ft)	Mean Power Rating at 1000 MHz[3] kW
CELLFLEX								
Superflexible Cables	SCF14-50	J; JFN	1/4"	7.8(0.31)	0.07(0.05)	25(1.0)	19.5(5.94)	0.339
	SCF38-50	J; JFN; JGR	3/8"	10.2(0.4)	0.12(0.08)	25(1.0)	14.1(4.29)	0.560
	SCF12-50	J; JFN; JGR	1/2"	13.7(0.54)	0.21(0.14)	32(1.25)	11.2(3.41)	0.770
Ultraflexible Cables	UCF78-50A	J; JFN	7/8"	27.5(1.08)	0.43(0.29)	90(4)	4.44(1.35)	2.27
	UCF114-50A-P*[7]	J; JFN	1-1/4"	39.4(1.55)	0.86(0.58)	150(6)	3.14(0.957)	3.52
	UCF114-50A-A*[7]	J; JFN	1-1/4"	39.4(1.55)	0.86(0.58)	150(6)	3.02(0.921)	3.56
Low Loss Cables	LCF14-50	J; JFN	1/4"	10(0.39)	0.13(0.09)	40(2)	14.48(4.41)	0.55
	LCF38-50	J; JFN	3/8"	11.2(0.44)	0.12(0.08)	50(2)	11.33(3.45)	0.64
	LCF12-50	J; JFN; JGR	1/2"	16.2(0.64)	0.22(0.15)	70(3)	7.20(2.19)	1.18
	LCF58-50	J; JFN	5/8"	21.4(0.84)	0.37(0.25)	90(4)	5.59(1.70)	1.67
	LCF78-50A-P*[7]	J; JFN; JGR	7/8"	28.0(1.10)	0.51(0.34)	120(5)	3.93(1.20)	2.66
	LCF78-50A-A*[7]	J; JFN; JGR	7/8"	28.0(1.10)	0.51(0.34)	120(5)	3.78(1.15)	2.61
	LCFS114-50A-P*[7]	J; JFN; JGR	1-1/4"	39.0(1.54)	0.86(0.58)	200(8)	2.94(0.896)	3.60
	LCFS114-50A-A*[7]	J; JFN; JGR	1-1/4"	39.0(1.54)	0.86(0.58)	200(8)	2.85(0.870)	3.87
	LCF158-50A-P*[7]	J; JFN	1-5/8"	50.3(1.98)	1.19(0.80)	200(8)	2.39(0.729)	4.86
	LCF158-50A-A*[7]	J; JFN	1-5/8"	50.3(1.98)	1.19(0.80)	200(8)	2.25(0.685)	4.99
	LCF214-50A	J; JFN	2-1/4"	59.9(2.36)	1.70(1.14)	280(11)	2.11(0.643)	6.61
RGFLEX								
RF Type	RF174-50	JF	5/64"	2.7(0.11)	0.012(0.008)	14(0.55)	42(1.65)	–
RG Type	RG58-50	JF	9/64"	5.0(0.197)	0.037(0.024)	25.4(1)	100(3.94)	–
	RG223-50	JF	5/32"	5.4(0.213)	0.055(0.121)	30(1.18)	55(2.165)	–
	RG213-50	JF	5/16"	10.31(0.41)	0.155(0.103)	50.0(1.97)	205(8.0)	–
	RG214-50	JF	3/8"	10.8(0.425)	0.185(0.408)	55.0(2.165)	110(4.33)	–
RGC Type	RGC58-50	J	9/64"	5.0(0.197)	0.030(0.020)	25.4(1)	100(3.94)	–
	RGC213-50	J	5/16"	10.34(0.407)	0.120(0.080)	50.0(1.97)	205(8.07)	–
	RGC8-50	J	5/16"	10.24(0.403)	0.133(0.088)	25.4(1)	60(2.36)	–
HELIFLEX								
Standard Cables	HCA38-50	J; JB	3/8"	13.9(0.55)	0.31(0.21)	50(2)	9.10(2.77)	0.769
	HCA12-50	JPL	1/2"	15.7(0.62)	0.27(0.18)	120(5)	7.77(2.37)	2.09
	HCA58-50	J; JB	5/8"	21.4(0.84)	0.70(0.47)	80(3)	5.66(1.72)	1.46
	HCA78-50	J; JB; JPL	7/8"	28.3(1.11)	0.68(0.46)	100(4)	3.94(1.20)	2.58
	HCA118-50	J; JB	1-1/8"	36.4(1.43)	1.10(0.74)	130(5)	3.09(0.94)	3.72
	HCA158-50	J; JB; JPL	1-5/8"	50.4(1.984)	1.30(0.89)	180(7)	2.01(0.61)	6.11
	HCA214-50	J	2-1/4"	60.5(2.37)	1.7(1.15)	210(8)	1.93(0.588)	6.63
	HCA295-50	J; JB; JFN	3"	71.0(2.795)	2.6 (1.75)	270 (11)	1.47(0.448)	11.2
	HCA300-50	J; JFN	3"	76.7(3.02)	2.6(1.78)	270(11)	1.48(0.452)	11.4
	HCA318-50	J; JB	3-1/8"	90.5(3.56)	3.3(2.25)	380(15)	1.26(0.380)	17
	HCA418-50	J; JB; JFN	4-1/8"	115.1(4.53)	5.4(3.63)	500(20)	0.96(0.292)[4]	25.1
	HCA500-50	J; JB; JFN	5"	147.2(5.79)	8.65(5.78)	800(31)	0.69(0.210)[4]	42.0[4]
	HCA618-50	J; JFN	6-1/8"	169.0(6.65)	11.0(7.39)	1000(39)	0.61(0.186)[5]	54.0[4]
	HCA800-50	J; JB	8"	223.0(8.78)	18.6(12.5)	1400(55)	0.42(0.128)[5]	103[5]
Increased Mean Power Cables	HCA38-50	JT	3/8"	13.9(0.55)	0.31(0.21)	50(2)	9.31(2.84)	1.13
	HCA78-50	JT	7/8"	28.3(1.11)	0.68(0.46)	100(4)	3.94(1.20)	2.58
	HCA118-50	JT	1-1/8"	36.4(1.43)	1.10(0.74)	130(5)	3.09(0.94)	3.72
	HCA158-50	JT	1-5/8"	50.4(1.984)	1.30(0.89)	180(7)	2.23(0.680)	8.21
	HCA500-50	JT	5"	147.2(5.79)	8.65(5.78)	800(31)	0.728(0.222)[4]	63.6[4]
	HCA618-50	JT	6-1/8"	169.0(6.65)	11.0(7.39)	1000(39)	0.61(0.186)[4]	54.0[4]
	HCA800-50	JT; JBT	8"	223.0(8.78)	18.5(12.4)	1400(55)	0.37(0.113)[5]	139[5]
	HCA900-50	No Jacket	9''		9.6(6.48)	1700(67)	0.41(0.125)[6]	245[6]

Note [1] Single Bend
Note [2] Attenuation @ 20° C (68° F)
Note [3] Mean power rating @ 40° C (104 °F)
Note [4] At 860 MHz
Note [5] At 650 MHz
Note [6] At 500 MHz
Note [7] For CELLFLEX premium attenuation and VSWR codes see page 29

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Why choose cables from RFS?

Feeder cables from RFS are used as a reliable backbone for cellular radio systems including GSM, PCN/PCS, CDMA, AMPS, PDC or ETACS. RFS has a variety of coaxial cable types for many telecommunications system original equipment manufacturers (OEMs), system installers or designers. CELLFLEX low loss foam dielectric cables are manufactured by the gas injection extrusion method and the proprietary UNIWEMA welding and corrugation process.
Foam dielectric cables combine excellent electrical characteristics with robust mechanical performance. HELIFLEX air dielectric cables combine select dielectric materials for low-power or high-power applications and feature the same proprietary UNIWEMA manufacturing process. RFS braided shield coaxial cables offer cost-effective solutions for less demanding applications while maintaining system integrity and performance.

Product Spectrum

CELLFLEX foam dielectric cables are offered as low loss cables, superflexible cables and ultraflexible cables. Diameters range from 1/4" up to 2-1/4".
The characteristic impedance of all cables is 50 Ohm.

Characteristics of CELLFLEX cables

CELLFLEX foam dielectric cables combine a remarkable flexibility with high strength and superior electrical performance. The cable construction allows easy handling and easy preparation for attachment of connectors together with high resistance to connector pull-off.

CELLFLEX foam dielectric cables have the following characteristics:

- High flexibility
- High crush resistance
- Low attenuation
- High power rating
- Longitudinal uniformity
- Small reflection factor
- High screening effectiveness
- Resistant to hostile environments

Low loss cables use foam with very low dielectric losses resulting in low attenuation of RF power.

Superflexible cables are highly bendable due to the mechanical construction of the cable.

Ultraflexible cables use a specific inner conductor design resulting in the highest flexibility of copper cables available on the market.

LCF12-50

LCF78-50

HCA38-50

Characteristics of RFS RG cables

RFS braided shield RG cables use a double-shielded design consisting of an aluminum wrap under a tin-plated copper braid. The jacket material is a black polyethylene material for high resistance to abrasion. The dielectric is a foam polyethylene material to provide low attenuation and reliable electrical performance.

All RFS braided shield RG cables are designed to incorporate the following features:

- Very high flexibility
- Low attenuation
- High screening effectiveness

Characteristics of HELIFLEX Cables

HELIFLEX air dielectric cables consist of an inner conductor and an outer conductor. By using a dielectric helix (made of high density polyethylene) the inner conductor is centered to the outer conductor. The shape of the dielectric is either rectangular or in the case of small diameter cables, trapezoidal. Larger cables use a low material content helix with T-shaped supports. Cables for the highest power transmission use three-legged teflon spacers, which are positioned periodically along the cable.

All HELIFLEX air dielectric cables are designed to incorporate the following features:

- High flexibility
- High crush resistance
- Low attenuation
- High power rating
- Longitudinal uniformity

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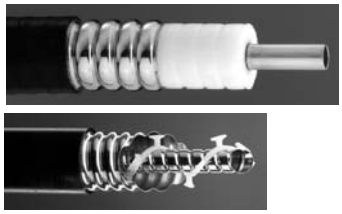
Applications

Used as antenna feeders, cabling of antenna arrays, radio equipment interconnections, jumper assemblies or indoor applications, CELLFLEX® foam dielectric cables provide a reliable and technically superior solution for many wireless applications.

CELLFLEX® foam dielectric cables are often specified in communications and electronic systems.

- Microwave communications systems
- Landmobile systems
- Cellular systems
- Rural telephone systems
- HF systems
- Broadband
- Wireless



HELIFLEX® cables are designed for applications where high flexibility and crush resistance are required.

The attenuation of HELIFLEX® cables is much lower when compared to the foam dielectric cables. HELIFLEX® cables are used extensively worldwide for the transmission of large RF power.

- Feeder cables for broadcast stations
- AM / FM
- Analog and digital TV
- MDS / MMDS

CELLFLEX	CABLE TYPE	INNER CONDUCTOR	DIELECTRIC	OUTER CONDUCTOR
Superflexible Cables	SCF14-50	Copper-Clad Aluminum Wire	PE-Foam	Helically Corrugated Copper Tube
	SCF38-50	Copper-Clad Aluminum Wire	PE-Foam	Helically Corrugated Copper Tube
	SCF12-50	Copper-Clad Aluminum Wire	PE-Foam	Helically Corrugated Copper Tube
Ultraflexible Cables	UCF78-50A	Corrugated Copper Tube	PE-Foam	Annularly Corrugated Copper Tube
	UCF114-50A	Corrugated Copper Tube	PE-Foam	Annularly Corrugated Copper Tube
Low Loss Cables	LCF14-50	Copper-Clad Aluminum Wire	PE-Foam	Annularly Corrugated Copper Tube
	LCF38-50	Copper-Clad Aluminum Wire	PE-Foam	Annularly Corrugated Copper Tube
	LCF12-50	Copper-Clad Aluminum Wire	PE-Foam	Annularly Corrugated Copper Tube
	LCF58-50	Copper Tube	PE-Foam	Annularly Corrugated Copper Tube
	LCF78-50A	Copper Tube	PE-Foam	Annularly Corrugated Copper Tube
	LCFS114-50A	Copper Tube	PE-Foam	Annularly Corrugated Copper Tube
	LCF158-50A	Corrugated Copper Tube	PE-Foam	Annularly Corrugated Copper Tube
	LCF214-50A	Corrugated Copper Tube	PE-Foam	Annularly Corrugated Copper Tube
RG TYPE CABLES				
	RF174-50	Stranded Copper Wire	PE-Solid	Tinned Copper Braid
	RG58-50	Stranded Tinned Copper Wire	PE-Solid	Tinned Copper Braid
	RG223-50	Silver Plated Copper Wire	PE-Solid	Dual Silver Plated Copper Braid
	RG213-50	Stranded Copper Wire	PE-Solid	Copper Braid
	RG214-50	Stranded Silver Plated Copper Wire	PE-Solid	Dual Silver Plated Copper Braid
	RGC58-50	Bare Copper	PE-Foam	Tinned Copper Braid and Aluminum Shield
	RGC213-50	Bare Copper	PE Foam	Tinned Copper Braid and Aluminum Shield
	RGC8-50	Bare Copper	PE-Foam	Tinned Copper Braid and Aluminum Shield
HELIFLEX				
Standard Cables	HCA38-50	Copper Wire	PE-Helix	Helically Corrugated Copper Tube
	HCA12-50	Copper-Clad Aluminum Wire	Teflon Helix	Annularly Corrugated Copper Tube
	HCA58-50	Copper Wire	PE-Helix	Helically Corrugated Copper Tube
	HCA78-50	Copper Tube	PE-Helix	Helically Corrugated Copper Tube
	HCA118-50	Copper Tube	PE-Helix	Helically Corrugated Copper Tube
	HCA158-50	Corrugated Copper Tube	PE-Helix	Helically Corrugated Copper Tube
	HCA214-50	Corrugated Copper Tube	PE-Helix	Helically Corrugated Copper Tube
	HCA295-50	Corrugated Copper Tube	PE-Helix	Helically Corrugated Copper Tube
	HCA300-50	Corrugated Copper Tube	PE-Helix	Helically Corrugated Copper Tube
	HCA318-50	Corrugated Copper Tube	PE-Helix	Helically Corrugated Copper Tube
	HCA418-50	Corrugated Copper Tube	PE-Helix	Helically Corrugated Copper Tube
	HCA500-50	Corrugated Copper Tube	PE-Helix	Helically Corrugated Copper Tube
	HCA618-50	Corrugated Copper Tube	PE-Helix	Helically Corrugated Copper Tube
	HCA800-50	Corrugated Copper Tube	PE-Helix	Helically Corrugated Copper Tube
Increased Mean Power Cables	HCA38-50	Copper Wire	PTFE-Helix	Helically Corrugated Copper Tube
	HCA78-50	Copper Tube	PTFE-Helix	Helically Corrugated Copper Tube
	HCA118-50	Copper Tube	PTFE-Helix	Helically Corrugated Copper Tube
	HCA158-50	Corrugated Copper Tube	PTFE-Helix	Helically Corrugated Copper Tube
	HCA500-50	Corrugated Copper Tube	PTFE-Helix	Helically Corrugated Copper Tube
	HCA618-50	Corrugated Copper Tube	PTFE-Helix	Helically Corrugated Copper Tube
	HCA800-50	Corrugated Copper Tube	PTFE Spacer	Helically Corrugated Copper Tube
	HCA900-50	Corrugated Copper Tube	PTFE Spacer	Helically Corrugated Aluminum Tube

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Technical Parameters

The most important parameters to consider when specifying a cable are:

- Characteristic impedance
- Return loss
- Attenuation
- Mean power rating
- Bending radius
- Bending moment

Cable Construction

All CELLFLEX® foam and HELIFLEX® air dielectric cables are designed to maximize technical and mechanical performance in typical installations.

CELLFLEX® foam and HELIFLEX® air dielectric cables have an inner and outer conductor in coaxial configurations that are separated by a dielectric material (foam or web material). For CELLFLEX® foam cables, the polyethylene foam is applied to the center conductor by the gas injection extrusion method. This state-of-the-art process consistently produces a low-density, closed cell foam structure with low dielectric losses. The polymer dielectric is non-hygroscopic, environmentally friendly, and adheres well enough to the center conductor to avoid conductor migration during and after installation. CELLFLEX® cables are available in sizes from 1/4" to 2-1/4" in diameter.

The outer conductor of CELLFLEX® and HELIFLEX® cables are seam welded and corrugated with our proprietary UNIWEMA process. CELLFLEX® cables of the LCF and UCF types are annularly corrugated as opposed to the HCA (except HCA12, which is annularly corrugated) and SCF (Superflexible) types that are helically corrugated. The corrugations of these cables are deeper and shorter pitched for higher flexibility when compared to LCF and UCF cables.

SCF type cables are typically used for jumpers at the bottom and top of the main trunk. The conductor materials are typically high conductivity copper or copper clad aluminum for the center conductor.

A comprehensive range of HELIFLEX® air dielectric cables are available in a range of sizes; from 3/8" up to 9" in diameter. The characteristic impedance of all cables is 50 Ohm.

Instead of using a PE helix the high power cable types are manufactured with a PTFE helix or PTFE spacers. For nominal sizes below 2-1/4", the jacket is made of PVC instead of PE. These cables feature an increased mean power rating. HELIFLEX® cables with this increased mean power rating are offered in a limited number of sizes only. Plenum-rated

HELIFLEX® cables feature PVDF jacket material to comply with UL 910 (Steiner tunnel) specification and are suited for CATVP applications.

All standard CELLFLEX® and HELIFLEX® cables have abrasion resistant black PE jackets. The material is halogen free, UV resistant and non-corrosive.

CELLFLEX® A-Series

Design and process modifications to the LCF78, UCF78, LCFS114, UCF114 (old LCF114), LCF158 and LCF214 cables have optimized the attenuation performance. These changes allow improved electrical performance without sacrificing any mechanical performance properties. The cables are available with standard "J" and flame-retardant "JFN" jacket materials. The cables are marked with an "A" suffix after the model name, to distinguish them from the previous version. Existing accessories are totally compatible.

RAPID FIT™ connectors are upgraded to improve VSWR and make them reverse-compatible to the previous cables. Electrical tests show outstanding VSWR and passive intermodulation (3rd order) values. Cable prep tooling is compatible with the improved connectors on both previous designs and A-Series cables.

Premium Attenuation

CELLFLEX A-Series cables in the popular sizes 7/8", 1-1/4" and 1-5/8" are also available in a further enhanced premium attenuation version to offer lowest possible attenuation especially at higher frequencies. The respective RAPID FIT™ connectors are compatible with both A-Series variants.

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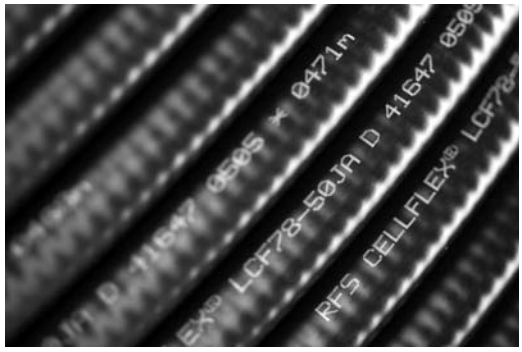
World-Class Precision Manufacturing

RFS coaxial cables are manufactured in RFS various production facilities on proprietary machines designed and built by the RFS Organization. A special process, invented by RFS parent company, welds a continuous seam in a tube formed from metal strip. The tube is then corrugated, creating a flexible sheath of armor around the cable interior or outer conductor. All cables are manufactured under stringent quality control, in a sophisticated, climate controlled environment which insures uniform product quality and performance year-round.

Continuous Factory Testing

All cables undergo continuous vacuum and statistical quality control testing during production that ensures foam integrity and product quality. Each cable assembly is inspected and electrically tested to confirm performance.



Traceability

Each cable run has sequential marking on its side that contains:

- Precise length marking
- Factory marked product codes and order number
- Production lot tracer code

FEATURES AND BENEFITS:

Low Attenuation

The low attenuation of RFS coaxial cable results in highly efficient signal transfer in your RF system.

Complete Shielding

The solid outer conductor of RFS coaxial cable creates a continuous RFI/EMI shield that minimizes system interference.

Low VSWR

Special low VSWR versions of RFS coaxial cables contribute to low system noise.

Outstanding Intermodulation Performance

RFS coaxial cable's solid inner and outer conductors virtually eliminate intermods. Intermodulation performance is also confirmed with state-of-the-art equipment at the RFS factory.

High Power Rating

Due to their low attenuation, outstanding heat transfer properties and temperature stabilized dielectric materials, RFS cable provides safe long term operating life at high transmit power levels.

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Jacket Options

The standard jacket material is black polyethylene, denoted by the "J" suffix. Gray polyethylene jacket material is denoted by the "JGR" suffix. These cables are:

- Abrasion-resistant
- Halogen-free
- Non-corrosive
- Ultraviolet resistant
- Meet the requirements according to:
  - IEC 60754-1
  - IEC 60754-2

The optional jacket material for HELIFLEX® is black polyethylene with a bitumen flooding compound. These cables use the suffix JB. These cables are:

- Abrasion-resistant
- Ultraviolet resistant
- Self-healing

Cables with flame and fire retardant jackets use the suffix JFN. These cables are:

- Abrasion-resistant
- Halogen-free
- Non-corrosive
- Flame-retardant
- Fire-retardant
- Ultraviolet resistant
- Meet the requirements according to:
  - IEC 60754-1
  - IEC 60754-2
  - IEC 60332-1
  - UL 1581-1991 Sect. 1080 VW 1 Flame Test
  - IEC 60332-3-24
  - UL 1581-1991 Sect. 1160 Vertical Tray Flame Test
  - IEC 61034 (up to 2-1/4).

RG cables use the jacket option JF for a polyvinyl chloride jacket. These cables are:

- Abrasion-resistant
- Flame-retardant
- Fire-retardant
- Ultraviolet resistant
- Meet the requirements according to:
  - IEC 60332-1

Cables rated for plenum applications have PVDF jackets and use the suffix JPL. These unique cables are:

- Abrasion-resistant
- Flame-retardant
- Fire-retardant
- Meet the requirements according to:
  - UL 910
  - NEC 820-53(a) CATVP
  - NFPA-262

Flame and fire retardant jackets are specified according to tests defined by IEC or UL.

- IEC 60754-1 Test of gases emitted during the combustion of materials from cables: Determination of the amount of halogen acid gas (< 0.2% Chlorine)
- IEC 60754-2 Test of gases emitted during the combustion of materials from cables: Determination of degree of acidity of gases (PH-value > 4.3, conductivity < 100 m Siemens/cm)
- IEC 60332-1 Flame test on single cable
- IEC 60332-3.C Fire test on bunched cables
- IEC 61034 smoke emission test
- UL 1581-1991 Section 1080 VW 1 Flame Test: Flame test on single cable
- UL 1581-1991 Section 1160 Vertical Tray Flame Test: Fire test on bunched cable
- IEC 60754-1 and IEC 60754-2 means that the jacket is halogen-free and non-corrosive.
- IEC 60332-1 means that the jacket is flame retardant.
- IEC 60332-3-24 means that the jacket is fire retardant.
- IEC 61034 means that the jacket produces low smoke levels.
- UL 1581-1991 Section 1080 VW 1 Flame Test: means that the jacket is flame retardant
- UL 1581-1991 Section 1160 Vertical Tray Flame Test: means that the jacket is fire retardant
- UL 910 refers to the Steiner Tunnel Test, measuring flame spread and smoke density
- NFPA 262 is derived from and surpasses UL 910

Special flame retardant jacketing is available for all CELLFLEX®coaxial transmission line products. The jacketing meets the testing requirements of Underwriters Laboratories UL 1666, and qualifies for the NEC CATVR type rating code (NEC Section 820-51(b) Type CATVR-NEC 1996). Flame retardant jacketing contains UV stabilizer for added protection against direct sunlight.

CELLFLEX® and HELIFLEX® cables are available in several jacket materials and power ratings, depending on the cable type, as listed below. Refer to the specific cable data pages for the model numbers of available jacket options.

Jacket Options

Model Number	Jacket Type/Power	Installation Temperature °C(°F)	Operation Temperature °C(°F)	Storage Temperature °C(°F)
J, JGR	Standard, Grey (RAL 7004)	-40 to +60 (-40 to +140)	-50 to +85 (-58 to +185)	-70 to +85 (-94 to +185)
JT	High Power	-40 to +60 (-40 to +140)	-50 to +85 (-58 to +185)	-70 to +85 (-94 to +185)
JB	Standard, Self-Healing	-10 to +60 (14 to +140)	-40 to +85 (-40 to +185)	-70 to +85 (-94 to +185)
JBT	Standard, Self-Healing, High Power	-10 to +60 (14 to +140)	-40 to +85 (-40 to +185)	-70 to +85 (-94 to +185)
JF, JFN	Flame Retardant	-25 to +60 (-13 to +140)	-50 to +85 (-58 to +185)	-40 to +85 (-40 to +185)
JPL	Plenum rated	-40 to +60 (-40 to +140)	-40 to +85 (-40 to +185)	-40 to +85 (-40 to +185)

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CELLFLEX® Foam and HELIFLEX® Air Cables

Standard or Premium Performance

Cables with standard performance fulfill the common requirements of typical applications. Our quality management system is in accordance with ISO 9000, it guarantees an excellent electrical and mechanical performance of every meter.

In case of more stringent requirements for the reflection factor, choose the premium performance cables. RFS offers a complete line of low VSWR cables in a full variety of types, frequencies and VSWR performance. These cables are selected to provide the lowest possible VSWR over a specified operating bandwidth. Please specify the operating frequency range when ordering the premium versions. Standard cables feature a minimum of -18 dB Return Loss (1.29:1 VSWR) within most global telecommunication frequency ranges, and up to -24 dB (1.135:1 VSWR) for specific bands in some markets. Contact your local sales representative for more details of VSWR performance on cable types available in your area.

How to Choose the Optimum Cable

The power handling capability and allowable attenuation for the specific application determines the cable size to use.

In case of critical bending radii or repeated bending, the bending radius of the cable is a primary selection criterium.

If no specific requirements are stated, choose a standard flexible cable from the LCF series.

For applications that require tight bending, choose superflexible cables.

For mobile applications with several hundreds of re-reelings, choose the ultraflexible cable.

Cables are delivered in standard bulk lengths or are customer's specification. For standard bulk lengths refer to the shipping information.

Phase stabilized cables provide repeatable phase-temperature characteristics in multiple element antenna applications and broadcast sampling line systems. The stabilization is achieved through factory temperature cycling techniques which relieve the mechanical stress introduced during the manufacturing process.

HELIFLEX Cable Return Loss Data

General Purpose Cables

If no specific requirements are stated, and the connector face dimensions are about the same as the cable dimensions, the following values can be expected:

40 - 970 MHz	RF	RL (dB)	VSWR
Typical value	3-5%	30.5-26.0	1.062-1.105
Maximum Value	7%	23.1	1.151

Broadcast and Television Grade Cables

Cable can be selected for certain frequency ranges with values as follows:

Maximum Frequency Range	RF	RL (dB)	VSWR
40 - 300 MHz	5%	26.0	1.105
40 - 68 MHz	4%	28.0	1.083
87 - 108 MHz	4%	28.0	1.083
174 - 230 MHz	4%	28.0	1.083
300 - 970 MHz	5%	26.0	1.105
410 - 470 MHz	5%	26.0	1.105
470 - 862 MHz*	4%	28.0	1.083

*For customer-specified sub-channel, see page 662.

Microwave Grade Cables

Cable can be selected for certain frequency bands with the following values:

Maximum Frequency Range	Cable Size	RF	RL (dB)	VSWR
950 - 1850 MHz	5/8"	7%	23.1	1.151
	7/8"	7%	23.1	1.151
	1-1/8"	7%	23.1	1.151
	1-5/8"	7%	23.1	1.151
1700 - 2300 MHz	7/8"	7%	23.1	1.151
	1-5/8"	7%	23.1	1.151
2300 - 2700 MHz	7/8"	7%	23.1	1.151
1700 - 2300 MHz	7/8"	5%	26.0	1.105
	1-5/8"	5%	26.0	1.105
2300 - 2700 MHz	7/8"	5%	26.0	1.105
	1-5/8"	7%	23.1	1.151

CELLFLEX Cable Return Loss

PREMIUM CODE		FREQUENCY RANGE	ASSEMBLED VERSION RETURN LOSS (VSWR) {REFLECTION COEFFICIENT}
Standard Attenuation	Premium Attenuation		
no code	A0	Specify when ordering	18.0dB (1.288:1) {12.6%}
P1	A1	410 - 470 MHz	23.0dB (1.152:1) {7.1%}
P2	A2	806 - 960 MHz	24.0dB (1.135:1) {6.3%}
P3	A3	1425 - 1535 MHz	24.0dB (1.135:1) {6.3%}
P4	A4	1700 - 1880 MHz	24.0dB (1.135:1) {6.3%}
P5	A5	1850 - 1990 MHz	28.0dB (1.083:1) {4.0%}
P6	A6	1900 - 2200 MHz	24.0dB (1.135:1) {6.3%}
P7	A7	824 - 960 MHz and 1850 - 1990 MHz	24.0dB (1.135:1) {6.3%}
P8	A8	890 - 960 MHz and 1710 - 2200 MHz	23.0dB (1.152:1) {7.1%}

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SCF14-50 Series
1/4" Superflexible Foam Coax

APPLICATIONS	
OEM jumpers, BTS inter-cabinet connections, GPS lines, Riser-rated In-Building (JFN types, only), Microwave IF cabling	
GENERAL INFORMATION	
Cable Type	Foam-Dielectric, Superflexible
Size	1/4"
STRUCTURE	
Inner Conductor Material	Copper-Clad Aluminum Wire
Diameter Inner Conductor, mm (in)	1.9 (0.075)
Diameter Dielectric, mm (in)	4.3 (0.170)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	6.5 (0.26)
Diameter over Jacket Nominal, mm (in)	7.8 (0.31)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	0.07 (0.05)
Minimum Bending Radius, Repeated Bends, mm (in)	25 (1.0)
Bending Moment, N•m (lb-ft)	0.7 (0.5)
Flat Plate Crush Strength, N/mm (lb/in)	18.4 (100)
Tensile Strength, N (lb)	600 (135)
Recommended / Maximum Clamp Spacing, m (ft)	0.20 / 0.20 (0.67 / 0.67)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 1
Velocity, percent	82
Capacitance, pF/m (pF/ft)	82.0 (25.0)
Inductance, µH/m (µH/ft)	0.207 (0.063)
Maximum Frequency, GHz	20.4
Peak Power Rating, kW	5.5
RF Peak Voltage, Volts	740
Jacket Spark, Volt RMS	5000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	10.40 (3.17)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	6.60 (2.01)

See Installation, Operation and Storage Temperatures on page 28.
For premium return loss codes see page 29.

CONNECTORS AND ACCESSORIES	
Connectors	See pages 70-77
Jumpers	See pages 82-87
Accessories	See pages 97-102
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

SCF14-50J/JFN ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.401	0.122	5.50
1.0	0.568	0.173	5.50
1.5	0.696	0.212	5.50
2.0	0.804	0.245	5.50
10	1.81	0.550	3.66
20	2.56	0.781	2.58
30	3.15	0.960	2.10
50	4.08	1.24	1.62
88	5.45	1.66	1.21
100	5.82	1.77	1.14
108	6.06	1.85	1.09
150	7.17	2.19	0.922
174	7.75	2.36	0.854
200	8.33	2.54	0.794
300	10.3	3.13	0.643
400	12.0	3.65	0.553
450	12.7	3.88	0.519
500	13.5	4.10	0.491
512	13.6	4.15	0.485
600	14.8	4.52	0.446
700	16.1	4.91	0.411
800	17.3	5.27	0.382
824	17.6	5.35	0.376
894	18.4	5.59	0.360
900	18.4	5.61	0.359
925	18.7	5.70	0.354
960	19.1	5.81	0.347
1000	19.5	5.94	0.339
1250	22.0	6.71	0.300
1500	24.3	7.41	0.272
1700	26.1	7.94	0.254
1800	26.9	8.20	0.246
2000	28.5	8.69	0.232
2100	29.3	8.93	0.226
2200	30.1	9.2	0.220
2400	31.6	9.6	0.209
3000	35.8	10.9	0.185
3500	39.1	11.9	0.169
4000	42.2	12.9	0.157
5000	48.0	14.6	0.138
6000	53.4	16.3	0.124
7000	58.6	17.9	0.113
8000	63.4	19.3	0.104
9000	68.1	20.8	0.097
10000	72.6	22.1	0.091
12000	81	24.8	0.081
14000	89	27.2	0.074
16000	97	29.6	0.068
18000	105	31.9	0.063
20000	112	34.2	0.059
20400	113	34.6	0.058

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 100° C (212° F). No solar loading.

ORDERING INFORMATION	
Model Number	**Jacket**
SCF14-50J	Standard
SCF14-50JFN	Flame Retardant

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SCF38-50 Series
3/8" Superflexible Foam Coax

APPLICATIONS

OEM jumpers, BTS inter-cabinet connections, GPS lines, Riser-rated In-Building (JFN types, only)

GENERAL INFORMATION	
Cable Type	Foam-Dielectric, Superflexible
Size	3/8"
STRUCTURE	
Inner Conductor Material	Copper-Clad Aluminum Wire
Diameter Inner Conductor, mm (in)	2.6 (0.1)
Diameter Dielectric, mm (in)	6.3 (0.25)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	9.1 (0.36)
Diameter over Jacket Nominal, mm (in)	10.2 (0.4)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	0.12 (0.08)
Minimum Bending Radius, Repeated Bends, mm (in)	25 (1.0)
Bending Moment, N•m (lb-ft)	1.4 (1.0)
Flat Plate Crush Strength, N/mm (lb/in)	18.4 (100)
Tensile Strength, N (lb)	600 (135)
Recommended / Maximum Clamp Spacing, m (ft)	0.25 / 0.25 (0.80 / 0.80)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 1
Velocity, percent	82
Capacitance, pF/m (pF/ft)	82.0 (25.0)
Inductance, µH/m (µH/ft)	0.207 (0.063)
Maximum Frequency, GHz	13.4
Peak Power Rating, kW	11.9
RF Peak Voltage, Volts	1090
Jacket Spark, Volt RMS	5000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	5.3 (1.62)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	5.6 (1.71)

See Installation, Operation and Storage Temperatures on page 28.
For premium return loss codes see page 29.

CONNECTORS AND ACCESSORIES

Connectors	See pages 70-77
Jumpers	See pages 82-87
Accessories	See pages 97-102
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

SCF38-50J/JFN ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.291	0.0888	11.9
1.0	0.412	0.126	11.9
1.5	0.505	0.154	11.9
2.0	0.584	0.178	11.9
10	1.31	0.400	6.02
20	1.86	0.567	4.24
30	2.28	0.696	3.46
50	2.96	0.903	2.67
88	3.95	1.21	2.00
100	4.22	1.29	1.87
108	4.39	1.34	1.80
150	5.20	1.59	1.52
174	5.61	1.71	1.41
200	6.03	1.84	1.31
300	7.45	2.27	1.06
400	8.66	2.64	0.912
450	9.22	2.81	0.857
500	9.74	2.97	0.810
512	9.87	3.01	0.800
600	10.7	3.27	0.736
700	11.7	3.55	0.678
800	12.5	3.81	0.631
824	12.7	3.87	0.621
894	13.3	4.05	0.595
900	13.3	4.06	0.593
925	13.5	4.12	0.584
960	13.8	4.20	0.572
1000	14.1	4.30	0.560
1250	15.9	4.85	0.496
1500	17.6	5.36	0.449
1700	18.8	5.74	0.420
1800	19.4	5.92	0.407
2000	20.6	6.27	0.384
2100	21.1	6.45	0.373
2200	21.7	6.61	0.364
2400	22.8	6.94	0.347
3000	25.8	7.87	0.306
3500	28.2	8.59	0.280
4000	30.4	9.27	0.260
5000	34.6	10.5	0.228
6000	38.4	11.7	0.205
7000	42.1	12.8	0.188
8000	45.6	13.9	0.173
9000	48.9	14.9	0.161
10000	52.1	15.9	0.152
12000	58.2	17.7	0.136
13400	62.3	19.0	0.127

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 100° C (212° F). No solar loading.

ORDERING INFORMATION

Model Number	Jacket
SCF38-50J	Standard
SCF38-50JFN	Flame Retardant
SCF38-50JGR	Standard, Gray

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CELLFLEX® Cable

SCF12-50 Series
1/2" Superflexible Foam Coax

APPLICATIONS
OEM jumpers, Main feed transitions to equipment, GPS lines, Riser-rated In-Building (JFN types, only)

GENERAL INFORMATION	
Cable Type	Foam-Dielectric, Superflexible
Size	1/2"
STRUCTURE	
Inner Conductor Material	Copper-Clad Aluminum Wire
Diameter Inner Conductor, mm (in)	3.6 (0.14)
Diameter Dielectric, mm (in)	8.3 (0.33)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	12.3 (0.48)
Diameter over Jacket Nominal, mm (in)	13.7 (0.54)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	0.21 (0.14)
Minimum Bending Radius, Repeated Bends, mm (in)	32 (1.25)
Bending Moment, N•m (lb-ft)	1.8 (1.3)
Flat Plate Crush Strength, N/mm (lb/in)	20.4 (110)
Tensile Strength, N (lb)	650 (146)
Recommended / Maximum Clamp Spacing, m (ft)	0.30 / 0.30 (1.00 / 1.00)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 1
Velocity, percent	82
Capacitance, pF/m (pF/ft)	82.0 (25.0)
Inductance, µH/m (µH/ft)	0.207 (0.063)
Maximum Frequency, GHz	11.7
Peak Power Rating, kW	20.5
RF Peak Voltage, Volts	1430
Jacket Spark, Volt RMS	5000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	2.9 (0.88)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	3.4 (1.04)

See Installation, Operation and Storage Temperatures on page 28.
For premium return loss codes see page 29.

CONNECTORS AND ACCESSORIES	
Connectors	See pages 70-77
Jumpers	See pages 82-87
Accessories	See pages 97-102
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

SCF12-50J/JFN ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.229	0.0697	20.5
1.0	0.324	0.0986	20.5
1.5	0.397	0.121	20.5
2.0	0.458	0.140	18.8
10	1.03	0.314	8.37
20	1.46	0.446	5.90
30	1.80	0.548	4.80
50	2.33	0.710	3.70
88	3.11	0.949	2.77
100	3.33	1.01	2.59
108	3.46	1.06	2.49
150	4.10	1.25	2.10
174	4.43	1.35	1.95
200	4.76	1.45	1.81
300	5.89	1.79	1.46
400	6.85	2.09	1.26
450	7.29	2.22	1.18
500	7.71	2.35	1.12
512	7.81	2.38	1.10
600	8.50	2.59	1.01
700	9.23	2.81	0.934
800	9.92	3.02	0.869
824	10.1	3.07	0.855
894	10.5	3.21	0.818
900	10.6	3.22	0.815
925	10.7	3.27	0.803
960	11.0	3.34	0.787
1000	11.2	3.41	0.770
1250	12.7	3.86	0.682
1500	14.0	4.26	0.616
1700	15.0	4.57	0.575
1800	15.5	4.72	0.557
2000	16.4	5.01	0.525
2100	16.9	5.15	0.511
2200	17.3	5.28	0.498
2400	18.2	5.55	0.474
3000	20.7	6.30	0.417
3500	22.6	6.88	0.382
4000	24.4	7.4	0.353
5000	27.8	8.5	0.310
6000	31.0	9.4	0.278
7000	34.0	10.4	0.254
8000	36.8	11.2	0.234
9000	39.6	12.1	0.218
10000	42.3	12.9	0.204
11700	46.6	14.2	0.185

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 100° C (212° F). No solar loading.

ORDERING INFORMATION

Model Number	Jacket
SCF12-50J	Standard
SCF12-50JFN	Flame Retardant
SCF12-50JGR	Standard, Gray

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UCF78-50A Series
7/8" Ultraflexible Foam Coax

APPLICATIONS	
Main feed line, Riser-rated In-Building (JFN types, only), Jumper for attenuation sensitive application	
GENERAL INFORMATION	
Cable Type	Foam-Dielectric, Ultraflexible
Size	7/8"
STRUCTURE	
Inner Conductor Material	Corrugated Copper Tube
Diameter Inner Conductor, mm (in)	9.42 (0.371)
Diameter Dielectric, mm (in)	21.1 (0.83)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	24.89 (0.980)
Diameter over Jacket Nominal, mm (in)	27.48 (1.082)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	0.432 (0.290)
Minimum Bending Radius, Single Bend, mm (in)	90 (3.5)
Minimum Bending Radius, Repeated Bends, mm (in)	125 (5)
Bending Moment, N•m (lb-ft)	13.0 (9.6)
Flat Plate Crush Strength, N/mm (lb/in)	14.3 (80)
Recommended / Maximum Clamp Spacing, m (ft)	0.8 / 1.0 (2.75 / 3.25)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 1
Velocity, percent	88
Capacitance, pF/m (pF/ft)	76 (23.2)
Inductance, µH/m (µH/ft)	0.190 (0.058)
Maximum Frequency, GHz	4.9
Peak Power Rating, kW	83
RF Peak Voltage, Volts	2850
Jacket Spark, Volt RMS	8000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	2.82 (0.86)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	1.04 (0.32)

See Installation, Operation and Storage Temperatures on page 28.
For premium return loss codes see page 29.

UCF78-50JA/JFNA ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.0841	0.0256	83.0
1.0	0.119	0.0363	83.0
1.5	0.146	0.0445	69.4
2.0	0.169	0.0514	60.0
10	0.379	0.116	26.7
20	0.539	0.164	18.8
30	0.66	0.202	15.3
50	0.86	0.262	11.8
88	1.15	0.351	8.80
100	1.23	0.375	8.24
108	1.28	0.390	7.91
150	1.52	0.462	6.67
174	1.64	0.500	6.17
200	1.76	0.537	5.74
300	2.18	0.665	4.64
400	2.54	0.775	3.98
450	2.71	0.826	3.74
500	2.87	0.874	3.53
512	2.90	0.885	3.49
600	3.16	0.964	3.20
700	3.44	1.05	2.94
800	3.70	1.13	2.74
824	3.76	1.15	2.69
894	3.93	1.20	2.57
900	3.94	1.20	2.57
925	4.00	1.22	2.53
960	4.09	1.25	2.48
1000	4.18	1.27	2.42
1250	4.73	1.44	2.14
1500	5.24	1.60	1.93
1700	5.62	1.71	1.80
1800	5.81	1.77	1.74
2000	6.16	1.88	1.64
2100	6.34	1.93	1.60
2200	6.51	1.98	1.56
2400	6.84	2.09	1.48
3000	7.79	2.37	1.30
3500	8.52	2.60	1.19
4000	9.22	2.81	1.10
4900	10.4	3.17	0.97

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 100° C (212° F). No solar loading.

CONNECTORS AND ACCESSORIES	
Connectors	See pages 70-77
Jumpers	See pages 82-87
Accessories	See pages 97-102
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

ORDERING INFORMATION	
Model Number	**Jacket**
UCF78-50JA-P*	Standard
UCF78-50JFNA-P*	Flame Retardant

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UCF114-50A Series
1-1/4" Ultraflexible Foam Coax

APPLICATIONS
Main feed line, Riser-rated In-Building (JFN types, only)

GENERAL INFORMATION	
Cable Type	Foam-Dielectric, Ultraflexible
Size	1-1/4"
STRUCTURE	
Inner Conductor Material	Corrugated Copper Tube
Diameter Inner Conductor, mm (in)	13.6 (0.54)
Diameter Dielectric, mm (in)	31.2 (1.23)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	36.0 (1.42)
Diameter over Jacket Nominal, mm (in)	39.0 (1.54)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	0.81 (0.55)
Minimum Bending Radius, Single Bend, mm (in)	150 (6.0)
Minimum Bending Radius, Repeated Bends, mm (in)	250 (10)
Bending Moment, N•m (lb-ft)	36.0 (25.6)
Flat Plate Crush Strength, N/mm (lb/in)	25.5 (140)
Tensile Strength, N (lb)	2900 (650)
Recommended / Maximum Clamp Spacing, m (ft)	1.0 / 1.2 (3.25 / 4.0)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 1
Velocity, percent	89
Capacitance, pF/m (pF/ft)	75 (22.9)
Inductance, µH/m (µH/ft)	0.184 (0.056)
Maximum Frequency, GHz	3.6
Peak Power Rating, kW	178
RF Peak Voltage, Volts	4200
Jacket Spark, Volt RMS	10000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	2.20 (0.67)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	0.62 (0.19)

See Installation, Operation and Storage Temperatures on page 28.
For premium return loss codes see page 29.

CONNECTORS AND ACCESSORIES	
Connectors	See pages 70-77
Jumpers	See pages 82-87
Accessories	See pages 97-102
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

UCF114-50JA/JFNA ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.0597	0.0182	178
1.0	0.0846	0.0258	131
1.5	0.104	0.0316	107
2.0	0.120	0.0366	92.2
10	0.271	0.0825	40.8
20	0.386	0.118	28.7
30	0.475	0.145	23.3
50	0.619	0.189	17.9
88	0.831	0.253	13.3
100	0.889	0.271	12.4
108	0.926	0.282	11.9
150	1.10	0.336	10.0
174	1.19	0.364	9.26
200	1.29	0.392	8.60
300	1.60	0.488	6.90
400	1.87	0.571	5.90
450	2.00	0.610	5.53
500	2.12	0.646	5.21
512	2.15	0.655	5.14
600	2.35	0.716	4.71
700	2.56	0.781	4.32
800	2.76	0.842	4.00
824	2.81	0.857	3.93
894	2.94	0.897	3.75
900	2.96	0.901	3.74
925	3.00	0.915	3.68
960	3.07	0.935	3.60
1000	3.14	0.957	3.52
1250	3.57	1.09	3.09
1500	3.98	1.21	2.78
1700	4.28	1.31	2.58
1800	4.43	1.35	2.49
2000	4.72	1.44	2.34
2100	4.86	1.48	2.27
2200	5.00	1.52	2.21
2400	5.27	1.61	2.10
3000	6.05	1.84	1.83
3300	6.42	1.96	1.72

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 100° C (212° F). No solar loading.

ORDERING INFORMATION	
Model Number	**Jacket**
UCF114-50JA-P*	Standard
UCF114-50JFNA-P*	Flame Retardant

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UCF114-50A Series
1-1/4" Premium Attenuation
Ultraflexible Low-Loss Foam Coax

APPLICATIONS

Main feed line, Riser-rated In-Building (JFN types, only)

GENERAL INFORMATION	
Cable Type	Foam-Dielectric, Corrugated
Size	1-1/4"
STRUCTURE	
Inner Conductor Material	Corrugated Copper Tube
Diameter Inner Conductor, mm (in)	13.8 (0.55)
Diameter Dielectric, mm (in)	31.0 (1.22)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	36.0 (1.42)
Diameter over Jacket Nominal, mm (in)	39.0 (1.54)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	0.79 (0.53)
Minimum Bending Radius, Single Bend, mm (in)	150 (6.0)
Minimum Bending Radius, Repeated Bends, mm (in)	250 (10)
Bending Moment, N•m (lb-ft)	36.0 (25.6)
Flat Plate Crush Strength, N/mm (lb/in)	25.5 (140)
Tensile Strength, N (lb)	2900 (650)
Recommended / Maximum Clamp Spacing, m (ft)	1.0 / 1.2 (3.25 / 4.0)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 1
Velocity, percent	89
Capacitance, pF/m (pF/ft)	75 (22.9)
Inductance, µH/m (µH/ft)	0.184 (0.056)
Maximum Frequency, GHz	3.3
Peak Power Rating, kW	178
RF Peak Voltage, Volts	4200
Jacket Spark, Volt RMS	10000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	1.94 (0.59)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	0.55 (0.17)

See Installation, Operation and Storage Temperatures on page 28.
For premium return loss codes see page 29.

UCF114-50JA/JFNA PREMIUM ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.059	0.018	178
1.0	0.084	0.026	128
1.5	0.103	0.032	104
2.0	0.119	0.036	90.1
10	0.269	0.082	40.0
20	0.382	0.120	28.1
30	0.470	0.143	22.9
50	0.611	0.186	17.6
88	0.819	0.250	13.1
100	0.875	0.267	12.3
108	0.911	0.278	11.8
150	1.08	0.330	9.93
174	1.17	0.357	9.19
200	1.26	0.384	8.54
300	1.56	0.476	6.88
400	1.82	0.556	5.89
450	1.95	0.593	5.53
500	2.06	0.628	5.22
512	2.09	0.636	5.15
600	2.28	0.694	4.72
700	2.48	0.755	4.34
800	2.67	0.813	4.03
824	2.71	0.827	3.96
894	2.84	0.865	3.79
900	2.85	0.868	3.77
925	2.89	0.882	3.72
960	2.95	0.900	3.64
1000	3.02	0.921	3.56
1250	3.43	1.05	3.14
1500	3.80	1.16	2.83
1800	4.22	1.29	2.54
2000	4.49	1.37	3.39
2200	4.75	1.45	2.26
2300	4.87	1.49	2.21
3000	5.71	1.74	1.88
3300	6.04	1.84	1.78

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 100° C (212° F). No solar loading.

CONNECTORS AND ACCESSORIES

Connectors	See pages 70-77
Jumpers	See pages 82-87
Accessories	See pages 97-102
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

ORDERING INFORMATION

Model Number	Jacket
UCF114-50JA-A*	Standard
UCF114-50JFNA-A*	Flame Retardant

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LCF14-50 Series
1/4" Low-Loss Foam Coax

APPLICATIONS	
OEM jumpers, BTS inter-cabinet connections, GPS lines, Riser-rated In-Building (JFN types, only), Microwave IF cabling	
GENERAL INFORMATION	
Cable Type	Foam-Dielectric, Corrugated
Size	1/4"
STRUCTURE	
Inner Conductor Material	Copper-Clad Aluminum Wire
Diameter Inner Conductor, mm (in)	2.4 (0.09)
Diameter Dielectric, mm (in)	6.0 (0.24)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	7.5 (0.3)
Diameter over Jacket Nominal, mm (in)	10 (0.39)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	0.11 (0.074)
Minimum Bending Radius, Single Bend, mm (in)	40 (1.6)
Minimum Bending Radius, Repeated Bends, mm (in)	120 (5)
Bending Moment, N•m (lb-ft)	1.9 (1.4)
Flat Plate Crush Strength, N/mm (lb/in)	14 (80)
Tensile Strength, N (lb)	890 (200)
Recommended / Maximum Clamp Spacing, m (ft)	0.5 / 1.0 (1.75 / 3.25)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 1.5
Velocity, percent	83
Capacitance, pF/m (pF/ft)	80 (24)
Inductance, µH/m (µH/ft)	0.205 (0.063)
Maximum Frequency, GHz	15.8
Peak Power Rating, kW	10.9
RF Peak Voltage, Volts	1050
Jacket Spark, Volt RMS	5000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	6.1 (1.86)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	3.5 (1.25)

See Installation, Operation and Storage Temperatures on page 28.
For premium return loss codes see page 29.

CONNECTORS AND ACCESSORIES	
Connectors	See pages 70-77
Jumpers	See pages 82-87
Accessories	See pages 97-102
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

LCF14-50J/JFN ATTENUATION AND AVERAGE POWER			
Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.291	0.0887	10.9
1.0	0.412	0.126	10.9
1.5	0.505	0.154	10.9
2.0	0.583	0.178	10.9
10	1.31	0.399	5.56
20	1.86	0.566	3.92
30	2.28	0.695	3.20
50	2.95	0.900	2.47
88	3.94	1.20	1.85
100	4.20	1.28	1.73
108	4.37	1.33	1.67
150	5.17	1.58	1.41
174	5.58	1.70	1.30
200	6.00	1.83	1.21
300	7.40	2.25	0.985
400	8.59	2.62	0.848
450	9.13	2.78	0.798
500	9.65	2.94	0.755
512	9.77	2.98	0.745
600	10.6	3.24	0.686
700	11.5	3.51	0.632
800	12.4	3.77	0.589
824	12.6	3.83	0.580
894	13.1	4.00	0.556
900	13.2	4.01	0.554
925	13.4	4.07	0.546
960	13.6	4.15	0.535
1000	13.9	4.24	0.523
1250	15.7	4.78	0.464
1500	17.3	5.27	0.421
1700	18.5	5.64	0.393
1800	19.1	5.82	0.381
2000	20.2	6.16	0.360
2100	20.8	6.33	0.351
2200	21.3	6.49	0.342
2400	22.4	6.81	0.326
3000	25.3	7.70	0.288
3500	27.5	8.39	0.265
4000	29.7	9.05	0.245
5000	33.7	10.3	0.216
6000	37.4	11.4	0.195
7000	40.8	12.4	0.178
8000	44.1	13.5	0.165
9000	47.3	14.4	0.154
10000	50.3	15.3	0.145
12000	56.1	17.1	0.130
14000	61.5	18.8	0.118
15800	66.2	20.2	0.110

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 100° C (212° F). No solar loading.

ORDERING INFORMATION	
Model Number	**Jacket**
LCF14-50J	Standard
LCF14-50JFN	Flame Retardant

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LCF38-50 Series
3/8" Low-Loss Foam Coax

APPLICATIONS
OEM jumpers, BTS inter-cabinet connections, GPS lines, Riser-rated In-Building (JFN types, only), Microwave IF cabling

GENERAL INFORMATION	
Cable Type	Foam-Dielectric, Corrugated
Size	3/8"
STRUCTURE	
Inner Conductor Material	Copper-Clad Aluminum Wire
Diameter Inner Conductor, mm (in)	3.1 (0.12)
Diameter Dielectric, mm (in)	7.2 (0.28)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	9.5 (0.37)
Diameter over Jacket Nominal, mm (in)	11.2 (0.44)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	0.12 (0.08)
Minimum Bending Radius, Single Bend, mm (in)	50 (2)
Minimum Bending Radius, Repeated Bends, mm (in)	95 (4)
Bending Moment, N•m (lb-ft)	1.9 (1.4)
Flat Plate Crush Strength, N/mm (lb/in)	20.4 (110)
Tensile Strength, N (lb)	530 (119)
Recommended / Maximum Clamp Spacing, m (ft)	0.5 / 1.0 (1.75 / 3.25)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 1.5
Velocity, percent	88
Capacitance, pF/m (pF/ft)	76.0 (23.2)
Inductance, µH/m (µH/ft)	0.190 (0.058)
Maximum Frequency, GHz	13.5
Peak Power Rating, kW	15.4
RF Peak Voltage, Volts	1240
Jacket Spark, Volt RMS	5000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	3.8 (1.16)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	2.9 (0.88)

See Installation, Operation and Storage Temperatures on page 28.
For premium return loss codes see page 29.

CONNECTORS AND ACCESSORIES	
Connectors	See pages 70-77
Jumpers	See pages 82-87
Accessories	See pages 97-102
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

LCF38-50J/JFN ATTENUATION AND AVERAGE POWER			
Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.237	0.0724	15.4
1.0	0.336	0.102	15.4
1.5	0.412	0.125	15.4
2.0	0.476	0.145	15.2
10	1.07	0.325	6.79
20	1.51	0.461	4.79
30	1.86	0.566	3.90
50	2.41	0.734	3.01
88	3.21	0.978	2.26
100	3.43	1.04	2.12
108	3.56	1.09	2.04
150	4.21	1.29	1.72
174	4.55	1.39	1.59
200	4.89	1.49	1.48
300	6.02	1.84	1.20
400	7.00	2.13	1.04
450	7.44	2.27	0.975
500	7.86	2.40	0.923
512	7.96	2.43	0.911
600	8.65	2.64	0.838
700	9.38	2.86	0.773
800	10.1	3.07	0.720
824	10.2	3.12	0.709
894	10.7	3.25	0.679
900	10.7	3.27	0.677
925	10.9	3.31	0.667
960	11.1	3.38	0.654
1000	11.3	3.45	0.640
1250	12.8	3.89	0.568
1500	14.1	4.29	0.515
1700	15.1	4.59	0.481
1800	15.5	4.74	0.467
2000	16.5	5.01	0.441
2100	16.9	5.15	0.429
2200	17.3	5.28	0.418
2400	18.2	5.54	0.399
3000	20.6	6.26	0.353
3500	22.4	6.82	0.324
4000	24.1	7.35	0.301
5000	27.4	8.34	0.265
6000	30.3	9.25	0.239
7000	33.2	10.1	0.219
8000	35.8	10.9	0.202
9000	38.4	11.7	0.189
10000	40.8	12.4	0.178
12000	45.5	13.9	0.159
13500	48.8	14.9	0.149

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 100° C (212° F). No solar loading.

ORDERING INFORMATION	
Model Number	**Jacket**
LCF38-50J	Standard
LCF38-50JFN	Flame Retardant

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LCF12-50 Series
1/2" Low-Loss Foam Coax

APPLICATIONS

OEM jumpers, Main feed transitions to equipment, GPS lines, Riser-rated In-Building (JFN types, only)

GENERAL INFORMATION	
Cable Type	Foam-Dielectric, Corrugated
Size	1/2"
STRUCTURE	
Inner Conductor Material	Copper-Clad Aluminum Wire
Diameter Inner Conductor, mm (in)	4.8 (0.190)
Diameter Dielectric, mm (in)	11.3 (0.44)
Outer Conductor Material	Annularly Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	13.8 (0.54)
Diameter over Jacket Nominal, mm (in)	16.2 (0.64)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	0.22 (0.15)
Minimum Bending Radius, Single Bend, mm (in)	70 (3)
Minimum Bending Radius, Repeated Bends, mm (in)	125 (5)
Bending Moment, N•m (lb-ft)	5.0 (3.7)
Flat Plate Crush Strength, N/mm (lb/in)	20.4 (110)
Tensile Strength, N (lb)	1100 (247)
Recommended / Maximum Clamp Spacing, m (ft)	0.6 / 1.0 (2.0 / 3.25)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 1
Velocity, percent	88
Capacitance, pF/m (pF/ft)	76.0 (23.2)
Inductance, µH/m (µH/ft)	0.190 (0.058)
Maximum Frequency, GHz	8.8
Peak Power Rating, kW	38
RF Peak Voltage, Volts	1950
Jacket Spark, Volt RMS	8000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	1.57 (0.48)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	1.93 (0.59)

See Installation, Operation and Storage Temperatures on page 28.
For premium return loss codes see page 29.

LCF12-50J/JFN ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.149	0.0454	38.0
1.0	0.211	0.0643	38.0
1.5	0.258	0.0788	32.9
2.0	0.298	0.0910	28.5
10	0.67	0.204	12.7
20	0.95	0.290	8.93
30	1.17	0.356	7.27
50	1.51	0.462	5.61
88	2.02	0.616	4.20
100	2.16	0.658	3.94
108	2.25	0.684	3.78
150	2.66	0.810	3.20
174	2.87	0.875	2.96
200	3.08	0.940	2.75
300	3.81	1.16	2.23
400	4.43	1.35	1.92
450	4.71	1.44	1.80
500	4.98	1.52	1.71
512	5.04	1.54	1.69
600	5.48	1.67	1.55
700	5.95	1.81	1.43
800	6.39	1.95	1.33
824	6.49	1.98	1.31
894	6.78	2.07	1.25
900	6.80	2.07	1.25
925	6.90	2.10	1.23
960	7.04	2.15	1.21
1000	7.20	2.20	1.18
1250	8.12	2.48	1.05
1500	8.97	2.73	0.947
1700	9.6	2.93	0.884
1800	9.9	3.02	0.857
2000	10.5	3.20	0.809
2100	10.8	3.29	0.787
2200	11.1	3.38	0.767
2400	11.6	3.54	0.731
3000	13.2	4.01	0.645
3500	14.4	4.38	0.591
4000	15.5	4.72	0.548
5000	17.6	5.37	0.482
6000	19.6	5.97	0.434
7000	21.4	6.54	0.396
8000	23.2	7.07	0.366
8800	24.6	7.49	0.346

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 100° C (212° F). No solar loading.

CONNECTORS AND ACCESSORIES

Connectors	See pages 70-77
Jumpers	See pages 82-87
Accessories	See pages 97-102
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

ORDERING INFORMATION

Model Number	Jacket
LCF12-50J	Standard
LCF12-50JFN	Flame Retardant
LCF12-50JGR	Standard, Gray

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LCF58-50 Series
5/8" Low-Loss Foam Coax

APPLICATIONS

OEM jumpers, Microwave Hop feeds, GPS lines, Riser-rated In-Building (JFN types, only)

GENERAL INFORMATION	
Cable Type	Foam-Dielectric, Corrugated
Size	5/8"
STRUCTURE	
Inner Conductor Material	Copper Tube
Diameter Inner Conductor, mm (in)	6.6 (0.26)
Diameter Dielectric, mm (in)	15.5 (0.61)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	18.5 (0.73)
Diameter over Jacket Nominal, mm (in)	21.4 (0.84)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	0.37 (0.25)
Minimum Bending Radius, Single Bend, mm (in)	90 (4)
Minimum Bending Radius, Repeated Bends, mm (in)	190 (7)
Bending Moment, N•m (lb-ft)	10.0 (7.4)
Flat Plate Crush Strength, N/mm (lb/in)	13.3 (70)
Tensile Strength, N (lb)	1150 (259)
Recommended / Maximum Clamp Spacing, m (ft)	0.7 / 1.0 (2.25 / 3.25)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 1
Velocity, percent	88
Capacitance, pF/m (pF/ft)	76.0 (23.2)
Inductance, µH/m (µH/ft)	0.190 (0.058)
Maximum Frequency, GHz	6.2
Peak Power Rating, kW	45
RF Peak Voltage, Volts	2110
Jacket Spark, Volt RMS	8000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	1.32 (0.40)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	1.43 (0.44)

See Installation, Operation and Storage Temperatures on page 28.
For premium return loss codes see page 29.

LCF58-50J/JFN ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.112	0.0340	45.0
1.0	0.158	0.0482	45.0
1.5	0.194	0.0591	45.0
2.0	0.224	0.0683	41.7
10	0.504	0.154	18.5
20	0.716	0.218	13.0
30	0.881	0.268	10.6
50	1.14	0.349	8.16
88	1.53	0.467	6.10
100	1.64	0.499	5.71
108	1.70	0.519	5.48
150	2.02	0.616	4.62
174	2.18	0.666	4.28
200	2.35	0.716	3.97
300	2.91	0.887	3.21
400	3.39	1.03	2.75
450	3.62	1.10	2.58
500	3.83	1.17	2.44
512	3.88	1.18	2.41
600	4.22	1.29	2.21
700	4.59	1.40	2.03
800	4.94	1.51	1.89
824	5.02	1.53	1.86
894	5.25	1.60	1.78
900	5.27	1.61	1.77
925	5.35	1.63	1.74
960	5.46	1.67	1.71
1000	5.59	1.70	1.67
1250	6.33	1.93	1.48
1500	7.01	2.14	1.33
1700	7.53	2.30	1.24
1800	7.78	2.37	1.20
2000	8.26	2.52	1.13
2100	8.50	2.59	1.10
2200	8.7	2.66	1.07
2400	9.2	2.80	1.02
3000	10.5	3.19	0.893
3500	11.5	3.49	0.815
4000	12.4	3.78	0.753
5000	14.2	4.32	0.658
6000	15.9	4.83	0.589
6200	16.2	4.93	0.577

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 100° C (212° F). No solar loading.

CONNECTORS AND ACCESSORIES

Connectors	See pages 70-77
Jumpers	See pages 82-87
Accessories	See pages 97-102
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

ORDERING INFORMATION

Model Number	Jacket
LCF58-50J	Standard
LCF58-50JFN	Flame Retardant

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CELLFLEX® Cable

LCF78-50A Series
7/8" Low-Loss Foam Coax

APPLICATIONS
Main feed line, Riser-rated In-Building (JFN types, only)

GENERAL INFORMATION	
Cable Type	Foam-Dielectric, Corrugated
Size	7/8"
STRUCTURE	
Inner Conductor Material	Copper Tube
Diameter Inner Conductor, mm (in)	9.3 (0.37)
Diameter Dielectric, mm (in)	21.5 (0.85)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	25.2 (0.99)
Diameter over Jacket Nominal, mm (in)	27.8 (1.09)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	0.51 (0.34)
Minimum Bending Radius, Single Bend, mm (in)	120 (5)
Minimum Bending Radius, Repeated Bends, mm (in)	250 (10)
Bending Moment, N•m (lb-ft)	13.0 (9.6)
Flat Plate Crush Strength, N/mm (lb/in)	14 (80)
Tensile Strength, N (lb)	1440 (324)
Recommended / Maximum Clamp Spacing, m (ft)	0.8 / 1.0 (2.75 / 3.25)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 1
Velocity, percent	90
Capacitance, pF/m (pF/ft)	74.0 (22.5)
Inductance, µH/m (µH/ft)	0.185 (0.056)
Maximum Frequency, GHz	5
Peak Power Rating, kW	85
RF Peak Voltage, Volts	2910
Jacket Spark, Volt RMS	8000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	1.27 (0.39)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	1.05 (0.32)

See Installation, Operation and Storage Temperatures on page 28.
For premium return loss codes see page 29.

CONNECTORS AND ACCESSORIES	
Connectors	See pages 70-77
Jumpers	See pages 82-87
Accessories	See pages 97-102
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

LCF78-50JA/JFNA ATTENUATION AND AVERAGE POWER			
Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.0780	0.0238	85.0
1.0	0.110	0.0337	85.0
1.5	0.135	0.0413	77.1
2.0	0.157	0.0477	66.8
10	0.353	0.107	29.7
20	0.501	0.153	20.9
30	0.616	0.188	17.0
50	0.801	0.244	13.1
88	1.07	0.327	9.75
100	1.15	0.349	9.12
108	1.19	0.363	8.76
150	1.42	0.431	7.38
174	1.53	0.466	6.83
200	1.65	0.502	6.35
300	2.04	0.622	5.12
400	2.38	0.726	4.39
450	2.54	0.773	4.12
500	2.69	0.819	3.89
512	2.72	0.829	3.84
600	2.97	0.904	3.52
700	3.23	0.983	3.24
800	3.47	1.06	3.01
824	3.53	1.08	2.96
894	3.69	1.13	2.83
900	3.71	1.13	2.82
925	3.76	1.15	2.78
960	3.84	1.17	2.72
1000	3.93	1.20	2.66
1250	4.45	1.36	2.35
1500	4.94	1.50	2.12
1700	5.30	1.62	1.97
1800	5.48	1.67	1.91
2000	5.82	1.77	1.80
2100	5.99	1.83	1.75
2200	6.15	1.88	1.70
2400	6.47	1.97	1.62
3000	7.38	2.25	1.42
3500	8.09	2.46	1.29
4000	8.76	2.67	1.19
4900	9.91	3.02	1.06
5000	10.0	3.06	1.04

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 100° C (212° F). No solar loading.

ORDERING INFORMATION	
Model Number	**Jacket**
LCF78-50JA-P*	Standard
LCF78-50JFNA-P*	Flame Retardant
LCF78-50JAGR	Standard, Gray

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LCF78-50A Series
7/8" Premium Attenuation Low-Loss Foam Coax

APPLICATIONS

Main feed line, Riser-rated In-Building (JFN types, only)

GENERAL INFORMATION	
Cable Type	Foam-Dielectric, Corrugated
Size	7/8"
STRUCTURE	
Inner Conductor Material	Copper Tube
Diameter Inner Conductor, mm (in)	9.3 (0.37)
Diameter Dielectric, mm (in)	21.5 (0.85)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	25.2 (0.99)
Diameter over Jacket Nominal, mm (in)	27.8 (1.09)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	0.51 (0.34)
Minimum Bending Radius, Single Bend, mm (in)	120 (5)
Minimum Bending Radius, Repeated Bends, mm (in)	250 (10)
Bending Moment, N•m (lb-ft)	13.0 (9.6)
Flat Plate Crush Strength, N/mm (lb/in)	14 (80)
Tensile Strength, N (lb)	1440 (324)
Recommended / Maximum Clamp Spacing, m (ft)	0.8 / 1.0 (2.75 / 3.25)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 1
Velocity, percent	90
Capacitance, pF/m (pF/ft)	74.0 (22.5)
Inductance, µH/m (µH/ft)	0.185 (0.056)
Maximum Frequency, GHz	5
Peak Power Rating, kW	85
RF Peak Voltage, Volts	2920
Jacket Spark, Volt RMS	8000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	1.27 (0.39)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	1.05 (0.32)

See Installation, Operation and Storage Temperatures on page 28.
For premium return loss codes see page 29.

LCF78-50JA/JFNA PREMIUM ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.0780	0.0238	85.0
1.0	0.110	0.0336	85.0
1.5	0.135	0.0412	73.5
2.0	0.156	0.0476	63.6
10	0.351	0.107	28.3
20	0.498	0.152	20.0
30	0.612	0.186	16.3
50	0.793	0.242	12.5
88	1.06	0.323	9.39
100	1.13	0.345	8.79
108	1.18	0.359	8.45
150	1.39	0.425	7.13
174	1.50	0.459	6.61
200	1.62	0.493	6.15
300	2.00	0.609	4.98
400	2.32	0.708	4.28
450	2.47	0.753	4.02
500	2.61	0.796	3.81
512	2.65	0.806	3.76
600	2.88	0.877	3.46
700	3.12	0.952	3.18
800	3.36	1.02	2.96
824	3.41	1.04	2.92
894	3.56	1.09	2.79
900	3.57	1.09	2.78
925	3.63	1.11	2.74
960	3.70	1.13	2.69
1000	3.78	1.15	2.63
1250	4.27	1.30	2.33
1500	4.72	1.44	2.11
1700	5.05	1.54	1.97
1800	5.21	1.59	1.91
2000	5.53	1.68	1.80
2100	5.68	1.73	1.75
2200	5.83	1.78	1.71
2400	6.12	1.86	1.63
3000	6.94	2.11	1.43
3500	7.57	2.31	1.31
4000	8.17	2.49	1.22
4900	9.19	2.80	1.08
5000	9.30	2.83	1.07

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 100° C (212° F). No solar loading.

CONNECTORS AND ACCESSORIES

Connectors	See pages 70-77
Jumpers	See pages 82-87
Accessories	See pages 97-102
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

ORDERING INFORMATION

Model Number	Jacket
LCF78-50JA-A*	Standard
LCF78-50JFNA-A*	Flame Retardant

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CELLFLEX® Cable

LCFS114-50A Series
1-1/4" Low-Loss Foam Coax

APPLICATIONS
Main feed line, Riser-rated In-Building (JFN types, only)

GENERAL INFORMATION	
Cable Type	Foam-Dielectric, Corrugated
Size	1-1/4"
STRUCTURE	
Inner Conductor Material	Copper Tube
Diameter Inner Conductor, mm (in)	13.1 (0.52)
Diameter Dielectric, mm (in)	31.2 (1.23)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	36.0 (1.42)
Diameter over Jacket Nominal, mm (in)	39.0 (1.54)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	0.86 (0.58)
Minimum Bending Radius, Single Bend, mm (in)	200 (8)
Minimum Bending Radius, Repeated Bends, mm (in)	380 (15)
Bending Moment, N•m (lb-ft)	35.0 (26.0)
Flat Plate Crush Strength, N/mm (lb/in)	24 (137)
Tensile Strength, N (lb)	2490 (560)
Recommended / Maximum Clamp Spacing, m (ft)	1.0 / 1.2 (3.25 / 4.0)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 1
Velocity, percent	90
Capacitance, pF/m (pF/ft)	74.0 (22.5)
Inductance, µH/m (µH/ft)	0.185 (0.056)
Maximum Frequency, GHz	3.6
Peak Power Rating, kW	176
RF Peak Voltage, Volts	4200
Jacket Spark, Volt RMS	10000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	0.78 (0.24)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	0.67 (0.20)

See Installation, Operation and Storage Temperatures on page 28.
For premium return loss codes see page 29.

CONNECTORS AND ACCESSORIES	
Connectors	See pages 70-77
Jumpers	See pages 82-87
Accessories	See pages 97-102
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

LCFS114-50JA/JFNA ATTENUATION AND AVERAGE POWER			
Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.0558	0.0170	176
1.0	0.0791	0.0241	134
1.5	0.0970	0.0296	109
2.0	0.112	0.0342	94.4
10	0.253	0.0772	41.8
20	0.361	0.110	29.4
30	0.444	0.135	23.8
50	0.579	0.176	18.3
88	0.777	0.237	13.6
100	0.831	0.253	12.7
108	0.866	0.264	12.2
150	1.03	0.314	10.3
174	1.12	0.340	9.49
200	1.20	0.366	8.80
300	1.50	0.456	7.07
400	1.75	0.534	6.04
450	1.87	0.570	5.66
500	1.98	0.605	5.33
512	2.01	0.613	5.26
600	2.20	0.670	4.82
700	2.40	0.731	4.42
800	2.59	0.788	4.09
824	2.63	0.802	4.02
894	2.76	0.840	3.84
900	2.77	0.843	3.83
925	2.81	0.856	3.77
960	2.87	0.875	3.69
1000	2.94	0.896	3.60
1250	3.35	1.02	3.16
1500	3.72	1.14	2.84
1700	4.01	1.22	2.64
1800	4.15	1.27	2.55
2000	4.42	1.35	2.39
2100	4.55	1.39	2.32
2200	4.68	1.43	2.26
2400	4.94	1.51	2.14
3000	5.66	1.73	1.87
3300	6.01	1.83	1.76

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 100° C (212° F). No solar loading.

ORDERING INFORMATION	
Model Number	**Jacket**
LCFS114-50JA-P*	Standard
LCFS114-50JFNA-P*	Flame Retardant
LCFS114-50JAGR	Standard, Gray

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LCFS114-50A Series
1-1/4" Premium Attenuation Low-Loss Foam Coax

APPLICATIONS

Main feed line, Riser-rated In-Building (JFN types, only)

GENERAL INFORMATION	
Cable Type	Foam-Dielectric, Corrugated
Size	1-1/4"
STRUCTURE	
Inner Conductor Material	Copper Tube
Diameter Inner Conductor, mm (in)	13.1 (0.52)
Diameter Dielectric, mm (in)	31.2 (1.23)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	36.0 (1.42)
Diameter over Jacket Nominal, mm (in)	39.0 (1.54)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	0.86 (0.58)
Minimum Bending Radius, Single Bend, mm (in)	200 (8)
Minimum Bending Radius, Repeated Bends, mm (in)	380 (15)
Bending Moment, N•m (lb-ft)	35.0 (26.0)
Flat Plate Crush Strength, N/mm (lb/in)	24 (137)
Tensile Strength, N (lb)	2490 (560)
Recommended / Maximum Clamp Spacing, m (ft)	1.0 / 1.2 (3.25 / 4.0)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 1
Velocity, percent	90
Capacitance, pF/m (pF/ft)	74.0 (22.5)
Inductance, µH/m (µH/ft)	0.185 (0.056)
Maximum Frequency, GHz	3.6
Peak Power Rating, kW	181
RF Peak Voltage, Volts	4200
Jacket Spark, Volt RMS	10000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	0.78 (0.24)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	0.67 (0.20)

See Installation, Operation and Storage Temperatures on page 28.
For premium return loss codes see page 29.

LCFS114-50JA/JFNA PREMIUM ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.056	0.017	181
1.0	0.079	0.024	140
1.5	0.097	0.030	114
2.0	0.112	0.034	98.6
10	0.252	0.077	43.7
20	0.359	0.109	30.7
30	0.442	0.135	25.0
50	0.574	0.175	19.2
88	0.770	0.235	14.3
100	0.823	0.251	13.4
108	0.857	0.261	12.9
150	1.02	0.310	10.8
174	1.10	0.336	10.0
200	1.19	0.361	9.31
300	1.47	0.449	7.50
400	1.72	0.524	6.42
450	1.83	0.559	6.02
500	1.94	0.592	5.68
512	1.97	0.599	5.61
600	2.15	0.654	5.14
700	2.34	0.712	4.72
800	2.52	0.767	4.38
824	2.56	0.780	4.31
894	2.68	0.816	4.12
900	2.69	0.819	4.10
925	2.73	0.832	4.04
960	2.79	0.850	3.96
1000	2.85	0.870	3.87
1250	3.24	0.987	3.41
1500	3.87	1.18	2.85
1900	4.12	1.26	2.68
2000	4.25	1.30	2.60
2200	4.49	1.37	2.45
2500	4.85	1.48	2.28
3000	5.41	1.65	2.04
3300	5.73	1.75	1.93

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 100° C (212° F). No solar loading.

CONNECTORS AND ACCESSORIES

Connectors	See pages 70-77
Jumpers	See pages 82-87
Accessories	See pages 97-102
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

ORDERING INFORMATION

Model Number	Jacket
LCFS114-50JA-A*	Standard
LCFS114-50JFNA-A*	Flame Retardant
LCFS114-50JAGR-A*	Standard, Gray

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LCF158-50A Series
1-5/8" Low-Loss Foam Coax

APPLICATIONS
Main feed line, Riser-rated In-Building (JFN types, only)

GENERAL INFORMATION	
Cable Type	Foam-Dielectric, Corrugated
Size	1-5/8"
STRUCTURE	
Inner Conductor Material	Corrugated Copper Tube
Diameter Inner Conductor, mm (in)	17.6 (0.69)
Diameter Dielectric, mm (in)	40.9 (1.61)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	46.5 (1.83)
Diameter over Jacket Nominal, mm (in)	50.3 (1.98)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	1.19 (0.80)
Minimum Bending Radius, Single Bend, mm (in)	200 (8)
Minimum Bending Radius, Repeated Bends, mm (in)	500 (20)
Bending Moment, N•m (lb-ft)	46.0 (34.0)
Flat Plate Crush Strength, N/mm (lb/in)	25 (143)
Tensile Strength, N (lb)	2500 (562)
Recommended / Maximum Clamp Spacing, m (ft)	1.2 / 1.5 (4.0 / 5.0)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 1
Velocity, percent	90
Capacitance, pF/m (pF/ft)	74.0 (22.5)
Inductance, µH/m (µH/ft)	0.190 (0.058)
Maximum Frequency, GHz	2.75
Peak Power Rating, kW	310
RF Peak Voltage, Volts	5600
Jacket Spark, Volt RMS	10000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	1.26 (0.38)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	0.47 (0.14)

See Installation, Operation and Storage Temperatures on page 28.
For premium return loss codes see page 29.

CONNECTORS AND ACCESSORIES	
Connectors	See pages 70-77
Jumpers	See pages 82-87
Accessories	See pages 97-102
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

LCF158-50JA/JFNA ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.0436	0.0133	266
1.0	0.0618	0.0188	188
1.5	0.0758	0.0231	153
2.0	0.0877	0.0267	133
10	0.199	0.0605	58.5
20	0.283	0.0864	41.0
30	0.350	0.107	33.2
50	0.456	0.139	25.5
88	0.615	0.187	18.9
100	0.658	0.201	17.6
108	0.686	0.209	16.9
150	0.819	0.250	14.2
174	0.888	0.271	13.1
200	0.958	0.292	12.1
300	1.20	0.365	9.70
400	1.41	0.429	8.26
450	1.50	0.458	7.72
500	1.60	0.487	7.27
512	1.62	0.493	7.18
600	1.77	0.540	6.55
700	1.94	0.591	5.99
800	2.10	0.639	5.54
824	2.13	0.650	5.45
894	2.24	0.682	5.19
900	2.25	0.684	5.17
925	2.28	0.696	5.09
960	2.33	0.711	4.98
1000	2.39	0.728	4.86
1250	2.73	0.833	4.25
1500	3.05	0.93	3.81
1700	3.29	1.00	3.53
1800	3.41	1.04	3.40
2000	3.64	1.11	3.19
2100	3.76	1.14	3.09
2200	3.87	1.18	3.00
2400	4.09	1.25	2.84
2750	4.45	1.36	2.61

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 100° C (212° F). No solar loading.

ORDERING INFORMATION

Model Number	Jacket
LCF158-50JA-P*	Standard
LCF158-50JFNA-P*	Flame Retardant

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LCF158-50A Series
1-5/8" Premium Attenuation Low-Loss Foam Coax

APPLICATIONS
Main feed line, Riser-rated In-Building (JFN types, only)

GENERAL INFORMATION	
Cable Type	Foam-Dielectric, Corrugated
Size	1-5/8"
STRUCTURE	
Inner Conductor Material	Corrugated Copper Tube
Diameter Inner Conductor, mm (in)	17.6 (0.69)
Diameter Dielectric, mm (in)	40.9 (1.61)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	46.5 (1.83)
Diameter over Jacket Nominal, mm (in)	50.3 (1.98)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	1.19 (0.80)
Minimum Bending Radius, Single Bend, mm (in)	200 (8)
Minimum Bending Radius, Repeated Bends, mm (in)	500 (20)
Bending Moment, N•m (lb-ft)	46.0 (34.0)
Flat Plate Crush Strength, N/mm (lb/in)	25 (143)
Tensile Strength, N (lb)	2500 (562)
Recommended / Maximum Clamp Spacing, m (ft)	1.2 / 1.5 (4.0 / 5.0)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 1
Velocity, percent	90
Capacitance, pF/m (pF/ft)	74.0 (22.5)
Inductance, µH/m (µH/ft)	0.185 (0.056)
Maximum Frequency, GHz	2.75
Peak Power Rating, kW	310
RF Peak Voltage, Volts	5600
Jacket Spark, Volt RMS	10000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	1.26 (0.38)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	0.47 (0.14)

See Installation, Operation and Storage Temperatures on page 28.
For premium return loss codes see page 29.

LCF158-50JA/JFNA PREMIUM ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.0435	0.0133	258
1.0	0.0617	0.0188	182
1.5	0.0756	0.0230	148
2.0	0.0874	0.0266	128
10	0.197	0.0601	56.9
20	0.281	0.0855	40.0
30	0.345	0.105	32.5
50	0.449	0.137	25.0
88	0.603	0.184	18.6
100	0.644	0.196	17.4
108	0.671	0.204	16.7
150	0.798	0.243	14.1
174	0.863	0.263	13.0
200	0.929	0.283	12.1
300	1.15	0.352	9.71
400	1.35	0.412	8.30
450	1.44	0.439	7.79
500	1.53	0.465	7.35
512	1.55	0.471	7.25
600	1.69	0.514	6.64
700	1.84	0.560	6.10
800	1.98	0.604	5.66
824	2.01	0.614	5.56
894	2.11	0.643	5.31
900	2.12	0.645	5.29
925	2.15	0.656	5.21
960	2.20	0.669	5.10
1000	2.25	0.685	4.99
1250	2.55	0.778	4.39
1500	2.84	0.865	3.95
1700	3.05	0.931	3.67
1800	3.16	0.96	3.55
2000	3.36	1.02	3.34
2100	3.46	1.05	3.24
2200	3.56	1.08	3.15
2400	3.74	1.14	2.99
2750	4.06	1.24	2.76

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 100° C (212° F). No solar loading.

CONNECTORS AND ACCESSORIES

Connectors	See pages 70-77
Jumpers	See pages 82-87
Accessories	See pages 97-102
Coaxial Devices	See pages 106-108
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ORDERING INFORMATION

Model Number	Jacket
LCF158-50JA-A*	Standard
LCF158-50JFNA-A*	Flame Retardant

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CELLFLEX® Cable

LCF214-50A Series
2-1/4" Low-Loss Foam Coax

APPLICATIONS
Main feed line, Riser-rated In-Building (JFN types, only)

GENERAL INFORMATION	
Cable Type	Foam-Dielectric, Corrugated
Size	2-1/4"
STRUCTURE	
Inner Conductor Material	Corrugated Copper Tube
Diameter Inner Conductor, mm (in)	20.8 (0.82)
Diameter Dielectric, mm (in)	49.0 (1.93)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	56.1 (2.21)
Diameter over Jacket Nominal, mm (in)	59.9 (2.36)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	1.70 (1.14)
Minimum Bending Radius, Single Bend, mm (in)	280 (11)
Minimum Bending Radius, Repeated Bends, mm (in)	560 (22)
Bending Moment, N•m (lb-ft)	81.0 (60.0)
Flat Plate Crush Strength, N/mm (lb/in)	27.6 (150)
Tensile Strength, N (lb)	2610 (587)
Recommended / Maximum Clamp Spacing, m (ft)	1.5 / 2.0 (5.0 / 6.6)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 1
Velocity, percent	88
Capacitance, pF/m (pF/ft)	75.0 (22.9)
Inductance, µH/m (µH/ft)	0.190 (0.058)
Maximum Frequency, GHz	2.2
Peak Power Rating, kW	425
RF Peak Voltage, Volts	6520
Jacket Spark, Volt RMS	10000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	0.92 (0.28)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	0.31 (0.09)

See Installation, Operation and Storage Temperatures on page 28.
For premium return loss codes see page 29.

CONNECTORS AND ACCESSORIES	
Connectors	See pages 70-77
Jumpers	See pages 82-87
Accessories	See pages 97-102
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

LCF214-50JA/JFNA ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.0369	0.0112	321
1.0	0.0523	0.0160	226
1.5	0.0642	0.0196	184
2.0	0.0743	0.0226	159
10	0.169	0.0514	70.2
20	0.241	0.0736	49.1
30	0.298	0.0909	39.7
50	0.390	0.119	30.3
88	0.528	0.161	22.4
100	0.566	0.172	20.9
108	0.590	0.180	20.1
150	0.706	0.215	16.8
174	0.766	0.233	15.5
200	0.827	0.252	14.3
300	1.04	0.317	11.4
400	1.23	0.373	9.66
450	1.31	0.400	9.03
500	1.39	0.425	8.49
512	1.41	0.431	8.37
600	1.55	0.473	7.63
700	1.70	0.519	6.96
800	1.84	0.562	6.42
824	1.88	0.572	6.31
894	1.97	0.601	6.01
900	1.98	0.603	5.98
925	2.01	0.613	5.88
960	2.06	0.627	5.75
1000	2.11	0.643	5.61
1250	2.42	0.738	4.89
1500	2.71	0.827	4.36
1700	2.94	0.895	4.03
1800	3.05	0.929	3.89
2000	3.26	0.99	3.63
2100	3.36	1.03	3.52
2200	3.47	1.06	3.42

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 100° C (212° F). No solar loading.

ORDERING INFORMATION	
Model Number	**Jacket**
LCF214-50JA-P*	Standard
LCF214-50JFNA-P*	Flame Retardant

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RG Type Cable

RF174 Coax Braided Cable

APPLICATIONS
OEM jumpers, BTS inter-cabinet connections

GENERAL INFORMATION	
Cable Type	PE-Dielectric, Braid Shield
Size	5/64"
STRUCTURE	
Jacket	PVC
Inner Conductor Material	Stranded Copper Wire 7x0.16mm (7x0.0063in)
Diameter Inner Conductor, mm (in)	0.48 (0.019)
Diameter Dielectric, mm (in)	1.5 (0.06)
Outer Conductor Material	Tinned copper braid with 85% of coverage
Diameter Copper Outer Conductor, mm (in)	1.91 (0.07)
Diameter over Jacket Nominal, mm (in)	2.7 (0.11)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	0.012 (0.008)
Minimum Bending Radius, Single Bend, mm (in)	14 (0.55)
Minimum Bending Radius, Repeated Bends, mm (in)	42 (1.65)

ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 2
Velocity, percent	66
Capacitance, pF/m (pF/ft)	100 (30.5)
Inductance, µH/m (µH/ft)	0.25 (0.076)
Maximum Frequency, GHz	2.4
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	122 (37.2)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	36 (11)

See Installation, Operation and Storage Temperatures on page 28.

RF174-50JF ATTENUATION		
Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft
0.5	2.90	0.884
1.0	4.00	1.22
5.0	8.20	2.50
10	8.90	2.71
20	11.7	3.57
30	14.0	4.27
50	18.0	5.49
88	24.7	7.53
100	26.0	7.92
108	27.3	8.32
150	33.8	10.3
174	36.4	11.1
200	38.9	11.9
300	48.0	14.6
400	55.0	16.8
450	58.6	17.9
500	62.0	18.9
512	63.0	19.2
600	67.4	20.5
700	73.0	22.2
800	83.2	25.4
824	84.7	25.8
894	88.0	26.8
900	88.3	26.9
925	90.0	27.4
960	92.0	28.0
1000	93.0	28.3
1250	106	32.3
1500	114	34.7
1700	122	37.2
1800	126	38.4
2000	134	40.8
2400	150	45.7

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).

CONNECTORS AND ACCESSORIES	
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Accessories	See pages 88-105
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

ORDERING INFORMATION	
Model Number	**Jacket**
RF174-50JF	Standard

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RG Type Cable

RG58 Coax Braided Cable

APPLICATIONS

OEM jumpers, BTS inter-cabinet connections

GENERAL INFORMATION	
Cable Type	PE-Dielectric, Braid Shield
Size	9/64"
STRUCTURE	
Jacket	PVC
Inner Conductor Material	Stranded Tinned Wire 19x0.18mm (19x0.007in)
Diameter Inner Conductor, mm (in)	0.9 (0.035)
Diameter Dielectric, mm (in)	2.9 (0.11)
Outer Conductor Material	Tinned copper braid with 96% of coverage
Diameter Copper Outer Conductor, mm (in)	3.55 (0.14)
Diameter over Jacket Nominal, mm (in)	5.0 (0.197)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	0.037 (0.024)
Minimum Bending Radius, Single Bend, mm (in)	25.4 (1)
Minimum Bending Radius, Repeated Bends, mm (in)	100 (3.94)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 2
Velocity, percent	66
Capacitance, pF/m (pF/ft)	101 (30.8)
Inductance, µH/m (µH/ft)	0.253 (0.077)
Maximum Frequency, GHz	2.4
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	39 (11.89)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	15 (4.6)

See Installation, Operation and Storage Temperatures on page 28.

RG58-50JF ATTENUATION

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft
0.5	1.30	0.396
1.0	1.60	0.488
5.0	3.40	1.04
10	4.80	1.46
20	6.80	2.07
30	8.50	2.59
50	10.9	3.32
88	14.7	4.48
100	15.6	4.75
108	16.2	4.94
150	19.2	5.85
174	22.4	6.83
200	24.0	7.31
300	29.0	8.84
400	34.0	10.4
450	36.2	11.0
500	40.0	12.2
512	40.5	12.3
600	42.8	13.0
700	49.0	14.9
800	50.0	15.2
824	51.0	15.5
894	56.8	17.3
900	57.0	17.4
925	58.6	17.9
960	59.0	18.0
1000	61.0	18.6
1250	70.0	21.3
1500	80.4	24.5
1700	89.4	27.2
1800	92.0	28.0
2000	100	30.5
2400	116	35.4

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).

CONNECTORS AND ACCESSORIES

Connectors	See page 78
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Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

ORDERING INFORMATION

Model Number	Jacket
RG58-50JF	Standard

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RG Type Cable

RG223 Coax Braided Cable

APPLICATIONS
OEM jumpers, BTS inter-cabinet connections

GENERAL INFORMATION	
Cable Type	PE-Dielectric, Double Braid Shield
Size	5/32"

STRUCTURE	
Jacket	PVC
Inner Conductor Material	Silver Plated Copper-Wire
Diameter Inner Conductor, mm (in)	0.9 (0.035)
Diameter Dielectric, mm (in)	2.96 (0.117)
Outer Conductor Material	1st shield: Silver plated copper braid with 96% of coverage; 2nd shield: Silver plated copper braid with 94% of coverage
Diameter Copper Outer Conductor, mm (in)	4.1 (0.16)
Diameter over Jacket Nominal, mm (in)	5.4 (0.213)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	0.055 (0.121)
Minimum Bending Radius, Single Bend, mm (in)	30 (1.18)
Minimum Bending Radius, Repeated Bends, mm (in)	55 (2.165)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 2
Velocity, percent	66
Capacitance, pF/m (pF/ft)	94.8 (28.9)
Inductance, µH/m (µH/ft)	0.237 (0.072)
Maximum Frequency, GHz	6.0
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	29 (8.84)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	7.5 (2.29)

See Installation, Operation and Storage Temperatures on page 28.

RG223-50JF ATTENUATION		
Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft
300	24.8	7.56
600	36.4	11.1
900	45.9	14.0
1200	54.3	16.5
1500	61.9	18.9
1800	69.0	21.0
2100	75.7	23.1
2400	82.2	25.0
2700	88.3	26.9
3000	94.3	28.7
3300	100	30.5
3600	106	32.2
3900	111	33.9
4200	117	35.5
4500	122	37.2
4800	127	38.7
5100	132	40.3
5400	137	41.8
5700	142	43.3
6000	147	44.8

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).

CONNECTORS AND ACCESSORIES	
Connectors	See page 78
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ORDERING INFORMATION	
Model Number	**Jacket**
RG223-50JF	Standard

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RG Type Cable

RG213 Coax Braided Cable

APPLICATIONS
OEM jumpers, BTS inter-cabinet connections, GPS lines, Microwave IF cabling

GENERAL INFORMATION	
Cable Type	PE-Dielectric, Braid Shield
Size	5/16"

STRUCTURE	
Jacket	PVC
Inner Conductor Material	Stranded Tinned Wire 7x0.75mm (7x0.03in)
Diameter Inner Conductor, mm (in)	2.26 (0.09)
Diameter Dielectric, mm (in)	7.25 (0.28)
Outer Conductor Material	Tinned copper braid with 96% of coverage
Diameter Copper Outer Conductor, mm (in)	8.11 (0.32)
Diameter over Jacket Nominal, mm (in)	10.31 (0.41)

MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	0.155 (0.103)
Minimum Bending Radius, Single Bend, mm (in)	50.0 (1.97)
Minimum Bending Radius, Repeated Bends, mm (in)	205 (8.0)

ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 2
Velocity, percent	66
Capacitance, pF/m (pF/ft)	101 (30.8)
Inductance, µH/m (µH/ft)	0.253 (0.077)
Maximum Frequency, GHz	2.0
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	5.8 (1.76)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	4.1 (1.25)

See Installation, Operation and Storage Temperatures on page 28.

RG213-50JF ATTENUATION		
Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft
0.5	0.450	0.137
1.0	0.630	0.192
1,5	0.770	0.235
10	2.00	0.610
30	3.60	1.10
50	4.60	1.40
100	6.90	2.10
200	10.2	3.11
400	15.2	4.63
600	18.1	5.52
800	23.0	7.01
1000	27.3	8.32
2000	40.0	12.2

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).

CONNECTORS AND ACCESSORIES	
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Accessories	See pages 88-105
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ORDERING INFORMATION	
Model Number	**Jacket**
RG213-50JF	Standard

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RG Type Cable

RG214 Coax Braided Cable

APPLICATIONS	
OEM jumpers, BTS inter-cabinet connections, GPS lines, Microwave IF cabling	
GENERAL INFORMATION	
Cable Type	PE-Dielectric, Double Braid Shield
Size	3/8"
STRUCTURE	
Jacket	PVC
Inner Conductor Material	Stranded Silver Plated Wire 7x0.75mm (7x0.03in)
Diameter Inner Conductor, mm (in)	2.25 (0.089)
Diameter Dielectric, mm (in)	7.28 (0.287)
Outer Conductor Material	1st shield: Silver plated copper braid with 93% of coverage; 2nd shield: Silver plated copper braid with 95% of coverage
Diameter Copper Outer Conductor, mm (in)	8.7 (0.343)
Diameter over Jacket Nominal, mm (in)	10.8 (0.425)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	0.185 (0.408)
Minimum Bending Radius, Single Bend, mm (in)	55.0 (2.165)
Minimum Bending Radius, Repeated Bends, mm (in)	110 (4.33)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 2
Velocity, percent	66
Capacitance, pF/m (pF/ft)	101 (30.8)
Inductance, µH/m (µH/ft)	0.253 (0.077)
Maximum Frequency, GHz	6.0
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	

See Installation, Operation and Storage Temperatures on page 28.

RG214-50JF ATTENUATION		
Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft
300	12.0	3.66
600	19.0	5.79
900	24.0	7.31
1200	29.0	8.84
1500	33.0	10.1
1800	37.0	11.3
2100	41.0	12.5
2400	45.0	13.7
2700	49.0	14.9
3000	52.0	15.8
3300	56.0	17.1
3600	60.0	18.3
3900	63.0	19.2
4200	66.0	20.1
4500	70.0	21.3
4800	73.0	22.2
5100	76.0	23.2
5400	79.0	24.1
5700	83.0	25.3
6000	86.0	26.2

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).

CONNECTORS AND ACCESSORIES	
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ORDERING INFORMATION	
Model Number	**Jacket**
RG214-50JF	Standard

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RG Type Cable

RGC58 Foam-Dielectric Coax Braided Cable

APPLICATIONS
OEM jumpers, BTS inter-cabinet connections

GENERAL INFORMATION	
Cable Type	Foam-Dielectric, Braid/Foil Shield
Size	9/64"
STRUCTURE	
Jacket	PE
Inner Conductor Material	Copper Wire
Diameter Inner Conductor, mm (in)	1.06 (0.040)
Diameter Dielectric, mm (in)	2.95 (0.117)
Outer Conductor Material	1st shield: Al/PET foil bonded to the core with 100% of coverage; 2nd shield: Tinned copper braid with 75% of coverage
Diameter Copper Outer Conductor, mm (in)	3.60 (0.141)
Diameter over Jacket Nominal, mm (in)	5.0 (0.197)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	0.030 (0.020)
Minimum Bending Radius, Single Bend, mm (in)	25.4 (1)
Minimum Bending Radius, Repeated Bends, mm (in)	100 (3.94)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 2
Velocity, percent	82
Capacitance, pF/m (pF/ft)	82 (25.0)
Inductance, µH/m (µH/ft)	0.205 (0.062)
Maximum Frequency, GHz	2.4
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	21.5 (6.55)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	19.1 (5.8)

See Installation, Operation and Storage Temperatures on page 28.

RGC58-50J ATTENUATION		
Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft
0.5	1.00	0.305
1.0	1.30	0.396
5.0	2.80	0.853
10	3.70	1.13
20	4.70	1.43
30	5.70	1.74
50	7.30	2.22
88	9.80	2.99
100	10.4	3.17
108	10.9	3.32
150	13.0	3.96
174	14.0	4.27
200	15.0	4.57
300	18.4	5.61
400	21.2	6.46
450	22.6	6.89
500	23.8	7.25
512	24.0	7.31
600	26.0	7.92
700	28.9	8.81
800	30.8	9.39
824	32.2	9.81
894	33.5	10.2
900	33.7	10.3
925	34.0	10.4
960	34.7	10.6
1000	35.4	10.8
1250	42.0	12.8
1500	46.0	14.0
1700	49.0	14.9
1800	51.0	15.5
2000	55.0	16.8
2400	62.0	18.9

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).

CONNECTORS AND ACCESSORIES	
Connectors	See page 78
Accessories	See pages 88-105
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

ORDERING INFORMATION	
Model Number	**Jacket**
RGC58-50J	Standard

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RG Type Cable

RGC213 Foam-Dielectric Coax Braided Cable

APPLICATIONS	
OEM jumpers, BTS inter-cabinet connections, GPS lines, Microwave IF cabling	
GENERAL INFORMATION	
Cable Type	Foam-Dielectric, Braid/Foil Shield
Size	5/16"
STRUCTURE	
Jacket	PE
Inner Conductor Material	Copper Wire
Diameter Inner Conductor, mm (in)	2.55 (0.100)
Diameter Dielectric, mm (in)	7.25 (0.285)
Outer Conductor Material	1st shield: Al/PET foil bonded to the core with 100% of coverage; 2nd shield: Tinned copper braid with 75% of coverage
Diameter Copper Outer Conductor, mm (in)	8.14 (0.320)
Diameter over Jacket Nominal, mm (in)	10.34 (0.407)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	0.120 (0.080)
Minimum Bending Radius, Single Bend, mm (in)	50.0 (1.97)
Minimum Bending Radius, Repeated Bends, mm (in)	205 (8.07)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 2
Velocity, percent	82
Capacitance, pF/m (pF/ft)	82 (25.0)
Inductance, µH/m (µH/ft)	0.205 (0.062)
Maximum Frequency, GHz	3.0
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	3.5 (1.06)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	8.0 (2.43)

See Installation, Operation and Storage Temperatures on page 28.

RGC213-50J ATTENUATION		
Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft
0.5	0.555	0.169
1.0	0.784	0.239
1.5	0.841	0.256
2.0	0.971	0.296
10	1.57	0.479
20	2.05	0.625
30	2.38	0.725
50	2.97	0.905
88	3.86	1.18
100	4.15	1.26
108	4.34	1.32
150	5.20	1.58
174	5.63	1.72
200	6.10	1.86
300	7.63	2.33
400	8.96	2.73
450	9.53	2.90
500	10.0	3.05
512	10.2	3.11
600	11.2	3.41
700	12.2	3.72
800	13.2	4.02
824	13.4	4.08
894	13.9	4.24
900	14.0	4.27
925	14.3	4.36
960	14.6	4.45
1000	14.9	4.54
1250	16.9	5.15
1500	18.8	5.73
1700	20.2	6.16
1800	20.9	6.37
2000	22.3	6.80
2200	24.0	7.31
2300	24.6	7.50
3000	28.4	8.66

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).

CONNECTORS AND ACCESSORIES	
Connectors	See page 78
Accessories	See pages 88-105
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

ORDERING INFORMATION	
Model Number	**Jacket**
RGC213-50J	Standard

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RG Type Cable

RGC8 Foam-Dielectric Coax Braided Cable

APPLICATIONS

OEM jumpers, BTS inter-cabinet connections, GPS lines, Microwave IF cabling

GENERAL INFORMATION	
Cable Type	Foam-Dielectric, Braid/Foil Shield
Size	5/16"
STRUCTURE	
Jacket	PE
Inner Conductor Material	Copper Wire
Diameter Inner Conductor, mm (in)	2.74 (0.108)
Diameter Dielectric, mm (in)	7.37 (0.290)
Outer Conductor Material	1st shield: Al/PET foil bonded to the core with 100% of coverage; 2nd shield: Tinned copper braid with 88% of coverage
Diameter Copper Outer Conductor, mm (in)	8.13 (0.320)
Diameter over Jacket Nominal, mm (in)	10.24 (0.403)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	0.133 (0.088)
Minimum Bending Radius, Single Bend, mm (in)	25.4 (1)
Minimum Bending Radius, Repeated Bends, mm (in)	60 (2.36)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 2
Velocity, percent	85
Capacitance, pF/m (pF/ft)	78 (23.8)
Inductance, µH/m (µH/ft)	0.195 (0.059)
Maximum Frequency, GHz	3.0
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	3.0 (0.91)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	5.3 (1.62)

See Installation, Operation and Storage Temperatures on page 28.

RGC8-50J ATTENUATION

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft
0.5	0.363	0.111
1.0	0.453	0.138
1.5	0.623	0.190
2.0	0.802	0.244
10	1.50	0.457
20	2.12	0.646
30	2.46	0.750
50	3.10	0.945
88	3.85	1.17
100	4.08	1.24
108	4.22	1.29
150	4.88	1.49
174	5.23	1.59
200	5.61	1.71
300	6.95	2.12
400	8.09	2.47
450	8.65	2.64
500	9.13	2.78
512	9.24	2.82
600	10.1	3.08
700	10.9	3.32
800	11.8	3.60
824	12.0	3.66
894	12.5	3.81
900	12.6	3.84
925	12.8	3.90
960	13.0	3.96
1000	13.2	4.02
1250	14.9	4.54
1500	16.5	5.03
1700	17.7	5.39
1800	18.2	5.55
2000	19.4	5.91
2200	21.4	6.52
2300	21.8	6.64
3000	24.3	7.41

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).

CONNECTORS AND ACCESSORIES

Connectors	See page 78
Accessories	See pages 88-105
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

ORDERING INFORMATION

Model Number	Jacket
RGC8-50J	Standard

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HCA38-50 Series
3/8" Air Coax

APPLICATIONS
UHF, VHF, High Power (JFT types, only)

GENERAL INFORMATION	
Cable Type	Air-Dielectric, Corrugated
Size	3/8"
STRUCTURE	
Inner Conductor Material	Copper Wire
Diameter Inner Conductor, mm (in)	4.0 (0.16)
Diameter Dielectric, mm (in)	8.6 (0.34)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	12.4 (0.49)
Diameter over Jacket Nominal, mm (in)	13.9 (0.55)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	0.32 (0.215)
Minimum Bending Radius, Single Bend, mm (in)	50 (2)
Minimum Bending Radius, Repeated Bends, mm (in)	150 (6)
Tensile Strength, N (lb)	1000 (225)
Recommended / Maximum Clamp Spacing, m (ft)	0.5 / 0.5 (1.8 / 1.8)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 1
Velocity, percent	89
Capacitance, pF/m (pF/ft)	74.0 (22.6)
Inductance, µH/m (µH/ft)	0.185 (0.056)
Maximum Frequency, GHz	3
Peak Power Rating, kW	16.9
RF Peak Voltage, Volts	1300
Jacket Spark, Volt RMS	8000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	1.44 (0.44)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	1.63 (0.50)

See Installation, Operation and Storage Temperatures on page 28.

CONNECTORS AND ACCESSORIES	
Connectors	See pages 79-81
Jumpers	See pages 82-87
Accessories	See pages 103-105
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

ORDERING INFORMATION	
Model Number	**Jacket**
HCA38-50J	Standard
HCA38-50JB	Standard, Self-Healing
HCA38-50JT	Standard, High Power

HCA38-50J/JB ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.193	0.0587	16.90
1.0	0.272	0.0830	16.90
1.5	0.334	0.102	16.90
2.0	0.386	0.118	16.90
10	0.865	0.264	7.98
20	1.23	0.374	5.63
30	1.50	0.459	4.59
50	1.95	0.594	3.54
88	2.60	0.791	2.66
100	2.77	0.844	2.49
108	2.88	0.878	2.40
150	3.41	1.04	2.03
174	3.67	1.12	1.88
200	3.95	1.20	1.75
300	4.86	1.48	1.43
400	5.64	1.72	1.23
450	5.99	1.83	1.16
500	6.33	1.93	1.10
512	6.41	1.95	1.08
600	6.96	2.12	1.00
700	7.55	2.30	0.924
800	8.09	2.47	0.863
824	8.22	2.51	0.850
894	8.58	2.61	0.815
900	8.61	2.62	0.812
925	8.73	2.66	0.801
960	8.91	2.71	0.786
1000	9.10	2.77	0.769
1250	10.2	3.12	0.686
1500	11.3	3.44	0.625
1800	12.4	3.79	0.569
2000	13.2	4.01	0.539
2200	13.9	4.22	0.514
2300	14.2	4.33	0.502
3000	16.4	5.00	0.439

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 115° C (239° F). No solar loading.

HCA38-50JT ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.190	0.0578	16.9
1.0	0.268	0.0818	16.9
1.5	0.329	0.100	16.9
2.0	0.380	0.116	16.9
10	0.855	0.260	11.8
20	1.21	0.370	8.33
30	1.49	0.454	6.78
50	1.93	0.590	5.23
88	2.58	0.788	3.92
100	2.76	0.841	3.67
108	2.87	0.875	3.53
150	3.40	1.04	2.98
174	3.68	1.12	2.77
200	3.95	1.21	2.57
300	4.89	1.49	2.09
400	5.69	1.73	1.80
450	6.06	1.85	1.70
500	6.41	1.95	1.61
512	6.49	1.98	1.59
600	7.06	2.15	1.46
700	7.67	2.34	1.35
800	8.25	2.51	1.26
824	8.38	2.55	1.24
894	8.76	2.67	1.19
900	8.79	2.68	1.19
925	8.92	2.72	1.17
960	9.11	2.78	1.15
1000	9.31	2.84	1.13
1250	10.5	3.21	1.01
1500	11.6	3.55	0.920
1800	12.9	3.93	0.840
2000	13.7	4.16	0.798
2200	14.4	4.39	0.762
2300	14.8	4.51	0.745
3000	17.2	5.24	0.657

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 150° C (302° F). No solar loading.

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HCA12-50 Series
1/2" Air Coax

APPLICATIONS
Plenum In-Building only

GENERAL INFORMATION	
Cable Type	Air-Dielectric, Corrugated
Size	1/2"
STRUCTURE	
Inner Conductor Material	Copper-Clad Aluminum Wire
Diameter Inner Conductor, mm (in)	4.8 (0.19)
Diameter Dielectric, mm (in)	n/a
Outer Conductor Material	Annularly Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	14.0 (0.55)
Diameter over Jacket Nominal, mm (in)	15.7 (0.62)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	0.27 (0.18)
Minimum Bending Radius, Single Bend, mm (in)	120 (5)
Minimum Bending Radius, Repeated Bends, mm (in)	125 (5)
Tensile Strength, N (lb)	1112 (250)
Recommended / Maximum Clamp Spacing, m (ft)	0.5 / 0.9 (1.8 / 3.0)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 1
Velocity, percent	93
Capacitance, pF/m (pF/ft)	66.8 (20.4)
Inductance, µH/m (µH/ft)	0.191 (0.058)
Maximum Frequency, GHz	4
Peak Power Rating, kW	21.4
RF Peak Voltage, Volts	3000
Jacket Spark, Volt RMS	8000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	1.48 (0.45)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	1.90 (0.58)

See Installation, Operation and Storage Temperatures on page 28.

CONNECTORS AND ACCESSORIES	
Connectors	See pages 79-81
Jumpers	See pages 82-87
Accessories	See pages 103-105
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

HCA12-50JPL ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.141	0.0430	21.4
1.0	0.211	0.0640	21.4
1.5	0.254	0.0775	21.4
2.0	0.300	0.0910	21.4
10	0.675	0.206	21.4
20	0.961	0.293	16.4
30	1.18	0.360	13.3
50	1.36	0.414	11.8
60	1.53	0.466	10.3
88	2.05	0.627	7.66
100	2.19	0.670	7.16
108	2.28	0.697	6.89
150	2.68	0.817	6.07
160	2.71	0.828	5.80
174	2.93	0.895	5.36
200	3.15	0.963	4.98
300	3.90	1.19	4.03
400	4.56	1.39	3.45
450	4.85	1.48	3.24
500	5.24	1.60	3.00
512	5.32	1.62	2.80
600	5.67	1.73	2.77
700	6.16	1.88	2.55
800	6.66	2.03	2.36
824	6.75	2.06	2.33
894	7.08	2.16	2.22
900	7.11	2.17	2.23
925	7.21	2.20	2.20
960	7.34	2.24	2.14
1000	7.54	2.30	2.09
1250	8.53	2.60	1.85
1700	10.1	3.10	1.55
1800	10.5	3.20	1.46
2000	11.1	3.40	1.41
2200	11.7	3.58	1.35
2300	12.0	3.67	1.32
3000	14.1	4.32	1.11
4000	17.1	5.21	0.80

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20˚ C (68˚ F).
For average power: VSWR 1.0, ambient temperature 40˚ C (104˚F), inner conductor temperature 150° C (302° F). No solar loading.

ORDERING INFORMATION	
Model Number	**Jacket**
HCA12-50JPL	Plenum rated

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HCA58-50 Series
5/8" Air Coax

APPLICATIONS	
UHF, VHF	

GENERAL INFORMATION	
Cable Type	Air-Dielectric, Corrugated
Size	5/8"
STRUCTURE	
Inner Conductor Material	Copper Wire
Diameter Inner Conductor, mm (in)	6.3 (0.28)
Diameter Dielectric, mm (in)	13.7 (0.54)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	19.0 (0.75)
Diameter over Jacket Nominal, mm (in)	21.4 (0.84)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	0.70 (0.47)
Minimum Bending Radius, Single Bend, mm (in)	80 (3)
Minimum Bending Radius, Repeated Bends, mm (in)	250 (10)
Tensile Strength, N (lb)	2400 (540)
Recommended / Maximum Clamp Spacing, m (ft)	0.5 / 0.9 (1.8 / 3.0)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 0.5
Velocity, percent	92
Capacitance, pF/m (pF/ft)	72.0 (21.9)
Inductance, µH/m (µH/ft)	0.180 (0.055)
Maximum Frequency, GHz	3
Peak Power Rating, kW	32
RF Peak Voltage, Volts	1800
Jacket Spark, Volt RMS	8000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	0.57 (0.18)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	0.86 (0.28)

See Installation, Operation and Storage Temperatures on page 28.

HCA58-50J/JB ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.120	0.0366	32.0
1.0	0.170	0.0518	32.0
1.5	0.208	0.0634	32.0
2.0	0.240	0.0732	32.0
10	0.539	0.164	15.2
20	0.764	0.233	10.7
30	0.937	0.286	8.75
50	1.21	0.370	6.76
88	1.62	0.493	5.08
100	1.72	0.526	4.76
108	1.79	0.547	4.58
150	2.12	0.646	3.87
174	2.29	0.697	3.59
200	2.46	0.749	3.35
300	3.03	0.922	2.72
400	3.51	1.07	2.35
450	3.73	1.14	2.21
500	3.94	1.20	2.09
512	3.99	1.22	2.07
600	4.33	1.32	1.91
700	4.69	1.43	1.76
800	5.03	1.53	1.64
824	5.11	1.56	1.62
894	5.34	1.63	1.55
900	5.35	1.63	1.55
925	5.43	1.66	1.53
960	5.54	1.69	1.50
1000	5.66	1.73	1.47
1250	6.37	1.94	1.31
1500	7.01	2.14	1.19
1800	7.73	2.36	1.08
2000	8.18	2.49	1.03
2200	8.61	2.62	0.978
2300	8.82	2.69	0.956
3000	10.2	3.10	0.835

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 115° C (239° F). No solar loading.

CONNECTORS AND ACCESSORIES	
Connectors	See pages 79-81
Jumpers	See pages 82-87
Accessories	See pages 103-105
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

ORDERING INFORMATION

Model Number	Jacket
HCA58-50J	Standard
HCA58-50JB	Standard, Self-Healing

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HCA78-50 Series
7/8" Air Coax

APPLICATIONS

UHF, VHF, Plenum In-Building (JPL types, only)

GENERAL INFORMATION

Cable Type	Air-Dielectric, Corrugated
Size	7/8"

STRUCTURE

Inner Conductor Material	Copper Tube
Diameter Inner Conductor, mm (in)	9.0 (0.35)
Diameter Dielectric, mm (in)	20.2 (0.79)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	25.5 (1.00)
Diameter over Jacket Nominal, mm (in)	28.3 (1.11)

MECHANICAL SPECIFICATIONS

Cable Weight, kg/m (lb/ft)	0.68 (0.46)
Minimum Bending Radius, Single Bend, mm (in)	100 (4)
Minimum Bending Radius, Repeated Bends, mm (in)	250 (10)
Tensile Strength, N (lb)	1600 (360)
Recommended / Maximum Clamp Spacing, m (ft)	0.5 / 0.9 (1.8 / 3.0)

ELECTRICAL SPECIFICATIONS

Impedance, Ohm	50 +/- 0.5
Velocity, percent	93
Capacitance, pF/m (pF/ft)	71.0 (21.6)
Inductance, µH/m (µH/ft)	0.178 (0.054)
Maximum Frequency, GHz	3
Peak Power Rating, kW	73
RF Peak Voltage, Volts	2700
Jacket Spark, Volt RMS	8000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	1.02 (0.31)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	0.66 (0.20)

See Installation, Operation and Storage Temperatures on page 28.

CONNECTORS AND ACCESSORIES

Connectors	See pages 79-81
Jumpers	See pages 82-87
Accessories	See pages 103-105
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

ORDERING INFORMATION

Model Number	Jacket
HCA78-50J	Standard
HCA78-50JB	Standard, Self-Healing
HCA78-50JPL	Plenum rated
HCA78-50JT	Standard, High Power

HCA78-50J/JB/JPL ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.0813	0.0248	73.0
1.0	0.115	0.0351	73.0
1.5	0.141	0.0430	70.9
2.0	0.163	0.0497	61.4
10	0.366	0.112	27.3
20	0.520	0.158	19.3
30	0.638	0.194	15.7
50	0.827	0.252	12.1
88	1.10	0.337	9.07
100	1.18	0.359	8.50
108	1.23	0.374	8.17
150	1.45	0.443	6.91
174	1.57	0.478	6.40
200	1.69	0.514	5.96
300	2.08	0.634	4.83
400	2.42	0.738	4.17
450	2.57	0.785	3.92
500	2.72	0.830	3.71
512	2.76	0.840	3.67
600	3.00	0.914	3.38
700	3.25	0.992	3.12
800	3.49	1.07	2.91
824	3.55	1.08	2.86
894	3.71	1.13	2.74
900	3.72	1.13	2.73
925	3.78	1.15	2.70
960	3.85	1.17	2.64
1000	3.94	1.20	2.59
1250	4.45	1.36	2.31
1500	4.91	1.50	2.10
1800	5.43	1.65	1.91
2000	5.75	1.75	1.81
2200	6.07	1.85	1.72
2300	6.22	1.90	1.68
3000	7.22	2.20	1.47

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 115° C (239° F). No solar loading.

HCA78-50JT ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.0815	0.0248	73.0
1.0	0.115	0.0352	73.0
1.5	0.142	0.0431	73.0
2.0	0.164	0.0499	73.0
10	0.369	0.113	39.6
20	0.526	0.160	27.8
30	0.647	0.197	22.6
50	0.843	0.257	17.4
88	1.13	0.345	13.0
100	1.21	0.369	12.1
108	1.26	0.384	11.7
150	1.50	0.457	9.82
174	1.62	0.494	9.09
200	1.75	0.533	8.45
300	2.17	0.663	6.83
400	2.54	0.775	5.87
450	2.71	0.827	5.51
500	2.88	0.877	5.21
512	2.91	0.888	5.15
600	3.18	0.970	4.74
700	3.47	1.06	4.37
800	3.74	1.14	4.07
824	3.81	1.16	4.01
894	3.99	1.22	3.84
900	4.00	1.22	3.83
925	4.06	1.24	3.77
960	4.15	1.27	3.70
1000	4.25	1.30	3.62
1250	4.83	1.47	3.23
1500	5.38	1.64	2.94
1800	5.99	1.82	2.68
2000	6.37	1.94	2.54
2200	6.75	2.06	2.42
2300	6.93	2.11	2.37
3000	8.15	2.48	2.09

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 150° C (302° F). No solar loading.

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HCA118-50 Series
1-1/8" Air Coax

APPLICATIONS
UHF, VHF, Broadcast

GENERAL INFORMATION	
Cable Type	Air-Dielectric, Corrugated
Size	1-1/8"
STRUCTURE	
Inner Conductor Material	Copper Tube
Diameter Inner Conductor, mm (in)	12.0 (0.47)
Diameter Dielectric, mm (in)	27.2 (1.069)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	33.2 (1.30)
Diameter over Jacket Nominal, mm (in)	36.4 (1.43)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	1.10 (0.74)
Minimum Bending Radius, Single Bend, mm (in)	130 (5)
Minimum Bending Radius, Repeated Bends, mm (in)	400 (16)
Tensile Strength, N (lb)	2200 (495)
Recommended / Maximum Clamp Spacing, m (ft)	0.5 / 0.9 (1.8 / 3.0)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 0.5
Velocity, percent	92
Capacitance, pF/m (pF/ft)	73.0 (22.3)
Inductance, µH/m (µH/ft)	0.183 (0.056)
Maximum Frequency, GHz	3
Peak Power Rating, kW	137
RF Peak Voltage, Volts	3700
Jacket Spark, Volt RMS	8000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	0.64 (0.195)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	0.50 (0.152)

See Installation, Operation and Storage Temperatures on page 28.

CONNECTORS AND ACCESSORIES	
Connectors	See pages 79-81
Jumpers	See pages 82-87
Accessories	See pages 103-105
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

ORDERING INFORMATION	
Model Number	**Jacket**
HCA118-50J	Standard
HCA118-50JB	Standard, Self-Healing
HCA118-50JT	Standard, High Power

HCA118-50J/JB ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.0623	0.0190	137
1.0	0.0882	0.0269	125
1.5	0.108	0.0330	102
2.0	0.125	0.0381	88.1
10	0.281	0.0857	39.2
20	0.399	0.122	27.6
30	0.491	0.150	22.4
50	0.637	0.194	17.3
88	0.852	0.260	13.0
100	0.910	0.277	12.1
108	0.947	0.289	11.7
150	1.12	0.342	9.86
174	1.21	0.370	9.14
200	1.31	0.398	8.50
300	1.62	0.492	6.90
400	1.88	0.574	5.95
450	2.00	0.611	5.60
500	2.12	0.646	5.30
512	2.15	0.655	5.24
600	2.34	0.713	4.83
700	2.54	0.775	4.46
800	2.73	0.833	4.17
824	2.78	0.847	4.11
894	2.91	0.886	3.94
900	2.92	0.889	3.93
925	2.96	0.902	3.87
960	3.02	0.921	3.80
1000	3.09	0.942	3.72
1250	3.50	1.07	3.33
1500	3.87	1.18	3.04
1800	4.29	1.31	2.78
2000	4.55	1.39	2.64
2200	4.81	1.46	2.52
2300	4.93	1.50	2.46
3000	5.75	1.75	2.18

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 115° C (239° F). No solar loading.

HCA118-50JT ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.0625	0.0190	137
1.0	0.0885	0.0270	137
1.5	0.109	0.0331	137
2.0	0.126	0.0383	128
10	0.284	0.0866	56.7
20	0.405	0.123	39.8
30	0.500	0.152	32.3
50	0.652	0.199	24.8
88	0.877	0.267	18.5
100	0.939	0.286	17.3
108	0.978	0.298	16.6
150	1.17	0.356	13.9
174	1.26	0.385	12.9
200	1.36	0.416	12.0
300	1.70	0.519	9.65
400	2.00	0.609	8.28
450	2.13	0.651	7.77
500	2.27	0.691	7.35
512	2.30	0.700	7.26
600	2.51	0.766	6.67
700	2.75	0.837	6.14
800	2.97	0.904	5.72
824	3.02	0.920	5.64
894	3.16	0.965	5.40
900	3.18	0.968	5.38
925	3.23	0.984	5.30
960	3.30	1.01	5.20
1000	3.38	1.03	5.09
1250	3.86	1.18	4.53
1500	4.30	1.31	4.12
1800	4.81	1.47	3.76
2000	5.13	1.56	3.57
2200	5.44	1.66	3.40
2300	5.60	1.71	3.33
3000	6.62	2.02	2.93

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 150° C (302° F). No solar loading.

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HCA158-50 Series
1-5/8" Air Coax

APPLICATIONS

UHF, VHF, Broadcast, High Power (JFT types, only), Plenum In-Building (JPL types, only)

GENERAL INFORMATION

Cable Type	Air-Dielectric, Corrugated
Size	1-5/8"

STRUCTURE

Inner Conductor Material	Corrugated Copper Tube
Diameter Inner Conductor, mm (in)	18.6 (0.73)
Diameter Dielectric, mm (in)	39.8 (1.56)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	46.6 (1.83)
Diameter over Jacket Nominal, mm (in)	50.4 (1.984)

MECHANICAL SPECIFICATIONS

Cable Weight, kg/m (lb/ft)	1.30 (0.89)
Minimum Bending Radius, Single Bend, mm (in)	180 (7)
Minimum Bending Radius, Repeated Bends, mm (in)	550 (22)
Tensile Strength, N (lb)	1500 (337)
Recommended / Maximum Clamp Spacing, m (ft)	0.8 / 1.2 (2.75 / 4.0)

ELECTRICAL SPECIFICATIONS

Impedance, Ohm	50 +/- 0.5
Velocity, percent	95
Capacitance, pF/m (pF/ft)	70.0 (21.3)
Inductance, µH/m (µH/ft)	0.175 (0.053)
Maximum Frequency, GHz	3
Peak Power Rating, kW	270
RF Peak Voltage, Volts	5200
Jacket Spark, Volt RMS	8000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	1.06 (0.33)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	0.34 (0.11)

See Installation, Operation and Storage Temperatures on page 28.

CONNECTORS AND ACCESSORIES

Connectors	See pages 79-81
Jumpers	See pages 82-87
Accessories	See pages 103-105
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

ORDERING INFORMATION

Model Number	Jacket
HCA158-50J	Standard
HCA158-50JB	Standard, Self-Healing
HCA158-50JT	Standard, High Power
HCA158-50JPL	Plenum rated

HCA158-50J/JFN/JPL ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.0437	0.0133	270
1.0	0.0618	0.0188	196
1.5	0.0757	0.0231	160
2.0	0.0875	0.0267	138
10	0.197	0.0599	61.6
20	0.279	0.0850	43.4
30	0.342	0.104	35.4
50	0.444	0.135	27.3
88	0.592	0.180	20.5
100	0.632	0.193	19.2
108	0.657	0.200	18.5
150	0.778	0.237	15.6
174	0.840	0.256	14.5
200	0.902	0.275	13.5
300	1.11	0.339	10.9
400	1.29	0.394	9.42
450	1.38	0.419	8.86
500	1.45	0.443	8.39
512	1.47	0.449	8.29
600	1.60	0.488	7.64
700	1.74	0.529	7.05
800	1.86	0.568	6.58
824	1.89	0.577	6.48
894	1.98	0.603	6.21
900	1.98	0.605	6.19
925	2.01	0.614	6.10
960	2.05	0.626	5.98
1000	2.10	0.640	5.86
1250	2.37	0.722	5.22
1500	2.61	0.797	4.75
1800	2.89	0.880	4.32
2000	3.06	0.932	4.09
2200	3.22	0.982	3.89
2300	3.30	1.01	3.80
3000	3.83	1.17	3.32

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 115° C (239° F). No solar loading.

HCA158-50JT ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.0442	0.0135	270
1.0	0.0626	0.0191	270
1.5	0.0767	0.0234	228
2.0	0.0886	0.0270	197
10	0.200	0.0608	87.7
20	0.284	0.0865	61.7
30	0.349	0.106	50.2
50	0.454	0.138	38.7
88	0.607	0.185	28.9
100	0.649	0.198	27.1
108	0.675	0.206	26.0
150	0.802	0.244	22.0
174	0.867	0.264	20.4
200	0.933	0.284	18.9
300	1.16	0.353	15.3
400	1.35	0.411	13.2
450	1.44	0.438	12.4
500	1.52	0.464	11.8
512	1.54	0.470	11.6
600	1.68	0.513	10.7
700	1.83	0.558	9.87
800	1.97	0.600	9.21
824	2.00	0.610	9.07
894	2.10	0.639	8.69
900	2.10	0.641	8.66
925	2.14	0.651	8.54
960	2.18	0.664	8.38
1000	2.23	0.680	8.21
1250	2.53	0.770	7.32
1500	2.80	0.854	6.67
1800	3.11	0.948	6.09
2000	3.31	1.01	5.78
2200	3.49	1.06	5.51
2300	3.59	1.09	5.39
3000	4.19	1.28	4.75

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 150° C (302° F). No solar loading.

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HCA214-50 Series
2-1/4" Air Coax

APPLICATIONS
TV, Broadcast, Riser-rated In-Building (JFN types, only)

GENERAL INFORMATION	
Cable Type	Air-Dielectric, Corrugated
Size	2-1/4"
STRUCTURE	
Inner Conductor Material	Corrugated Copper Tube
Diameter Inner Conductor, mm (in)	22.6 (0.89)
Diameter Dielectric, mm (in)	49.8 (1.96)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	56.6 (2.23)
Diameter over Jacket Nominal, mm (in)	60.5 (2.37)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	1.7 (1.15)
Minimum Bending Radius, Single Bend, mm (in)	210 (8)
Minimum Bending Radius, Repeated Bends, mm (in)	560 (22)
Tensile Strength, N (lb)	1900 (427)
Recommended / Maximum Clamp Spacing, m (ft)	0.8 / 1.0 (2.75 / 3.25)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 0.5
Velocity, percent	95
Capacitance, pF/m (pF/ft)	66.6 (20.3)
Inductance, µH/m (µH/ft)	0.167 (0.051)
Maximum Frequency, GHz	2.3
Peak Power Rating, kW	425
RF Peak Voltage, Volts	6500
Jacket Spark, Volt RMS	8000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	0.32 (0.16)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	0.23 (0.07)

See Installation, Operation and Storage Temperatures on page 28.

HCA214-50J/JFN ATTENUATION AND AVERAGE POWER			
Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.0374	0.0114	340
1.0	0.0529	0.0161	240
1.5	0.0649	0.0198	196
2.0	0.0750	0.0229	169
10	0.169	0.0516	75.1
20	0.241	0.0734	52.8
30	0.296	0.0903	42.9
50	0.385	0.117	33.0
88	0.517	0.158	24.6
100	0.553	0.168	23.0
108	0.576	0.175	22.1
150	0.684	0.209	18.6
174	0.740	0.226	17.2
200	0.797	0.243	16.0
300	0.991	0.302	12.9
400	1.16	0.353	11.0
450	1.24	0.377	10.3
500	1.31	0.399	9.74
512	1.33	0.404	9.62
600	1.45	0.441	8.82
700	1.58	0.481	8.10
800	1.70	0.518	7.52
824	1.73	0.527	7.40
894	1.81	0.552	7.07
900	1.82	0.554	7.04
925	1.84	0.562	6.94
960	1.88	0.574	6.79
1000	1.93	0.588	6.64
1250	2.19	0.668	5.86
1500	2.43	0.742	5.28
1800	2.71	0.825	4.76
2000	2.88	0.878	4.48
2200	3.05	0.929	4.24
2300	3.13	0.954	4.13

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 115° C (239° F). No solar loading.

CONNECTORS AND ACCESSORIES	
Connectors	See pages 79-81
Jumpers	See pages 82-87
Accessories	See pages 103-105
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

ORDERING INFORMATION	
Model Number	**Jacket**
HCA214-50J	Standard
HCA214-50JFN	Flame Retardant

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HELIFLEX® Cable

HCA295-50 Series
3" Air Coax

APPLICATIONS
TV, Broadcast, Riser-rated In-Building (JFN types, only)

GENERAL INFORMATION	
Cable Type	Air-Dielectric, Corrugated
Size	3"
STRUCTURE	
Inner Conductor Material	Corrugated Copper Tube
Diameter Inner Conductor, mm (in)	27.1 (1.067)
Diameter Dielectric, mm (in)	58.4 (2.30)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	66.6 (2.622)
Diameter over Jacket Nominal, mm (in)	71.0 (2.795)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	2.6 (1.75)
Minimum Bending Radius, Single Bend, mm (in)	270 (11)
Minimum Bending Radius, Repeated Bends, mm (in)	800 (31)
Tensile Strength, N (lb)	1800 (405)
Recommended / Maximum Clamp Spacing, m (ft)	0.8 / 1.2 (2.75 / 4.0)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 0.5
Velocity, percent	96
Capacitance, pF/m (pF/ft)	70.0 (21.3)
Inductance, µH/m (µH/ft)	0.175 (0.053)
Maximum Frequency, GHz	1.5
Peak Power Rating, kW	580
RF Peak Voltage, Volts	7600
Jacket Spark, Volt RMS	8000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	0.51 (0.16)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	0.18 (0.06)

See Installation, Operation and Storage Temperatures on page 28.

HCA295-50J/JB ATTENUATION AND AVERAGE POWER			
Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.0307	0.0094	518
1.0	0.0434	0.0132	366
1.5	0.0532	0.0162	299
2.0	0.0615	0.0187	259
10	0.138	0.0421	115
20	0.196	0.0597	81.3
30	0.240	0.0732	66.2
50	0.311	0.0949	51.2
88	0.415	0.127	38.4
100	0.443	0.135	36.0
108	0.461	0.141	34.6
150	0.546	0.166	29.3
174	0.589	0.179	27.2
200	0.633	0.193	25.3
300	0.780	0.238	20.6
400	0.906	0.276	17.8
450	0.964	0.294	16.8
500	1.02	0.311	15.9
512	1.03	0.314	15.7
600	1.12	0.342	14.5
700	1.22	0.371	13.4
800	1.31	0.398	12.6
824	1.33	0.404	12.4
894	1.38	0.422	11.9
900	1.39	0.424	11.8
925	1.41	0.430	11.7
960	1.44	0.438	11.5
1000	1.47	0.448	11.2
1250	1.66	0.505	10.1
1500	1.83	0.557	9.19

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 115° C (239° F). No solar loading.

CONNECTORS AND ACCESSORIES	
Connectors	See pages 79-81
Jumpers	See pages 82-87
Accessories	See pages 103-105
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

ORDERING INFORMATION	
Model Number	**Jacket**
HCA295-50J	Standard
HCA295-50JB	Standard, Self-Healing
HCA295-50JFN	Flame Retardant

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HCA300-50 Series
3" Air Coax

APPLICATIONS
TV, Broadcast, Riser-rated In-Building (JFN types, only)

GENERAL INFORMATION	
Cable Type	Air-Dielectric, Corrugated
Size	3"
STRUCTURE	
Inner Conductor Material	Corrugated Copper Tube
Diameter Inner Conductor, mm (in)	29.3 (1.15)
Diameter Dielectric, mm (in)	63.5 (2.5)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	72.4 (2.85)
Diameter over Jacket Nominal, mm (in)	76.7 (3.02)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	2.6 (1.78)
Minimum Bending Radius, Single Bend, mm (in)	270 (11)
Minimum Bending Radius, Repeated Bends, mm (in)	760 (30)
Tensile Strength, N (lb)	1800 (405)
Recommended / Maximum Clamp Spacing, m (ft)	0.8 / 1.2 (2.75 / 4.0)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 0.5
Velocity, percent	96
Capacitance, pF/m (pF/ft)	66.6 (20.3)
Inductance, µH/m (µH/ft)	0.167 (0.051)
Maximum Frequency, GHz	1.63
Peak Power Rating, kW	640
RF Peak Voltage, Volts	8000
Jacket Spark, Volt RMS	8000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	0.39 (0.12)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	0.16 (0.05)

See Installation, Operation and Storage Temperatures on page 28.

HCA300-50J ATTENUATION AND AVERAGE POWER			
Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.0280	0.0085	596
1.0	0.0397	0.0121	421
1.5	0.0487	0.0148	343
2.0	0.0563	0.0172	297
10	0.127	0.0388	131
20	0.181	0.0552	92.2
30	0.223	0.0680	74.8
50	0.291	0.0886	57.5
88	0.391	0.119	42.8
100	0.418	0.127	40.0
108	0.436	0.133	38.4
150	0.519	0.158	32.3
174	0.561	0.171	29.8
200	0.605	0.184	27.7
300	0.754	0.230	22.2
400	0.883	0.269	19.0
450	0.943	0.287	17.8
500	1.00	0.305	16.8
512	1.01	0.309	16.6
600	1.11	0.338	15.2
700	1.21	0.368	13.9
800	1.30	0.398	12.9
824	1.33	0.404	12.7
894	1.39	0.424	12.1
900	1.40	0.425	12.1
925	1.42	0.432	11.9
960	1.45	0.441	11.7
1000	1.48	0.452	11.4
1250	1.69	0.515	10.0
1500	1.88	0.573	9.04
1630	1.98	0.602	8.62

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 100° C (221° F). No solar loading.

CONNECTORS AND ACCESSORIES	
Connectors	See pages 79-81
Jumpers	See pages 82-87
Accessories	See pages 103-105
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

ORDERING INFORMATION	
Model Number	**Jacket**
HCA300-50J	Standard
HCA300-50JFN	Flame Retardant

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HCA318-50 Series
3-1/8" Air Coax

APPLICATIONS
TV, Broadcast

GENERAL INFORMATION	
Cable Type	Air-Dielectric, Corrugated
Size	3-1/8"
STRUCTURE	
Inner Conductor Material	Corrugated Copper Tube
Diameter Inner Conductor, mm (in)	34.8 (1.37)
Diameter Dielectric, mm (in)	75.3 (2.96)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	85.5 (3.36)
Diameter over Jacket Nominal, mm (in)	90.5 (3.56)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	3.3 (2.25)
Minimum Bending Radius, Single Bend, mm (in)	380 (15)
Minimum Bending Radius, Repeated Bends, mm (in)	1100 (43)
Tensile Strength, N (lb)	2600 (585)
Recommended / Maximum Clamp Spacing, m (ft)	0.8 / 1.2 (2.75 / 4.0)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 0.5
Velocity, percent	96
Capacitance, pF/m (pF/ft)	70.0 (21.3)
Inductance, µH/m (µH/ft)	0.175 (0.053)
Maximum Frequency, GHz	1.5
Peak Power Rating, kW	940
RF Peak Voltage, Volts	9700
Jacket Spark, Volt RMS	8000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	0.43 (0.13)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	0.13 (0.04)

See Installation, Operation and Storage Temperatures on page 28.

HCA318-50J/JB ATTENUATION AND AVERAGE POWER			
Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.0245	0.0075	793
1.0	0.0346	0.0106	560
1.5	0.0425	0.0129	457
2.0	0.0491	0.0150	395
10	0.111	0.0337	175
20	0.158	0.0480	123
30	0.194	0.0591	100
50	0.252	0.0769	77.3
88	0.338	0.103	57.9
100	0.362	0.110	54.2
108	0.377	0.115	52.1
150	0.448	0.136	44.0
174	0.484	0.148	40.8
200	0.521	0.159	38.0
300	0.648	0.198	30.9
400	0.757	0.231	26.7
450	0.808	0.246	25.1
500	0.856	0.261	23.8
512	0.867	0.264	23.6
600	0.946	0.288	21.8
700	1.03	0.314	20.2
800	1.11	0.339	18.9
824	1.13	0.344	18.6
894	1.18	0.360	17.9
900	1.19	0.362	17.9
925	1.21	0.367	17.6
960	1.23	0.375	17.3
1000	1.26	0.384	17.0
1250	1.43	0.436	15.3
1500	1.59	0.485	14.1

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 115° C (239° F). No solar loading.

CONNECTORS AND ACCESSORIES	
Connectors	See pages 79-81
Jumpers	See pages 82-87
Accessories	See pages 103-105
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

ORDERING INFORMATION	
Model Number	**Jacket**
HCA318-50J	Standard
HCA318-50JB	Standard, Self-Healing

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HCA418-50 Series
4-1/8" Air Coax

APPLICATIONS
TV, Broadcast, Riser-rated In-Building (JFN types, only)

GENERAL INFORMATION	
Cable Type	Air-Dielectric, Corrugated
Size	4-1/8"
STRUCTURE	
Inner Conductor Material	Corrugated Copper Tube
Diameter Inner Conductor, mm (in)	45.0 (1.77)
Diameter Dielectric, mm (in)	98.1 (3.86)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	109.3 (4.30)
Diameter over Jacket Nominal, mm (in)	115.1 (4.53)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	5.4 (3.63)
Minimum Bending Radius, Single Bend, mm (in)	500 (20)
Minimum Bending Radius, Repeated Bends, mm (in)	1200 (47)
Tensile Strength, N (lb)	2600 (585)
Recommended / Maximum Clamp Spacing, m (ft)	1.0 / 2.0 (3.3 / 6.6)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 0.5
Velocity, percent	97
Capacitance, pF/m (pF/ft)	68.0 (20.7)
Inductance, µH/m (µH/ft)	0.170 (0.052)
Maximum Frequency, GHz	1
Peak Power Rating, kW	1560
RF Peak Voltage, Volts	12500
Jacket Spark, Volt RMS	8000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	0.31 (0.095)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	0.094 (0.029)

See Installation, Operation and Storage Temperatures on page 28.

CONNECTORS AND ACCESSORIES	
Connectors	See pages 79-81
Jumpers	See pages 82-87
Accessories	See pages 103-105
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

HCA418-50J/JB/JFN ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.0195	0.00594	1200
1.0	0.0276	0.00841	848
1.5	0.0338	0.0103	692
2.0	0.0391	0.0119	599
10	0.0879	0.0268	266
20	0.125	0.0380	188
30	0.153	0.0467	153
50	0.199	0.0606	118
88	0.266	0.0810	88.4
100	0.284	0.0865	82.8
108	0.295	0.0900	79.6
150	0.350	0.107	67.3
174	0.378	0.115	62.4
200	0.406	0.124	58.1
300	0.503	0.153	47.2
400	0.585	0.178	40.7
450	0.623	0.190	38.3
500	0.659	0.201	36.3
512	0.667	0.203	35.9
600	0.726	0.221	33.1
700	0.789	0.240	30.6
800	0.848	0.258	28.6
824	0.861	0.263	28.1
894	0.900	0.274	27.0
900	0.904	0.275	26.9
925	0.917	0.280	26.5
960	0.936	0.285	26.0
1000	0.957	0.292	25.5

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 115° C (239° F). No solar loading.

ORDERING INFORMATION	
Model Number	**Jacket**
HCA418-50J	Standard
HCA418-50JB	Standard, Self-Healing
HCA418-50JFN	Flame Retardant

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HCA500-50 Series
5" Air Coax

APPLICATIONS
TV, Broadcast, Riser-rated In-Building (JFN types, only)

GENERAL INFORMATION	
Cable Type	Air-Dielectric, Corrugated
Size	5"
STRUCTURE	
Inner Conductor Material	Corrugated Copper Tube
Diameter Inner Conductor, mm (in)	58.0 (2.28)
Diameter Dielectric, mm (in)	127.0 (5.0)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	140.5 (5.53)
Diameter over Jacket Nominal, mm (in)	147.2 (5.79)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	8.65 (5.78)
Minimum Bending Radius, Single Bend, mm (in)	800 (31)
Minimum Bending Radius, Repeated Bends, mm (in)	1600 (63)
Tensile Strength, N (lb)	3500 (787)
Recommended / Maximum Clamp Spacing, m (ft)	1.0 / 1.75 (3.25 / 5.7)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 0.5
Velocity, percent	96
Capacitance, pF/m (pF/ft)	70.0 (21.3)
Inductance, µH/m (µH/ft)	0.175 (0.053)
Maximum Frequency, GHz	0.86
Peak Power Rating, kW	2250
RF Peak Voltage, Volts	15000
Jacket Spark, Volt RMS	8000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	0.2 (0.06)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	0.057 (0.017)

See Installation, Operation and Storage Temperatures on page 28.

CONNECTORS AND ACCESSORIES	
Connectors	See pages 79-81
Jumpers	See pages 82-87
Accessories	See pages 103-105
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

HCA500-50J/JB/JFN ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.0149	0.00454	1887
1.0	0.0211	0.00643	1333
1.5	0.0258	0.00788	1087
2.0	0.0299	0.00910	941
10	0.0673	0.0205	418
20	0.0956	0.0292	294
30	0.118	0.0359	240
50	0.153	0.0466	185
88	0.205	0.0624	138
100	0.219	0.0667	130
108	0.228	0.0694	125
150	0.270	0.0824	105
174	0.292	0.0890	97.7
200	0.314	0.0958	91.0
300	0.390	0.119	74.0
400	0.455	0.139	64.0
450	0.485	0.148	60.3
500	0.513	0.156	57.2
512	0.520	0.158	56.5
600	0.567	0.173	52.3
700	0.616	0.188	48.4
800	0.663	0.202	45.4
824	0.674	0.206	44.7
860	0.691	0.211	43.8

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 115° C (239° F). No solar loading.

HCA500-50JFT ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.0149	0.00455	2250
1.0	0.0211	0.00644	1984
1.5	0.0259	0.00790	1618
2.0	0.0300	0.00913	1399
10	0.0677	0.0206	619
20	0.0965	0.0294	435
30	0.119	0.0363	353
50	0.155	0.0473	271
88	0.209	0.0636	202
100	0.223	0.0680	189
108	0.232	0.0708	181
150	0.277	0.0844	153
174	0.300	0.0914	141
200	0.323	0.0985	131
300	0.403	0.123	106
400	0.472	0.144	90.7
450	0.504	0.154	85.2
500	0.535	0.163	80.5
512	0.542	0.165	79.5
600	0.593	0.181	73.0
700	0.647	0.197	67.3
800	0.699	0.213	62.6
824	0.711	0.217	61.7
860	0.728	0.222	60.3

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 150° C (302° F). No solar loading.

ORDERING INFORMATION	
Model Number	**Jacket**
HCA500-50J	Standard
HCA500-50JB	Standard, Self-Healing
HCA500-50JFN	Flame Retardant
HCA500-50JT	High Power

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HCA618-50 Series
6-1/8" Air Coax

APPLICATIONS	
TV, Broadcast, UHF (JT types, only), VHF (JT types, only), High Power (JT types, only)	
GENERAL INFORMATION	
Cable Type	Air-Dielectric, Corrugated
Size	6-1/8"
STRUCTURE	
Inner Conductor Material	Corrugated Copper Tube
Diameter Inner Conductor, mm (in)	67.0 (2.63)
Diameter Dielectric, mm (in)	147.0 (5.78)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	162.0 (6.37)
Diameter over Jacket Nominal, mm (in)	169.0 (6.65)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	11.0 (7.39)
Minimum Bending Radius, Single Bend, mm (in)	1000 (39)
Minimum Bending Radius, Repeated Bends, mm (in)	2000 (79)
Tensile Strength, N (lb)	5000 (1124)
Recommended / Maximum Clamp Spacing, m (ft)	1.0 / 2.0 (3.3 / 6.6)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 0.5
Velocity, percent	97
Capacitance, pF/m (pF/ft)	69.0 (21.0)
Inductance, µH/m (µH/ft)	0.173 (0.053)
Maximum Frequency, GHz	0.86
Peak Power Rating, kW	2890
RF Peak Voltage, Volts	17000
Jacket Spark, Volt RMS	8000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	0.17 (0.052)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	0.044 (0.013)

See Installation, Operation and Storage Temperatures on page 28.

CONNECTORS AND ACCESSORIES	
Connectors	See pages 79-81
Jumpers	See pages 82-87
Accessories	See pages 103-105
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

HCA618-50J/JB/JFN ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.0128	0.00389	2507
1.0	0.0181	0.00551	1770
1.5	0.0222	0.00676	1444
2.0	0.0256	0.00781	1249
10	0.0578	0.0176	554
20	0.0822	0.0251	390
30	0.101	0.0308	317
50	0.132	0.0401	244
88	0.176	0.0538	183
100	0.189	0.0575	171
108	0.196	0.0599	164
150	0.233	0.0711	139
174	0.252	0.0770	129
200	0.272	0.0829	120
300	0.338	0.103	97.1
400	0.395	0.120	83.7
450	0.421	0.128	78.8
500	0.446	0.136	74.7
512	0.452	0.138	73.8
600	0.493	0.150	68.1
700	0.537	0.164	63.0
800	0.579	0.176	58.9
824	0.588	0.179	58.1
860	0.602	0.184	56.8

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 115° C (239° F). No solar loading.

HCA618-50JT ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.0128	0.00390	2890
1.0	0.0182	0.00554	2595
1.5	0.0223	0.00680	2114
2.0	0.0258	0.00786	1828
10	0.0587	0.0179	804
20	0.0840	0.0256	562
30	0.104	0.0316	455
50	0.136	0.0415	348
88	0.184	0.0562	258
100	0.198	0.0602	241
108	0.206	0.0628	231
150	0.247	0.0752	194
174	0.268	0.0817	179
200	0.290	0.0883	166
300	0.364	0.111	133
400	0.430	0.131	113
450	0.461	0.140	106
500	0.490	0.149	100
512	0.497	0.152	99.1
600	0.546	0.167	90.9
700	0.599	0.183	83.6
800	0.650	0.198	77.7
824	0.662	0.202	76.5
860	0.679	0.207	74.7

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 150° C (302° F). No solar loading.

ORDERING INFORMATION	
Model Number	**Jacket**
HCA618-50J	Standard
HCA618-50JB	Standard, Self-Healing
HCA618-50JFN	Flame Retardant
HCA618-50JT	High Power

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HCA800-50 Series
8" Air Coax

APPLICATIONS
TV, Broadcast, UHF (JT types, only), VHF (JT types, only), High Power (JT types, only)

GENERAL INFORMATION	
Cable Type	Air-Dielectric, Corrugated
Size	8"

STRUCTURE	
Inner Conductor Material	Corrugated Copper Tube
Diameter Inner Conductor, mm (in)	88.5 (3.48)
Diameter Dielectric, mm (in)	195.0 (7.67)
Outer Conductor Material	Corrugated Copper
Diameter Copper Outer Conductor, mm (in)	215.0 (8.46)
Diameter over Jacket Nominal, mm (in)	223.0 (8.78)

MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	18.6 (12.5)
Minimum Bending Radius, Single Bend, mm (in)	1400 (55)
Minimum Bending Radius, Repeated Bends, mm (in)	2500 (98)
Tensile Strength, N (lb)	4700 (1057)
Recommended / Maximum Clamp Spacing, m (ft)	1.0 / 2.0 (3.3 / 6.6)

ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 0.5
Velocity, percent	97
Capacitance, pF/m (pF/ft)	69.0 (21.0)
Inductance, µH/m (µH/ft)	0.173 (0.053)
Maximum Frequency, GHz	0.65
Peak Power Rating, kW	4000
RF Peak Voltage, Volts	20000
Jacket Spark, Volt RMS	8000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	0.13 (0.04)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	0.027 (0.008)

See Installation, Operation and Storage Temperatures on page 28.
The Tensile Strength for High Power versions is 3700 N (832 lb).

CONNECTORS AND ACCESSORIES	
Connectors	See pages 79-81
Jumpers	See pages 82-87
Accessories	See pages 103-105
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

HCA800-50J/JB ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.0100	0.00305	4000
1.0	0.0142	0.00432	2910
1.5	0.0174	0.00529	2373
2.0	0.0201	0.00612	2053
10	0.0454	0.0138	909
20	0.0647	0.0197	639
30	0.0797	0.0243	519
50	0.104	0.0317	399
88	0.140	0.0426	298
100	0.149	0.0455	279
108	0.156	0.0474	268
150	0.185	0.0565	226
174	0.201	0.0612	209
200	0.216	0.0660	195
300	0.270	0.0823	158
400	0.316	0.0964	136
450	0.338	0.103	129
500	0.358	0.109	122
512	0.363	0.111	120
600	0.397	0.121	111
650	0.415	0.127	107

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 115° C (239° F). No solar loading.

HCA800-50JBT/JT ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.0104	0.00316	4000
1.0	0.0147	0.00449	4000
1.5	0.0181	0.00551	3685
2.0	0.0209	0.00638	3184
10	0.0478	0.0146	1397
20	0.0686	0.0209	974
30	0.0850	0.0259	787
50	0.112	0.0341	600
88	0.152	0.0465	442
100	0.164	0.0499	412
108	0.171	0.0521	395
150	0.206	0.0629	329
174	0.225	0.0685	303
200	0.244	0.0744	280
300	0.312	0.0951	222
400	0.374	0.114	187
450	0.404	0.123	174
500	0.434	0.132	163
512	0.441	0.134	161
600	0.492	0.150	146
650	0.521	0.159	138

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 150° C (302° F). No solar loading.

ORDERING INFORMATION

Model Number	Jacket
HCA800-50J	Standard
HCA800-50JB	Standard, Self-Healing
HCA800-50JBT	Standard, Self-Healing, High Power
HCA800-50JT	High Power

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HCA900-50T Series
9" Air Coax

APPLICATIONS
TV, Broadcast

GENERAL INFORMATION	
Cable Type	Air-Dielectric, Corrugated
Size	9"
STRUCTURE	
Inner Conductor Material	Corrugated Copper Tube
Diameter Inner Conductor, mm (in)	99.4 (3.91)
Diameter Dielectric, mm (in)	216.7 (8.53)
Outer Conductor Material	Corrugated Aluminum
Diameter Copper Outer Conductor, mm (in)	247.7 (9.75)
MECHANICAL SPECIFICATIONS	
Cable Weight, kg/m (lb/ft)	9.6 (6.48)
Minimum Bending Radius, Single Bend, mm (in)	1700 (67)
Tensile Strength, N (lb)	9600 (2158)
Recommended / Maximum Clamp Spacing, m (ft)	1.0 / 2.0 (3.3 / 6.6)
ELECTRICAL SPECIFICATIONS	
Impedance, Ohm	50 +/- 0.5
Velocity, percent	98
Capacitance, pF/m (pF/ft)	68.0 (20.7)
Inductance, µH/m (µH/ft)	0.170 (0.052)
Maximum Frequency, GHz	0.56
Peak Power Rating, kW	5800
RF Peak Voltage, Volts	24000
Inner Conductor dc Resistance, ohm/1000 m (ohm/1000 ft)	0.11 (0.034)
Outer Conductor dc Resistance, ohm/1000 m (Ohm/1000 ft)	0.031 (0.009)

See Installation, Operation and Storage Temperatures on page 28.

CONNECTORS AND ACCESSORIES	
Connectors	See pages 79-81
Jumpers	See pages 82-87
Accessories	See pages 103-105
Coaxial Devices	See pages 106-108
Technical Appendix	See pages 639-648

HCA900-50T ATTENUATION AND AVERAGE POWER

Frequency MHz	Attenuation dB/100 m	Attenuation dB/100 ft	Average Power kW
0.5	0.0103	0.00314	5800
1.0	0.0146	0.00445	5800
1.5	0.0179	0.00546	5262
2.0	0.0207	0.00631	4551
10	0.0469	0.0143	2011
20	0.0670	0.0204	1410
30	0.0828	0.0252	1144
50	0.108	0.0330	878
88	0.146	0.0446	653
100	0.157	0.0479	611
108	0.164	0.0499	586
150	0.196	0.0599	492
174	0.214	0.0651	454
200	0.231	0.0705	422
300	0.294	0.0896	337
400	0.351	0.107	287
450	0.379	0.115	268
500	0.406	0.124	252
512	0.413	0.126	249
560	0.439	0.134	236

Standard Conditions:
For attenuation: VSWR 1.0, cable temperature 20° C (68° F).
For average power: VSWR 1.0, ambient temperature 40° C (104°F), inner conductor temperature 150° C (302° F). No solar loading.

ORDERING INFORMATION	
Model Number	**Jacket**
HCA900-50T	No jacket

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Connectors

Overview

CELLFLEX

	7-16 DIN	N	7/8" EIA	1-5/8" EIA	BNC	SMA	TNC	UHF	4.1-9.5
SCF14-50	•	•			•	•	•	•	
SCF38-50	•	•							
SCF12-50	•	•	•				•	•	•
UCF78-50A	•	•		•					
UCF114-50A	•	•	•	•					
LCF14-50	•	•					•		
LCF38-50	•	•	•				•		
LCF12-50	•	•	•					•	•
LCF58-50	•	•							
LCF78-50A	•	•	•	•					
LCFS114-50A	•	•	•	•					
LCF158-50A	•	•	•	•					
LCF214-50A	•			•					

RG Type Cables

	N
RGC-8	•
RGC-213	•

HELIFLEX

	7-16 DIN	N	7/8" EIA	1-5/8" EIA	3 1/8" EIA	4 1/2" EIA	6 1/8" EIA	100-230	SPLICE
HCA38-50	•	•	•						
HCA12-50	•	•							
HCA58-50	•	•	•						
HCA78-50	•	•	•						•
HCA118-50	•	•	•	•					
HCA158-50	•	•	•	•	•				•
HCA214-50		•	•	•	•				•
HCA300-50					•				•
HCA318-50				•	•				•
HCA418-50						•	•		•
HCA500-50						•	•		•
HCA618-50							•		•
HCA800-50								•	•
HCA900-50								•	•

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Connectors

Introduction

CELLFLEX®

Premium is Our Standard

Connectors for CELLFLEX® foam dielectric cables feature a self-flaring design for low VSWR and easy installation. Contacts are silver or gold plated (ss, sg). The connector design has been optimized to ensure superior intermodulation performance as well as premium low VSWR. Therefore, connectors from RFS are always premium quality.

- Resilient contacts: CuBe, tempered spring bronze
- Insulation: PTFE/FEP/PE/cross-linked polystyrene
- Center and outer conductor parts: Copper alloy, silver-plated
- Other metal parts: Copper alloy, nickel-plated
- Gaskets: Silicone rubber

Traditional Connectors

These connectors use a proven and reliable collet-style attachment and offer outstanding electrical performance paired with rugged mechanical features. For available types and plating, see the connector selection guide.

Their trimming dimensions vary from both CAF and RAPID FIT™, so they can be installed using a different preparation tool (which is recommended), or simple hand tools.

RAPID FIT™ Connectors

RFS's RAPID FIT connectors are renowned for performance, ease of installation and ruggedness.

Installation time and associated costs are greatly reduced because it is no longer necessary to disassemble the connector before installation. The potential loss of smaller parts during installation has been eliminated. The connector can be easily unmounted and reused if required. O-ring or Plast 2000* sealing ensures excellent water tightness.

A special trimming tool is recommended and available from RFS for trimming the cable. The use of the trimming tool enhances the speed and quality of the installation.

RAPID FIT™ connectors are available for:

- SCF38
- SCF12
- UCF78A
- UCF114A
- LCF12
- LCF58
- LCF78A
- LCFS114A
- LCF158
- LCF214A

For LCF78-50A and UCF78-50A, RFS is now introducing the RAPID FIT 2™ connector line to continue to meet the demanding requirements of the world's markets. This connector is initially available in the 7/8" size only but will be extended to other sizes as required.

RGFLEX™

A variety of connectors for RGFLEX cables are available to meet most customers needs.

HELIFLEX®

All connectors for HELIFLEX® cables are characterized by excellent gas tightness and extremely low losses. HELIFLEX® connectors can be installed with basic hand tools, but the use of dedicated installation tools further facilitates ease of assembly and improves performance.

Premium Connectors

HELIFLEX® premium connectors have excellent electrical values and provide outstanding performance for the most demanding applications. The connector design provides maximum sealing integrity and gas tightness. For even higher performance needs, tunable connectors are available to optimize the VSWR according to the operating frequency band.

RAPID FIT™ Connectors

RAPID FIT™ connectors use a simple technique for easy installation. RAPID FIT™ connectors are a single-piece design that quickly terminate to the cable. After cutting the jacket to the required length the connector is screwed onto the cable and tightened. It is not necessary to flare the outer conductor, so a flanging tool is not required for RAPID FIT™ connectors.

* Plast 2000 is a trademark of Spinner GmbH

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Connectors

Introduction

Connector Series 7-16

The 7-16 connector is the most rugged RF connection meeting all requirements even under severe environmental conditions.

Connector Series N

The N connector is one of the most common RF connector types. N type connectors from RFS will be delivered with a non-slotted outer conductor contact sleeve and a special gasket. Due to a special design of the coupling nut (without spring ring) N connectors can be tightened with increased torque. This increases the contact pressure.

Connector Series EIA

To join two cables with EIA connectors, two identical socket connectors are installed on one end of the cables to be joined, and a coupling element is required to make the connection of the center conductor. The coupling element must be ordered separately.

Connectors are available in sizes matching the nominal cable size. EIA connectors provide optimal power handling for the complete transmission line system.

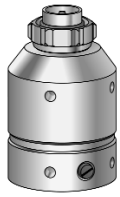
Connectors Series 100-230

This special design is exclusive for 8" and 9" diameter HELIFLEX® cables and are optimized for high-power, low-frequency applications. They are designed to be welded onto the inner and outer conductors to provide years of trouble-free operation. The coupling interface is comparable to EIA-type flanges and uses coupling elements for inter-connection between identical connectors.

TNC connectors are identical to BNC connectors except for the coupling nut. The electrical performance of TNC connectors is superior to BNC connectors. RFS connectors are torque-tightened with a torque of 4 Nm.

The rugged design of the 4.1 - 9.5 connector series is suitable for outdoor installation. The performance is superior to the N connector series with dimensions comparable to the N connectors.

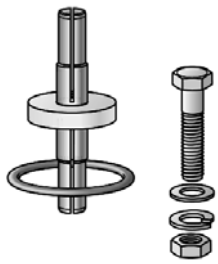
4 - 11 connectors are designed for extremely adverse mechanical and environmental conditions. The three-nosed bayonet coupling guarantees a safe contact even under severe vibration and shock conditions.



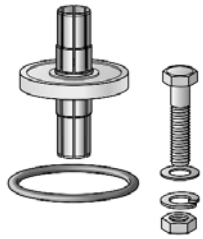
Connector 7-16 male, P2000

Connector N-male, P2000

Connector 1-5/8" EIA, P2000



Coupling Element for 7/8" EIA



Coupling Element for 1-5/8" EIA

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Reliable Sealing

At RFS, we think in sub-systems rather than just in single products. One good example that demonstrates our philosophy is the way in which we deal with the sealing of CELLFLEX® and HELIFLEX® connectors.

There are several solutions for the water-proofing of CELLFLEX® and HELIFLEX® connectors. Instead of relying on additional weatherproofing kits only, our connectors are perfectly sealed against environmental threats by using specially designed O-rings or gasket seals, or by injecting Plast 2000 between the cable and connector interface.

When discussing water-resistance one needs to differentiate two cases. The first case is transversal, where humidity enters from outside the coaxial system; the second case is longitudinal where humidity enters from inside, for instance through a damaged antenna.

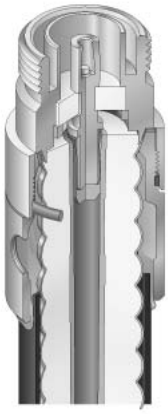
The connection between two connectors provides a water-tight seal by inserting an O-ring in the interface. All components in the connector assembly are protected against water-ingress by the installation of O-rings that are factory assembled. Water-proofing of the coupling nut against the cable jacket and outer conductor is achieved by several methods.

One method is the injection of a specially designed sealing compound known as Plast 2000. Plast 2000 is designed to cure upon contact with the air and retains its flexibility after setting. It is injected after the connectors are attached.

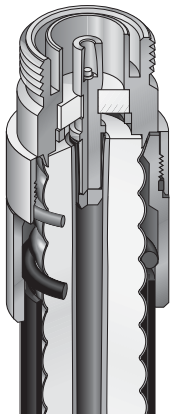
Another method is the use of specially designed O-rings or gasket seals that seal against the outer conductor. For severe environmental conditions additional sealing against the jacket can be achieved by a heat-shrink sleeve with thermoplastic adhesive or a cold shrink sleeve.

Also used are specially designed O-rings or gasket seals that seal against the corrugation valleys of the outer conductor and connector inner surfaces. These seals have a greater surface area to keep water out of the backshell entrance, and do not rely on the surface quality of a single corrugation ridge.

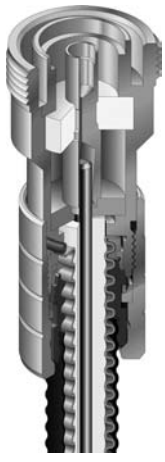
Longitudinal watertightness for our connectors is achieved by properly designed dielectric beads. In this way water penetration along the cable axis is blocked from entering the cable. One exception would be EIA gas-pass connectors for HELIFLEX® cables.



Sealing with Plast 2000



Sealing with O-ring



Sealing with Gasket

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Connectors

Reliable Sealing

Plast 2000

Plast 2000 has a very good adhesion to the metallic parts of the connector and to the cable. The curing process depends on the humidity and temperature of the air. Under normal conditions the sealing against moisture is effective in a short time.

Plast 2000 is supplied in tubes of 20 ccm and 70 ccm contents. The 20 ccm tube can be screwed directly into a port of the coupling nut. If large quantities of connectors are to be sealed with Plast 2000 we recommend an injection gun.

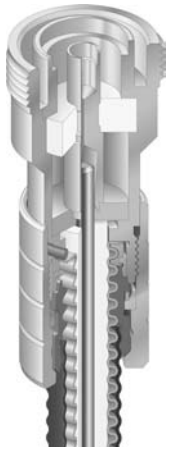
RFS professional sealing concepts give reliable protection, up to IP 68 level, such ensuring performance under any climatic conditions.

Plast 2000 Sealing Compound

Profile Gasket/Heat Shrink Tube

Superflexible cables are sealed with heat shrink tubes or specially designed sealing glands. SCF12-50 and SCF38-50 type connectors use a specially designed sealing gland that seals the connector to the outer conductor of the cable and the jacket. SCF14-50 type connectors use heat shrink with an adhesive that bonds itself to the connector backshell and cable outer conductor and jacket. These concepts again prevent moisture advancement into the connector even in the event that the cable jacket should be damaged.

Sealing with heat shrinking tube



Sealing with profile gasket

O-ring Seals

In addition to the standard O-ring seals found in N and 7-16 DIN connector interfaces and between the front and rear connector body halves, O-ring seals can be successfully used to waterproof cable entry points of the connector, too. Silicon O-rings are easy-to-use and provide years of reliable service, surviving all varieties of environmental conditions. Threaded gasket seals are used for helically corrugated cables like SCF and HCA cables, and provide a water-seal around complex corrugation profiles. The RFS design places the O-ring in the corrugation valley of the cable, and then seals against the inner wall of the connector backshell. O-ring lubricant is included with the connector to facilitate simple installation.

CELLFLEX	Cable type	Plast content (approximately)
	UCF78-50A	7 cm³ (cc) (0.24 US fluid ounces)
	UCF114-50A	15 cm³ (cc) (0.51 US fluid ounces)
	LCF12-50	4 cm³ (cc) (0.14 US fluid ounces)
	LCF58-50	6 cm³ (cc) (0.20 US fluid ounces)
	LCF78-50A	7 cm³ (cc) (0.24 US fluid ounces)
	LCFS114-50A	15 cm³ (cc) (0.51 US fluid ounces)
	LCF158-50A	20 cm³ (cc) (0.68 US fluid ounces)
	LCF214-50A	28 cm³ (cc) (0.95 US fluid ounces)
HELIFLEX		
	HCA38-50	5 cm³ (cc) (0.17 US fluid ounces)
	HCA58-50	5 cm³ (cc) (0.17 US fluid ounces)
	HCA78-50	5 cm³ (cc) (0.17 US fluid ounces)
	HCA118-50	10 cm³ (cc) (0.34 US fluid ounces)
	HCA158-50	20 cm³ (cc) (0.68 US fluid ounces)
	HCA295-50	40 cm³ (cc) (1.36 US fluid onnces)
	HCA318-50	70 cm³ (cc) (2.37 US fluid ounces)
	HCA418-50	120 cm³ (cc) (4.06 US fluid ounces)
	HCA500-50	250 cm³ (cc) (8.45 US fluid ounces)
	HCA618-50	300 cm³ (cc) (10.10 US fluid ounces)
	HCA800-50	900 cm³ (cc) (30.40 US fluid ounces)

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Connector Selection Guide

CELLFLEX® Foam Cables

Model Number	Description	Sealing Method	Plating Outer/Inner	Contact Attachment Inner	Contact Attachment Outer	Trimming Tool	Length, mm (in)	Outer Dia., mm (in)	Weight, kg (lb)
SCF14-50 SERIES									
NFB-SCF14-005	N Female Bulkhead	O-ring	Silver/Gold	Basket	Self Clamp	TRIM-Series-B	50.3 (2.0)	22.1 (0.9)	0.10 (0.22)
NM-SCF14-003	N Male	O-ring	Brass/Silver	Soldered	Tab Flare	TRIM-Series-B	48.3 (1.9)	41.4 (1.6)	0.09 (0.20)
SMAF-SCF14-001	SMA Female	O-ring	Brass/Gold	Soldered	Tab Flare	TRIM-Series-B	46.0 (1.8)	13.2 (0.5)	0.07 (0.15)
SMAM-SCF14-002	SMA Male	O-ring	Brass/Silver	Soldered	Tab Flare	TRIM-Series-B	40.6 (1.6)	13.2 (0.5)	0.06 (0.14)
UHFF-SCF14-007	UHF Female	O-ring	Silver/Silver	Basket	Tab Flare	TRIM-Series-B	58.4 (2.3)	16.0 (0.6)	0.07 (0.15)
UHFM-SCF14-006	UHF Male Knurled nut	O-ring	Silver/Silver	Basket	Tab Flare	TRIM-Series-B	58.4 (2.3)	20.3 (0.8)	0.09 (0.20)
716F-SCF14-001	7-16 DIN Female	Shrinking Sleeve	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	40.0 (1.6)	29.0 (1.2)	0.09 (0.20)
716M-SCF14-001	7-16 DIN Male	Shrinking Sleeve	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	41.0 (1.6)	37.0 (1.5)	0.11 (0.25)
NF-SCF14-001	N Female	Shrinking Sleeve	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	28.0 (1.1)	16.0 (0.6)	0.04 (0.09)
NF-SCF14-035	N Female	Shrinking Sleeve	Silver/Gold	Basket	Spring Finger	TRIM-Series-A	28.0 (1.1)	16.0 (0.6)	0.04 (0.09)
NM-SCF14-001	N Male	Shrinking Sleeve	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	36.5 (1.4)	21.0 (0.8)	0.05 (0.12)
NM-SCF14-035	N Male	Shrinking Sleeve	Silver/Gold	Basket	Spring Finger	TRIM-Series-A	26.5 (1.1)	37.0 (1.5)	0.05 (0.12)
NMR-SCF14-045	N Male Right Angle	Shrinking Sleeve	Silver/Gold	Basket	Spring Finger	TRIM-Series-A	36.2 (1.4)	16.0 (0.6)	0.07 (0.15)
TNCF-SCF14-001	TNC Female	Shrinking Sleeve	Silver/Gold	Basket	Spring Finger	TRIM-Series-A	35.0 (1.4)	16.0 (0.7)	0.04 (0.01)
TNCM-SCF14-001	TNC Male	Shrinking Sleeve	Silver/Gold	Basket	Spring Finger	TRIM-Series-A	34.0 (1.4)	16.0 (0.7)	0.04 (0.01)
BNCM-SCF14-040	BNC Male	Shrinking Sleeve	Silver/Gold	Basket	Spring Finger	TRIM-Series-A	35.5 (1.4)	18.0 (0.7)	0.04 (0.01)
SCF38-50 SERIES									
NM-SCF38-070	N Male	Threaded Gasket	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	52.4 (2.06)	21.0 (0.8)	0.08 (0.18)
NM-SCF38-075	N Male	Threaded Gasket	Silver/Gold	Basket	Tab Flare	TRIM-Series-A	52.4 (2.06)	21.0 (0.83)	0.08 (0.18)
716F-SCF38-001	7-16 DIN Female	Shrinking Sleeve	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	47.0 (1.9)	29.0 (1.2)	0.13 (0.29)
716M-SCF38-001	7-16 DIN Male	Shrinking Sleeve	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	47.0 (1.9)	37.0 (1.5)	0.11 (0.25)
716MR-SCF38-041	7-16 DIN Male Right Angle	Shrinking Sleeve	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	42.7 (1.7)	37.0 (1.5)	0.20 (0.45)
716MR-SCF38-071	7-16 DIN Male Right Angle	O-ring	Silver/Silver	Basket	Crush Flare	TRIM-Series-A	50 (1.9)	31.8 (1.2)	0.20 (0.45)
NF-SCF38-002	N Female	Shrinking Sleeve	Silver/Gold	Basket	Spring Finger	TRIM-Series-A	36.5 (1.4)	16.0 (0.6)	0.04 (0.09)
NF-SCF38-070	N Female	Shrinking Sleeve	Silver/Silver	Basket	Crush Flare	TRIM-Series-A	44.2 (1.7)	21 (0.8)	0.08 (0.18)
NF-SCF38-075	N Female	Shrinking Sleeve	Silver/Gold	Basket	Crush Flare	TRIM-Series-A	44.2 (1.7)	21 (0.8)	0.08 (0.18)
NMR-SCF38-071	N Male Right Angle	Shrinking Sleeve	Silver/Gold	Basket	Crush Flare	TRIM-Series-A	41.8 (1.6)	31.8 (1.2)	0.20 (0.45)
SCF12-50 SERIES									
UHFF-SCF12-003	UHF Female	O-ring	Silver/Silver	Basket	Tab Flare	TRIM-Series-B	68.6 (2.7)	22.1 (0.9)	0.10 (0.23)
UHFM-SCF12-002	UHF Male Knurled nut	O-ring	Brass/Silver	Soldered	Tab Flare	TRIM-Series-B	66.0 (2.6)	22.1 (0.9)	0.10 (0.23)
716F-SCF12-070	7-16 DIN Female	Threaded Gasket	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	60.5 (2.4)	29.0 (1.2)	0.13 (0.29)
716M-SCF12-070	7-16 DIN Male	Threaded Gasket	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	60.0 (2.4)	37.0 (1.5)	0.13 (0.29)
716MR-SCF12-071	7-16 DIN Male Right Angle	Threaded Gasket	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	43.2 (1.7)	37.0 (1.5)	0.21 (0.47)
NF-SCF12-070	N Female	Threaded Gasket	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	59.2 (2.3)	23.8 (0.9)	0.10 (0.2)
NM-SCF12-070	N Male	Threaded Gasket	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	60.0 (2.4)	23.8 (0.9)	0.10 (0.2)
NMR-SCF12-071	N Male Right Angle	Threaded Gasket	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	44.8 (1.8)	23.8 (0.9)	0.12 (0.27)
4195M-SCF12-001	4.1-9.5 DIN Male	Shrinking Sleeve	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	47.0 (1.9)	25.0 (1.0)	0.089 (0.20)
NM-SCF12-075	N Male	Shrinking Sleeve	Silver/Gold	Basket	Spring Finger	TRIM-Series-A	60.0 (2.4)	23.8 (0.9)	0.10 (0.2)
78EIA-SCF12-070	7/8" EIA RAPID FIT	Threaded Gasket	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	90 (3.5)	57 (2.2)	0.67 (1.48)
TNCF-SCF12-001	TNC Female	Shrinking Sleeve	Silver/Gold	Basket	Spring Finger	TRIM-Series-A	38.4 (1.5)	23.0 (0.9)	0.99 (2.18)
TNCM-SCF12-001	TNC Male	Shrinking Sleeve	Silver/Gold	Basket	Spring Finger	TRIM-Series-A	49.2 (1.9)	23.0 (0.9)	0.10 (0.22)
UCF78-50A SERIES									
716F-LCF78-062	7-16 DIN Female RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	62.0 (2.5)	35.0 (1.4)	0.22 (0.49)
716M-LCF78-062	7-16 DIN Male RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	66.0 (2.6)	37.0 (1.5)	0.22 (0.49)
716M-LCF78-066	7-16 DIN Male Right angle	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	61.0 (2.4)	37.0 (1.5)	0.30 (0.66)
NF-LCF78-062	N Female RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	55.0 (2.2)	35.0 (1.4)	0.15 (0.34)
NM-LCF78-062	N Male RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	65.6 (2.6)	35.0 (1.4)	0.15 (0.34)
78EIA-LCF78-062	7/8" EIA RAPID FIT	Plast 2000	Silver/Silver	Self Tapping	Spring Finger	TRIM-Series-A	76.5 (3.0)	57.0 (2.3)	0.38 (0.85)
158EIA-LCF78-062	1-5/8" EIA RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	110.0 (4.3)	90.0 (3.6)	0.95 (2.10)
HNM-LCF78-062	HN Male RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	69.4 (2.7)	34.8 (1.4)	0.18 (0.40)
716F-LCF78-072	7-16 DIN Female RAPID FIT	O-ring	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	61.0 (2.4)	35.0 (1.4)	0.22 (0.49)
716F-LCF78-020	7-16 DIN Female RAPID FIT 2	O-ring	Silver/Silver	Spring Finger	CAF Clamping	TRIM-Series-D	56 (2.21)	35.8 (1.41)	0.20 (0.43)
716M-LCF78-072	7-16 DIN Male RAPID FIT	O-ring	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	66.0 (2.6)	37.0 (1.5)	0.22 (0.49)
716M-LCF78-020	7-16 DIN Male RAPID FIT 2	O-ring	Silver/Silver	Spring Finger	CAF Clamping	TRIM-Series-D	52.1 (2.05)	36.5 (1.44)	0.21 (0.46)
716M-LCF78-076	7-16 DIN Male RAPID FIT	O-ring	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	61.0 (2.4)	37.0 (1.5)	0.30 (0.66)
NF-LCF78-072	N Female RAPID FIT	O-ring	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	55.0 (2.2)	35.0 (1.4)	0.20 (0.45)
NF-LCF78-020	N Female RAPID FIT 2	O-ring	Silver/Silver	Spring Finger	CAF Clamping	TRIM-Series-D	44.5 (1.75)	35.8 (1.41)	0.18 (0.39)
NM-LCF78-072	N Male RAPID FIT	O-ring	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	65.6 (2.6)	35.0 (1.4)	0.15 (0.34)

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Connector Selection Guide

CELLFLEX® Foam Cables

Model Number	Description	Sealing Method	Plating Outer/Inner	Contact Attachment Inner	Contact Attachment Outer	Trimming Tool	Length, mm (in)	Outer Dia., mm (in)	Weight, kg (lb)
UCF78-50A SERIES CONT'D									
NM-LCF78-020	N Male RAPID FIT 2	O-ring	Silver/Silver	Spring Finger	CAF Clamping	TRIM-Series-D	57.5 (2.26)	35.8 (1.41)	0.18 (0.39)
716F-LCF78-026	7-16 DIN Female	Shrinking Sleeve	Silver/Silver	Soldered	Soldered	TRIM-Series-C	59.2 (2.3)	37.0 (1.5)	0.12 (0.27)
716M-LCF78-026	7-16 DIN Male	Shrinking Sleeve	Silver/Silver	Soldered	Soldered	TRIM-Series-C	59.2 (2.3)	37.0 (1.5)	0.12 (0.27)
UCF114-50A SERIES									
716F-LCF114-062	7-16 DIN Female RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Self Flare	TRIM-Series-A	68.0 (2.7)	48.0 (1.9)	0.42 (0.93)
716M-LCF114-062	7-16 DIN Male RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	72.0 (2.8)	48.0 (1.9)	0.42 (0.93)
NF-LCF114-062	N Female RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	62.0 (2.5)	48.0 (1.9)	0.45 (1.00)
NM-LCF114-062	N Male RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	76.1 (3.0)	48.0 (1.9)	0.44 (0.98)
78EIA-LCF114-062	7/8" EIA RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	62.0 (2.5)	57.0 (2.3)	0.54 (1.20)
158EIA-LCF114-062	1-5/8" EIA RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	86.0 (3.4)	90.0 (3.6)	0.42 (0.93)
716F-LCF114-072	7-16 DIN Female RAPID FIT	O-ring	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	68.0 (2.7)	48.0 (1.9)	0.45 (1.00)
716M-LCF114-072	7-16 DIN Male RAPID FIT	O-ring	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	72.0 (2.8)	48.0 (1.9)	0.45 (1.00)
NF-LCF114-072	N Female RAPID FIT	O-ring	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	62.0 (2.5)	48.0 (1.9)	0.48 (1.06)
NM-LCF114-072	N Male RAPID FIT	O-ring	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	76.3 (3.0)	48.0 (1.9)	0.48 (1.06)
716F-LCF114-026	7-16 DIN Female	Shrinking Sleeve	Silver/Silver	Soldered	Soldered	TRIM-Series-C	89.1 (3.51)	40.36 (1.6)	0.14 (0.31)
716M-LCF114-026	7-16 DIN Male	Shrinking Sleeve	Silver/Silver	Soldered	Soldered	TRIM-Series-C	85.3 (3.4)	41.0 (1.6)	0.14 (0.31)
LCF14-50 SERIES									
716M-LCF14-070	7-16 DIN Male RAPID FIT	O-ring	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	48.0 (1.9)	37.0 (1.5)	0.06 (0.14)
NF-LCF14-070	N Female RAPID FIT	O-ring	Silver/Gold	Basket	Spring Finger	TRIM-Series-A	39.0 (1.5)	16.0 (0.6)	0.05 (0.12)
NFS-LCF14-071	N Female RAPID FIT, Panel mount	O-ring	Silver/Gold	Basket	Spring Finger	TRIM-Series-A	39.0 (1.5)	20.0 (0.8)	0.05 (0.11)
NM-LCF14-070	N Male RAPID FIT	O-ring	Silver/Gold	Basket	Spring Finger	TRIM-Series-A	47.1 (1.9)	22.0 (0.9)	0.05 (0.12)
NMR-LCF14-075	N Male Right angle	O-ring	Silver/Gold	Basket	Spring Finger	TRIM-Series-A	34.0 (1.3)	22.0 (0.9)	0.05 (0.12)
TNCM-LCF14-070	TNC Male RAPID FIT	O-ring	Silver/Gold	Basket	Spring Finger	TRIM-Series-A	45.2 (1.8)	16.0 (0.6)	0.05 (0.12)
TNCMR-LCF14-075	TNC Male Right angle	O-ring	Silver/Gold	Basket	Spring Finger	TRIM-Series-A	33.5 (1.3)	16.0 (0.6)	0.05 (0.12)
LCF38-50 SERIES									
716F-LCF38-070	7-16 DIN Female RAPID FIT	O-ring	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	56.0 (2.2)	29.0 (1.2)	0.11 (0.25)
716M-LCF38-070	7-16 DIN Male RAPID FIT	O-ring	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	55.0 (2.2)	37.0 (1.5)	0.11 (0.25)
NF-LCF38-070	N Female RAPID FIT	O-ring	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	45.0 (1.8)	18.0 (0.7)	0.08 (0.18)
NM-LCF38-070	N Male RAPID FIT	O-ring	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	53.1 (2.1)	22.0 (0.9)	0.08 (0.18)
NM-LCF38-015	N Male RAPID FIT Indoor	O-ring	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	52.5 (2.1)	21.2 (0.8)	0.08 (0.18)
NMR-LCF38-071	N Male Right angle	O-ring	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	51.6 (2.0)	22.0 (0.9)	0.10 (0.23)
78EIA-LCF38-001	7/8" EIA	O-ring	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	83.5 (3.3)	57.0 (2.3)	0.27 (0.59)
TNCM-LCF38-075	TNC Male RAPID FIT	O-ring	Silver/Gold	Basket	Spring Finger	TRIM-Series-A	54.2 (2.1)	18.0 (0.7)	0.05 (0.12)
LCF12-50 SERIES									
716F-LCF12-060	7-16 DIN Female RAPID FIT	Plast 2000	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	57.0 (2.3)	29.0 (1.2)	0.13 (0.29)
716M-LCF12-060	7-16 DIN Male RAPID FIT	Plast 2000	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	58.0 (2.3)	37.0 (1.5)	0.16 (0.36)
716MR-LCF12-061	7-16 DIN Male Right angle	Plast 2000	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	43.2 (1.7)	37.0 (1.5)	0.19 (0.42)
NF-LCF12-060	N Female RAPID FIT	Plast 2000	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	50.0 (2.0)	22.0 (0.9)	0.10 (0.23)
NF-LCF12-011	N Female Panel mount	Plast 2000	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	51.0 (2.0)	34.0 (1.3)	0.19 (0.42)
NF-LCF12-065	N Female RAPID FIT	Plast 2000	Silver/Gold	Basket	Spring Finger	TRIM-Series-A	55.0 (2.2)	22.0 (0.9	0.10 (0.22)
NM-LCF12-060	N Male RAPID FIT	Plast 2000	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	58.6 (2.3)	22.0 (0.9)	0.11 (0.25)
NM-LCF12-061	N Male Right angle	Plast 2000	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	45.4 (1.8)	22.0 (0.9)	0.15 (0.34)
NM-LCF12-065	N Male RAPID FIT	Plast 2000	Silver/Gold	Basket	Spring Finger	TRIM-Series-A	65.0 (2.6)	22.0 (0.9	0.11 (0.25)
4195F-LCF12-060	4.1-9.5 Female RAPID FIT	Plast 2000	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	51.0 (2.0)	22.0 (0.9)	0.11 (0.25)
4195M-LCF12-060	4.1-9.5 Male RAPID FIT	Plast 2000	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	51.6 (2.0)	25.0 (1.0)	0.12 (0.27)
78EIA-LCF12-060	7/8" EIA RAPID FIT	Plast 2000	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	85.0 (3.4)	57.0 (2.3)	0.28 (0.62)
UHFF-LCF12-060	UHF Female RAPID FIT	Plast 2000	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	61.0 (2.4)	22.0 (0.9)	0.10 (0.23)
UHFM-LCF12-060	UHF Male RAPID FIT	Plast 2000	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	59.2 (2.3)	22.0 (0.9)	0.10 (0.23)
716F-LCF12-070	7-16 DIN Female RAPID FIT	O-ring	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	57.0 (2.3)	29.0 (1.2)	0.15 (0.34)
716F-LCF12-072	7-16 DIN Female Bulkhead	O-ring	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	57.0 (2.3)	48 (1.9)	0.15 (0.34)
716M-LCF12-070	7-16 DIN Male RAPID FIT	O-ring	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	58.0 (2.3)	37.0 (1.5)	0.15 (0.34)
716M-LCF12-071	7-16 DIN Male Right angle	O-ring	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	43.2 (1.7)	37.0 (1.5)	0.19 (0.42)
NF-LCF12-070	N Female RAPID FIT	O-ring	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	50.0 (2.0)	22.0 (0.9)	0.11 (0.25)
NM-LCF12-070	N Male RAPID FIT	O-ring	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	58.6 (2.3)	22.0 (0.9)	0.11 (0.25)
NM-LCF12-071	N Male Right angle	O-ring	Silver/Silver	Basket	Spring Finger	TRIM-Series-A	45.4 (1.8)	22.0 (0.9)	0.18 (0.40)
78EIA-LCF12-002	7/8" EIA	O-ring	Brass/Silver	Basket	Self Flare	TRIM-Series-B	86.4 (3.4)	25.4 (1.0)	0.17 (0.38)
UHFF-LCF12-001	UHF Female	O-ring	Brass/Silver	Basket	Self Flare	TRIM-Series-B	81.3 (3.2)	25.4 (1.0)	0.18 (0.40)
UHFM-LCF12-001	UHF Male Knurled nut	O-ring	Brass/Silver	Basket	Self Flare	TRIM-Series-B	78.7 (3.1)	25.4 (1.0)	0.17 (0.38)
C-LCF12-002	Splice	O-ring	Brass/Silver	Basket	Self Flare	TRIM-Series-B	91.4 (3.6)	25.4 (1.0)	0.18 (0.40)
C-LCF12-011	Splice, Indoor	N/A	Silver/Silver	Basket	Spring Finger	TRIM-Series-B	81 (3.2)	23.8 (0.9)	0.42 (0.93)

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Connector Selection Guide

CELLFLEX® Foam Cables

Model Number	Description	Sealing Method	Plating Outer/Inner	Contact Attachment Inner	Contact Attachment Outer	Trimming Tool	Length, mm (in)	Outer Dia., mm (in)	Weight, kg (lb)
LCF58-50A SERIES									
NF-LCF58-070	N Female RAPID FIT	O-ring	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	52.5 (2.07)	28.0 (1.10)	0.15 (0.33)
NM-LCF58-070	N Male RAPID FIT	O-ring	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	62.0 (2.44)	28.0 (1.10)	0.14 (0.31)
LCF78-50A-A* SERIES									
716F-LCF78-062	7-16 DIN Female RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	62.0 (2.5)	35.0 (1.4)	0.22 (0.49)
716M-LCF78-062	7-16 DIN Male RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	66.0 (2.6)	37.0 (1.5)	0.22 (0.49)
716MR-LCF78-066	7-16 DIN Male Right angle	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	61.0 (2.4)	37.0 (1.5)	0.30 (0.66)
NF-LCF78-062	N Female RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	55.0 (2.2)	35.0 (1.4)	0.15 (0.34)
NM-LCF78-062	N Male RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	65.6 (2.6)	35.0 (1.4)	0.15 (0.34)
78EIA-LCF78-062	7/8" EIA RAPID FIT	Plast 2000	Silver/Silver	Self Tapping	Spring Finger	TRIM-Series-A	76.5 (3.0)	57.0 (2.3)	0.38 (0.85)
158EIA-LCF78-062	1-5/8" EIA RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	110.0 (4.3)	90.0 (3.6)	0.95 (2.10)
HNM-LCF78-062	HN Male RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger		69.4 (2.7)	34.8 (1.4)	0.18 (0.40)
716F-LCF78-072	7-16 DIN Female RAPID FIT	O-ring	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	61.0 (2.4)	35.0 (1.4)	0.22 (0.49)
716F-LCF78-020	7-16 DIN Female RAPID FIT 2	O-ring	Silver/Silver	Spring Finger	CAF Clamping	TRIM-Series-D	56 (2.21)	35.8 (1.41)	0.20 (0.43)
716M-LCF78-072	7-16 DIN Male RAPID FIT	O-ring	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	66.0 (2.6)	37.0 (1.5)	0.22 (0.49)
716M-LCF78-020	7-16 DIN Male RAPID FIT 2	O-ring	Silver/Silver	Spring Finger	CAF Clamping	TRIM-Series-D	52.1 (2.05)	36.5 (1.44)	0.21 (0.46)
716M-LCF78-076	7-16 DIN Male RAPID FIT	O-ring	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	61.0 (2.4)	37.0 (1.5)	0.30 (0.66)
NF-LCF78-072	N Female RAPID FIT	O-ring	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	55.0 (2.2)	35.0 (1.4)	0.20 (0.45)
NF-LCF78-020	N Female RAPID FIT 2	O-ring	Silver/Silver	Spring Finger	CAF Clamping	TRIM-Series-D	44.5 (1.75)	35.8 (1.41)	0.18 (0.39)
NM-LCF78-072	N Male RAPID FIT	O-ring	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	65.6 (2.6)	35.0 (1.4)	0.15 (0.34)
NM-LCF78-020	N Male RAPID FIT 2	O-ring	Silver/Silver	Spring Finger	CAF Clamping	TRIM-Series-D	57.5 (2.26)	35.8 (1.41)	0.18 (0.39)
716F-LCF78-026	7-16 DIN Female	Shrinking Sleeve	Silver/Silver	Soldered	Soldered	TRIM-Series-C	59.2 (2.3)	37.0 (1.5)	0.12 (0.27)
716M-LCF78-026	7-16 DIN Male	Shrinking Sleeve	Silver/Silver	Soldered	Soldered	TRIM-Series-C	59.2 (2.3)	37.0 (1.5)	0.12 (0.27)
LCFS114-50A SERIES									
716F-LCF114-062	7-16 DIN Female RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Self Flare	TRIM-Series-A	68.0 (2.7)	48.0 (1.9)	0.42 (0.93)
716M-LCF114-062	7-16 DIN Male RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	72.0 (2.8)	48.0 (1.9)	0.42 (0.93)
NF-LCF114-062	N Female RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	62.0 (2.5)	48.0 (1.9)	0.45 (1.00)
NM-LCF114-062	N Male RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	76.1 (3.0)	48.0 (1.9)	0.44 (0.98)
78EIA-LCF114-062	7/8" EIA RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	62.0 (2.5)	57.0 (2.3)	0.54 (1.20)
158EIA-LCF114-062	1-5/8" EIA RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	86.0 (3.4)	90.0 (3.6)	0.42 (0.93)
716F-LCF114-072	7-16 DIN Female RAPID FIT	O-ring	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	68.0 (2.7)	48.0 (1.9)	0.45 (1.00)
716M-LCF114-072	7-16 DIN Male RAPID FIT	O-ring	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	72.0 (2.8)	48.0 (1.9)	0.45 (1.00)
NF-LCF114-072	N Female RAPID FIT	O-ring	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	62.0 (2.5)	48.0 (1.9)	0.48 (1.06)
NM-LCF114-072	N Male RAPID FIT	O-ring	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	76.3 (3.0)	48.0 (1.9)	0.48 (1.06)
716F-LCF114-026	7-16 DIN Female	Shrinking Sleeve	Silver/Silver	Soldered	Soldered	TRIM-Series-C	89.1 (3.51)	40.36 (1.6)	0.14 (0.31)
716M-LCF114-026	7-16 DIN Male	Shrinking Sleeve	Silver/Silver	Soldered	Soldered	TRIM-Series-C	85.3 (3.4)	41.0 (1.6)	0.14 (0.31)
LCF158-50A SERIES									
716F-LCF158-062	7-16 DIN Female RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	84.0 (3.3)	60.0 (2.4)	0.65 (1.44)
716M-LCF158-062	7-16 DIN Male RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	89.0 (3.5)	60.0 (2.4)	0.67 (1.48)
NF-LCF158-062	N Female RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	77.0 (3.0)	60.0 (2.4)	0.66 (1.46)
NM-LCF158-062	N Male RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	88.6 (3.5)	60.0 (2.4)	0.67 (1.48)
78EIA-LCF158-062	7/8" EIA RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	105 (4.1)	59.5 (2.3)	0.70 (1.55)
158EIA-LCF158-062	1-5/8" EIA RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	99.0 (3.9)	90.0 (3.6)	1.18 (2.61)
716F-LCF158-072	7-16 DIN Female RAPID FIT	O-ring	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	84.0 (3.3)	60.0 (2.4)	0.73 (1.61)
716M-LCF158-072	7-16 DIN Male RAPID FIT	O-ring	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	89.0 (3.5)	60.0 (2.4)	0.70 (1.55)
NF-LCF158-072	N Female RAPID FIT	O-ring	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	77.0 (3.0)	60.0 (2.4)	0.71 (1.57)
NM-LCF158-072	N Male RAPID FIT	O-ring	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	88.6 (3.5)	60.0 (2.4)	0.67 (1.48)
78EIA-LCF158-003	7/8" EIA	O-ring	Brass/Brass	Self Tapping	Tab Flare		113.1 (4.45)	63.1 (2.48)	0.70 (1.55)
716F-LCF158-026	7-16 DIN Female	Shrinking Sleeve	Silver/Silver	Soldered	Soldered	TRIM-Series-C	94.0 (3.7)	51.8 (2.0)	0.15 (0.34)
716M-LCF158-026	7-16 DIN Male	Shrinking Sleeve	Silver/Silver	Soldered	Soldered	TRIM-Series-C	90.2 (3.6)	51.0 (2.0)	0.15 (0.34)
716M-LCF158-008	7-16 DIN Male Indoor Quick Clamp	N/A	Silver/Silver	Spring Finger	Spring Finger	TRIM-114-C06	118 (4.6)	78 (3.1)	1.00 (2.21)
LCF214-50A-P* SERIES									
716F-LCF214-062	7-16 DIN Female RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	98.0 (3.9)	70.0 (2.8)	1.00 (2.21)
716M-LCF214-062	7-16 DIN Male RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	98.0 (3.9)	70.0 (2.8)	1.00 (2.21)
716F-LCF214-072	7-16 DIN Female RAPID FIT	O-ring	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	98.6 (3.9)	70.0 (2.8)	1.00 (2.21)
716M-LCF214-072	7-16 DIN Male RAPID FIT	O-ring	Silver/Silver	Spring Finger	Spring Finger	TRIM-Series-A	98.0 (3.9)	70.0 (2.8)	1.00 (2.21)
716F-LCF214-025	7-16 DIN Female	Shrinking Sleeve	Silver/Silver	Soldered	Soldered	TRIM-Series-C	98.5 (3.88)	60.0 (2.4)	0.18 (0.40)
716M-LCF214-025	7-16 DIN Male	Shrinking Sleeve	Silver/Silver	Soldered	Soldered	TRIM-Series-C	94.7 (3.7)	60.0 (2.4)	0.18 (0.40)

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Connector Selection Guide

RG Type Cables

Model Number	Description	Sealing Method	Plating Outer/Inner	Contact Attachment Inner	Contact Attachment Outer	Length, mm (in)	Outer Dia., mm (in)	Weight, kg (lb)
RGC-08 BRAIDED CABLE SOLDERED SERIES								
NM-RGC8-1	N Male, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp	38 (1.49)	20.8 (0.82)	0.060 (0.132)
NF-RGC8-1	N Female, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp	38 (1.49)	19.0 (0.75)	0.060 (0.132)
NMR-RGC8-213-1	N Male, Soldered Inner Contact, Right angle	O-ring	Silver/Silver	Soldered	Clamp	36 (1.42)	20.8 (0.82)	0.090 (0.198)
RGC-213 BRAIDED CABLE SOLDERED SERIES								
NM-RGC213-1	N Male, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp	38 (1.49)	20.8 (0.82)	0.060 (0.132)
NF-RGC213-1	N Female, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp	38 (1.49)	19.0 (0.75)	0.060 (0.132)
NMR-RGC8-213-1	N Male, Soldered Inner Contact, Right angle	O-ring	Silver/Silver	Soldered	Clamp	36 (1.42)	20.8 (0.82)	0.090 (0.198)
RGC-213/08 BRAIDED CABLE BASKET CLAMP SERIES								
NM-RGC8-213-3	N Male, Spring Finger Inner Contact	O-ring	Silver/Silver	Spring Finger	Clamp	38 (1.49)	20.8 (0.82)	0.048 (0.106)
NF-RGC8-213-3	N Female, Spring Finger Inner Contact	O-ring	Silver/Silver	Spring Finger	Clamp	38 (1.49)	19.5 (0.77)	0.046 (0.101)
NMR-RGC8-213-3	N Male, Right angle, Spring Finger Inner Contact	O-ring	Silver/Silver	Spring Finger	Clamp	32.8 (1.29)	20.8 (0.82)	0.080 (0.176)
RG-213 BRAIDED CABLE SOLDERED SERIES								
NM-RG213-1	N Male, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp	38 (1.49)	20.8 (0.82)	0.060 (0.132)
NF-RG213-1	N Female, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp	38 (1.49)	19.0 (0.75)	0.060 (0.132)
NMR-RG213-1	N Male, Soldered Inner Contact, Right angle	O-ring	Silver/Silver	Soldered	Clamp	36 (1.42)	20.8 (0.82)	0.090 (0.198)
RG-214 BRAIDED CABLE SOLDERED SERIES								
NM-RG214-1	N Male, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp			
NMR-RG214-1	N Male, Soldered Inner Contact, Right angle	O-ring	Silver/Silver	Soldered	Clamp			
716M-RG214-1	7-16 DIN Female, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp			
716MR-RG214-1	7-16 DIN Female, Soldered Inner Contact, Right angle	O-ring	Silver/Silver	Soldered	Clamp			
RG-223 BRAIDED CABLE SOLDERED SERIES								
TNCM-RG223-1	TNC Male, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp			
TNCMR-RG223-1	TNC Male, Soldered Inner Contact, Right angle	O-ring	Silver/Silver	Soldered	Clamp			
SMAM-RG223-1	SMA Male, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp			
SMAMR-RG223-1	SMA Male, Soldered Inner Contact, Right angle	O-ring	Silver/Silver	Soldered	Clamp			
RG-174 BRAIDED CABLE SOLDERED SERIES								
TNCM-RG174-1	TNC Male, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp			
TNCMR-RG174-1	TNC Male, Soldered Inner Contact, Right angle	O-ring	Silver/Silver	Soldered	Clamp			
SMAM-RG174-1	SMA Male, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp			
SMAMR-RG174-1	SMA Male, Soldered Inner Contact, Right angle	O-ring	Silver/Silver	Soldered	Clamp			
RG-58 BRAIDED CABLE SOLDERED SERIES								
TNCM-RG58-1	TNC Male, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp			
TNCMR-RG58-1	TNC Male, Soldered Inner Contact, Right angle	O-ring	Silver/Silver	Soldered	Clamp			
SMAM-RG58-1	SMA Male, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp			
SMAMR-RG58-1	SMA Male, Soldered Inner Contact, Right angle	O-ring	Silver/Silver	Soldered	Clamp			
RGC-58 BRAIDED CABLE SOLDERED SERIES								
TNCM-RGC58-1	TNC Male, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp			
TNCMR-RGC58-1	TNC Male, Soldered Inner Contact, Right angle	O-ring	Silver/Silver	Soldered	Clamp			
SMAM-RGC58-1	SMA Male, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp			
SMAMR-RGC58-1	SMA Male, Soldered Inner Contact, Right angle	O-ring	Silver/Silver	Soldered	Clamp			

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Connector Selection Guide

HELIFLEX® Air-Dielectric Cables

Model Number	Description	Sealing Method	Plating Outer/Inner	Contact Attachment Inner	Contact Attachment Outer	Length, mm (in)	Outer Dia., mm (in)	Weight, kg (lb)
HCA38-50 SERIES								
716F-HCA38-020	7-16 DIN Female RAPID FIT	Plast 2000	Silver/Silver	Basket	Threaded	61 (2.40)	29 (1.14)	0.15 (0.33)
716M-HCA38-020	7-16 DIN Male RAPID FIT	Plast 2000	Silver/Silver	Basket	Threaded	60 (2.36)	36.5 (1.44)	0.16 (0.35)
NF-HCA38-020	N Female RAPID FIT	Plast 2000	Silver/Silver	Basket	Threaded	68 (2.68)	25 (0.98)	0.15 (0.33)
NM-HCA38-020	N Male RAPID FIT	Plast 2000	Silver/Silver	Basket	Threaded	66 (2.60)	25 (0.98)	0.14 (0.31)
78EIAP-HCA38-020	7/8" EIA Female Gas Pass	Plast 2000	Silver/Silver	Tapping	Tab Flare	57 (2.24)	25 (0.98)	0.38 (0.84)
HCA12-50 SERIES								
716F-LCF12-060	7-16 DIN Female RAPID FIT	Plast 2000	Silver/Silver	Basket	Spring Finger	57.0 (2.3)	29.0 (1.2)	0.13 (0.29)
716M-LCF12-060	7-16 DIN Male RAPID FIT	Plast 2000	Silver/Silver	Basket	Spring Finger	58.0 (2.3)	37.0 (1.5)	0.16 (0.36)
716MR-LCF12-061	7-16 DIN Male Right angle	Plast 2000	Silver/Silver	Basket	Spring Finger	43.2 (1.7)	37.0 (1.5)	0.19 (0.42)
NF-LCF12-060	N Female RAPID FIT	Plast 2000	Silver/Silver	Basket	Spring Finger	50.0 (2.0)	22.0 (0.9)	0.10 (0.23)
NFS-LCF12-011	N Female Panel mount	Plast 2000	Silver/Silver	Basket	Spring Finger	51.0 (2.0)	34.0 (1.3)	0.19 (0.42)
NF-LCF12-065	N Female RAPID FIT	Plast 2000	Silver/Gold	Basket	Spring Finger	55.0 (2.2)	22.0 (0.9	0.10 (0.22)
NM-LCF12-060	N Male RAPID FIT	Plast 2000	Silver/Silver	Basket	Spring Finger	58.6 (2.3)	22.0 (0.9)	0.11 (0.25)
NMR-LCF12-061	N Male Right angle	Plast 2000	Silver/Silver	Basket	Spring Finger	45.4 (1.8)	22.0 (0.9)	0.15 (0.34)
NM-LCF12-065	N Male RAPID FIT	Plast 2000	Silver/Gold	Basket	Spring Finger	65.0 (2.6)	22.0 (0.9	0.11 (0.25)
4195F-LCF12-060	4.1-9.5 Female RAPID FIT	Plast 2000	Silver/Silver	Basket	Spring Finger	51.0 (2.0)	22.0 (0.9)	0.11 (0.25)
4195M-LCF12-060	4.1-9.5 Male RAPID FIT	Plast 2000	Silver/Silver	Basket	Spring Finger	51.6 (2.0)	25.0 (1.0)	0.12 (0.27)
78EIA-LCF12-060	7/8" EIA RAPID FIT	Plast 2000	Silver/Silver	Basket	Spring Finger	85.0 (3.4)	57.0 (2.3)	0.28 (0.62)
UHFF-LCF12-060	UHF Female RAPID FIT	Plast 2000	Silver/Silver	Basket	Spring Finger	61.0 (2.4)	22.0 (0.9)	0.10 (0.23)
UHFM-LCF12-060	UHF Male RAPID FIT	Plast 2000	Silver/Silver	Basket	Spring Finger	59.2 (2.3)	22.0 (0.9)	0.10 (0.23)
716F-LCF12-070	7-16 DIN Female RAPID FIT	O-ring	Silver/Silver	Basket	Spring Finger	57.0 (2.3)	29.0 (1.2)	0.15 (0.34)
716FB-LCF12-072	7-16 DIN Female Bulkhead	O-ring	Silver/Silver	Basket	Spring Finger	57.0 (2.3)	48 (1.9)	0.15 (0.34)
716M-LCF12-070	7-16 DIN Male RAPID FIT	O-ring	Silver/Silver	Basket	Spring Finger	58.0 (2.3)	37.0 (1.5)	0.15 (0.34)
716MR-LCF12-071	7-16 DIN Male Right angle	O-ring	Silver/Silver	Basket	Spring Finger	43.2 (1.7)	37.0 (1.5)	0.19 (0.42)
NF-LCF12-070	N Female RAPID FIT	O-ring	Silver/Silver	Basket	Spring Finger	50.0 (2.0)	22.0 (0.9)	0.11 (0.25)
NM-LCF12-070	N Male RAPID FIT	O-ring	Silver/Silver	Basket	Spring Finger	58.6 (2.3)	22.0 (0.9)	0.11 (0.25)
NMR-LCF12-071	N Male Right angle	O-ring	Silver/Silver	Basket	Spring Finger	45.4 (1.8)	22.0 (0.9)	0.18 (0.40)
78EIA-LCF12-002	7/8" EIA	O-ring	Brass/Silver	Basket	Self Flare	86.4 (3.4)	25.4 (1.0)	0.17 (0.38)
UHFF-LCF12-001	UHF Female	O-ring	Brass/Silver	Basket	Self Flare	81.3 (3.2)	25.4 (1.0)	0.18 (0.40)
UHFM-LCF12-001	UHF Male Knurled nut	O-ring	Brass/Silver	Basket	Self Flare	78.7 (3.1)	25.4 (1.0)	0.17 (0.38)
C-LCF12-002	Splice	O-ring	Brass/Silver	Basket	Self Flare	91.4 (3.6)	25.4 (1.0)	0.18 (0.40)
C-LCF12-011	Splice, Indoor	N/A	Silver/Silver	Basket	Spring Finger	81 (3.2)	23.8 (0.9)	0.42 (0.93)
HCA58-50 SERIES								
716M-HCA58-020	7-16 DIN Male RAPID FIT	Plast 2000	Silver/Silver	Basket	Threaded	72 (2.84)	36.5 (1.44)	0.25 (0.55)
NF-HCA58-020	N Female RAPID FIT	Plast 2000	Silver/Silver	Basket	Threaded	92 (3.62)	33 (1.30)	0.25 (0.55)
NM-HCA58-020	N Male RAPID FIT	Plast 2000	Silver/Silver	Basket	Threaded	95 (3.74)	33 (1.30)	0.26 (0.57)
78EIA-HCA58-020	7/8" EIA Female RAPID FIT	Plast 2000	Silver/Silver	Basket	Threaded	107 (4.21)	57.2 (2.25)	0.49 (1.08)
HCA78-50 SERIES								
716F-HCA78-020	7-16 DIN Female RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Threaded	72 (2.84)	39.5 (1.55)	0.33 (0.73)
716M-HCA78-020	7-16 DIN Male RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Threaded	74 (2.91)	39.5 (1.55)	0.40 (0.88)
NF-HCA78-020	N Female RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Threaded	77 (3.03)	39.5 (1.55)	0.33 (0.73)
NM-HCA78-020	N Male RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Threaded	80 (3.15)	39.5 (1.55)	0.34 (0.75)
78EIA-HCA78-020	7/8" EIA Female RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Threaded	91 (3.58)	57.2 (2.25)	0.54 (1.19)
CP-HCA78-001	Splice Gas Pass	Plast 2000	Silver/Silver	Tapping	Tab Flare	90 (3.54)	42 (1.65)	0.50 (1.10)
NF-HCA78-001	N Female	O-ring	Brass/Silver	Self Tapping	Tab Flare	99 (3.9)	36 (1.4)	0.4 (0.85)
NFT-HCA78-002	N Female Tunable	O-ring	Brass/Silver	Self Tapping	Tab Flare	188 (7.4)	46 (1.8)	1.0 (2.25)
NM-HCA78-001	N Male	O-ring	Brass/Silver	Self Tapping	Tab Flare	99 (3.9)	36 (1.4)	0.4 (0.85)
NM-HCA78-002	N Male	O-ring	Silver/Gold	Self Tapping	Self Flare	99 (3.9)	36 (1.4)	0.4 (0.85)
NMT-HCA78-002	N Male Tunable	O-ring	Brass/Silver	Self Tapping	Tab Flare	188 (7.4)	46 (1.8)	1.0 (2.25)
78EIA-HCA78-001	7/8" EIA Gas Barrier	O-ring	Brass/Silver	Self Tapping	Tab Flare	89 (3.5)	36 (1.4)	0.5 (1.2)
78EIAP-HCA78-001	7/8" EIA Gas Pass	O-ring	Brass/Silver	Self Tapping	Tab Flare	89 (3.5)	36 (1.4)	0.6 (1.3)
CP-HCA78-005	Splice	O-ring	Brass/Brass	Self Tapping	Tab Flare	137 (5.4)	36 (1.4)	0.6 (1.3)
HCA118-50 SERIES								
716F-HCA118-001	7-16 DIN Female Gas Barrier	Plast 2000	Silver/Silver	Plug Finger	Tab Flare	102 (4.02)	59 (2.32)	1.07 (2.36)
NF-HCA118-001	N Female Gas Barrier	Plast 2000	Silver/Silver	Plug Finger	Tab Flare	115 (4.53)	59 (2.32)	1.10 (2.43)
NM-HCA118-001	N Male Gas Barrier	Plast 2000	Silver/Silver	Plug Finger	Tab Flare	115 (4.53)	59 (2.32)	1.18 (2.60)
78EIA-HCA118-001	7/8" EIA Female Gas Barrier	Plast 2000	Silver/Silver	Plug Finger	Tab Flare	117 (4.61)	59 (2.32)	1.32 (2.91)
158EIA-HCA118-001	1-5/8" EIA Female Gas Barrier	Plast 2000	Silver/Silver	Plug Finger	Tab Flare	128 (5.04)	59 (2.32)	1.75 (3.86)

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Connector Selection Guide

HELIFLEX® Air-Dielectric Cables

Model Number	Description	Sealing Method	Plating Outer/Inner	Contact Attachment Inner	Contact Attachment Outer	Length, mm (in)	Outer Dia., mm (in)	Weight, kg (lb)
HCA158-50 SERIES								
716F-HCA158-001	7-16 DIN Female Gas Barrier	Plast 2000	Silver/Silver	Threaded	Tab Flare	150 (5.91)	74 (2.91)	1.67 (3.68)
716M-HCA158-001	7-16 DIN Male Gas Barrier	Plast 2000	Silver/Silver	Threaded	Tab Flare	150 (5.91)	74 (2.91)	1.67 (3.68)
NM-HCA158-001	N Male Gas Barrier	Plast 2000	Silver/Silver	Threaded	Tab Flare	163 (6.42)	74 (2.91)	2.00 (4.41)
158EIA-HCA158-001	1-5/8" EIA Female Gas Barrier	Plast 2000	Silver/Silver	Threaded	Tab Flare	152 (5.98)	90 (3.54)	2.11 (4.65)
CP-HCA158-004	Splice Gas Pass	Plast 2000	Silver/Silver	Threaded	Tab Flare	215 (8.47)	80 (3.15)	1.70 (3.75)
NF-HCA158-001	N Female	O-ring	Silver/Gold	Threaded	Tab Flare	135 (5.31)	63 (2.5)	1.4 (3.0)
NF-HCA158-002	N Female	O-ring	Brass/Silver	Threaded	Tab Flare	135 (5.31)	63 (2.5)	1.4 (3.0)
NM-HCA158-002	N Male	O-ring	Brass/Silver	Threaded	Tab Flare	133 (5.25)	63 (2.5)	1.4 (3.0)
78EIA-HCA158-001	7/8" EIA Gas Barrier	O-ring	Brass/Silver	Threaded	Tab Flare	105 (4.14)	63 (2.5)	1.81 (4.0)
78EIAP-HCA158-001	7/8" EIA Gas Pass	O-ring	Brass/Silver	Threaded	Tab Flare	105 (4.14)	63 (2.5)	1.81 (4.0)
158EIA-HCA158-002	1-5/8" EIA Gas Barrier	O-ring	Brass/Silver	Threaded	Tab Flare	116 (4.55)	89 (3.5)	1.91 (4.2)
158EIAP-HCA158-001	1-5/8" EIA Gas Pass	O-ring	Brass/Silver	Threaded	Tab Flare	116 (4.55)	89 (3.5)	1.91 (4.2)
CP-HCA158-005	Splice	O-ring	Brass/Brass	Threaded	Tab Flare	123 (4.83)	63 (2.5)	1.95 (4.3)
HCA214-50 SERIES								
NF-HCA214-001	N Female	O-ring	Silver/Gold	Threaded	Tab Flare	135.3 (5.32)	73 (2.88)	1.63 (3.6)
78EIA-HCA214-001	7/8" EIA Gas Barrier	O-ring	Brass/Silver	Threaded	Tab Flare	105 (4.14)	73 (2.88)	1.77 (3.9)
78EIAP-HCA214-001	7/8" EIA Gas Pass	O-ring	Brass/Silver	Threaded	Tab Flare	105 (4.14)	73 (2.88)	1.77 (3.9)
158EIA-HCA214-001	1-5/8" EIA Gas Barrier	O-ring	Brass/Silver	Threaded	Tab Flare	115.6 (4.55)	89.4 (3.52)	1.68 (3.7)
158EIAP-HCA214-001	1-5/8" EIA Gas Pass	O-ring	Brass/Silver	Threaded	Tab Flare	115.6 (4.55)	89.4 (3.52)	1.68 (3.7)
318EIA-HCA214-001	3-1/8" EIA Female Gas Barrier	O-ring	Brass/Silver	Threaded	Tab Flare	127 (5)	136.8 (5.2)	1.81 (4.0)
318EIAP-HCA214-001	3-1/8" EIA Female Gas Pass	O-ring	Brass/Silver	Threaded	Tab Flare	127 (5)	136.8 (5.2)	1.81 (4.0)
CP-HCA214-005	Splice	O-ring	Brass/Brass	Threaded	Tab Flare	122.6 (4.83)	73 (2.88)	1.72 (3.8)
HCA295-50 SERIES								
158EIA-HCA295-002	1-5/8" EIA Female	Plast 2000	Silver/Silver	Threaded	Tab Flare	170 (6.69)	119 (4.69)	4.00 (8.82)
318EIA-HCA295-001	3-1/8" EIA Female	Plast 2000	Silver/Silver	Threaded	Tab Flare	175 (6.89)	131 (5.2)	4.80 (10.58)
CP-HCA295-003	Splice Gas Pass	Plast 2000	Silver/Silver	Threaded	Tab Flare	252 (9.92)	119 (4.69)	4.30 (9.48)
HCA300-50 SERIES								
318EIA-HCA300-005	3-1/8" EIA Gas Barrier	O-ring	Brass/Silver	Threaded	Tab Flare	203 (8.0)	131 (5.2)	4.60 (10.15)
318EIAP-HCA300-001	3-1/8" EIA Gas Pass	O-ring	Brass/Silver	Threaded	Tab Flare	201 (7.9)	131 (5.2)	4.60 (10.15)
CP-HCA300-005	Splice	O-ring	Brass/Brass	Threaded	Tab Flare	191 (7.5)	114 (4.5)	4.58 (10.10)
HCA318-50 SERIES								
158EIA-HCA318-001	1-5/8" EIA	Plast 2000	Silver/Silver	Threaded	Tab Flare	200 (7.87)	128 (5.04)	3.50 (7.72)
CP-HCA318-001	Splice Gas Pass	Plast 2000	Silver/Silver	Threaded	Tab Flare	214 (8.43)	128 (5.04)	1.10 (2.43)
318EIA-HCA318-001	3-1/8" EIA Gas Barrier	O-ring	Brass/Silver	Threaded	Tab Flare	155 (6.1)	127 (5)	4.76 (10.5)
318EIA-HCA318-002	3-1/8" EIA Gas Barrier	O-ring	Brass/Silver	Threaded	Tab Flare	155 (6.1)	127 (5)	4.76 (10.5)
318EIAP-HCA318-001	3-1/8" EIA Gas Pass	O-ring	Brass/Silver	Threaded	Tab Flare	155 (6.1)	127 (5)	4.76 (10.5)
CP-HCA318-005	Splice	O-ring	Brass/Brass	Threaded	Tab Flare	210 (8.3)	127 (5)	4.63 (10.2)
HCA418-50 SERIES								
412EIA-HCA418-001	4-1/2" IEC Female Gas Barrier	Plast 2000	Silver/Silver	Threaded	Tab Flare	245 (9.65)	177 (6.97)	12.20 (26.90)
618EIA-HCA418-001	6-1/8" EIA Female Gas Barrier	Plast 2000	Silver/Silver	Threaded	Tab Flare	295 (11.61)	210 (8.27)	17.0 (37.5)
618EIA-HCA418-002	6-1/8" EIA Male Gas Barrier	O-ring	Brass/Silver	Threaded	Tab Flare	114 (4.4)	158 (6.2)	9.3 (20.5)
618EIAP-HCA418-001	6-1/8" EIA Male Gas Pass	O-ring	Brass/Silver	Threaded	Tab Flare	114 (4.4)	158 (6.2)	9.3 (20.5)
HCA500-50 SERIES								
412EIA-HCA500-001	4-1/2" IEC Female Gas Barrier	Plast 2000	Silver/Silver	Threaded	Tab Flare	300 (11.81)	212 (8.35)	5.00 (11.02)
618EIA-HCA500-002	6-1/8" EIA Female Gas Barrier	Plast 2000	Silver/Silver	Threaded	Tab Flare	310 (12.21)	212 (8.35)	25.6 (56.44)
HCA618-50 SERIES								
618EIA-HCA618-002	6-1/8" EIA Female Gas Barrier	Plast 2000	Silver/Silver	Threaded	Tab Flare	312 (12.28)	219 (8.62)	25.50 (56.22)
HCA800-50 SERIES								
100230-HCA800-001	100-230 Female Welding, High Power	Plast 2000	Chromating/Silver	Threaded	Welding Tab Flare	470 (18.50)	310 (12.21)	
100230-HCA800-002	100-230 Female Welding, High Power	Plast 2000	Hard coat/Silver	Threaded	Welding Tab Flare	470 (18.50)	310 (12.21)	
100230-HCA800-005	100-230 Female Welding	Plast 2000	Chromating/Silver	Threaded	Welding Tab Flare	470 (18.50)	310 (12.21)	
100230-HCA800-009	100-230 Female Welding	Plast 2000	Hard coat/Silver	Threaded	Welding Tab Flare	470 (18.50)	310 (12.21)	
CP-HCA800-001	Splice Welding, High Power	Plast 2000	Chromating/Silver	Threaded	Welding Tab Flare	617 (24.29)	385 (15.16)	
CP-HCA800-003	Splice Welding	Plast 2000	Chromating/Silver	Threaded	Welding Tab Flare	617 (24.29)	385 (15.16)	
CP-HCA800-009	Splice Welding	Plast 2000	Hard coat/Silver	Threaded	Welding Tab Flare	617 (24.29)	385 (15.16)	

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HELIFLEX® Air-Dielectric Cables

Model Number	Description	Sealing Method	Plating Outer/Inner	Contact Attachment Inner	Contact Attachment Outer	Length, mm (in)	Outer Dia., mm (in)	Weight, kg (lb)
HCA900-50T SERIES								
100230-HCA900-001	100-230 Female Welding	Plast 2000	Chromating/Silver	Threaded	Welding Tab Flare	535 (21.06)	354 (13.94)	
100230-HCA900-004	100-230 Female Welding	Plast 2000	Hard coat/Silver	Threaded	Welding Tab Flare	535 (21.06)	354 (13.94)	
CP-HCA900-003	Splice Welding	Plast 2000	Chromating/Silver	Threaded	Welding Tab Flare	550 (21.65)	325 (12.80)	
CP-HCA900-004	Splice Welding	Plast 2000	Hard coat/Silver	Threaded	Welding Tab Flare	550 (21.65)	325 (12.80)	
COUPLING ELEMENTS								
78EIA-CE-001	7/8" EIA Coupling Element, long	O-ring	Silver	Spring Finger		49.3 (1.9)	21 (0.83)	0.05 (0.10)
78EIA-CE-002	7/8" EIA Coupling Element	O-ring	Silver	Spring Finger		49 (1.93)	21 (0.83)	0.06 (0.13)
158EIA-CE-001	1-5/8" EIA Coupling Element, long	O-ring	Silver	Spring Finger		82.6 (3.3)	42 (1.65)	0.07 (0.15)
158EIA-CE-002	1-5/8" EIA Coupling Element	O-ring	Silver	Spring Finger		60 (2.36)	42 (1.65)	0.17 (0.37)
318EIA-CE-002	3-1/8" EIA Coupling Element	O-ring	Silver	Spring Finger		101 (3.98)	81 (3.19)	0.59 (1.30)
412EIA-CE-002	4-1/2" EIA Coupling Element	O-ring	Silver	Spring Finger		77 (3.03)	105 (4.13)	1.09 (2.40)
618EIA-CE-002	6-1/8" EIA Coupling Element	O-ring	Silver	Spring Finger		109 (4.29)	154 (6.06)	2.14 (4.72)
100230-CE-002	100-230 Coupling Element	O-ring	Silver	Spring Finger		288 (11.34)	310 (12.21)	

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Connector Selection Guide

RG Type Cables

Model Number	Description	Sealing Method	Plating Outer/Inner	Contact Attachment Inner	Contact Attachment Outer	Length, mm (in)	Outer Dia., mm (in)	Weight, kg (lb)
RGC-08 BRAIDED CABLE SOLDERED SERIES								
NM-RGC8-1	N Male, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp	38 (1.49)	20.8 (0.82)	0.060 (0.132)
NF-RGC8-1	N Female, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp	38 (1.49)	19.0 (0.75)	0.060 (0.132)
NMR-RGC8-213-1	N Male, Soldered Inner Contact, Right angle	O-ring	Silver/Silver	Soldered	Clamp	36 (1.42)	20.8 (0.82)	0.090 (0.198)
RGC-213 BRAIDED CABLE SOLDERED SERIES								
NM-RGC213-1	N Male, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp	38 (1.49)	20.8 (0.82)	0.060 (0.132)
NF-RGC213-1	N Female, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp	38 (1.49)	19.0 (0.75)	0.060 (0.132)
NMR-RGC8-213-1	N Male, Soldered Inner Contact, Right angle	O-ring	Silver/Silver	Soldered	Clamp	36 (1.42)	20.8 (0.82)	0.090 (0.198)
RGC-213/08 BRAIDED CABLE BASKET CLAMP SERIES								
NM-RGC8-213-3	N Male, Spring Finger Inner Contact	O-ring	Silver/Silver	Spring Finger	Clamp	38 (1.49)	20.8 (0.82)	0.048 (0.106)
NF-RGC8-213-3	N Female, Spring Finger Inner Contact	O-ring	Silver/Silver	Spring Finger	Clamp	38 (1.49)	19.5 (0.77)	0.046 (0.101)
NMR-RGC8-213-3	N Male, Right angle, Spring Finger Inner Contact	O-ring	Silver/Silver	Spring Finger	Clamp	32.8 (1.29)	20.8 (0.82)	0.080 (0.176)
RG-213 BRAIDED CABLE SOLDERED SERIES								
NM-RG213-1	N Male, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp	38 (1.49)	20.8 (0.82)	0.060 (0.132)
NF-RG213-1	N Female, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp	38 (1.49)	19.0 (0.75)	0.060 (0.132)
NMR-RG213-1	N Male, Soldered Inner Contact, Right angle	O-ring	Silver/Silver	Soldered	Clamp	36 (1.42)	20.8 (0.82)	0.090 (0.198)
RG-214 BRAIDED CABLE SOLDERED SERIES								
NM-RG214-1	N Male, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp			
NMR-RG214-1	N Male, Soldered Inner Contact, Right angle	O-ring	Silver/Silver	Soldered	Clamp			
716M-RG214-1	7-16 DIN Female, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp			
716MR-RG214-1	7-16 DIN Female, Soldered Inner Contact, Right angle	O-ring	Silver/Silver	Soldered	Clamp			
RG-223 BRAIDED CABLE SOLDERED SERIES								
TNCM-RG223-1	TNC Male, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp			
TNCMR-RG223-1	TNC Male, Soldered Inner Contact, Right angle	O-ring	Silver/Silver	Soldered	Clamp			
SMAM-RG223-1	SMA Male, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp			
SMAMR-RG223-1	SMA Male, Soldered Inner Contact, Right angle	O-ring	Silver/Silver	Soldered	Clamp			
RG-174 BRAIDED CABLE SOLDERED SERIES								
TNCM-RG174-1	TNC Male, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp			
TNCMR-RG174-1	TNC Male, Soldered Inner Contact, Right angle	O-ring	Silver/Silver	Soldered	Clamp			
SMAM-RG174-1	SMA Male, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp			
SMAMR-RG174-1	SMA Male, Soldered Inner Contact, Right angle	O-ring	Silver/Silver	Soldered	Clamp			
RG-58 BRAIDED CABLE SOLDERED SERIES								
TNCM-RG58-1	TNC Male, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp			
TNCMR-RG58-1	TNC Male, Soldered Inner Contact, Right angle	O-ring	Silver/Silver	Soldered	Clamp			
SMAM-RG58-1	SMA Male, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp			
SMAMR-RG58-1	SMA Male, Soldered Inner Contact, Right angle	O-ring	Silver/Silver	Soldered	Clamp			
RGC-58 BRAIDED CABLE SOLDERED SERIES								
TNCM-RGC58-1	TNC Male, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp			
TNCMR-RGC58-1	TNC Male, Soldered Inner Contact, Right angle	O-ring	Silver/Silver	Soldered	Clamp			
SMAM-RGC58-1	SMA Male, Soldered Inner Contact	O-ring	Silver/Silver	Soldered	Clamp			
SMAMR-RGC58-1	SMA Male, Soldered Inner Contact, Right angle	O-ring	Silver/Silver	Soldered	Clamp			

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Connector Selection Guide

HELIFLEX® Air-Dielectric Cables

Model Number	Description	Sealing Method	Plating Outer/Inner	Contact Attachment Inner	Contact Attachment Outer	Length, mm (in)	Outer Dia., mm (in)	Weight, kg (lb)
HCA38-50 SERIES								
716F-HCA38-020	7-16 DIN Female RAPID FIT	Plast 2000	Silver/Silver	Basket	Threaded	61 (2.40)	29 (1.14)	0.15 (0.33)
716M-HCA38-020	7-16 DIN Male RAPID FIT	Plast 2000	Silver/Silver	Basket	Threaded	60 (2.36)	36.5 (1.44)	0.16 (0.35)
NF-HCA38-020	N Female RAPID FIT	Plast 2000	Silver/Silver	Basket	Threaded	68 (2.68)	25 (0.98)	0.15 (0.33)
NM-HCA38-020	N Male RAPID FIT	Plast 2000	Silver/Silver	Basket	Threaded	66 (2.60)	25 (0.98)	0.14 (0.31)
78EIAP-HCA38-020	7/8" EIA Female Gas Pass	Plast 2000	Silver/Silver	Tapping	Tab Flare	57 (2.24)	25 (0.98)	0.38 (0.84)
HCA12-50 SERIES								
716F-LCF12-060	7-16 DIN Female RAPID FIT	Plast 2000	Silver/Silver	Basket	Spring Finger	57.0 (2.3)	29.0 (1.2)	0.13 (0.29)
716M-LCF12-060	7-16 DIN Male RAPID FIT	Plast 2000	Silver/Silver	Basket	Spring Finger	58.0 (2.3)	37.0 (1.5)	0.16 (0.36)
716MR-LCF12-061	7-16 DIN Male Right angle	Plast 2000	Silver/Silver	Basket	Spring Finger	43.2 (1.7)	37.0 (1.5)	0.19 (0.42)
NF-LCF12-060	N Female RAPID FIT	Plast 2000	Silver/Silver	Basket	Spring Finger	50.0 (2.0)	22.0 (0.9)	0.10 (0.23)
NFS-LCF12-011	N Female Panel mount	Plast 2000	Silver/Silver	Basket	Spring Finger	51.0 (2.0)	34.0 (1.3)	0.19 (0.42)
NF-LCF12-065	N Female RAPID FIT	Plast 2000	Silver/Gold	Basket	Spring Finger	55.0 (2.2)	22.0 (0.9	0.10 (0.22)
NM-LCF12-060	N Male RAPID FIT	Plast 2000	Silver/Silver	Basket	Spring Finger	58.6 (2.3)	22.0 (0.9)	0.11 (0.25)
NMR-LCF12-061	N Male Right angle	Plast 2000	Silver/Silver	Basket	Spring Finger	45.4 (1.8)	22.0 (0.9)	0.15 (0.34)
NM-LCF12-065	N Male RAPID FIT	Plast 2000	Silver/Gold	Basket	Spring Finger	65.0 (2.6)	22.0 (0.9	0.11 (0.25)
4195F-LCF12-060	4.1-9.5 Female RAPID FIT	Plast 2000	Silver/Silver	Basket	Spring Finger	51.0 (2.0)	22.0 (0.9)	0.11 (0.25)
4195M-LCF12-060	4.1-9.5 Male RAPID FIT	Plast 2000	Silver/Silver	Basket	Spring Finger	51.6 (2.0)	25.0 (1.0)	0.12 (0.27)
78EIA-LCF12-060	7/8" EIA RAPID FIT	Plast 2000	Silver/Silver	Basket	Spring Finger	85.0 (3.4)	57.0 (2.3)	0.28 (0.62)
UHFF-LCF12-060	UHF Female RAPID FIT	Plast 2000	Silver/Silver	Basket	Spring Finger	61.0 (2.4)	22.0 (0.9)	0.10 (0.23)
UHFM-LCF12-060	UHF Male RAPID FIT	Plast 2000	Silver/Silver	Basket	Spring Finger	59.2 (2.3)	22.0 (0.9)	0.10 (0.23)
716F-LCF12-070	7-16 DIN Female RAPID FIT	O-ring	Silver/Silver	Basket	Spring Finger	57.0 (2.3)	29.0 (1.2)	0.15 (0.34)
716FB-LCF12-072	7-16 DIN Female Bulkhead	O-ring	Silver/Silver	Basket	Spring Finger	57.0 (2.3)	48 (1.9)	0.15 (0.34)
716M-LCF12-070	7-16 DIN Male RAPID FIT	O-ring	Silver/Silver	Basket	Spring Finger	58.0 (2.3)	37.0 (1.5)	0.15 (0.34)
716MR-LCF12-071	7-16 DIN Male Right angle	O-ring	Silver/Silver	Basket	Spring Finger	43.2 (1.7)	37.0 (1.5)	0.19 (0.42)
NF-LCF12-070	N Female RAPID FIT	O-ring	Silver/Silver	Basket	Spring Finger	50.0 (2.0)	22.0 (0.9)	0.11 (0.25)
NM-LCF12-070	N Male RAPID FIT	O-ring	Silver/Silver	Basket	Spring Finger	58.6 (2.3)	22.0 (0.9)	0.11 (0.25)
NMR-LCF12-071	N Male Right angle	O-ring	Silver/Silver	Basket	Spring Finger	45.4 (1.8)	22.0 (0.9)	0.18 (0.40)
78EIA-LCF12-002	7/8" EIA	O-ring	Brass/Silver	Basket	Self Flare	86.4 (3.4)	25.4 (1.0)	0.17 (0.38)
UHFF-LCF12-001	UHF Female	O-ring	Brass/Silver	Basket	Self Flare	81.3 (3.2)	25.4 (1.0)	0.18 (0.40)
UHFM-LCF12-001	UHF Male Knurled nut	O-ring	Brass/Silver	Basket	Self Flare	78.7 (3.1)	25.4 (1.0)	0.17 (0.38)
C-LCF12-002	Splice	O-ring	Brass/Silver	Basket	Self Flare	91.4 (3.6)	25.4 (1.0)	0.18 (0.40)
C-LCF12-011	Splice, Indoor	N/A	Silver/Silver	Basket	Spring Finger	81 (3.2)	23.8 (0.9)	0.42 (0.93)
HCA58-50 SERIES								
716M-HCA58-020	7-16 DIN Male RAPID FIT	Plast 2000	Silver/Silver	Basket	Threaded	72 (2.84)	36.5 (1.44)	0.25 (0.55)
NF-HCA58-020	N Female RAPID FIT	Plast 2000	Silver/Silver	Basket	Threaded	92 (3.62)	33 (1.30)	0.25 (0.55)
NM-HCA58-020	N Male RAPID FIT	Plast 2000	Silver/Silver	Basket	Threaded	95 (3.74)	33 (1.30)	0.26 (0.57)
78EIA-HCA58-020	7/8" EIA Female RAPID FIT	Plast 2000	Silver/Silver	Basket	Threaded	107 (4.21)	57.2 (2.25)	0.49 (1.08)
HCA78-50 SERIES								
716F-HCA78-020	7-16 DIN Female RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Threaded	72 (2.84)	39.5 (1.55)	0.33 (0.73)
716M-HCA78-020	7-16 DIN Male RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Threaded	74 (2.91)	39.5 (1.55)	0.40 (0.88)
NF-HCA78-020	N Female RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Threaded	77 (3.03)	39.5 (1.55)	0.33 (0.73)
NM-HCA78-020	N Male RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Threaded	80 (3.15)	39.5 (1.55)	0.34 (0.75)
78EIA-HCA78-020	7/8" EIA Female RAPID FIT	Plast 2000	Silver/Silver	Spring Finger	Threaded	91 (3.58)	57.2 (2.25)	0.54 (1.19)
CP-HCA78-001	Splice Gas Pass	Plast 2000	Silver/Silver	Tapping	Tab Flare	90 (3.54)	42 (1.65)	0.50 (1.10)
NF-HCA78-001	N Female	O-ring	Brass/Silver	Self Tapping	Tab Flare	99 (3.9)	36 (1.4)	0.4 (0.85)
NFT-HCA78-002	N Female Tunable	O-ring	Brass/Silver	Self Tapping	Tab Flare	188 (7.4)	46 (1.8)	1.0 (2.25)
NM-HCA78-001	N Male	O-ring	Brass/Silver	Self Tapping	Tab Flare	99 (3.9)	36 (1.4)	0.4 (0.85)
NM-HCA78-002	N Male	O-ring	Silver/Gold	Self Tapping	Self Flare	99 (3.9)	36 (1.4)	0.4 (0.85)
NMT-HCA78-002	N Male Tunable	O-ring	Brass/Silver	Self Tapping	Tab Flare	188 (7.4)	46 (1.8)	1.0 (2.25)
78EIA-HCA78-001	7/8" EIA Gas Barrier	O-ring	Brass/Silver	Self Tapping	Tab Flare	89 (3.5)	36 (1.4)	0.5 (1.2)
78EIAP-HCA78-001	7/8" EIA Gas Pass	O-ring	Brass/Silver	Self Tapping	Tab Flare	89 (3.5)	36 (1.4)	0.6 (1.3)
CP-HCA78-005	Splice	O-ring	Brass/Brass	Self Tapping	Tab Flare	137 (5.4)	36 (1.4)	0.6 (1.3)
HCA118-50 SERIES								
716F-HCA118-001	7-16 DIN Female Gas Barrier	Plast 2000	Silver/Silver	Plug Finger	Tab Flare	102 (4.02)	59 (2.32)	1.07 (2.36)
NF-HCA118-001	N Female Gas Barrier	Plast 2000	Silver/Silver	Plug Finger	Tab Flare	115 (4.53)	59 (2.32)	1.10 (2.43)
NM-HCA118-001	N Male Gas Barrier	Plast 2000	Silver/Silver	Plug Finger	Tab Flare	115 (4.53)	59 (2.32)	1.18 (2.60)
78EIA-HCA118-001	7/8" EIA Female Gas Barrier	Plast 2000	Silver/Silver	Plug Finger	Tab Flare	117 (4.61)	59 (2.32)	1.32 (2.91)
158EIA-HCA118-001	1-5/8" EIA Female Gas Barrier	Plast 2000	Silver/Silver	Plug Finger	Tab Flare	128 (5.04)	59 (2.32)	1.75 (3.86)

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Connector Selection Guide

HELIFLEX® Air-Dielectric Cables

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HCA158-50 SERIES								
716F-HCA158-001	7-16 DIN Female Gas Barrier	Plast 2000	Silver/Silver	Threaded	Tab Flare	150 (5.91)	74 (2.91)	1.67 (3.68)
716M-HCA158-001	7-16 DIN Male Gas Barrier	Plast 2000	Silver/Silver	Threaded	Tab Flare	150 (5.91)	74 (2.91)	1.67 (3.68)
NM-HCA158-001	N Male Gas Barrier	Plast 2000	Silver/Silver	Threaded	Tab Flare	163 (6.42)	74 (2.91)	2.00 (4.41)
158EIA-HCA158-001	1-5/8" EIA Female Gas Barrier	Plast 2000	Silver/Silver	Threaded	Tab Flare	152 (5.98)	90 (3.54)	2.11 (4.65)
CP-HCA158-004	Splice Gas Pass	Plast 2000	Silver/Silver	Threaded	Tab Flare	215 (8.47)	80 (3.15)	1.70 (3.75)
NF-HCA158-001	N Female	O-ring	Silver/Gold	Threaded	Tab Flare	135 (5.31)	63 (2.5)	1.4 (3.0)
NF-HCA158-002	N Female	O-ring	Brass/Silver	Threaded	Tab Flare	135 (5.31)	63 (2.5)	1.4 (3.0)
NM-HCA158-002	N Male	O-ring	Brass/Silver	Threaded	Tab Flare	133 (5.25)	63 (2.5)	1.4 (3.0)
78EIA-HCA158-001	7/8" EIA Gas Barrier	O-ring	Brass/Silver	Threaded	Tab Flare	105 (4.14)	63 (2.5)	1.81 (4.0)
78EIAP-HCA158-001	7/8" EIA Gas Pass	O-ring	Brass/Silver	Threaded	Tab Flare	105 (4.14)	63 (2.5)	1.81 (4.0)
158EIA-HCA158-002	1-5/8" EIA Gas Barrier	O-ring	Brass/Silver	Threaded	Tab Flare	116 (4.55)	89 (3.5)	1.91 (4.2)
158EIAP-HCA158-001	1-5/8" EIA Gas Pass	O-ring	Brass/Silver	Threaded	Tab Flare	116 (4.55)	89 (3.5)	1.91 (4.2)
CP-HCA158-005	Splice	O-ring	Brass/Brass	Threaded	Tab Flare	123 (4.83)	63 (2.5)	1.95 (4.3)
HCA214-50 SERIES								
NF-HCA214-001	N Female	O-ring	Silver/Gold	Threaded	Tab Flare	135.3 (5.32)	73 (2.88)	1.63 (3.6)
78EIA-HCA214-001	7/8" EIA Gas Barrier	O-ring	Brass/Silver	Threaded	Tab Flare	105 (4.14)	73 (2.88)	1.77 (3.9)
78EIAP-HCA214-001	7/8" EIA Gas Pass	O-ring	Brass/Silver	Threaded	Tab Flare	105 (4.14)	73 (2.88)	1.77 (3.9)
158EIA-HCA214-001	1-5/8" EIA Gas Barrier	O-ring	Brass/Silver	Threaded	Tab Flare	115.6 (4.55)	89.4 (3.52)	1.68 (3.7)
158EIAP-HCA214-001	1-5/8" EIA Gas Pass	O-ring	Brass/Silver	Threaded	Tab Flare	115.6 (4.55)	89.4 (3.52)	1.68 (3.7)
318EIA-HCA214-001	3-1/8" EIA Female Gas Barrier	O-ring	Brass/Silver	Threaded	Tab Flare	127 (5)	136.8 (5.2)	1.81 (4.0)
318EIAP-HCA214-001	3-1/8" EIA Female Gas Pass	O-ring	Brass/Silver	Threaded	Tab Flare	127 (5)	136.8 (5.2)	1.81 (4.0)
CP-HCA214-005	Splice	O-ring	Brass/Brass	Threaded	Tab Flare	122.6 (4.83)	73 (2.88)	1.72 (3.8)
HCA295-50 SERIES								
158EIA-HCA295-002	1-5/8" EIA Female	Plast 2000	Silver/Silver	Threaded	Tab Flare	170 (6.69)	119 (4.69)	4.00 (8.82)
318EIA-HCA295-001	3-1/8" EIA Female	Plast 2000	Silver/Silver	Threaded	Tab Flare	175 (6.89)	131 (5.2)	4.80 (10.58)
CP-HCA295-003	Splice Gas Pass	Plast 2000	Silver/Silver	Threaded	Tab Flare	252 (9.92)	119 (4.69)	4.30 (9.48)
HCA300-50 SERIES								
318EIA-HCA300-005	3-1/8" EIA Gas Barrier	O-ring	Brass/Silver	Threaded	Tab Flare	203 (8.0)	131 (5.2)	4.60 (10.15)
318EIAP-HCA300-001	3-1/8" EIA Gas Pass	O-ring	Brass/Silver	Threaded	Tab Flare	201 (7.9)	131 (5.2)	4.60 (10.15)
CP-HCA300-005	Splice	O-ring	Brass/Brass	Threaded	Tab Flare	191 (7.5)	114 (4.5)	4.58 (10.10)
HCA318-50 SERIES								
158EIA-HCA318-001	1-5/8" EIA	Plast 2000	Silver/Silver	Threaded	Tab Flare	200 (7.87)	128 (5.04)	3.50 (7.72)
CP-HCA318-001	Splice Gas Pass	Plast 2000	Silver/Silver	Threaded	Tab Flare	214 (8.43)	128 (5.04)	1.10 (2.43)
318EIA-HCA318-001	3-1/8" EIA Gas Barrier	O-ring	Brass/Silver	Threaded	Tab Flare	155 (6.1)	127 (5)	4.76 (10.5)
318EIA-HCA318-002	3-1/8" EIA Gas Barrier	O-ring	Brass/Silver	Threaded	Tab Flare	155 (6.1)	127 (5)	4.76 (10.5)
318EIAP-HCA318-001	3-1/8" EIA Gas Pass	O-ring	Brass/Silver	Threaded	Tab Flare	155 (6.1)	127 (5)	4.76 (10.5)
CP-HCA318-005	Splice	O-ring	Brass/Brass	Threaded	Tab Flare	210 (8.3)	127 (5)	4.63 (10.2)
HCA418-50 SERIES								
412EIA-HCA418-001	4-1/2" IEC Female Gas Barrier	Plast 2000	Silver/Silver	Threaded	Tab Flare	245 (9.65)	177 (6.97)	12.20 (26.90)
618EIA-HCA418-001	6-1/8" EIA Female Gas Barrier	Plast 2000	Silver/Silver	Threaded	Tab Flare	295 (11.61)	210 (8.27)	17.0 (37.5)
618EIA-HCA418-002	6-1/8" EIA Male Gas Barrier	O-ring	Brass/Silver	Threaded	Tab Flare	114 (4.4)	158 (6.2)	9.3 (20.5)
618EIAP-HCA418-001	6-1/8" EIA Male Gas Pass	O-ring	Brass/Silver	Threaded	Tab Flare	114 (4.4)	158 (6.2)	9.3 (20.5)
HCA500-50 SERIES								
412EIA-HCA500-001	4-1/2" IEC Female Gas Barrier	Plast 2000	Silver/Silver	Threaded	Tab Flare	300 (11.81)	212 (8.35)	5.00 (11.02)
618EIA-HCA500-002	6-1/8" EIA Female Gas Barrier	Plast 2000	Silver/Silver	Threaded	Tab Flare	310 (12.21)	212 (8.35)	25.6 (56.44)
HCA618-50 SERIES								
618EIA-HCA618-002	6-1/8" EIA Female Gas Barrier	Plast 2000	Silver/Silver	Threaded	Tab Flare	312 (12.28)	219 (8.62)	25.50 (56.22)
HCA800-50 SERIES								
100230-HCA800-001	100-230 Female Welding, High Power	Plast 2000	Chromating/Silver	Threaded	Welding Tab Flare	470 (18.50)	310 (12.21)	
100230-HCA800-002	100-230 Female Welding, High Power	Plast 2000	Hard coat/Silver	Threaded	Welding Tab Flare	470 (18.50)	310 (12.21)	
100230-HCA800-005	100-230 Female Welding	Plast 2000	Chromating/Silver	Threaded	Welding Tab Flare	470 (18.50)	310 (12.21)	
100230-HCA800-009	100-230 Female Welding	Plast 2000	Hard coat/Silver	Threaded	Welding Tab Flare	470 (18.50)	310 (12.21)	
CP-HCA800-001	Splice Welding, High Power	Plast 2000	Chromating/Silver	Threaded	Welding Tab Flare	617 (24.29)	385 (15.16)	
CP-HCA800-003	Splice Welding	Plast 2000	Chromating/Silver	Threaded	Welding Tab Flare	617 (24.29)	385 (15.16)	
CP-HCA800-009	Splice Welding	Plast 2000	Hard coat/Silver	Threaded	Welding Tab Flare	617 (24.29)	385 (15.16)	

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HELIFLEX® Air-Dielectric Cables

Model Number	Description	Sealing Method	Plating Outer/Inner	Contact Attachment Inner	Contact Attachment Outer	Length, mm (in)	Outer Dia., mm (in)	Weight, kg (lb)
HCA900-50T SERIES								
100230-HCA900-001	100-230 Female Welding	Plast 2000	Chromating/Silver	Threaded	Welding Tab Flare	535 (21.06)	354 (13.94)	
100230-HCA900-004	100-230 Female Welding	Plast 2000	Hard coat/Silver	Threaded	Welding Tab Flare	535 (21.06)	354 (13.94)	
CP-HCA900-003	Splice Welding	Plast 2000	Chromating/Silver	Threaded	Welding Tab Flare	550 (21.65)	325 (12.80)	
CP-HCA900-004	Splice Welding	Plast 2000	Hard coat/Silver	Threaded	Welding Tab Flare	550 (21.65)	325 (12.80)	
COUPLING ELEMENTS								
78EIA-CE-001	7/8" EIA Coupling Element, long	O-ring	Silver	Spring Finger		49.3 (1.9)	21 (0.83)	0.05 (0.10)
78EIA-CE-002	7/8" EIA Coupling Element	O-ring	Silver	Spring Finger		49 (1.93)	21 (0.83)	0.06 (0.13)
158EIA-CE-001	1-5/8" EIA Coupling Element, long	O-ring	Silver	Spring Finger		82.6 (3.3)	42 (1.65)	0.07 (0.15)
158EIA-CE-002	1-5/8" EIA Coupling Element	O-ring	Silver	Spring Finger		60 (2.36)	42 (1.65)	0.17 (0.37)
318EIA-CE-002	3-1/8" EIA Coupling Element	O-ring	Silver	Spring Finger		101 (3.98)	81 (3.19)	0.59 (1.30)
412EIA-CE-002	4-1/2" EIA Coupling Element	O-ring	Silver	Spring Finger		77 (3.03)	105 (4.13)	1.09 (2.40)
618EIA-CE-002	6-1/8" EIA Coupling Element	O-ring	Silver	Spring Finger		109 (4.29)	154 (6.06)	2.14 (4.72)
100230-CE-002	100-230 Coupling Element	O-ring	Silver	Spring Finger		288 (11.34)	310 (12.21)	

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CELLFLEX® Foam Dielectric Jumpers

Why choose jumper cables from RFS?

CELLFLEX® foam dielectric jumper cables provide-provide the ideal combination of low-loss, high-strength and highest flexibility for optimum performance. Jumper cables are mainly used between main feeders and antennas or between main feeders and system equipment.

The use of jumpers provides greater flexibility if antennas are to be changed due to network upgrades, while the network is getting mature, reduced mechanical stress on antennas and connectors and better accessibility of feeder terminations (i.e. for trouble shooting).

Four lines of jumper assemblies are available, depending on cable type and connector configuration. The premium soldered, premium molded as well as the factory fit jumper line is already factory assembled with fully soldered connectors. The assembled jumper line is delivered as a kit with standard connectors to be installed on site or factory installed. In general, it can be said that the soldered versions offer advantages with regard to intermodulation performance. The assembled version gives higher flexibility in length and connector options and shortens delivery cycles for seldom-requested versions.

Characteristics of CELLFLEX® jumper cables are:

- Excellent contact force
- Low and stable intermodulation product IM3
- Excellent RF screening effectiveness
- Designed to IP68 classification

Passive third order intermodulation is a threat in mobile communication especially for multi-channel systems incorporating duplexers. For RFS jumpers the third order intermodulation is typically reduced to values below -155 dBc (which means 155 dB lower than the two incident test carriers of +43 dBm). For RFS soldered connectors of the premium soldered, premium molded and factory fit jumper lines this value is improved to typically -162 dBc.

The jumper cables are for indoor and outdoor applications and withstand severe environmental conditions.

Jumper assemblies are watertight (transversally and longitudinally), providing additional safety even if humidity should enter the coaxial system. Additional sealing (e.g. weather-proofing kits) can be used but is not mandatory.

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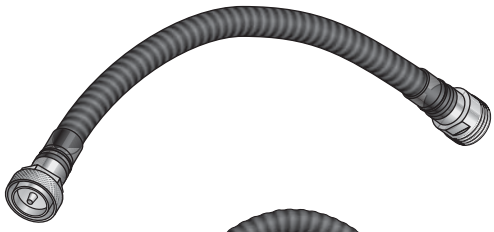
CELLFLEX® Foam Dielectric Jumpers

Product Spectrum

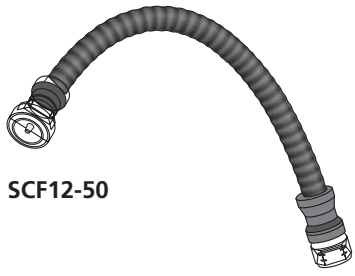
Jumper cables from RFS are manufactured with flexible and superflexible cables. Standard jumpers are offered with the following cable types and connectors.

- SCF14-50 J with N or 7-16 connectors
- SCF38-50 J with N or 7-16 connectors
- SCF12-50 J with N or 7-16 connectors
- LCF12-50 J with N or 7-16 connectors

The molded version is available in standard lengths of 1m, 2m, or 3m. For the assembled version the standard lengths are 3ft, 6ft, 8ft or 10ft.



LCF12-50



SCF12-50

ELECTRICAL AND MECHANICAL PROPERTIES

	RETURN LOSS (VSWR) {REFLECTION COEFFICIENT}		
	Soldered Version	Molded Version	
Frequency Range [1]	Straight Connectors	Straight Connectors	Right Angle Connectors
410 - 470 MHz	34.2dB (1.04:1) {2.0%}	30.5dB (1.062:1) {3.0%}	30.5dB (1.062:1) {3.0%}
820 - 960 MHz	32.3dB (1.05:1) {2.4%}	29.0dB (1.074:1) {3.5%}	28.0dB (1.083:1) {4.0%}
1710 - 1990 MHz	30.7dB (1.06:1) {2.9%}	28.0dB (1.083:1) {4.0%}	26.4dB (1.101:1) {4.8%}
2000 - 2200 MHz	28.3dB (1.08:1) {3.8%}	26.4dB (1.101:1) {4.8%}	25.7dB (1.109:1) {5.2%}
3rd Order Intermodulation Product [2]	-163 dBc	-162 dBc	-162 dBc

	Factory Fit Version	
Frequency Range [1]	Premium VSWR	Standard VSWR
806 - 960 MHz	30.0dB (1.065:1) {3.1%}	26.0dB (1.105:1) {5.0%}
1850 - 1990 MHz	30.0dB (1.065:1) {3.1%}	26.0dB (1.105:1) {5.0%}

Premium Code	Frequency Range [1]	Assembled Version Return Loss (VSWR)
P1	410 - 470 MHz	23.0dB (1.152:1) {7.1%}
P2	806 - 960 MHz	24.0dB (1.135:1) {6.3%}
P3	1425 - 1535 MHz	24.0dB (1.135:1) {6.3%}
P4	1700 - 1880 MHz	24.0dB (1.135:1) {6.3%}
P5	1850 - 1990 MHz	28.0dB (1.083:1) {4.0%}
P6	1900 - 2200 MHz	24.0dB (1.135:1) {6.3%}
P7	824 - 960 MHz and 1850 - 1990 MHz	24.0dB (1.135:1) {6.3%}
P8	890 - 960 MHz and 1710 - 2200 MHz	23.0dB (1.152:1) {7.1%}
3rd Order Intermodulation Product [2]	-155 dBc	-155 dBc

Attenuation per m (per ft) at 20°C [3]	SCF14-50J	SCF38-50J	SCF12-50J	LCF12-50J
450 MHz	0.127 dB/m (0.039 dB/ft)	0.092 dB/m (0.028 dB/ft)	0.073 dB/m (0.022 dB/ft)	0.047 dB/m (0.014 dB/ft)
900 MHz	0.184 dB/m (0.056 dB/ft)	0.133 dB/m (0.041 dB/ft)	0.106 dB/m (0.032 dB/ft)	0.068 dB/m (0.021 dB/ft)
1800 MHz	0.269 dB/m (0.082 dB/ft)	0.194 dB/m (0.059 dB/ft)	0.155 dB/m (0.047 dB/ft)	0.099 dB/m (0.030 dB/ft)
2100 MHz	0.293 dB/m (0.089 dB/ft)	0.212 dB/m (0.065 dB/ft)	0.169 dB/m (0.052 dB/ft)	0.108 dB/m (0.033 dB/ft)
Minimum Bending Radius [4]	25 mm (1 in)	25 mm (1 in)	32 mm (1.3 in)	125 mm (4.9 in)

Notes
[1] Other frequency ranges, connector configurations or return loss values on request.
[2] Typical values for 2x +43dBm carriers, at 950MHz and at 1800MHz
[3] Values without connectors. Typical connector attenuation is less than 0.02 dB.
[4] For repeated bending

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CELLFLEX® SCF14-50J Jumpers

CONNECTOR A	CONNECTOR B	LENGTH (M)	LENGTH (FT)	PREMIUM MOLDED MODEL NUMBER	ASSEMBLED MODEL NUMBER
7-16 DIN male	7-16 DIN male	1	3	7M7MS14-0100PM	7M7MS14-030P(*)
		2	6	7M7MS14-0200PM	7M7MS14-060P(*)
		2.5	8		7M7MS14-080P(*)
		3	10	7M7MS14-0300PM	7M7MS14-100P(*)
7-16 DIN male	7-16 DIN female	1	3	7M7FS14-0100PM	7M7FS14-030P(*)
		2	6	7M7FS14-0200PM	7M7FS14-060P(*)
		2.5	8		7M7FS14-080P(*)
		3	10	7M7FS14-0300PM	7M7FS14-100P(*)
7-16 DIN male	N male	1	3	7MNMS14-0100PM	7MNMS14-030P(*)
		2	6	7MNMS14-0200PM	7MNMS14-060P(*)
		2.5	8		7MNMS14-080P(*)
		3	10	7MNMS14-0300PM	7MNMS14-100P(*)
7-16 DIN female	N male	1	3	7FNMS14-0100PM	7FNMS14-030P(*)
		2	6	7FNMS14-0200PM	7FNMS14-060P(*)
		2.5	8		7FNMS14-080P(*)
		3	10	7FNMS14-0300PM	7FNMS14-100P(*)
N male	N male	1	3	NMNMS14-0100PM	NMNMS14-030P(*)
		2	6	NMNMS14-0200PM	NMNMS14-060P(*)
		2.5	8		NMNMS14-080P(*)
		3	10	NMNMS14-0300PM	NMNMS14-100P(*)
N male	N male right angle	1	3	NMNMRS14-0100PM	NMNMRS14-030P(*)
		2	6	NMNMRS14-0200PM	NMNMRS14-060P(*)
		2.5	8		NMNMRS14-080P(*)
		3	10	NMNMRS14-0300PM	NMNMRS14-100P(*)
N male	N female	1	3	NMNFS14-0100PM	NMNFS14-030P(*)
		2	6	NMNFS14-0200PM	NMNFS14-060P(*)
		2.5	8		NMNFS14-080P(*)
		3	10	NMNFS14-0300PM	NMNFS14-100P(*)
N female	N male right angle	1	3	NFNMRS14-0100PM	NFNMRS14-030P(*)
		2	6	NFNMRS14-0200PM	NFNMRS14-060P(*)
		2.5	8		NFNMRS14-080P(*)
		3	10	NFNMRS14-0300PM	NFNMRS14-100P(*)

(*) please add appropriate premium range according to premium return loss table on page 83.

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CELLFLEX® SCF38-50J Jumpers

		LENGTH		PREMIUM MOLDED	ASSEMBLED
CONNECTOR A	CONNECTOR B	(M)	(FT)	MODEL NUMBER	MODEL NUMBER
7-16 DIN male	7-16 DIN male	1	3	7M7MS38-0100PM	7M7MS38-030P(*)
		2	6	7M7MS38-0200PM	7M7MS38-060P(*)
		2.5	8		7M7MS38-080P(*)
		3	10	7M7MS38-0300PM	7M7MS38-100P(*)
7-16 DIN male	7-16 DIN male right angle	1	3	7M7MRS38-0100PM	7M7MRS38-030P(*)
		2	6	7M7MRS38-0200PM	7M7MRS38-060P(*)
		2.5	8		7M7MRS38-080P(*)
		3	10	7M7MRS38-0300PM	7M7MRS38-100P(*)
7-16 DIN male	7-16 DIN female	1	3	7M7FS38-0100PM	7M7FS38-030P(*)
		2	6	7M7FS38-0200PM	7M7FS38-060P(*)
		2.5	8		7M7FS38-080P(*)
		3	10	7M7FS38-0300PM	7M7FS38-100P(*)
7-16 DIN female	7-16 DIN male right angle	1	3	7F7MRS38-0100PM	7F7MRS38-030P(*)
		2	6	7F7MRS38-0200PM	7F7MRS38-060P(*)
		2.5	8		7F7MRS38-080P(*)
		3	10	7F7MRS38-0300PM	7F7MRS38-100P(*)
7-16 DIN male	N male	1	3	7MNMS38-0100PM	7MNMS38-030P(*)
		2	6	7MNMS38-0200PM	7MNMS38-060P(*)
		2.5	8		7MNMS38-080P(*)
		3	10	7MNMS38-0300PM	7MNMS38-100P(*)
7-16 DIN female	N male	1	3	7FNMS38-0100PM	7FNMS38-030P(*)
		2	6	7FNMS38-0200PM	7FNMS38-060P(*)
		2.5	8		7FNMS38-080P(*)
		3	10	7FNMS38-0300PM	7FNMS38-100P(*)
N male	N male	1	3	NMNMS38-0100PM	NMNMS38-030P(*)
		2	6	NMNMS38-0200PM	NMNMS38-060P(*)
		2.5	8		NMNMS38-080P(*)
		3	10	NMNMS38-0300PM	NMNMS38-100P(*)
N male	N male right angle	1	3	NMNMRS38-0100PM	NMNMRS38-030P(*)
		2	6	NMNMRS38-0200PM	NMNMRS38-060P(*)
		2.5	8		NMNMRS38-080P(*)
		3	10	NMNMRS38-0300PM	NMNMRS38-100P(*)
N male	N female	1	3	NMNFS38-0100PM	NMNFS38-030P(*)
		2	6	NMNFS38-0200PM	NMNFS38-060P(*)
		2.5	8		NMNFS38-080P(*)
		3	10	NMNFS38-0300PM	NMNFS38-100P(*)
N female	N male right angle	1	3	NFNMRS38-0100PM	NFNMRS38-030P(*)
		2	6	NFNMRS38-0200PM	NFNMRS38-060P(*)
		2.5	8		NFNMRS38-080P(*)
		3	10	NFNMRS38-0300PM	NFNMRS38-100P(*)

(*) please add appropriate premium range according to premium return loss table on page 83.

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CELLFLEX® SCF12-50J Jumpers

CONNECTOR A	CONNECTOR B	LENGTH (M)	LENGTH (FT)	PREMIUM MOLDED MODEL NUMBER	FACTORY FIT MODEL NUMBER	ASSEMBLED MODEL NUMBER
7-16 DIN male	7-16 DIN male	1	3	7M7MS12-0100PS	7M7MS12-030FF(**)	
		2	6	7M7MS12-0200PS	7M7MS12-060FF(**)	
		2.5	8	7M7MS12-0250PS	7M7MS12-080FF(**)	
		3	10	7M7MS12-0300PS	7M7MS12-100FF(**)	
7-16 DIN male	7-16 DIN male right angle	1	3	7M7MRS12-0100PS	7M7MRS12-030FF(**)	
		2	6	7M7MRS12-0200PS	7M7MRS12-060FF(**)	
		2.5	8		7M7MRS12-080FF(**)	
		3	10	7M7MRS12-0300PS	7M7MRS12-100FF(**)	
7-16 DIN male	7-16 DIN female	1	3	7M7FS12-0100PS		7M7FS12-030P(*)
		2	6	7M7FS12-0200PS		7M7FS12-060P(*)
		2.5	8			7M7FS12-080P(*)
		3	10	7M7FS12-0300PS		7M7FS12-100P(*)
7-16 DIN female	7-16 DIN male right angle	1	3	7F7MRS12-0100PS		7F7MRS12-030P(*)
		2	6	7F7MRS12-0200PS		7F7MRS12-060P(*)
		2.5	8			7F7MRS12-080P(*)
		3	10	7F7MRS12-0300PS		7F7MRS12-100P(*)
7-16 DIN male	N male	1	3	7MNMS12-0100PS		7MNMS12-030P(*)
		2	6	7MNMS12-0200PS		7MNMS12-060P(*)
		2.5	8			7MNMS12-080P(*)
		3	10	7MNMS12-0300PS		7MNMS12-100P(*)
7-16 DIN female	N male	1	3	7FNMS12-0100PS		7FNMS12-030P(*)
		2	6	7FNMS12-0200PS		7FNMS12-060P(*)
		2.5	8			7FNMS12-080P(*)
		3	10	7FNMS12-0300PS		7FNMS12-100P(*)
N male	N male	1	3	NMNMS12-0100PS		NMNMS12-030P(*)
		2	6	NMNMS12-0200PS		NMNMS12-060P(*)
		2.5	8			NMNMS12-080P(*)
		3	10	NMNMS12-0300PS		NMNMS12-100P(*)
N male	N male right angle	1	3	NMNMRS12-0100PS		NMNMRS12-030P(*)
		2	6	NMNMRS12-0200PS		NMNMRS12-060P(*)
		2.5	8			NMNMRS12-080P(*)
		3	10	NMNMRS12-0300PS		NMNMRS12-100P(*)
N male	N female	1	3	NMNFS12-0100PS		NMNFS12-030P(*)
		2	6	NMNFS12-0200PS		NMNFS12-060P(*)
		2.5	8			NMNFS12-080P(*)
		3	10	NMNFS12-0300PS		NMNFS12-100P(*)
N female	N male right angle	1	3	NFNMRS12-0100PS		NFNMRS12-030P(*)
		2	6	NFNMRS12-0200PS		NFNMRS12-060P(*)
		2.5	8	NFNMRS12-0300PS		NFNMRS12-080P(*)
		3	10			NFNMRS12-100P(*)

(*) please add appropriate premium range according to premium return loss table on page 83.

(**) please add S or P for standard or premium VSWR version, for specification refer to page 83.

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CELLFLEX® LCF12-50J Jumpers

CONNECTOR A	CONNECTOR B	LENGTH (M)	LENGTH (FT)	PREMIUM MOLDED MODEL NUMBER	FACTORY FIT MODEL NUMBER	ASSEMBLED MODEL NUMBER
7-16 DIN male	7-16 DIN male	1	3	7M7ML12-0100PM	7M7ML12-030FF(**)	
		2	6	7M7ML12-0200PM	7M7ML12-060FF(**)	
		2.5	8		7M7ML12-080FF(**)	
		3	10	7M7ML12-0300PM	7M7ML12-100FF(**)	
7-16 DIN male	7-16 DIN male right angle	1	3	7M7MRL12-0100PM	7M7MRL12-030FF(**)	
		2	6	7M7MRL12-0200PM	7M7MRL12-060FF(**)	
		2.5	8		7M7MRL12-080FF(**)	
		3	10	7M7MRL12-0300PM	7M7MRL12-100FF(**)	
7-16 DIN male	7-16 DIN female	1	3	7M7FL12-0100PM		7M7FL12-030P(*)
		2	6	7M7FL12-0200PM		7M7FL12-060P(*)
		2.5	8			7M7FL12-080P(*)
		3	10	7M7FL12-0300PM		7M7FL12-100P(*)
7-16 DIN female	7-16 DIN male right angle	1	3	7F7MRL12-0100PM		7F7MRL12-030P(*)
		2	6	7F7MRL12-0200PM		7F7MRL12-060P(*)
		2.5	8			7F7MRL12-080P(*)
		3	10	7F7MRL12-0300PM		7F7MRL12-100P(*)
7-16 DIN male	N male	1	3	7MNML12-0100PM	7MNML12-030FF(**)	
		2	6	7MNML12-0200PM	7MNML12-060FF(**)	
		2.5	8		7MNML12-080FF(**)	
		3	10	7MNML12-0300PM	7MNML12-100FF(**)	
7-16 DIN female	N male	1	3	7FNML12-0100PM		7FNML12-030P(*)
		2	6	7FNML12-0200PM		7FNML12-060P(*)
		2.5	8			7FNML12-080P(*)
		3	10	7FNML12-0300PM		7FNML12-100P(*)
N male	N male	1	3	NMNML12-0100PM	NMNML12-030FF(**)	
		2	6	NMNML12-0200PM	NMNML12-060FF(**)	
		2.5	8		NMNML12-080FF(**)	
		3	10	NMNML12-0300PM	NMNML12-100FF(**)	
N male	N male right angle	1	3	NMNMRL12-0100PM		NMNMRL12-030P(*)
		2	6	NMNMRL12-0200PM		NMNMRL12-060P(*)
		2.5	8			NMNMRL12-080P(*)
		3	10	NMNMRL12-0300PM		NMNMRL12-100P(*)
N male	N female	1	3	NMNFL12-0100PM		NMNFL12-030P(*)
		2	6	NMNFL12-0200PM		NMNFL12-060P(*)
		2.5	8			NMNFL12-080P(*)
		3	10	NMNFL12-0300PM		NMNFL12-100P(*)
N female	N male right angle	1	3	NFNMRL12-0100PM		NFNMRL12-030P(*)
		2	6	NFNMRL12-0200PM		NFNMRL12-060P(*)
		2.5	8			NFNMRL12-080P(*)
		3	10	NFNMRL12-0300PM		NFNMRL12-100P(*)

(*) please add appropriate premium range according to premium return loss table on page 83.

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Accessories

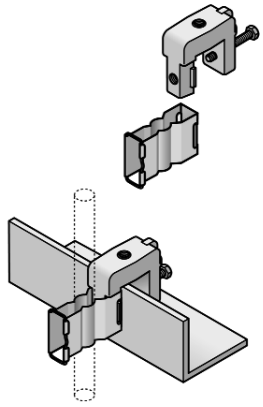
Introduction

While a number of cable related accessories are available on the market, RFS components are of the highest quality and are designed to provide years of trouble-free service. Together with the RFS transmission line products they have been thoroughly tested and released to insure inter-operability.

RFS offers all necessary tools and accessories for a complete cable system, such as:

- Cable Hangers
- Tools
- Grounding Kits
- Feed-Through Systems
- Weather-proofing Kits
- Installation Hardware

Most of them are described in detail in the succeeding accessories introduction, for availability concerning cable types and sizes please refer to the accessories selection guide.



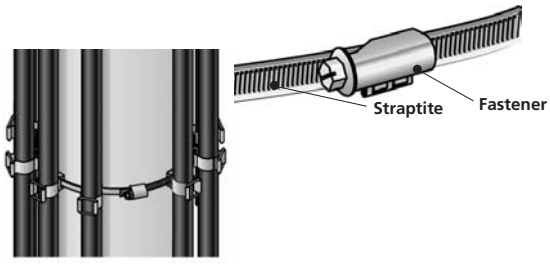
RSB Clip

Cable Hangers

RSB® CLIP

The RSB® Clip is designed for the installation of CELLFLEX® foam dielectric cables from sizes 1/4" up to 1-5/8". The clip is a universal clamp device and can be used in many mounting configurations. In case of replacing a cable the RSB Clips can be opened without any tools. After replacing the cable the clips are closed again.

The RSB is the abbreviation of Rostfreier Stahlbügel and means stainless steel hanger. The hanger is resistant against all environmental influences. Due to the mechanical construction a cable deformation is impossible. Therefore a deterioration of the electrical properties is avoided.



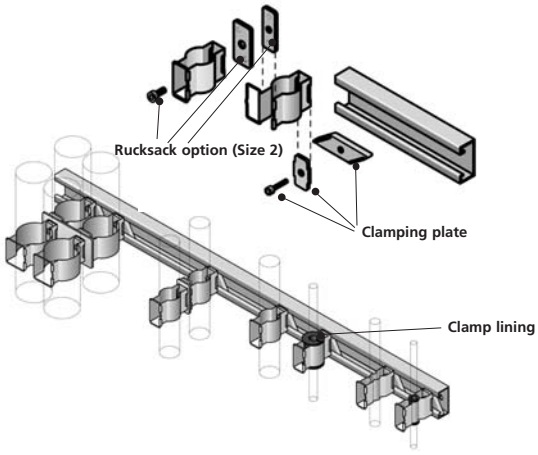
RSB Clip with Round Member Adapter or Straptite S/S Strapping

Rucksack Option RSB® Clip

For multiple cable layers RFS offers a special multiple extension. This so-called Rucksack option enables the stacking of cable layers. The cables are fixed by using cover plates to guarantee a safe and stable attachment. Only smaller or same size cables can be stacked.

Mounting RSB® Clips

A universal attachment onto flat iron or angle iron is possible with a special cleat. To attach the clip onto an anchor bar a simple clamping plate is necessary. In order to attach the clip onto a tube a straptite is used.



Mounting RSB Clips

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Cable Hangers

Multi Block Hangers

Multi block hanger support systems are designed for organizing bundled runs of coax cable. Each space-saving block securely holds two runs of coax, allowing a compact bundle of up to six runs to be supported by stacking three blocks. Multi Blocks are manufactured of durable glass polypropylene providing thermal, chemical and UV resistance in extreme environments. They come pre-assembled with the necessary hardware to connect to M8 threaded holes or 8.5mm (0.335in) through holes. Can also be mounted to Angle Member Adapters (purchased separately).

Multi Block Hangers

Bolt-on Hanger

This standard cable clamp is used for securing a vertical run of cable to a tower member or a horizontal run to an overhead carrier. The hanger is constructed of flexible stainless steel. Designed for versatile mounting, the hanger may be bolt or strap mounted directly to a mounting surface, or used with accessories such as an angle member adapter. Each kit contains ten hangers with captivated assembly hardware.

Bolt-on Hanger

HCH Clamps

Clamps are available for the installation of (large diameter HCA) cables on different supporting profiles, e.g. angle iron, flat iron or anchor bar.

HCH Clamp

SCS Hangers

SCS (Self Clamping hanger with calibrated Saddles) hangers feature a stainless steel hanger that accepts calibrated saddles made of glass-fiber reinforced plastic material. They are especially designed to accept CELLFLEX® foam dielectric cables and to protect them against excessive crush force while properly supporting and securing the cables. Different models are available o except 1, 2 or 3 cables per hanger in a stacked configuration. Three different fixing options are available to adjust to any installation situation. Version M works with a number of popular C- or AC-rail versions, accepting flat or round material between 3 and 12mm (0.118 and 0.472in) thickness. Version L works with L-profiles of a side-length between 40 and 50mm (1.58 and 1.97in). Version R works with flat material from 3 up to 25mm (0.118 up to 0.984in) or round material from 8 up to 25mm (0.135 up to 0.984in). The fixing bolt is equipped with an additional nut with star washer to give positive lock also under dynamic stress.

SCS Hangers

Snap-in Hanger

The one-piece stainless steel cable clamp is designed to save installation time and money while assuring a most secure method of cable attachment.

The one piece stainless steel snap-in cable hanger utilizes a patented* four prong locking design that ensures positive attachment to a 3/4”(19mm) pre-drilled mounting surface. A cable locking tab system is used to secure the cable within the hanger. Snap-In hangers are easily installed by hand and do not require any fastening hardware or tools. Recommended spacing, approx. 3 ft. (1 m). Ten hangers per package.

Snap-in Hanger

*US Patent No. 5.393.021. No assembly tool or secondary fasteners are used for hanger assembly or strut mounting.

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Accessories

Cable Hangers

Other Accessories

Angle Member Adapter Kit

Angle member adapter kits can be used to attach hangers, i.e. bolt on hangers or RSB-clips, to tower angle members without need of drilling. The kit contains ten angle adapters with mounting screws. There are two basic versions: ANGLE-CLPI is a heavy gauge stainless steel version with 3/8" imperial hardware. When installed onto a metal surface, the one piece angle adapter with serrated edge grip will support up to 290 kg (640 lbs). ANGLE-CLPM8 is a stainless steel version with M8 metric hardware.

Angle member adapter kit

Universal Angle Adapter

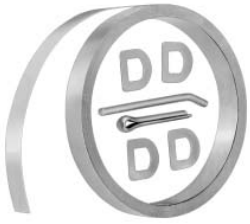
The Universal Angle Adapter exists in a metric and an imperial version. It provides a versatile means for securing cable hangers and other accessories to angle members. Removing a press fit insert quickly converts this unique angle adapter to accept snap-in hangers. This design also accommodates a standard 3/8" threaded rod or bolt when mounting multi hanger blocks or bolt-on hangers. The jaw opening allows mounting up to 22mm (7/8") thick angle members.

The Universal Angle Adapter is manufactured from corrosion resistant stainless steel, ensuring long term integrity in extreme weather applications. Ten per package.

Universal Angle Adapter

Straptite Stainless Steel Strapping

Stainless steel strapping kit used to secure cable mounting hardware components to round members. Kit consists of 30 m (100 ft.) 15mm (1/2") wide high strength alloy stainless steel strap, 50 fastener buckles, and installation tightening tool. Approximate weight 1.45kg (3.20 lb).



Straptite Stainless Steel Strapping

Round Member Adapter Kit

Round member adapters are used to mount hangers and standoffs to round tower members. The adapter kit consists of stainless steel hose-clamps with screw drive adjustment. Different kits cover diameters from 25 to 178mm (1 to 7in).

Round Member Adapter Kit

Tower Standoff

Constructed of heavy stainless steel, the stand-offs provide 63mm (2-1/2") tower clearance to hangers when running transmission lines over tower cross members, flanges and other tower obstacles. The kit consists of ten stainless steel tower stand-offs with stainless steel hardware and come in three versions with 9.5 (3/8") through holes.

Tower Standoff

Ceiling Adapter

The Ceiling Adapter exists in a metric and an imperial version. It consists of 305mm (12") or 610mm (24") long M10 or 3/8"-16 threaded electro-plated steel stud, with hardware and mounting plate. Top plate accepts 6.35mm (1/4") hardware (not supplied) on 54mm (2-1/8") centers.

Ceiling Adapter

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Other Accessories

Trimming Tools

Special trimming tools make the connector attachment onto CELLFLEX® foam dielectric cables even easier. No further tools are required to prepare the cable for the connector attachment. This is due to the special design of the trimming tool, which combines all necessary functions in one compact tool.

Only a few steps are necessary for a perfect connector attachment. The time reduction is 60% compared to conventional methods.

- Strip off the cable jacket a few centimeters.
- Cut the jacket, outer conductor and foam dielectric in one step to the precise trimming lengths by using the trimming tool.
- Debur the inner conductor and flare the outer conductor in one step by using the integrated tool of the trimming tool.
- Fit the connector.
- Select the trim tool appropriate for your selected connector by referring to the Trimming Tool column data in the Connector Selection Guide.

Combination Prep Tools for CELLFLEX®

Flanging Tools

Flanging tools have been developed to provide top quality connection between cable and connector. The use of flanging tools is strongly recommended for HELIFLEX® cables used in microwave systems or if low modulation figures are required. For other types of application the flanging tool provide a simple and safe installation.

The flanging tool consists of a basic tool and, for most cable sizes, an additional insert (die). Depending on the cable size the basic flanging tool must be ordered together with an insert.

For cable sizes from 3/8" up to 7/8" no flanging tool is required due to the construction of RAPID FIT™ connectors. A special insert must be ordered for EIA (S-Line) connectors.

For universal purposes RFS offers a special hand tool kit. This kit contains all necessary tools for the installation of connectors.

Flanging Tool

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Other Accessories

Combination Prep Tool for CELLFLEX®

This prep tool allows fast, precise and consistent connector attachment.

The combination chamfer and flare station eliminates the need for individual tools, allowing for jacket trimming, deburring and proper flaring using one tool.

Each tool contains two preset cutting blades designed to efficiently trim the cable jacket, outer conductor and foam dielectric for proper installation. Prep tool blades are reversible for a fresh cutting edge and spare blades are located in the tool handle.

Combination Prep Tools for CELLFLEX®

Automated Trimming Tool

Attach the tool to your drill and, in one quick step, strip the outer jacket, the outer conductor and foam insulation, then cut and chamfer the inner conductor to the correct dimensions for quick, consistent and reliable connector attachment.

Automated Trimming Tool

Jacket Stripping Tools

For quick and easy preparation of installed cable for the attachment of grounding straps, just clamp the tool around the cable and rotate.

New JSTRIP-2 tool available for popular cable sizes, refer to selection guide for availability.

Ideal for use on cable that is mounted close to structures and other cable runs.

JSTRIP-1

JSTRIP-2

Jacket Stripping Tool

Combination Preparation Tool for CELLFLEX® crank version

There are two different tools available for the bigger sizes of LCF cables starting at 1-1/4":

TRIM-214-C02 is a cost effective manual tool that works with all corrugated inner conductor versions, i.e. UCF114, LCF158 and LCF214. No further tools are required to prepare the cable for the connector attachment. This is due to the unique design of the trimming tool, which combines all necessary functions in one tool.

TRIM-214-C02

TRIM-114-C12 is a tool dedicated to the preparation of all 1-1/4" and 1-5/8" CELLFLEX® cables and is operated by hand.
It works with UCF114, LCFS114 and LCF158. No further tools are required to prepare the cable for the connector attachment. This is due to the unique design of the trimming tool, which combines all necessary functions in one tool.

TRIM-114-C12

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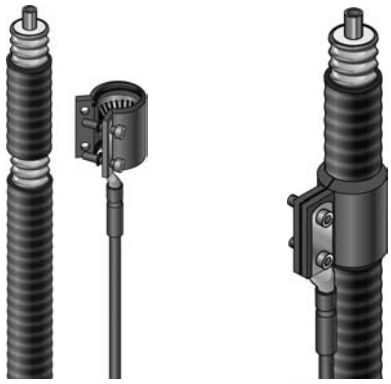
Grounding Kits

High Speed Grounding Kit

The HSE grounding kit is a pre-assembled grounding kit for low loss and flexible cables from sizes 1/4" to 1-5/8". After the installation, the grounding is resistant to all environmental influences.

The grounding body is made of stainless steel, and vulcanized with rubber. The contact mechanism is designed to provide low resistance and reliable contact while maintaining the outer conductor integrity. The stranded grounding wire is pre-assembled with stainless steel screws. Safety washers prevent the screws from loosening. A simple but helpful detail, especially when mounting the grounding kit on top of a tower.

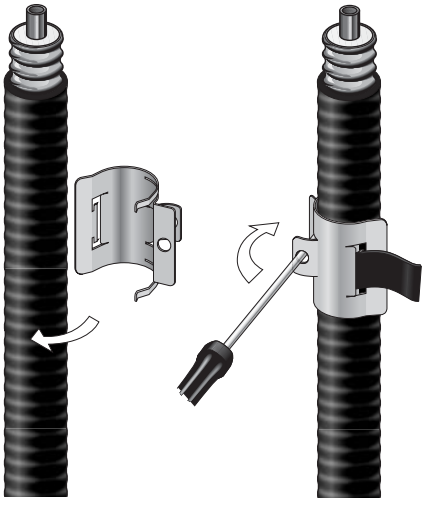
The installation process consists of three steps. At first the cable is stripped. For multiple cable runs with tight spacing a special stripping tool is recommended. In the second step the grounding body is wrapped around the cable. At last the screws are tightened. Three steps in three minutes for perfect grounding. The high speed grounding kits have successfully been tested with repeated 100kA (10/350 µ-s) lighting currents.



High Speed Grounding Kit HSE-78

High Speed Grounding Kit HSE-12

Cable Preparation

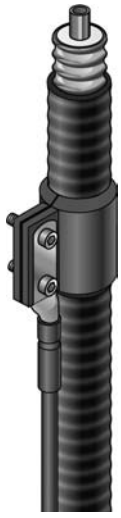


Step 1

Clean the cable jacket around the grounding point and cut off the appropriate strip width as per instructions using stripping tool. (Optional)

Step 2

Align grounding body around the cable and close it around the cable.



Step 3

Lock the grounding kit with both screws.

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Accessories

Grounding Kits – Clip On

Clip-on Ground Kits provide an advanced coax grounding solution, providing quick and easy installation coupled with dependable protection of the coaxial cable system. The unique clip design and pre-formed strap allow the Clip-on Ground Kit to be easily slipped over the outer conductor of the coax and firmly latched into place. The latch mechanism has been optimized to provide a secure fit, maximizing performance by ensuring proper contact surface area and pressure.

The Clip-on Ground Kit is designed to comply with ASTM A967, protecting coax from the damaging effects of lightning current in excess of 200 kA. Each kit includes a 6-gauge, 7-strand copper ground lead with your choice of lead lengths and attached or unattached lugs. All bus bar attachment hardware is included, along with required mastic and electrical tape for weatherproofing each kit.

Grounding Kit - Clip On

Grounding Kits – Pre-formed Strap

The grounding kit with pre-formed copper strap facilitates installation with a pre-formed copper strap that eliminates the need for a coiling tool.

This kit has been verified by independent labs to protect coax from the damaging effects of lightning current in excess of 200kA.

Each kit includes a 1.5m (5ft), 6-gauge 7-strand copper ground lead which can be trimmed to the exact length required for a neat and effective installation. One 1/4" two-hole ground lug, one 3/8" two-hole ground lug, and all bus bar attachment hardware are also included along with the required mastic and electrical tape for weatherproofing.

Grounding Kit - Pre-formed

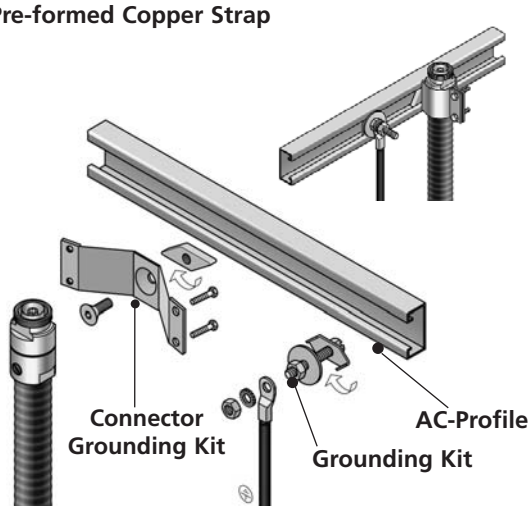
Grounding Kits – Pre-formed Copper Strap

The Strap-On Grounding Kit is designed for HCA cables and include all necessary hardware and weather proofing supplies.

Pre-formed Copper Strap

Connector Grounding Kit

These connector grounding kits provide direct connector grounding for instance on an anchor bar. The assembly or disassembly is quick and easy while providing mechanical fixture and reliable ground path at the same time. Optional accessories are AC-rails (standard length 300 mm/118") and the earthing terminal to connect a locally provided cable to the earthing bus. All components are made of stainless steel.



Connector Grounding Kit

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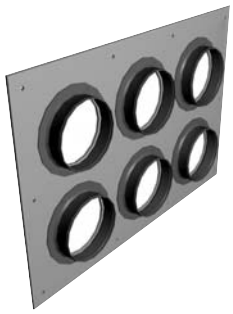
Accessories

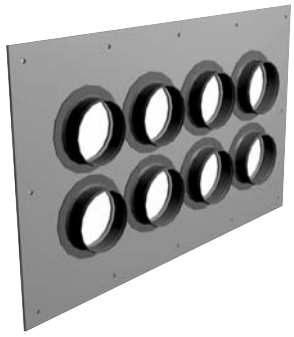
Wall/Roof Feed Through Entry Panels

Aluminum feed-through entry panels enable multiple coax runs to enter buildings and shelters. These rugged panels support the transmission line cable at the entry point and prevent moisture from entering the building. Each panel features 4" (101.6mm) or 5" (127mm) openings to accept boot assemblies.

Feed-through panels are offered with a broad selection of hole patterns (from 1 to 12 holes) and plate sizes to match your exact application. These entries can be used in both interior and exterior wall applications to create a neat and clean installation. Each panel includes a set of wall attachment hardware, including 6mm (#14) stainless steel screws, finishing washers, and plastic anchors and is powder coated to ensure long term integrity and provide appealing aesthetics. Sealing caps for all openings are also included. Boot assemblies are purchased separately to accommodate specific transmission line requirements.

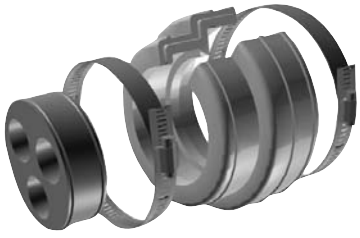


6 & 8 Hole Wall/Roof Feed Through Entry Panels



4" Feed Through Assemblies

These innovative boot assemblies feature a one-piece design which reduces installation time. The split, one-piece style simplifies clamping and frees the installer's hands to position the cable runs. Boot assemblies are designed to be fitted onto 4" (101.6mm) entry panels in wall/roof feed-through applications. The durable boot is designed to met ASTM-D2000 and SAE J200 specifications.
Each boot assembly includes the boot, two round member adapter clamps which fit inside the boot assembly to hold the coax in place.



Feed Through Assemblies

WF-Series Wall-Feed through

This flexible feed through solution can be installed also for already routed cables. The kit consists of a 6-hole stainless steel clamp, a single rubber boot, fixing and sealing material in a complete set.

Wall Feed-Through (without plate)

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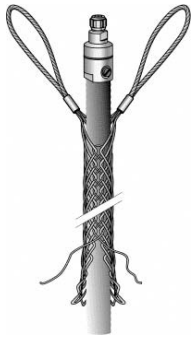
Accessories

Hoisting Grips

Hoisting grips are used to distribute the force introduced into a cable when hoisted using a winch which is usually the case when cable size and/or length lead to an overall weight that cannot be operated manually. They consist of a wire mesh and hold the cable by means of friction over their complete length when pulled. Two varieties are available for most cable types - one loop and two loop. Two type of varieties are available for most cable sizes; the closed version - used when the top connector is installed after the cable is hoisted - and the open version - used in cases where the top connector is installed prior to hoisting the cable. Also in the latter case the closed version might be used if it shall be left on the cable replacing the top cable clamp. Cables with factory-installed connectors can be delivered with preinstalled hoisting grips on customer request. Please contact our sales team for details. The maximum hoisting length per stocking is 60m (200ft) for HOIST1 versions and 70m (230ft) for HOIST2 versions of cable sizes up to and including 3-1/8" and 40m (130ft) for cable sizes above 3-1/8".. For longer sections additional grips have to be used, making sure each one carries its part of the overall weight. Two styles of hoisting grips are available depending on your installation needs. The two-loop versions are ideal for multi-use applications and can be reused many times. For example, installers can use the heavy duty HOIST2L versions available that also cover multiple cable sizes and types to reduce the number of products needed. The one-loop versions are ideal for permanent, one-time installations where the hoisting grip remains attached to the cable.



Two Loop Hoisting Grip Open Lacing

One Loop Hoisting Grip Open Lacing

Cold Shrink Kit

RFS offers a time-saving and easy way to secure a water-proof protection. No tools are necessary for installation. The shrinking process is done by simply unwinding a removable core.

Step 1

Slide the cold-shrink tube over the cable and set foam strips.

Step 2

Join the connectors and place the tube.

Step 3

Shrink the tube by pulling the core by hand

Weatherproofing Kit WPFG-1

Used for protection of splices and connectors that are directly buried or exposed to corrosive environmental conditions. WPFG-1 kit consists of 5 rolls of butyl rubber tape, 1 roll of 50mm (2") black electrical tape and 2 rolls of 19mm (3/4") black electrical tape. Other kits available on request to meet specific needs.

Weatherproofing Kit

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CELLFLEX® Foam Cables

Cable Type	Description	Model Number
SCF14-50		
	Grounding kit	EAR-14-S
	RSB-Clip (10 per kit/package, incl. clamp lining)	RSB-S14
	Combination preparation tool, Trim Series A	TRIM-14-S
	Spare blades for Trimming tool TRIM-14-S, TRIM-38-S and TRIM-12-S	TRIM-B01
SCF38-50		
	Grounding kit	EAR-38-S
	RSB-Clip (10 per kit/package, incl. clamp lining)	RSB-S38
	Hoisting grip lace up	HOIST2-L01
	Combination preparation tool, Trim Series A	TRIM-38-S
	Spare blades for Trimming tool TRIM-14-S, TRIM-38-S and TRIM-12-S	TRIM-B01
SCF12-50		
	Grounding kit	EAR-12-S
	RSB-Clip (10 per kit/package, incl. clamp lining)	RSB-S12
	Hoisting grip lace up	HOIST2-L01
	RAPID FIT Combination preparation tool	TRIM-12-S-06
	Combination preparation tool, Trim Series B	TRIM-12-SB
	Spare blades for Trimming tool TRIM-14-S, TRIM-38-S and TRIM-12-S	TRIM-B01
	Automated trimming tool	TRIM-S12-A
UCF78-50		
	Connector grounding kit	CEAR-78
	Grounding kit, clip-on, 610 mm (24")	GKCLIP24-78
	Grounding kit, clip-on, 1.5 m (60")	GKCLIP60-78
	Pre-formed grounding kit, 610 mm (24")	GKFORM24-78
	High speed grounding kit	HSE-78-005
	Cable hanger, non-insulated, bolt-on, stainless steel (kit of 10)	CLAMP-78
	Pre-formed grounding kit, 1.5 m (60")	GKFORM60-78
	Multi-Block Hanger Kit, 1 pair-2 runs (20 kits per package)	MBH78-2
	Multi-Block Hanger Kit, 2 pair-4 runs (20 kits per package)	MBH78-4
	Multi-Block Hanger Kit, 3 pair-6 runs (20 kits per package)	MBH78-6
	RSB-Clip (10 per kit/package)	RSB-78
	Rucksack option kit, size 2 (10 kits per package, without RSB-Clip)	RSB-78-R
	SCS Clamp for single run, angle bar (50 Clamps/package)	SCS-78-L1L
	SCS Clamp for single run, on AC rail, flat or round bar up to 12 mm (0.5") (50 Clamps/package)	SCS-78-L1M
	SCS Clamp for single run, on flat or round bar up to 25 mm (1") (50 Clamps/package)	SCS-78-L1R
	SCS Clamp for double run, angle bar (50 Clamps/package)	SCS-78-L2L
	SCS Clamp for double run, on AC rail, flat or round bar up to 12 mm (0.5") (50 Clamps/package)	SCS-78-L2M
	SCS Clamp for double run, on flat or round bar up to 25 mm (1") (50 Clamps/package)	SCS-78-L2R
	SCS Clamp for triple run, angle bar (50 Clamps/package)	SCS-78-L3L
	SCS Clamp for triple run, on AC rail, flat or round bar up to 12mm (0.5") (50 Clamps/package)	SCS-78-L3M
	SCS Clamp for triple run, on flat or round bar up to 25 mm (1") (50 Clamps/package)	SCS-78-L3R
	Cable clamp, snap-in, stainless steel (kit of 10)	SNAP-78
	Hoisting Grip, Closed Lacing, one loop	HOIST1-78C
	Hoisting Grip, Lace-Up, one loop	HOIST1-78L
	Hoisting Grip, Lace-Up, two loop	HOIST2-L04
	Manual Jacket Stripping Tool	JSTRIP-78
	Stripping tool for high speed grounding kit HSE-78	JSTRIP-78-2
	Spare blades for Trimming tool TRIM-14-L, TRIM-38-L, TRIM-12-L, TRIM-58-L and TRIM-78-L	TRIM-B03
	Automated trimming tool, Trim Series A	TRIM-L78-A
	Combination preparation tool, Trim Series A	TRIM-78-L
	Combination preparation tool, Trim Series B	TRIM-78-LB
	Combination preparation tool, Trim Series D	TRIM-78-LD
	Feed through assemblies for 7/8" coaxial cable, 102 mm (4"), 1-entry	BOOT4-78-1
	Feed through assemblies for 7/8" coaxial cable, 102 mm (4"), 2-entries	BOOT4-78-2
	Feed through assemblies for 7/8" coaxial cable, 102 mm (4"), 3-entries	BOOT4-78-3
	Feed through assemblies for 7/8" coaxial cable, 102 mm (4"), 4-entries	BOOT4-78-4
	Wall feed through (without feed through plate)	WF-78

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Accessories Selection Guide

CELLFLEX® Foam Cables

Cable Type	Description	Model Number
UCF114-50		
	Connector grounding kit	CEAR-114
	Grounding kit, clip-on, 610 mm (24")	GKCLIP24-114
	Grounding kit, clip-on, 1.5 m (60")	GKCLIP60-114
	Pre-formed grounding kit, 610 mm (24")	GKFORM24-114
	Pre-formed grounding kit, 1.5 m (60")	GKFORM60-114
	High speed grounding kit	HSE-114-005
	Cable hanger, non-insulated, bolt-on, stainless steel (kit of 10)	CLAMP-114
	Multi-Block Hanger Kit, 1 pair-2 runs (20 kit per package)	MBH114-2
	Multi-Block Hanger Kit, 2 pair-4 runs (20 kits per package)	MBH114-4
	Multi-Block Hanger Kit, 3 pair-6 runs (20 kits per package)	MBH114-6
	RSB-Clip (10 per kit/package)	RSB-114
	Rucksack cover plate kit, two-fold (10 kits per package, without RSB-Clip)	RSB-114-R2
	Rucksack cover plate, three-fold (10 kits per package, without RSB-Clip)	RSB-114-R3
	SCS Clamp for single run, angle bar (50 Clamps/package)	SCS-114-L1L
	SCS Clamp for single run, on AC rail, flat or round bar up to 12mm (0.5") (50 Clamps/package)	SCS-114-L1M
	SCS Clamp for single run, on flat or round bar up to 25 mm (1") (50 Clamps/package)	SCS-114-L1R
	SCS Clamp for single run, angle bar (50 Clamps/package)	SCS-114-L2L
	SCS Clamp for double run, on AC rail, flat or round bar up to 12 mm (0.5") (50 Clamps/package)	SCS-114-L2M
	SCS Clamp for double run, on flat or round bar up to 25 mm (1") (50 Clamps/package)	SCS-114-L2R
	SCS Clamp for triple run, angle bar (50 Clamps/package)	SCS-114-L3L
	SCS Clamp for triple run, on AC rail, flat or round bar up to 12mm (0.5") (50 Clamps/package)	SCS-114-L3M
	SCS Clamp for triple run, on flat or round bar up to 25 mm (1") (50 Clamps/package)	SCS-114-L3R
	Cable clamp, snap-in, stainless steel (kit of 10)	SNAP-114
	Hoisting Grip, Closed Lacing, one loop	HOIST1-114C
	Hoisting Grip, Lace-Up, one loop	HOIST1-114L
	Hoisting Grip, Lace-Up, two loop	HOIST2-L05
	Manual Jacket Stripping Tool	JSTRIP-114
	Stripping tool for high speed grounding kit HSE-114	JSTRIP-114-2
	Combination preparation tool, crank version	TRIM-214-C02
	Spare blades for Trimming tool TRIM-114-C06, TRIM-114-C12	TRIM-B04
	Automated trimming tool, Trim Series A	TRIM-L114-A
	Combination preparation tool, crank/drill version	TRIM-114-C12
	Feed through assemblies for 1-1/4" coaxial cable, 102 mm (4"), 1-entry	BOOT4-114-1
LCF14-50		
	Stripping tool for high speed grounding kit HSE-14	HSE-14-T
	Hoisting grip lace up	HOIST2-L01
	High speed grounding kit	HSE-14-005
	Combination preparation tool, Trim Series A	TRIM-14-C
	Spare blades for Trimming tool TRIM-14-L, TRIM-38-L, TRIM-12-L, TRIM-58-L and TRIM-78-L	TRIM-B03
LCF38-50		
	Pre-formed grounding kit, 1.5 m (60")	GKFORM60-12
	Stripping tool for high speed grounding kit HSE-38	HSE-38-T
	Hangers for anchor bar 18-22 mm (0.71-0.87")	HCH-38-1C
	Hangers for angle iron 40 mm (1.575")	HCH-38-1L4
	Hangers for flat iron 6-12 mm (0.24-0.47")	HCH-38-1R
	RSB-Clip (incl. clamp lining, 10 per kit/package)	RSB-38-001
	Hoisting Grip for 3/8" Coaxial Cable, Closed Lacing	HOIST1-38C
	Hoisting grip lace up	HOIST2-L01
	High speed grounding kit	HSE-38-005
	Combination preparation tool, Trim Series A	TRIM-38-L03
	Spare blades for Trimming tool TRIM-14-L, TRIM-38-L, TRIM-12-L, TRIM-58-L and TRIM-78-L	TRIM-B03
LCF12-50		
	Connector grounding kit	CEAR-12
	Grounding kit, clip-on, 610 mm (24")	GKCLIP24-12
	Grounding kit, clip-on, 1.5 m (60")	GKCLIP60-12
	Pre-formed grounding kit, 610 mm (24")	GKFORM24-12
	Pre-formed grounding kit, 1.5 m (60")	GKFORM60-12
	High speed grounding kit for CELLFLEX	HSE-12-005

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CELLFLEX® Foam Cables

Cable Type	Description	Model Number
LCF12-50 CONTINUED		
	Cable hanger, non-insulated, bolt-on, stainless steel (kit of 10)	CLAMP-12
	Multi-Block Hanger Kit, 1 pair-2 runs (20 kits per package)	MBH12-2
	Multi-Block Hanger Kit, 2 pair-4 runs (20 kits per package)	MBH12-4
	Multi-Block Hanger Kit, 3 pair-6 runs (20 kits per package)	MBH12-6
	RSB-Clip (10 per kit/package)	RSB-12
	Rucksack option kit, size 1 (10 kits per package, without RSB-Clip)	RSB-12-R
	SCS Clamp for single run, angle bar (50 Clamps/package)	SCS-12-L1L
	SCS Clamp for single run, on AC rail, flat or round bar up to 12 mm (0.5") (50 Clamps/package)	SCS-12-L1M
	SCS Clamp for single run, on flat or round bar up to 25 mm (1") (50 Clamps/package)	SCS-12-L1R
	SCS Clamp for double run, angle bar (50 Clamps/package)	SCS-12-L2L
	SCS Clamp for double run, on AC rail, flat or round bar up to 12 mm (0.5") (50 Clamps/package)	SCS-12-L2M
	SCS Clamp for double run, on flat or round bar up to 25 mm (1") (50 Clamps/package)	SCS-12-L2R
	SCS Clamp for triple run, angle bar (50 Clamps/package)	SCS-12-L3L
	SCS Clamp for triple run, on AC rail, flat or round bar up to 12 mm (0.5") (50 Clamps/package)	SCS-12-L3M
	SCS Clamp for triple run, on flat or round bar up to 25 mm (1") (50 Clamps/package)	SCS-12-L3R
	Cable clamp, snap-in, stainless steel (kit of 10)	SNAP-12
	Hoisting Grip, Closed Lacing, one loop	HOIST1-12C
	Hoisting Grip, Lace-Up, one loop	HOIST1-12L
	Hoisting Grip, Lace-Up, two loop	HOIST2-L02
	Stripping tool for high speed grounding kit HSE-12	JSTRIP-12-2
	Spare blades for Trimming tool TRIM-14-L, TRIM-38-L, TRIM-12-L, TRIM-58-L and TRIM-78-L	TRIM-B03
	Automated trimming tool, Trim Series A	TRIM-L12-A
	Combination preparation tool, Trim Series A	TRIM-12-L
	Feed through assemblies for 1/2" coaxial cable, 102 mm (4”), 1-entry	BOOT4-12-1
	Feed through assemblies for 1/2" coaxial cable, 102 mm (4”), 2-entries	BOOT4-12-2
	Feed through assemblies for 1/2" coaxial cable, 102 mm (4”), 3-entries	BOOT4-12-3
	Feed through assemblies for 1/2" coaxial cable, 102 mm (4”), 4-entries	BOOT4-12-4
LCF58-50		
	Pre-formed grounding kit, 610 mm (24”)	GKFORM24-58
	Pre-formed grounding kit, 1.5 m (60”)	GKFORM60-58
	Stripping tool for high speed grounding kit HSE-58	HSE-58-T
	Cable hanger, non-insulated, bolt-on, stainless steel (kit of 10)	CLAMP-58
	Hangers for anchor bar 18-22 mm (0.71-0.87")	HCH-58-1C
	Hangers for flat iron 6-12 mm (0.24-0.47")	HCH-58-1R
	Multi-Block Hanger Kit, 1 pair-2 runs (20 kits per package)	MBH58-2
	Multi-Block Hanger Kit, 2 pair-4 runs (20 kits per package)	MBH58-4
	Multi-Block Hanger Kit, 3 pair-6 runs (20 kits per package)	MBH58-6
	RSB-Clip (10 per kit/package)	RSB-58
	SCS Clamp for single run, angle bar (50 Clamps/package)	SCS-58-L1L
	SCS Clamp for single run, on AC rail, flat or round bar up to 12 mm (0.5") (50 Clamps/package)	SCS-58-L1M
	SCS Clamp for single run, on flat or round bar up to 25 mm (1") (50 Clamps/package)	SCS-58-L1R
	SCS Clamp for double run, angle bar (50 Clamps/package)	SCS-58-L2L
	SCS Clamp for double run, on AC rail, flat or round bar up to 12 mm (0.5") (50 Clamps/package)	SCS-58-L2M
	SCS Clamp for double run, on flat or round bar up to 25 mm (1") (50 Clamps/package)	SCS-58-L2R
	SCS Clamp for triple run, angle bar (50 Clamps/package)	SCS-58-L3L
	SCS Clamp for triple run, on AC rail, flat or round bar up to 12 mm (0.5") (50 Clamps/package)	SCS-58-L3M
	SCS Clamp for triple run, on flat or round bar up to 25 mm (1") (50 Clamps/package)	SCS-58-L3R
	Cable clamp, snap-in, stainless steel (kit of 10)	SNAP-58
	Hoisting Grip, Closed, single loop	HOIST1-58C
	Hoisting Grip, Lace-Up, single loop	HOIST1-58L
	Hoisting Grip, Lace-Up, double loop	HOIST2-L03
	High speed grounding kit	HSE-58
	Spare blades for Trimming tool TRIM-14-L, TRIM-38-L, TRIM-12-L, TRIM-58-L and TRIM-78-L	TRIM-B03
	Combination preparation tool, Trim Series B	TRIM-58-L
	Feed through assemblies for 5/8" coaxial cable, 102 mm (4”), 1-entry	BOOT4-58-1
	Feed through assemblies for 5/8" coaxial cable, 102 mm (4”), 3-entries	BOOT4-58-3
	Wall feed through (without feed through plate)	WF-58

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Accessories Selection Guide

CELLFLEX® Foam Cables

Cable Type	Description	Model Number
LCF78-50		
	Feed through assemblies for 7/8" coaxial cable, 102 mm (4"), 4-entries	BOOT4-78-4
	Cable hanger, non-insulated, bolt-on, stainless steel (kit of 10)	CLAMP-78
	Grounding kit, clip-on, 610 mm (24")	GKCLIP24-78
	Grounding kit, clip-on, 1.5 m (60")	GKCLIP60-78
	Pre-formed grounding kit, 610 mm (24")	GKFORM24-78
	Pre-formed grounding kit, 1.5 m (60")	GKFORM60-78
	Connector grounding kit	CEAR-78
	HCA Clamp for anchor bar 18-22 mm (0.71-0.87")	HCH-78-1C
	HCA Clamp for angle iron 40 mm (1.575")	HCH-78-1L4
	Stripping tool for high speed grounding kit HSE-78	JSTRIP-78-2
	Multi-Block Hanger Kit, 1 pair-2 runs (20 kits per package)	MBH78-2
	Multi-Block Hanger Kit, 2 pair-4 runs (20 kits per package)	MBH78-4
	Multi-Block Hanger Kit, 3 pair-6 runs (20 kits per package)	MBH78-6
	RSB-Clip (10 per kit/package)	RSB-78
	Rucksack option kit, size 2 (10 kits per package, without RSB-Clip)	RSB-78-R
	SCS Clamp for single run, angle bar (50 Clamps/package)	SCS-78-L1L
	SCS Clamp for single run, on AC rail, flat or round bar up to 12 mm (0.5") (50 Clamps/package)	SCS-78-L1M
	SCS Clamp for single run, on flat or round bar up to 25 mm (1") (50 Clamps/package)	SCS-78-L1R
	SCS Clamp for double run, angle bar (50 Clamps/package)	SCS-78-L2L
	SCS Clamp for double run, on AC rail, flat or round bar up to 12 mm (0.5") (50 Clamps/package)	SCS-78-L2M
	SCS Clamp for double run, on flat or round bar up to 25 mm (1") (50 Clamps/package)	SCS-78-L2R
	SCS Clamp for triple run, angle bar (50 Clamps/package)	SCS-78-L3L
	SCS Clamp for triple run, on AC rail, flat or round bar up to 12mm (0.5") (50 Clamps/package)	SCS-78-L3M
	SCS Clamp for triple run, on flat or round bar up to 25 mm (1") (50 Clamps/package)	SCS-78-L3R
	HCA Clamp for flat iron 6-12 mm (0.24-0.47")	HCH-78-1R
	Hoisting Grip, Closed Lacing, one loop	HOIST1-78C
	Hoisting Grip, Lace-Up, one loop	HOIST1-78L
	Hoisting Grip, Lace-Up, two loop	HOIST2-L04
	High speed grounding kit	HSE-78-005
	Manual Jacket Stripping Tool	JSTRIP-78
	Combination preparation tool, Trim Series D	TRIM-78-LD
	Spare blades for Trimming tool TRIM-14-L, TRIM-38-L, TRIM-12-L, TRIM-58-L and TRIM-78-L	TRIM-B03
	Automated trimming tool, Trim Series A	TRIM-L78-A
	Cable clamp, snap-in, stainless steel (kit of 10)	SNAP-78
	Combination preparation tool, Trim Series A	TRIM-78-L
	Combination preparation tool, Trim Series B	TRIM-78-LB
	Feed through assemblies for 7/8" coaxial cable, 102 mm (4"), 1-entry	BOOT4-78-1
	Feed through assemblies for 7/8" coaxial cable, 102 mm (4"), 2-entries	BOOT4-78-2
	Feed through assemblies for 7/8" coaxial cable, 102 mm (4"), 3-entries	BOOT4-78-3
	Wall feed through (without feed through plate)	WF-78
LCFS114-50		
	Connector grounding kit	CEAR-114
	Grounding kit, clip-on, 610 mm (24")	GKCLIP24-114
	Grounding kit, clip-on, 1.5 m (60")	GKCLIP60-114
	Pre-formed grounding kit, 610 mm (24")	GKFORM24-114
	Pre-formed grounding kit, 1.5 m (60")	GKFORM60-114
	High speed grounding kit	HSE-114-005
	Cable hanger, non-insulated, bolt-on, stainless steel (kit of 10)	CLAMP-114
	Multi-Block Hanger Kit, 1 pair-2 runs (20 kit per package)	MBH114-2
	Multi-Block Hanger Kit, 2 pair-4 runs (20 kits per package)	MBH114-4
	Multi-Block Hanger Kit, 3 pair-6 runs (20 kits per package)	MBH114-6
	RSB-Clip (10 per kit/package)	RSB-114
	Rucksack cover plate kit, two-fold (10 kits per package, without RSB-Clip)	RSB-114-R2
	Rucksack cover plate, three-fold (10 kits per package, without RSB-Clip)	RSB-114-R3
	SCS Clamp for single run, angle bar (50 Clamps/package)	SCS-114-L1L
	SCS Clamp for single run, on AC rail, flat or round bar up to 12mm (0.5") (50 Clamps/package)	SCS-114-L1M
	SCS Clamp for single run, on flat or round bar up to 25 mm (1") (50 Clamps/package)	SCS-114-L1R

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CELLFLEX® Foam Cables

Cable Type	Description	Model Number
LCFS114-50 CONTINUED		
	SCS Clamp for single run, angle bar (50 Clamps/package)	SCS-114-L2L
	SCS Clamp for double run, on AC rail, flat or round bar up to 12 mm (0.5") (50 Clamps/package)	SCS-114-L2M
	SCS Clamp for double run, on flat or round bar up to 25 mm (1") (50 Clamps/package)	SCS-114-L2R
	SCS Clamp for triple run, angle bar (50 Clamps/package)	SCS-114-L3L
	SCS Clamp for triple run, on AC rail, flat or round bar up to 12mm (0.5") (50 Clamps/package)	SCS-114-L3M
	SCS Clamp for triple run, on flat or round bar up to 25 mm (1") (50 Clamps/package)	SCS-114-L3R
	Cable clamp, snap-in, stainless steel (kit of 10)	SNAP-114
	Hoisting Grip, Closed Lacing, one loop	HOIST1-114C
	Hoisting Grip, Lace-Up, one loop	HOIST1-114L
	Hoisting Grip, Lace-Up, two loop	HOIST2-L05
	Manual Jacket Stripping Tool	JSTRIP-114
	Stripping tool for high speed grounding kit HSE-114	JSTRIP-114-2
	Combination preparation tool, crank version	TRIM-214-C02
	Spare blades for Trimming tool TRIM-114-C06, TRIM-114-C12	TRIM-B04
	Automated trimming tool, Trim Series A	TRIM-L114-A
	Combination preparation tool, crank/drill version	TRIM-114-C12
	Feed through assemblies for 1-1/4" coaxial cable, 102 mm (4”), 1-entry	BOOT4-114-1
LCF158-50		
	Connector grounding kit	CEAR-158
	Grounding kit, clip-on, 610 mm (24”)	GKCLIP24-158
	Grounding kit, clip-on, 1.5 m (60”)	GKCLIP60-158
	Pre-formed grounding kit, 610 mm (24”)	GKFORM24-158
	Pre-formed grounding kit, 1.5 m (60”)	GKFORM60-158
	High speed grounding kit for	HSE-158-005
	Cable hanger, non-insulated, bolt-on, stainless steel (kit of 10)	CLAMP-158
	HCA Clamp for anchor bar 18-22 mm (0.71-0.87")	HCH-158-1C
	HCA Clamp for angle iron 40 mm (1.575")	HCH-158-1L4
	HCA Clamp for flat iron 6-12 mm (0.24-0.47")	HCH-158-1R
	Multi-Block Hanger Kit, 1 pair-2 runs (20 kits per package)	MBH158-2
	Multi-Block Hanger Kit, 2 pair-4 runs (20 kits per package)	MBH158-4
	Multi-Block Hanger Kit, 3 pair-6 runs (20 kits per package)	MBH158-6
	RSB-Clip (10 per kit/package)	RSB-158
	Rucksack cover plate kit, two-fold (10 kits per package, without RSB-Clip)	RSB-158-R2
	Rucksack cover plate, three-fold (10 kits per package, without RSB-Clip)	RSB-158-R3
	SCS Clamp for single run, angle bar (25 Clamps/package)	SCS-158-L1L
	SCS Clamp for single run, on AC rail, flat or round bar up to 12 mm (0.5") (25 Clamps/package)	SCS-158-L1M
	SCS Clamp for single run, on flat or round bar up to 25 mm (1") (25 Clamps/package)	SCS-158-L1R
	SCS Clamp for double run, angle bar (25 Clamps/package)	SCS-158-L2L
	SCS Clamp for double run, on AC rail, flat or round bar up to 12 mm (0.5") (25 Clamps/package)	SCS-158-L2M
	SCS Clamp for double run, on flat or round bar up to 25 mm (1") (25 Clamps/package)	SCS-158-L2R
	SCS Clamp for triple run, angle bar (25 Clamps/package)	SCS-158-L3L
	SCS Clamp for triple run, on AC rail, flat or round bar up to 12 mm (0.5") (25 Clamps/package)	SCS-158-L3M
	SCS Clamp for triple run, on flat or round bar up to 25 mm (1") (25 Clamps/package)	SCS-158-L3R
	Cable clamp, snap-in, stainless steel (kit of 10)	SNAP-158
	Hoisting Grip, Closed Lacing, one loop	HOIST1-158C
	Hoisting Grip, Lace-Up, one loop	HOIST1-158L
	Hoisting Grip, Lace-Up, two loop	HOIST2-L06
	Manual Jacket Stripping Tool	JSTRIP-158
	Stripping tool for high speed grounding kit HSE-158	JSTRIP-158-2
	Spare blades for Trimming tool TRIM-114-C06, TRIM-114-C12	TRIM-B04
	Automated trimming tool, Trim Series A	TRIM-L158-A
	Combination preparation tool, crank/drill version	TRIM-114-C12
	Combination preparation tool, crank version	TRIM-214-C02
	Feed through assemblies for 1-5/8" coaxial cable, 102 mm (4”), 1-entry	BOOT4-158-1
	Wall feed through (without feed through plate)	WF-158

See www.rfsworld.com for additional accessories.

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CELLFLEX® Foam Cables

Cable Type	Description	Model Number
LCF214-50		
	Connector grounding kit	CEAR-214
	Grounding kit, clip-on, 610 mm (24")	GKCLIP24-214
	Grounding kit, clip-on, 1.5 m (60")	GKCLIP60-214
	Pre-formed grounding kit, 610 mm (24")	GKFORM24-214
	Pre-formed grounding kit, 1.5 m (60")	GKFORM60-214
	Hoisting Grip, Lace-Up, two loop	HOIST2-L08
	Cable hanger, non-insulated, bolt-on, stainless steel (kit of 10)	CLAMP-214
	Hangers for anchor bar 18-22 mm (0.71-0.87")	HCH-214-1C
	Hangers for angle iron 40 mm (1.575")	HCH-214-1L4
	Hangers for flat iron 6-12 mm (0.24-0.47")	HCH-214-1R
	SCS Clamp for single run, on AC rail, flat or round bar up to 12 mm (0.5") (25 Clamps/package)	SCS-214-L1M
	SCS Clamp for single run, on flat or round bar up to 25mm (1") (25 Clamps/package)	SCS-214-L1R
	SCS Clamp for double run, on AC rail, flat or round bar up to 12mm (0.5") (25 Clamps/package)	SCS-214-L2M
	SCS Clamp for double run, on flat or round bar up to 25 mm (1") (25 Clamps/package)	SCS-214-L2R
	Cable clamp, snap-in, stainless steel (kit of 10)	SNAP-214
	Hoisting Grip for 2-1/4" Coaxial Cable, Closed Lacing, one loop	HOIST1-214C
	Hoisting Grip for 2-1/4" Coaxial Cable, Lace-Up, one loop	HOIST1-214L
	Manual Jacket Stripping Tool	JSTRIP-214
	Combination preparation tool, crank version	TRIM-214-C02
	Feed through assemblies for 2-1/4" coaxial cable, 102 mm (4"), 1-entry	BOOT4-214-1

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HELIFLEX® Air-Dielectric Cables

Cable Type	Description	Model Number
HCA38-50		
	Grounding Kit, Pre-formed Copper Strap	EAR-38
	Hangers for anchor bar 18-22 mm (0.71-0.87")	HCH-38-1C
	Hangers for angle iron 40 mm (1.575")	HCH-38-1L4
	Hangers for flat iron 6-12 mm (0.24-0.47")	HCH-38-1R
	Hoisting Grip for 3/8" Coaxial Cable, Closed Lacing	HOIST1-38C
	Hoisting Grip, Lace-Up, two loop	HOIST2-L02
	Wall feed through (without feed through plate)	WF-38
HCA12-50 (SEE LCF12-50 SERIES ACCESSORIES)		
HCA58-50		
	Grounding Kit, Pre-formed Copper Strap	EAR-58
	Cable hanger, non-insulated, bolt-on, stainless steel (kit of 10)	CLAMP-58
	Hangers for anchor bar 18-22 mm (0.71-0.87")	HCH-58-1C
	Hangers for flat iron 6-12 mm (0.24-0.47")	HCH-58-1R
	Cable clamp, snap-in, stainless steel (kit of 10)	SNAP-58
	Hoisting Grip, Closed, single loop	HOIST1-58C
	Hoisting Grip, Lace-Up, single loop	HOIST1-58L
	Hoisting Grip, Lace-Up, double loop	HOIST2-L03
	Wall feed through (without feed through plate)	WF-58
HCA78-50		
	Flanging die, Size A	FDIE-A78
	Grounding Kit, Pre-formed Copper Strap	EAR-78
	HCA Clamp for anchor bar 18-22 mm (0.71-0.87")	HCH-78-1C
	HCA Clamp for angle iron 40 mm (1.575")	HCH-78-1L4
	HCA Clamp for flat iron 6-12 mm (0.24-0.47")	HCH-78-1R
	RSB-Clip (10 per kit/package)	RSB-78-H
	Hoisting Grip, Closed Lacing, one loop	HOIST1-78C
	Hoisting Grip, Lace-Up, one loop	HOIST1-78L
	Hoisting Grip, Lace-Up, two loop	HOIST2-L04
	Wall feed through (without feed through plate)	WF-78
HCA118-50		
	Flanging die for HCA 1-1/8" Size A	FDIE-A118
	Flanging die for HCA 1-1/8" Size B	FDIE-B118
	Basic Flanging Tool for HCA 1-1/8" - HCA 3-1/8"	FTOOL-B118318
	Grounding Kit, Pre-formed Copper Strap	EAR-118
	HCA Clamp for anchor bar 18-22 mm (0.71-0.87")	HCH-118-1C
	HCA Clamp for angle iron 40 mm (1.575")	HCH-118-1L4
	HCA Clamp for flat iron 6-12 mm (0.24-0.47")	HCH-118-1R
	RSB-Clip (10 per kit/package)	RSB-118
	Hoisting Grip, Lace-Up, two loop	HOIST2-L05
	Wall feed through (without feed through plate)	WF-118
HCA158-50		
	Flanging die for HCA 1-5/8" Size B	FDIE-B158
	Flanging die for HCA 1-1/8" Size B EIA (S-Line)	FDIE-B158S
	Basic Flanging Tool for HCA 1-1/8" - HCA 3-1/8"	FTOOL-B118318
	Grounding Kit, Pre-formed Copper Strap	EAR-158
	HCA Clamp for anchor bar 18-22 mm (0.71-0.87")	HCH-158-1C
	HCA Clamp for angle iron 40 mm (1.575")	HCH-158-1L4
	HCA Clamp for flat iron 6-12 mm (0.24-0.47")	HCH-158-1R
	Hoisting Grip, Closed Lacing, one loop	HOIST1-158C
	Hoisting Grip, Lace-Up, one loop	HOIST1-158L
	Hoisting Grip, Lace-Up, two loop	HOIST2-L06
	Wall feed through (without feed through plate)	WF-158
HCA214-50		
	Basic Flanging Tool for HCA 1-1/8" - HCA 3-1/8"	FTOOL-B118318
	Hangers for anchor bar 18-22 mm (0.71-0.87")	HCH-214-1C
	Hangers for angle iron 40 mm (1.575")	HCH-214-1L4
	Hangers for flat iron 6-12 mm (0.24-0.47")	HCH-214-1R
	Hoisting Grip for 2-1/4" Coaxial Cable, Closed Lacing, one loop	HOIST1-214C

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Accessories Selection Guide

HELIFLEX® Air-Dielectric Cables

Cable Type	Description	Model Number
HCA214-50 CONTINUED		
	Hoisting Grip for 2-1/4" Coaxial Cable, Lace-Up, one loop	HOIST1-214L
	Hoisting Grip, Lace-Up, two loop	HOIST2-L08
	Combination preparation tool, crank version	TRIM-214-C02
	Wall feed through (without feed through plate)	WF-214
HCA300-50		
	Basic Flanging Tool for HCA 1-1/8" - HCA 3-1/8"	FTOOL-B118318
	Grounding Kit, Pre-formed Copper Strap	EAR-300
	Hangers for anchor bar 18-22 mm (0.71-0.87")	HCH-300-1C
	Hangers for angle iron 40 mm (1.575")	HCH-300-1L4
	Hangers for flat iron 6-12 mm (0.24-0.47")	HCH-300-1R
	Hoisting Grip, Lace-Up, two loop	HOIST2-L09
	Wall feed through (without feed through plate)	WF-300
HCA318-50		
	Flanging die for HCA 3-1/8" Size B EIA (S-Line)	FDIE-B318S
	Flanging die for HCA 3-1/8" Size E	FDIE-E318
	Basic Flanging Tool for HCA 1-1/8" - HCA 3-1/8"	FTOOL-B118318
	Basic Flanging Tool, Size B, for HCA Cables 3-1/8" - 6-1/8"	FTOOL-E318618
	Grounding Kit, Pre-formed Copper Strap	EAR-318
	Hangers for anchor bar 18-22 mm (0.71-0.87")	HCH-318-1C
	Hangers for angle iron 40 mm (1.575")	HCH-318-1L4
	Hangers for flat iron 6-12 mm (0.24-0.47")	HCH-318-1R
	Hoisting Grip, Lace-Up, two loop	HOIST2-L09
	Wall feed through (without feed through plate)	WF-318
HCA418-50		
	Flanging die for HCA 4-1/8" Size E	FDIE-E418
	Flanging die for HCA 4-1/8" Size E EIA (S-line)	FDIE-E418S
	Basic Flanging Tool, Size B, for HCA Cables 3-1/8" - 6-1/8"	FTOOL-E318618
	Grounding Kit, Pre-formed Copper Strap	EAR-418
	Hangers for anchor bar 18-22 mm (0.71-0.87")	HCH-418-1C
	Hangers for angle iron 40 mm (1.575")	HCH-418-1L4
	Hangers for flat iron 6-12 mm (0.24-0.47")	HCH-418-1R
	Hoisting Grip, Lace-Up, two loop	HOIST2-L11
	Wall feed through (without feed through plate)	WF-418
HCA500-50		
	Flanging die for HCA 5" Size E	FDIE-E500
	Flanging die for HCA 5" Size E EIA (S-line)	FDIE-E500S
	Basic Flanging Tool, Size B, for HCA Cables 3-1/8" - 6-1/8"	FTOOL-E318618
	Grounding Kit, Pre-formed Copper Strap	EAR-500
	Hangers for anchor bar 18-22 mm (0.71-0.87")	HCH-500-1C
	Hangers for angle iron 40 mm (1.575")	HCH-500-1L4
	Hangers for flat iron 6-12 mm (0.24-0.47")	HCH-500-1R
	Hoisting Grip, Lace-Up, two loop	HOIST2-L12
	Wall feed through (without feed through plate)	WF-500
HCA618-50		
	Flanging die for HCA 6-1/8" Size E	FDIE-E618
	Flanging die for HCA 6-1/8" Size E EIA (S-Line)	FDIE-E618S
	Basic Flanging Tool, Size B, for HCA Cables 3-1/8" - 6-1/8"	FTOOL-E318618
	Grounding Kit, Pre-formed Copper Strap	EAR-618
	Hangers for anchor bar 18-22 mm (0.71-0.87")	HCH-618-1C
	Hangers for angle iron 40 mm (1.575")	HCH-618-1L4
	Hangers for flat iron 6-12 mm (0.24-0.47")	HCH-618-1R
	Hoisting Grip, Lace-Up, two loop	HOIST2-L13
	Wall feed through (without feed through plate)	WF-618
HCA800-50		
	Grounding Kit, Pre-formed Copper Strap	EAR-800
	Hoisting Grip, Lace-Up, two loop	HOIST2-L14

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CELLFLEX® Foam Cables & HELIFLEX® Air-Dielectric Cables

Type	Description	Model Number
COLD SHRINK KIT		
	Cold shrink tube, 1/2" – 1/2", 1/2" – 5/8", 5/8" – 5/8"	COLD-020
	Cold shrink tube, 1/2" – 7/8", 5/8" – 7/8"	COLD-021
	Cold shrink tube, 1/2" – 1-1/4", 1/2" – 1-5/8", 5/8 – 1-1/4", 5/8 – 1-5/8"	COLD-022
	Cold shrink tube, 7/8" – 7/8"	COLD-023
	Cold shrink tube, 7/8 – 1-1/4", 7/8 – 1-5/8"	COLD-024
	Cold shrink tube, 1-1/4" – 1-1/4", 1-1/4 – 1-5/8", 1-5/8 – 1-5/8"	COLD-025
	Cold shrink tube, 1/2" to 1-1/4", 1/2" to 1-5/8", 1/2" to 1-5/8", 1/2" to 2 1/4"	COLD-026
	Diameter line extension	COLD-035
GROUNDING KIT		
	Grounding terminal for AC-profile	CEAR-AC
HANGER		
	Universal installation cleat including screw M8	MKD-001
	Universal installation cleat (10 per kit/package)	MKD-10
	RSB Cleat (10 per kit/package)	RSB-310
	RSB clamping plate for anchor bar (10 per kit/package)	RSB-315
INSTALLATION HARDWARE		
	AC-profile, 200 mm, holes	AC7-020H
	Angle Member Adapter Kit 3/8" (SS) (Kit of 10)	ANGLE-CLPI
	Angle Member Adapter Kit M8 (SS) (Kit of 10)	ANGLE-CLPM8
	Universal angle adapter, Snap-in or 3/8" (kit of 10)	ANGLE-UI
	Ceiling adapter, 305 mm (12") (kit of 5), 3/8"	CEIL12-5I
	Ceiling adapter, 610 mm (24") (kit of 5), 3/8"	CEIL24-5I
	Tower Stand-off Kit 1-2" Diameter, 3/8" Hardware	KRTS2-A
	Tower Stand-off Kit 2-3" Diameter, 3/8" Hardware	KRTS2-B
	Tower Stand-off Kit 3-4" Diameter, 3/8" Hardware	KRTS2-C
	Tower Stand-off Kit 4-5" Diameter, 3/8" Hardware	KRTS2-D
	Tower Stand-off Kit 5-6" Diameter, 3/8" Hardware	KRTS2-E
	Round member adapter, 80 mm – 100 mm	RMA-100
	Round member adapter, 10 mm – 120 mm	RMA-120
	Round member adapter, 120 mm – 140 mm	RMA-140
	Round member adapter, 140 mm – 160 mm	RMA-160
	Round member adapter, 25 mm – 40 mm	RMA-40
	Round member adapter, 40 mm – 60 mm	RMA-60
	Round member adapter, 60 mm – 80 mm	RMA-80
	Round member adapter, 1" – 2"	RMA-AI
	Round member adapter, 2" – 3"	RMA-BI
	Round member adapter, 3" – 4"	RMA-CI
	Round member adapter, 4" – 5"	RMA-DI
	Round member adapter, 5" – 6"	RMA-EI
	Round member adapter, 6" – 7"	RMA-FI
	Stainless steel strapping kit	STRAP-1
	Stainless steel strapping kit, tube mounting	STRAP-2
	Threaded rod kit, 3/8", 3" (kit of 10)	TROD38-03I
	Threaded rod kit, 3/8", 6" (kit of 10)	TROD38-06I
	Threaded rod kit, 3/8", 12" (kit of 10)	TROD38-12I
	Weather proofing kit, (with Butyl Rubber)	WPFG-1
SEALING COMPOUND		
	Tube of Plast 2000, 20 ccm	P2000-001
	Tube of Plast 2000, 70 ccm	P2000-002
TOOL		
	Injection tool for Plast 2000	P2000-003
WALL/ROOF FEED-THROUGH SYSTEM		
	Feed through entry panel, 102 mm (4"), 1 hole, 1x1	FTP4-1X1
	Feed through entry panel, 102 mm (4"), 2 holes, 1x2	FTP4-1X2
	Feed through entry panel, 102 mm (4"), 3 holes, 1x3	FTP4-1X3
	Feed through entry panel, 102 mm (4"), 4 holes, 1x4	FTP4-1X4
	Feed through entry panel, 102 mm (4"), 4 holes, 2x2	FTP4-2X2
	Feed through entry panel, 102 mm (4"), 6 holes, 2x3	FTP4-2X3
	Feed through entry panel, 102 mm (4"), 8 holes, 2x4	FTP4-2X4
	Feed through entry panel, 102 mm (4"), 10 holes, 2x5	FTP4-2X5
	Feed through entry panel, 102 mm (4"), 12 holes, 2x6	FTP4-2X6
	Feed through entry panel, 102 mm (4"), 9 holes, 3x3	FTP4-3X3
	Feed through entry panel, 102 mm (4"), 12 holes, 3x4	FTP4-3X4
	Port cover for 102 mm (4") entry panel	FTP4-PC

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EMP Protection Devices

Atmospheric disturbances may cause problems in antenna and cable systems and can present a severe danger to high-frequency equipment. The two most effective types of EMP protection are the spark gap and the quarter wavelength shorting stub. RFS offers devices using coaxial technology for N and 7-16 connector systems. During normal operation these devices will not influence the RF behavior of the antenna and cable system.

Selection Criteria

To find selection criteria for the right choice of protection devices the following should be considered:

The spark gap protector can be used for broadband applications up to 2.5 GHz. The gas capsules are replaceable and can be ordered separately.

The device provides a DC-path for tower mounted amplifiers or other applications with remote bias supply. The protection level can be selected by choice of the appropriate breakdown voltage. The RF-voltage must not exceed the breakdown voltage, otherwise disturbances of the RF-signal can occur due to unwanted ignition of the spark gap.

The quarter wave stub protector is especially suited for transmit applications, since power handling is limited by the connecting system only. The new inline version no longer has the protruding stub and is therefore easier to fit to tight spaces. Due to its resonant behavior, it provides minimum VSWR in the design frequency range. Standard types are available for 800 to 2200 MHz frequency bands, other frequency ranges are available on request. No maintenance is necessary, a DC-path is not available with standard types.

The hybrid type combines the advantages of both types, also offering a DC port in an optional version. The DC port can be used to feed a DC supply voltage for TMAs or other tower to equipment. For the use with separate AISG devices, a version that caries the 2.176MHz signal undisturbed is also available.

Product Spectrum

Different housing options are available to meet specific user requirements.

Adapter types feature male/female connector combinations and can be easily inserted into any feeder system. They may even be installed at later stages to upgrade the protection level of existing systems.

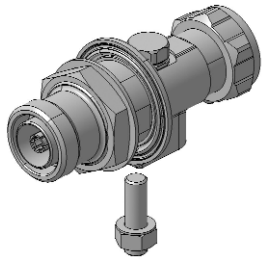
Fixed adapters with square flange can be installed in system cabinets, container walls or any other panel with a thickness not exceeding 4mm.

Fixed adapters with bulkhead version can be installed in system cabinets, container walls or any other panel with a thickness not exceeding 5mm. Only a single hole is required.

Gas type protectors are available with the gas capsule installed. Additional gas capsules are available separately to select the protection level at installation time or for replacement.

No tuning is necessary for any protection device offered by RFS.

Spark Gap Protector

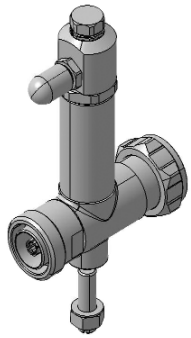


The spark gap protector is based on the gas discharge principle. Within an extremely short time the resistance drops from MOhm to mOhm in case of an atmospheric disturbance. This is caused by the ionization of the gas. A pulse traveling along the line will be diverted to ground.

Inline Quarter Wavelength Protector

The inline quarter wavelength protector consists of short-circuited branch lines connected to the main line, providing a direct ground path for the low frequency spectrum of the disturbances. The lines perform a 90° bend to run parallel to the main line, which removes the protruding stub and enables easier installation. The electrical length of the branch line equals a quarter wavelength at the designated frequency, transforming the short into an open circuit at the connecting point. There is a trade-off between the transformation bandwidth and the residual voltage, thus the standard types are optimized for the telecommunication frequency bands.

Hybrid Quarter Wave Shorting Stub



The hybrid quarter wavelength stub is a special design used in applications where high RF power, DC-fed components or trunked-/multi-channel transmitters are used on coaxial transmission lines. These devices have a specially designed gas capsule circuit, which is de-coupled from the RF path. This allows higher RF power or DC-fed components to reside on a single transmission line while improving the VSWR performance above ordinary spark gap protectors. Only a special 90V gas capsule protects the RF system where much higher voltage level gas capsules were previously required. Systems requiring tower-top amplifiers benefit from these types of EMP protection devices.

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Overview Table EMP Protection Devices

Protective Device	Connector Series	Connector Transition	Frequency Range	Return Loss (VSWR)[1]	Insertion Loss[2]	Surge Current	Model Number
Quarter Wave	7-16 DIN	7-16 DIN Male, 7-16 DIN Female, bulkhead	806-2200 MHz 824-960 MHz 1740-2200 MHz	20.8 dB (1.20:1) 26.0 dB (1.10:1) 26.0 dB (1.10:1)	0.1 dB	100 kA	716-STUB-10
Quarter Wave	N	N Male, N DIN Female, bulkhead	806-2200 MHz 824-960 MHz 1740-2200 MHz	20.8 dB (1.20:1) 26.0 dB (1.10:1) 26.0 dB (1.10:1)	0.1 dB	50 kA	N-STUB-10

Protective Device	Connector Series	Connector Transition	Frequency Range	Return Loss (VSWR)[3]	Insertion Loss	Nominal Breakdown Voltage	Model Number
Gas Tube	N	N Male N Female, bulkhead	DC-2500 MHz DC-1000 MHz	20 dB (1.22:1) 26.4 dB (1.10:1)	0.2 dB 0.15 dB	230 V	N-UC230-01
Gas Tube	7-16 DIN	7-16 DIN Male, 7-16 DIN Female, bulkhead	DC-2500 MHz DC-1000 MHz	20 dB (1.22:1) 26.4 dB (1.10:1)	0.2 dB 0.15 dB	230 V	716-UC230-05

Protective Device	Connector Series	Connector Transition	Frequency Range	Return Loss (VSWR)	Insertion Loss	Surge Current	Model Number
Quarter Wave Hybrid	7-16 DIN	7-16 DIN Male, 7-16 DIN Female, bulkhead	806-2500 MHz 806-960 MHz 1710-2500 MHz	20.8 dB (1.2:1) 26 dB (1.10:1) 26 dB (1.10:1)	0.10 dB	30kA	716-UC90-05
Quarter Wave Hybrid AISG Compliant @ 2.176 MHz	7-16 DIN	7-16 DIN Male, 7-16 DIN Female, bulkhead	806-2500 MHz 806-960 MHz 1710-2500 MHz 2.176 MHz	20.8 dB (1.2:1) 26 dB (1.10:1) 26 dB (1.10:1) 20 dB (1.22:1)	0.10 dB	30kA	716-UC90-10

Protective Device	Connector Series	Connector Transition	Frequency Range	Return Loss (VSWR)[3]	Insertion Loss	Surge Current	Model Number
Bias-T with Surge Protection[4]	7-16 DIN	7-16 DIN Female, (Protected) 7-16 DIN Male	800-2200 MHz	19 dB (1.25:1)	0.15	30kA	716-UC90-07
Bias-T with Surge Protection[4]	7-16 DIN	7-16 DIN Male, (Protected) 7-16 DIN Female	800-2200 MHz	19 dB (1.25:1)	0.15	30kA	716-UC90-09

Protective Device	Nominal Breakdown Voltage	Model Number
Spare Capsule	230 V	UC230
Spare Capsule for Quarter Wave Hybrid Only	90 V	UC90-HP

[1]For DC-1000MHz; Max. Return Loss (VSWR) for 1000-2500MHz = 20.0 dB (1.22:1)

[2]For 1000MHz; Max. Insertion Loss for 1000-2500MHz = 0.2 dB

[3]For 806-2500MHz; Max. Return Loss for 806-960 & 1710-2500MHz = 26 dB (1.1:1)

[4]TNC Female for DC injection, EF316D Jumper, single ended with TNC Male Connector, L=25ft included

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Accessories

Selection Guide for Attenuators & Adapters

Selection Guide for Attenuators

Connector Series	Connector Combination	Frequency Range [1]	Mean Power Dissipation [2]	Attenuation (nominal)	Model Number
7-16	male-female	0-2 GHz	5 W	3 dB	716-ATT-03
7-16	male-female	0-2 GHz	5 W	6 dB	716-ATT-06
7-16	male-female	0-2 GHz	5 W	10 dB	716-ATT-10
7-16	male-female	0-2 GHz	5 W	20 dB	716-ATT-20

[1] VSWR: 1.04:1 max. @ 0-1GHz; 1.06:1 max. @ 1-2GHz
[2] At 25°C (77°F) ambient temperature

Selection Guide for Terminations

Connector Series	Connector Combination	Frequency Range	Max. VSWR (Return loss, dB) 0-1 GHz	1-5 GHz	5-8 GHz	Mean Power Disipation [1]	Model Number
7-16	male	0-5 GHz	1.02:1 (40)	1.10:1 (26.4)	–	1 W	716-TER-01
7-16	male	0-8 GHz	1.06:1 (30.8)	1.17:1 (22.2)	1.22:1 (20.1)	25 W	716-TER-25
N	male	0-2.5GHz	1.02:1 (40)	1.10:1 (26.4)	–	1 W	N-TER-01
N	male	0-2.5GHz	1.06:1 (30.8)	1.17:1 (22.2)	1.22:1 (20.1)	25 W	N-TER-25

[1] At 25°C (77°F) ambient temperature

Selection Guide for Adapters

Type	Return Loss f=800-1000MHz	Return Loss f=1600-2000MHz	Insertion Loss f=800-1000MHz	Insertion Loss f=1600-2000MHz	Material / Finish	Model Number
7-16 female - female	>40dB	>40dB	≤ 0,02dB	≤ 0,02dB	copper alloy / silver plated	716F-716F
7-16 female - male	>45dB	>34dB	≤ 0,02dB	≤ 0,02dB	copper alloy / silver plated	716F-716M
7-16 male - male	>45dB	>34dB	≤ 0,02dB	≤ 0,02dB	copper alloy / silver plated	716M-716M
7-16 female - female, right angle	>32db	> 28dB	≤ 0,02dB	≤ 0,02dB	copper alloy / silver plated	716F-R-716F
7-16 female - male, right angle	>34dB	>32dB	≤ 0,02dB	≤ 0,02dB	copper alloy / silver plated	716F-R-716M
7-16 male - male, right angle	>40dB	>34dB	≤ 0,02dB	≤ 0,02dB	copper alloy / silver plated	716M-R-716M
N female - female	>40dB	>34dB	≤ 0,02dB	≤ 0,02dB	copper alloy / silver plated	NF-NF
N female - male	>40dB	>34dB	≤ 0,02dB	≤ 0,02dB	copper alloy / silver plated	NF-NM
N male - male	>40dB	>34dB	≤ 0,02dB	≤ 0,02dB	copper alloy / silver plated	NM-NM
N female - female, right angle	>24dB	>24dB	≤ 0,02dB	≤ 0,02dB	copper alloy / silver plated	NF-R-NF
N female - male, right angle	>26dB	>26dB	≤ 0,02dB	≤ 0,02dB	copper alloy / silver plated	NF-R-NM
N male - male, right angle	>26dB	>26dB	≤ 0,02dB	≤ 0,02dB	copper alloy / silver plated	NM-R-NM
7-16 male - N male	>40dB	>40dB	≤ 0,02dB	≤ 0,02dB	copper alloy / silver plated	716M-NM
7-16 female - N male	>40dB	>40dB	≤ 0,02dB	≤ 0,02dB	copper alloy / silver plated	716F-NM
7-16 male - N female	>40dB	>40dB	≤ 0,02dB	≤ 0,02dB	copper alloy / silver plated	716M-NF
7-16 female - N female	>40dB	>40dB	≤ 0,02dB	≤ 0,02dB	copper alloy / silver plated	716F-NF
N male - SMA male	>40dB	>34dB	≤ 0,02dB	≤ 0,02dB	copper alloy / silver plated	NM-SMAM
N male - SMA female	>40dB	>34dB	≤ 0,02dB	≤ 0,02dB	copper alloy / silver plated	NM-SMAF
N female - SMA male	>40dB	>34dB	≤ 0,02dB	≤ 0,02dB	copper alloy / silver plated	NF-SMAM
N female - SMA female	>40dB	>34dB	≤ 0,02dB	≤ 0,02dB	copper alloy / silver plated	NF-SMAF
Blind cover for 7-16 male						716M-SEAL
Blind cover for 7-16 female						716F-SEAL
Blind cover for N male						NM-SEAL
Blind cover for N female						NF-SEAL

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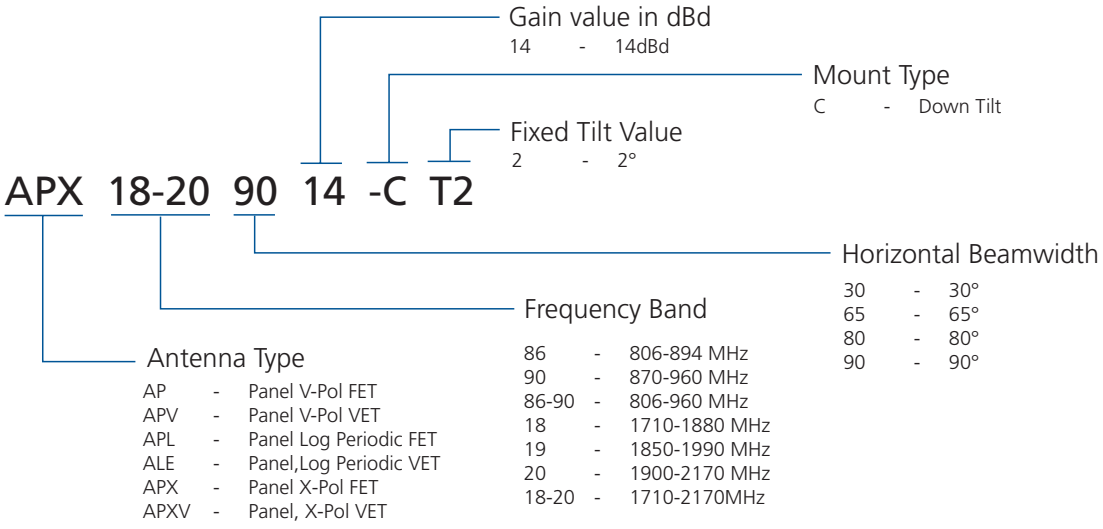
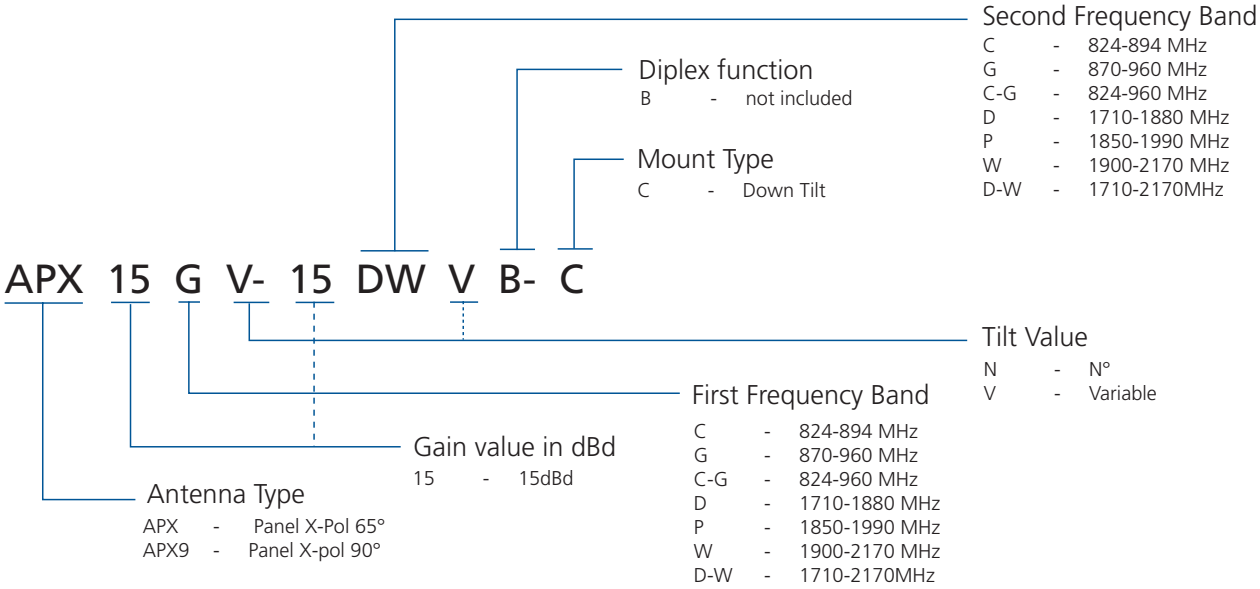
Model Numbering Structures

Single Band Antennas



Dual Band Antennas



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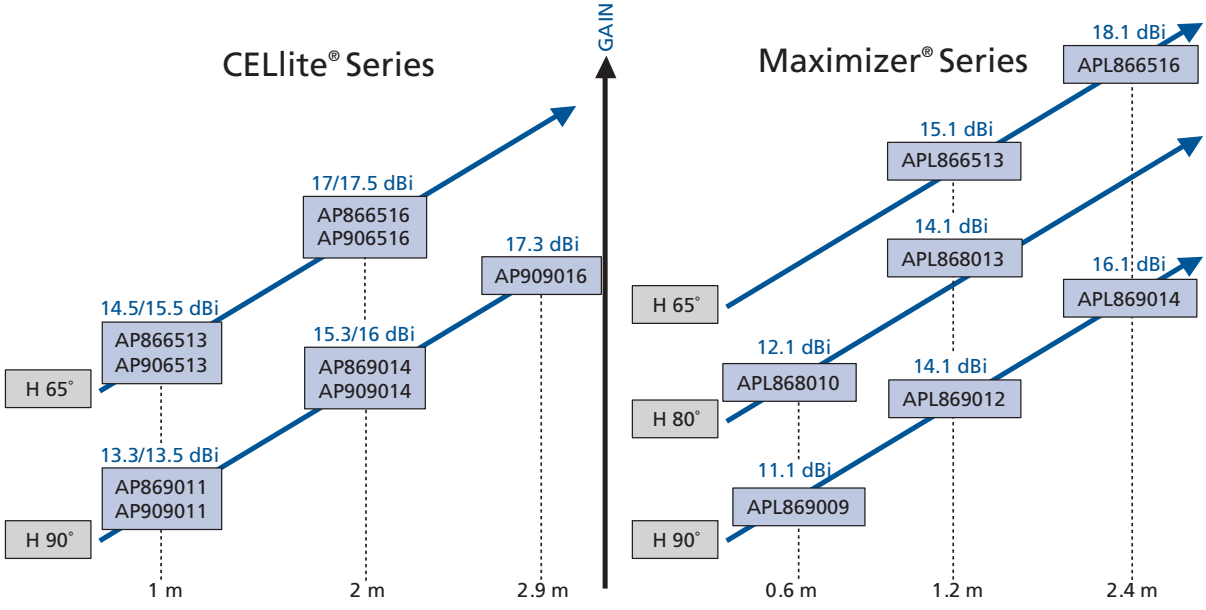
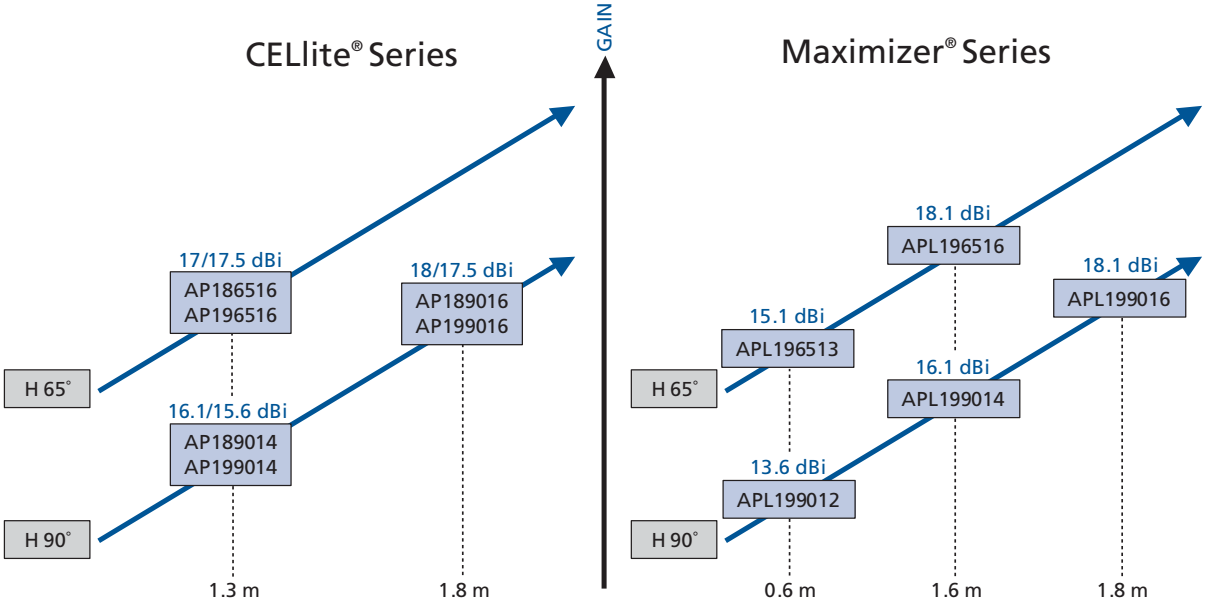
BSA Panel Portfolio Summary

BSA single band portfolio: Cellular850-GSM900

Vertical Polarisation antennas – 806-824 & 870-960 MHz



Vertical Polarisation antennas – 1710-1880 & 1850-1990 MHz



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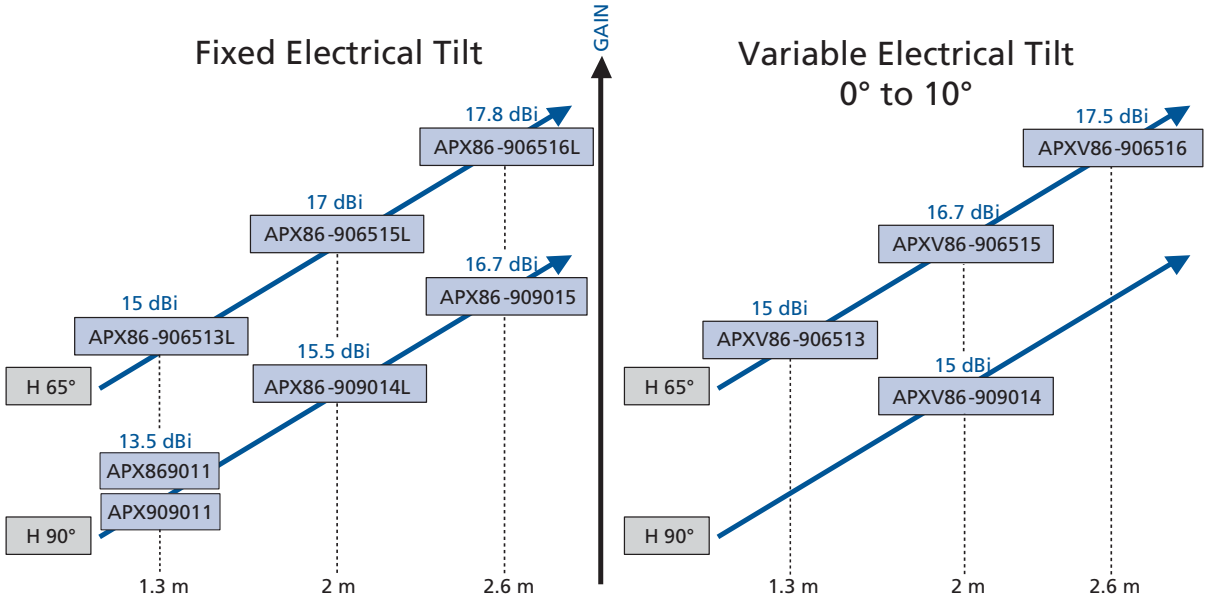
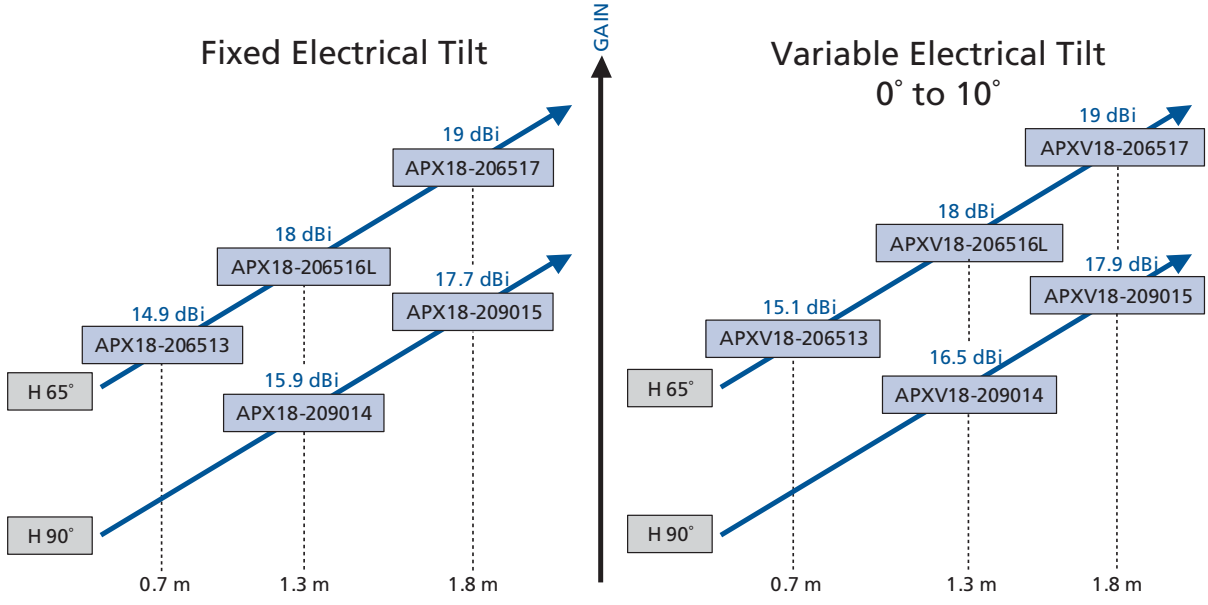
BSA Panel Portfolio Summary

BSA single band portfolio: Optimizer® Series

Cross Polarisation antennas – 806-960 MHz



Cross Polarisation antennas – 1710-2170 MHz



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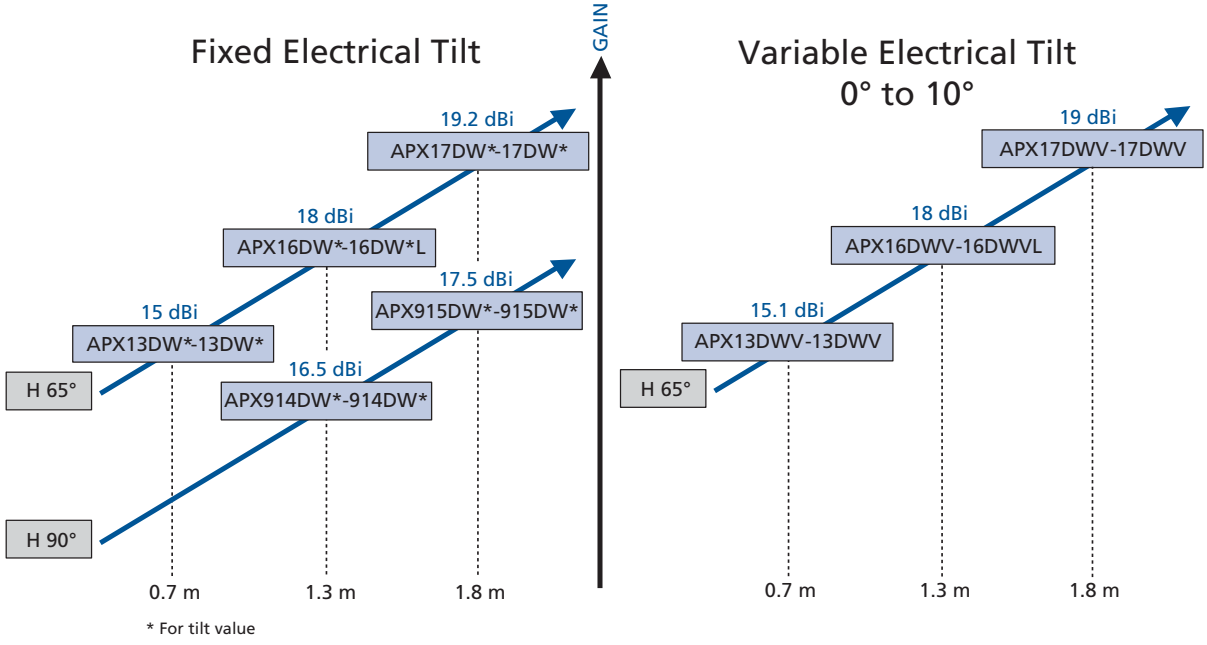
BSA Panel Portfolio Summary

BSA side-by-side portfolio: Optimizer® Series

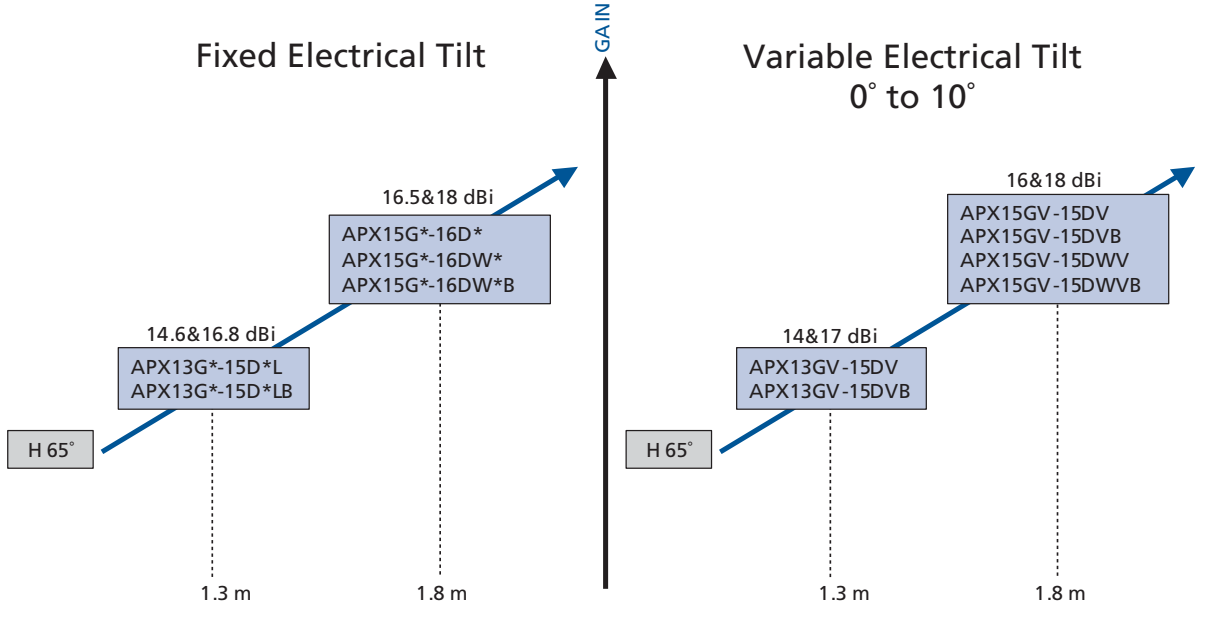
Cross Polarisation antennas – 1710-2170 MHz



* For tilt value

BSA dual-band portfolio: Optimizer® Series

Cross Polarisation antennas – 870-960 & 1710-2170 MHz



* For tilt value

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Availability List / Panel Portfolio Summary

Frequency, MHz	Polarization	Horizontal Beamwidth, deg	Vertical Beamwidth, deg	Gain*, dBi	Tilt, deg	Length, m (ft)	Model Number	Page No.
PANEL ANTENNAS (806-960 MHz)								
806-894	V	65	18	14.5	0	1	AP866513-CT0	136
806-894	V	65	15	15.1	0	1.2	APL866513-42T0	142
806-894	V	65	15	15.1	6	1.2	APL866513-42T6	142
806-894	V	65	9	17	0	2	AP866516-CT0	136
806-894	V	65	8	18.1	0	2.4	APL866516-42T0	143
806-894	V	65	8	18.1	4	2.4	APL866516-42T4	143
806-894	V	65	17	15.1	0-14	1.2	ALE866513-42T0	148
806-894	V	80	30	12.1	0	0.6	APL868010-42T0	144
806-894	V	80	15	14.1	0	1.2	APL868013-42T0	144
806-894	V	80	15	14.1	4	1.2	APL868013-42T4	145
806-894	V	90	30	11.1	0	0.6	APL869009-42T0	145
806-894	V	90	17.5	13.3	0	1	AP869011-CT0	137
806-894	V	90	15	14.1	0	1.2	APL869012-42T0	146
806-894	V	90	15	14.1	3	1.2	APL869012-42T3	146
806-894	V	90	9	15.3	0	2	AP869014-CT0	137
806-894	V	90	7.8	16.1	0	2.4	APL869014-42T0	147
806-894	V	90	7.8	16.1	6	2.4	APL869014-42T6	147
806-894	V	90	16	13.6	0-14	1.2	ALE859012-42T0	148
824-960	V	65	17	14.5-15.5	0	1	AP906513-CT0	138
824-960	V	65	8.5	17-17.5	0	2	AP906516-CT0	138
824-960	V	90	17.5	13.3-13.5	0	1	AP909011-CT0	139
824-960	V	90	8.5	15.5-16	0	2	AP909014-CT0	139
824-960	V	90	5.5	17.3	0	2.9	AP909016-CT0	140
806-960	X	65	16-15	14.5-15	0	1.3	APX86-906513L-CT0	126
806-960	X	65	16-15	14.3-15	4	1.3	APX86-906513L-CT4	126
806-960	X	65	16-15.5	14.3-14.8	8	1.3	APX86-906513L-CT8	127
806-960	X	65	16-15	14.3-14.7	12	1.3	APX86-906513L-CT12	127
806-894	X	65	9.6-9	16.5-17	0	2	APX86-906515L-CT0	128
806-894	X	65	9.6-9	16.5-17	6	2	APX86-906515L-CT6	128
806-960	X	65	7.4-6.8	17.5-18	0	2.6	APX86-906516L-CT0	129
806-960	X	65	7.4-6.8	17.2-17.8	4	2.6	APX86-906516L-CT4	129
806-960	X	65	7.4-6.8	16.8-17.5	6	2.6	APX86-906516L-CT6	130
806-960	X	65	7.4-6.8	16.8-17.3	9	2.6	APX86-906516L-CT9	130
806-894	X	90	15	13.7	0	1.3	APX869011-CT0	131
870-960	X	90	13	13.5	0	1.3	APX909011-CT0	131
806-960	X	90	9	15.2-15.5	0	2	APX86-909014L-CT0	132
806-960	X	90	9	15.3-15.7	4	2	APX86-909014L-CT4	132
806-960	X	90	9	15.2-15.6	6	2	APX86-909014L-CT6	133
806-960	X	90	7.5-7	16.3-16.8	0	2.6	APX86-909015-CT0	133
806-960	X	90	7.5-7	16.3-16.7	4	2.6	APX86-909015-CT4	134
806-960	X	90	7.5-7	16-16.5	6	2.6	APX86-909015-CT6	134
806-960	X	65	16-15	14.4-15	0-10	1.3	APXV86-906513L-C	122
806-960	X	65	16-15	14.4-14.8	4-14	1.3	APXV86-906513T-C	122
806-960	X	65	10-9	16.1-16.7	0-10	2	APXV86-906515-C	123
806-960	X	65	8-7	16.5-17.5	0-10	2.6	APXV86-906516-C	123
806-960	X	90	9.5	15	0-10	2	APXV86-909014-C	124

*** Gain is specified as an AVERAGE value over the whole frequency band**

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Base Station Antennas

Availability List / Panel Portfolio Summary

Frequency, MHz	Polarization	Horizontal Beamwidth, deg	Vertical Beamwidth, deg	Gain*, dBi	Tilt, deg	Length, m (ft)	Model Number	Page No.
PANEL ANTENNAS (1710-2170 MHz)								
1710-1990	V	65	7.5	17	0	1.3	AP186516-CT0	162
1710-1990	V	65	7.5	17	2	1.3	AP186516-CT2	162
1710-1990	V	90	7.5	16.1	0	1.3	AP189014-CT0	163
1710-1990	V	90	5.5	18	0	1.8	AP189016-CT0	163
1710-1990	V	90	5.5	18	2	1.8	AP189016-CT2	164
1850-1990	V	65	15	15.1	0	0.6	APL196513-42T0	168
1850-1990	V	65	7	17.5	0	1.3	AP196516-CT0	164
1850-1990	V	65	7	17.5	2	1.3	AP196516-CT2	165
1850-1990	V	65	6	18.1	0	1.6	APL196516-42T0	168
1850-1990	V	65	6	18.1	2	1.6	APL196516-42T2	169
1850-1990	V	90	15	13.6	0	0.6	APL199012-42T0	169
1850-1990	V	90	7	16.1	0	1.2	APL199014-42T0	170
1850-1990	V	90	7	16.1	2	1.2	APL199014-42T2	170
1850-1990	V	90	7.5	15.6	0	1.3	AP199014-CT0	165
1850-1990	V	90	5	17.5	0	1.8	AP199016-CT0	166
1850-1990	V	90	5	17.5	2	1.8	AP199016-CT2	166
1850-1990	V	90	4	18.1	0	1.8	APL199016-42T0	171
1850-1990	V	90	4	18.1	2	1.8	APL199016-42T2	171
1900-2170	V	63	6.5	17.2	0-7	1.3	APV206515-C	172
1710-2170	X	65	13.5-12.5	14.7-14.9	0	0.7	APX18-206513-CT0	154
1710-2170	X	65	13.5-12.5	13.8	6	0.7	APX18-206513-CT6	154
1710-2170	X	65	7-6	17.5-18	0	1.3	APX18-206516L-CT0	155
1710-2170	X	65	7-6	17.5-18	2	1.3	APX18-206516L-CT2	155
1710-2170	X	65	7-6	17.5-18	6	1.3	APX18-206516L-CT6	156
1710-2170	X	65	5-4.5	18.5-19	2	1.8	APX18-206517-CT2	156
1710-2170	X	65	5-4.5	18.5-19	5	1.8	APX18-206517-CT5	157
1710-2170	X	90	8-7.5	15.4-15.9	2	1.2	APX18-209014-CT2	157
1710-2170	X	90	8-7.5	15.4-15.8	5	1.2	APX18-209014-CT5	158
1710-2170	X	90	5-4.5	17.5-17.7	2	1.8	APX18-209015-CT2	158
1710-2170	X	90	5-4.5	17.4-17.5	5	1.8	APX18-209015-CT5	159
1710-2170	X	65	15.3-13.6	14.7-15.1	2-12	0.7	APXV18-206513-C	150
1710-2170	X	65	15.3-13.6	14.9-15.4	0-10	0.7	APXV18-206513T-C	150
1710-2170	X	65	7-6.4	17.6-18	0-10	1.3	APXV18-206516L-C	151
1710-2170	X	65	5-4.6	18.8-19	0-10	1.9	APXV18-206517-C	151
1710-2170	X	90	7-6.4	16.5-16.5	0-10	1.3	APXV18-209014-C	152
1710-2170	X	90	5.1-4.5	17.9-17.7	0-10	1.9	APXV18-209015-C	152

*** Gain is specified as an AVERAGE value over the whole frequency band**

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Availability List / Panel Portfolio Summary

Frequency, MHz	Polarization	Horizontal B-width, deg	Vertical B-width, deg	Gain*, dBi	Tilt, deg	Length, m (ft)	Model Number	Page No.
SIDE BY SIDE (QUAD POLE) ANTENNAS (1710-2170 MHZ)								
1710-2170	X	65	15.3-13.6	14.7-15.1	2-12	0.7	APX13DWV-13DWV-C	174
1710-2170	X	65	15.3-13.6	14.9-15.4	0-10	0.7	APX13DWV-13DWVT-C	174
1710-2170	X	65	7-6.4	17.6-18	0-10	1.3	APX16DWV-16DWVL-C	175
1710-2170	X	65	5.5-5	18.8-19	0-10	1.9	APX17DWV-17DWV-C	175
DUAL BAND LOW-HIGH BAND								
806-894 & 1850-1990	V	65	15.5-7	15.1-17.2	0 & 0	1.2	AV6B13C0-15P0-2	191-192
870-960 & 1710-1880	X	65	13.5-7	14.4-16.6	0 & 2	1.3	APX13G0-15D2L-C	184
870-960 & 1710-1880	X	65	13.5-7	14.6-16.8	0 & 2	1.3	APX13G0-15D2BL-C	184
870-960 & 1710-1880	X	65	14-7	14.4-16.6	8 & 6	1.3	APX13G8-15D6L-C	185
870-960 & 1710-1880	X	65	14-7	14.6-16.8	8 & 6	1.3	APX13G8-15D6BL-C	185
870-960 & 1710-1880	X	65	9-5	15.8-17.6	0 & 2	2	APX15G0-16D2-C	186
870-960 & 1710-2170	X	65	9-5	16-17.8	0 & 2	2	APX15G0-16DW2B-C	186
870-960 & 1710-1880	X	65	9-5	16.3-17.4	6 & 6	2	APX15G6-16D6-C	189
870-960 & 1710-2170	X	65	9-5	16.5-17.6	6 & 6	2	APX15G6-16DW6B-C	189
870-960 & 1710-1880	X	65	9-5	16.3-17.8	2 & 2	2	APX15G2-16D2-C	187
870-960 & 1710-2170	X	65	9-5	16.5 / 18-18.3	2 & 2	2	APX15G2-16DW2B-C	187
870-960 & 1710-1880	X	65	9-5	16.4-17.8	6 & 2	2	APX15G6-16D2-C	188
870-960 & 1710-2170	X	65	9-5	16.6 / 18-18.3	6 & 2	2	APX15G6-16DW2B-C	188
870-960 & 1710-1880	X	65	14.7-7	13.9-16.5	0-10 & 0-10	1.3	APX13GV-15DV-C	178
870-960 & 1710-1880	X	65	14.7-7	14.4-17	0-10 & 0-10	1.3	APX13GV-15DVB-C	178
824-894 & 1850-1990	X	65	14-7	14-17	0-10 & 0-10	1.3	APX13CV-15PVB-C	182
870-960 & 1710-2170	X	65	14.7-7	13.9-16.7	0-10 & 2-10	1.3	APX13GV-15DWV-C	179
870-960 & 1710-2170	X	65	14.7-7	14.4-17	0-10 & 2-10	1.3	APX13GV-15DWVB-C	179
870-960 & 1710-1880	X	65	9-5	15.9-17.5	0-10 & 0-10	2	APX15GV-15DV-C	180
870-960 & 1710-1880	X	65	9-5	16-18	0-10 & 0-10	2	APX15GV-15DVB-C	180
824-894 & 1850-1990	X	65	9-5	15.5-17.5	0-10 & 0-10	1.3	APX15CV-15PVB-C	182
870-960 & 1710-2170	X	65	9-5-5	15.5-17.7	0-10 & 2-10	2	APX15GV-15DWV-C	181
870-960 & 1710-2170	X	65	9-5-5	16 & 18.3-18.5	0-10 & 2-10	2	APX15GV-15DWVB-C	181
TRIPLE BAND GSM / DCS / UMTS ANTENNAS								
870-960 & 1710-1880 & 1920-2170	X	65	10-7.5-6.5	15.5-16.5-16.5	2 & 2 & 2	1.9	APX15G2-15D2-15W2B-C	194
870-960 & 1710-1880 & 1920-2170	X	65	10-7.5-6.5	15.5-16.5-16.5	6 & 2 & 2	1.9	APX15G6-15D2-15W2B-C	194
870-960 & 1900-2170 & 1900-2170	X	X	8-6.5-6	15.2-16.8-17.5	2-10	2.1	APX13GV-15DWV-15DWVB-C	195
870-960 & 1900-2170 & 1900-2170	X	X	6.8-6.5-6	16-16.9-17.5	2-10	2.6	APX14GV-15DWV-15DWVB-C	195
CLUSTER ANTENNA SYSTEMS (1710-2170 MHz)								
1710-2170	X	65	15.3-13.6	14.7-15.1	2-12	0.7	ACXV18-206513	198
1710-2170	X	65	15.3-13.6	14.9-15.4	0-10	0.7	ACXV18-206513T	198
1710-2170	X	65	7-6.4	17.6-18	0-10	1.3	ACXV18-206516L	199
1710-2170	X	65	5-4.6	18.8-19	0-10	1.9	ACXV18-206517	199
1710-2170	X	65	7-6.4	17.6-18	0-10	1.3	ACX16DWV-16DWVL	200
1710-2170	X	65	5.5-5	18.8-19	0-10	1.9	ACX17DWV-17DWV	200

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Optimizer® RT Antenna Remote Tilt System

General Description

The Optimizer® RT antenna control system permits accurate antenna tilt operations to be conducted - without riggers or crane equipment - either from tower base or the network management center.

Features

- Can fully retrofit to standard RFS APXV antennas. This reduces the initial network investment.
  - No components are housed in the antenna.
  - An operator can decide on appropriate sites at a later date.
  - You do not have to order a special version of antenna.
  - Can fully service/replace without replacing the antenna.
- Can tilt direct from one setting to another.
  - You do not have to tilt to an extreme each adjustment.
- Site learn capability.
  - Interrogates the antenna for serial number, antenna type, tag number and the current tilt setting. This prevents the loss of site data.
- Antenna control units can be controlled either via the antenna feeder cable or via a single separate multi-core cable.
- Allows an interface with Network Management Software. This allows antenna down tilting to become an additional easily accessed optimization tool.
- Controls up to 30 antennas at one site.
- 3 levels of security.
- Industry standard Bus - RS485, Modbus RTU or AISG.
- Modem control via RS232 serial port.
- Windows based control software.

Flexible site cabling systems

Cabling of the Optimizer® RT system is simple and straightforward. RFS provides a complete selection of network cable, jumper cables, ACU plug connectors, bias-T's and cable terminations, ensuring easy site connection.

Antenna Control Unit being fitted to an antenna

Methods of connection:

1. Via antenna feeders using AISG compatible bias-T's
2. Via antenna feeder using an AISG compatible RFS Tower mount amplifier (TMA) and AISG compatible bias-T.
3. Via a single separate cable using AISG or modbus RTU protocol.

Simple 'daisy chain' format

Base station ACUs are interconnected in simple 'daisy-chain' format. This ensures optimal cabling flexibility for the widest array of base station configurations.

Connectivity to multiple ACUs

A single system can link up to 15 ACUs over a maximum cabling distance of 200 meters.

Control Network Interface unit

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Optimizer® RT Antenna Remote Tilt System

Typical description of UMTS site

Variable Tilt Antenna

All the Optimizer variable tilt antenna range can be updated using our Optimizer RT system for remote tilt control.

ACU: Antenna Control Unit

The ACU-A11 Antenna Control Unit is part of the AISG compliant Optimizer RT remote tilt system.

The Optimizer RT antenna control system permits accurate antenna tilt operations to be conducted – without riggers or crane equipment – either from tower base or the network management center.

Electrical Specification

1. Supply voltage - 12-24 VDC
2. Power consumption - Standby 50 mA, during tilt 500 mA
3. Gas discharge tube and MOV surge protection
4. 8 pin circular connectors (IEC 60130-9 with locking screw + IP67 without cap) 1-male, 1-female
5. Meets EMC immunity: standard EN50082-1 and EN50081-1
6. Compliant with AISG Standard V1.1

TMA: Tower Mount Amplifier

The AISG TMA features the same RF functionalities and specifications as the standard TMA and includes communications features compliant with the AISG protocol that allow a remote monitoring of the equipment.

All the AISG TMAs include an AISG output connector to an Antenna Control Unit (ACU) for remote Electrical Tilt (RET).

Please refer to the RF Conditioning section of this catalog on page 240.

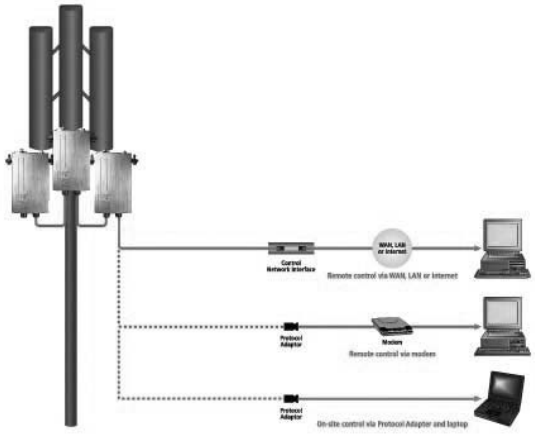
Bias-T

The BITA Bias-T has an AISG modem integrated that converts the 2.176 MHz on/off shift keying signal (OOSK) to RS485 communication.

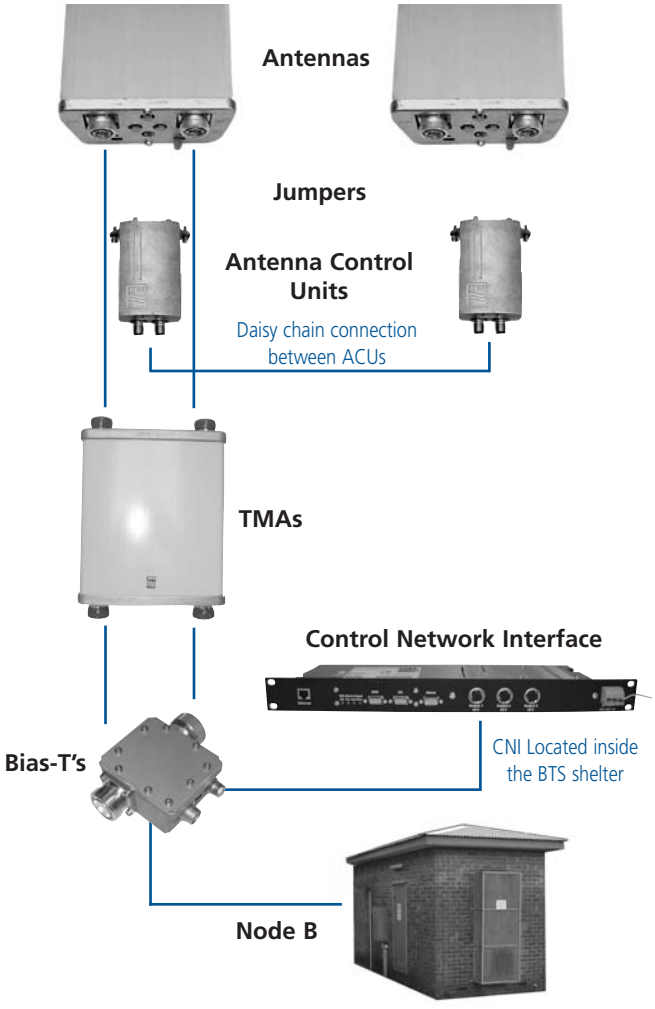
The BITA Bias-T is compatible to the AISG Protocol Standard (Antenna Interface Standardization Group). The BITA Bias-T can be used either indoor at Node B level to inject the DC current on the feeder, or outdoor at the top of the tower to extract DC current for the TMA and ACU. Please refer to the RF Conditioning section of this catalog on page 242.

CNI: Control Network Interface

The Control Network Interface and Power Distribution Unit (CNI-P) is used for delivery of DC current to the Antenna Line Devices (ALDs) as well as managing alarm control. The CNI-P supports the AISG signaling between Node B and the ALDs such as TMAs and ACUs.



AISG System - RET and TMA



RFS is a member of the Antenna Interface Standards Group.

AISG™ Antenna Interface Standards Group

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Optimizer® RT Antenna Remote Tilt System

AISG Software Features

Applications

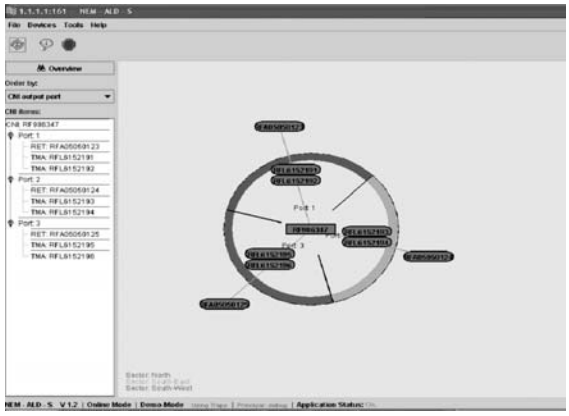
NEM is a network element manager, which can be used in connection with network management system. It interfaces with AISG compliant devices. It allows cell-based wireless carriers to control TMA and RET locally from the tower base, or remotely from the operations and maintenance center (OMC). The NEM software's primary functions are to set antenna properties – such as beam tilt – while monitoring all antenna system components, including CNI, TMA and RET control units.

Product Description

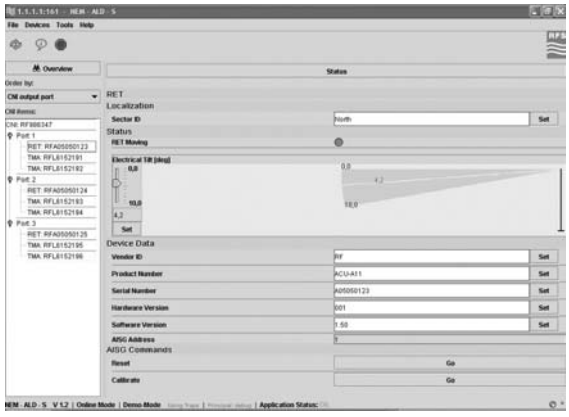
The PC-based software is available in two versions: the NEM-ALD-A and NEM-ALD-S. The NEM-ALD-A is designed to support local AISG protocol-compliant communication with antenna system components. The NEM-ALD-S is designed to support simple network management protocol (SNMP), including file transfer protocol (FTP) communication, to be used from the OMC. To provide a complete system, the software communicates with the control network interfaces (CNI) module, which is an autonomous AISG primary station to interface with SNMP communication. Fully compliant with the AISG version 1.1 open control interface specification for antenna line devices (ALD), NEM incorporates monitoring, and easy configuration by automatically detecting all the connected ALD modules. A user-friendly Graphical User Interface (GUI) guides the user easily through the set-up wizard and allows configurations and supervision of the ALDs. The NEM software can easily be updated to a newer version through a simple FTP download when new AISG protocol releases call for embedded software updates.

Features and Benefits:

- AISG protocol compliant
- Support up to 30 ALDs
- User-friendly GUI
- Clear overview and easy menu
- Provide remote tilt setting
- ALD alarm monitoring
- FTP software download
- Easy set-up wizard

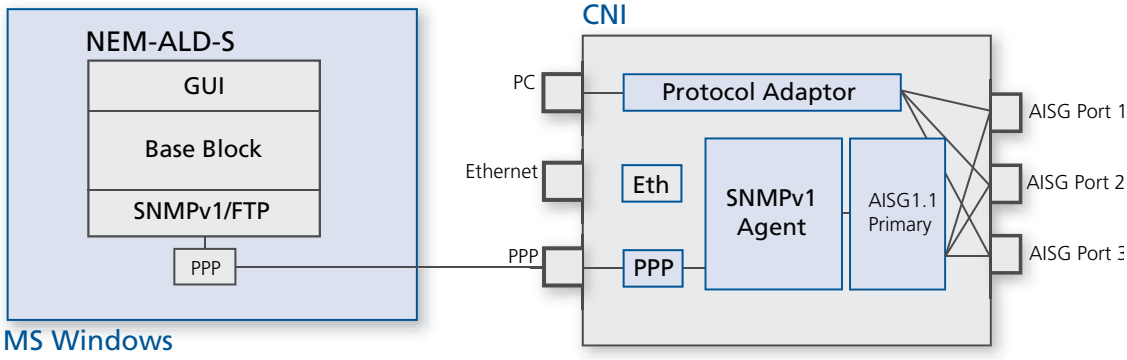


System overview window:



Remote tilt window:

RFS software architecture



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Optimizer® Broadband Antennas

Polarization: Dual ± 45° ***Broadband***
Electrical Downtilt: Adjustable ***Tilt range 10°***
Horizontal beamwidth: 65° or 90°

Applications

This innovative range of broadband variable tilt antennas are cross-polarized available in 65° or 90 degree horizontal beamwidths for use in the following systems:

Trunking / SMR (806-824, 851-869MHz)
Cellular (824-849, 869-896 MHz)
GSM 900 / ETACS (872-915, 917-960MHz)
Trunking (896-901, 935-940MHz)

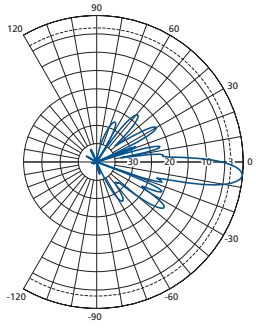
These high performance antennas have excellent upper sidelobe suppression, VSWR and front to back ratio. The antennas are available in a variety of gain options varying from 15.2 to 18.2dBi covered by an UV resistant fiberglass radome. Having continuously adjustable electrical downtilt over the range of 0° to 10°. These antennas have two 7-16 connectors mounted at the bottom and are designed for use with our new APM40 Global Mount system / APM70-3C cluster kit.

As with all our variable tilt antenna range they can be upgraded using our OPTIMIZER RT® system for remote tilt control.

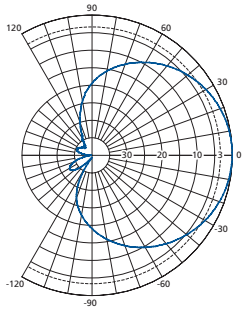
APXV86-90* Series

Features & Benefits

- Constant performance across frequency band for all tilt values
- At least 30 dB isolation between polarization's
- High gain
- Stable horizontal and vertical beamwidths
- Excellent upper sidelobe suppression
- Very low beam squint
- Effective polarization diversity ensured by high cross polar discrimination
- Broadband design
- Low wind load
- Optional remote tilt – can be retrofitted



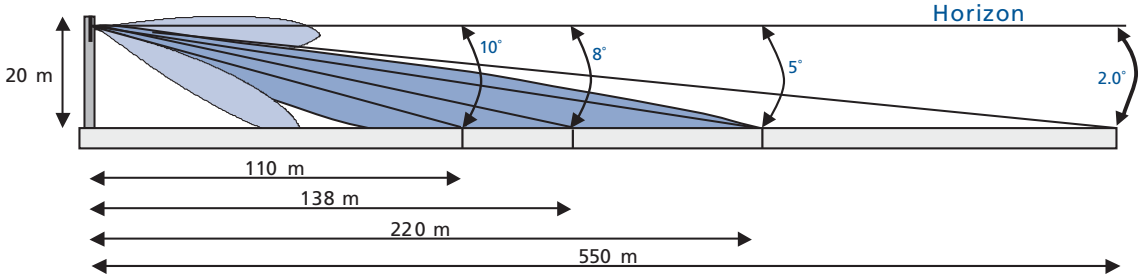
Vertical Pattern



Horizontal Pattern

Performance Optimization Techniques

Fighting co-channel interferences is key to improving network performances. A tight control of the coverage by adjusting downtilt to the optimum value helps reducing co-channel interferences.



Effect of adjustable antenna downtilt on tight coverage control

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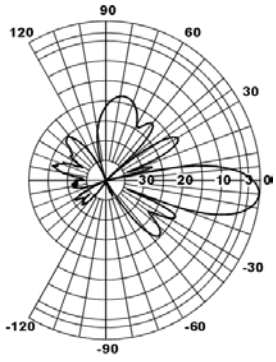
Optimizer® Broadband Antennas

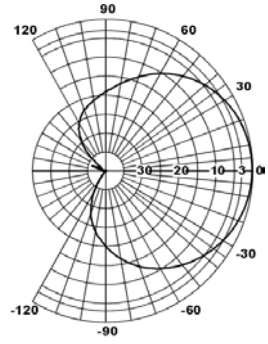
APXV86-906513L-C

Horizontal Beamwidth, deg 65
Gain, dBi 14.7
Electrical Downtilt, deg 0-10

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	806-870	870-960
Horizontal Beamwidth, deg	67	63
Vertical Beamwidth, deg	16	15
Gain, dBi (dBd)	14.4 (12.3)	15 (12.9)
1st Upper Sidelobe Suppression, dB	> 18	> 18
Front-To-Back Ratio, dB	> 25	
VSWR	< 1.5:1	< 1.4:1
Isolation between Ports, dB	> 30	
Maximum Power Input, W	500	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	1350 x 330 x 130 (53.15 x 13 x 5.12)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.45 (4.81)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	685 (154)	
Front Thrust @ Rated Wind, N (lbf)	685 (154)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	14 (30.8)	
Packing Dimensions - HxWxD, m (ft)	1.5 x 0.4 x 0.25 (4.95 x 1.32 x 0.83)	
Packing Dimensions, HxWxD, mm (in)	1520 x 400 x 250 (59.84 x 15.75 x 9.84)	



Vertical Pattern

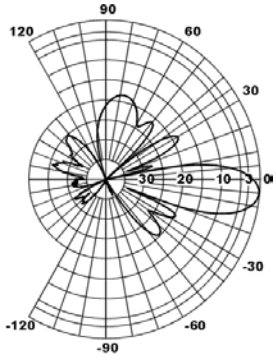


Horizontal Pattern

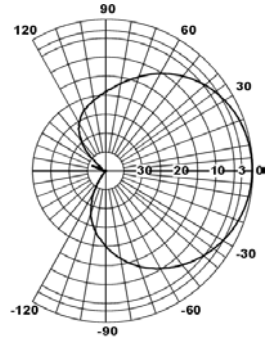
APXV86-906513T-C

Horizontal Beamwidth, deg 65
Gain, dBi 14.7
Electrical Downtilt, deg 4-14

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	806-870	870-960
Horizontal Beamwidth, deg	67	63
Vertical Beamwidth, deg	16	15
Gain, dBi (dBd)	14.4 (12.3)	14.8 (12.7)
1st Upper Sidelobe Suppression, dB	> 16	> 18
Front-To-Back Ratio, dB	> 25	
VSWR	< 1.3:1	
Isolation between Ports, dB	> 30	
Maximum Power Input, W	500	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	1350 x 330 x 130 (53.15 x 13 x 5.12)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.45 (4.81)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	685 (154)	
Front Thrust @ Rated Wind, N (lbf)	685 (154)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	14 (30.8)	
Packing Dimensions - HxWxD, m (ft)	1.5 x 0.4 x 0.25 (4.95 x 1.32 x 0.83)	
Packing Dimensions, HxWxD, mm (in)	1520 x 400 x 250 (59.84 x 15.75 x 9.84)	



Vertical Pattern



Horizontal Pattern

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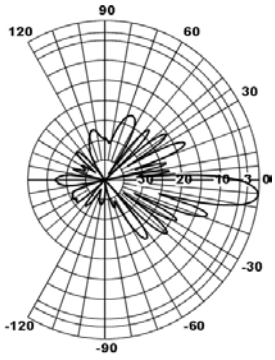
Optimizer® Broadband Antennas

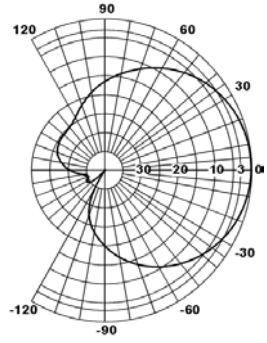
APXV86-906515-C

Horizontal Beamwidth, deg 65
Gain, dBi 16.7
Electrical Downtilt, deg 0-10

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	806-870	870-960
Horizontal Beamwidth, deg	65	
Vertical Beamwidth, deg	10	9
Gain, dBi (dBd)	16.1 (14.0)	16.7 (14.6)
1st Upper Sidelobe Suppression, dB	> 17 (typ >20)	
Front-To-Back Ratio, dB	> 25	> 30
VSWR	< 1.5:1	
Isolation between Ports, dB	> 30	
Maximum Power Input, W	500	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	2080 x 330 x 130 (82 x 13 x 5.12)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.7 (7.53)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	1050 (236)	
Front Thrust @ Rated Wind, N (lbf)	1050 (236)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	18.5 (40.7)	
Packing Dimensions - HxWxD, m (ft)	2.3 x 0.4 x 0.25 (7.6 x 1.32 x 0.83)	
Packing Dimensions, HxWxD, mm (in)	2255 x 400 x 250 (88.8 x 15.8 x 9.8)	



Vertical Pattern

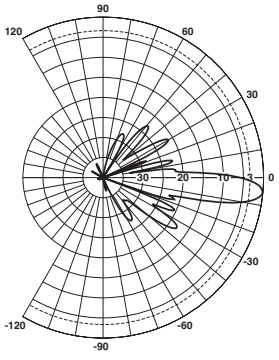


Horizontal Pattern

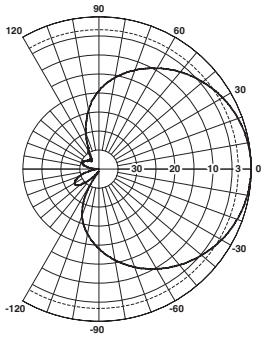
APXV86-906516-C

Horizontal Beamwidth, deg 65
Gain, dBi 17.5
Electrical Downtilt, deg 0-10

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	806-870	870-960
Horizontal Beamwidth, deg	66	63
Vertical Beamwidth, deg	8	7
Gain, dBi (dBd)	16.5 (14.3)	17.5 (15.3)
Upper Sidelobe Suppression, dB	>18 all (Typically >20)	
Front-To-Back Ratio, dB	> 26	
VSWR	< 1.4:1	
Isolation between Ports, dB	> 30	
Maximum Power Input, W	500	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	2600 x 330 x 130 (101 x 13 x 5.12)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	1.16 (12.11)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	1430 (321)	
Front Thrust @ Rated Wind, N (lbf)	1430 (321)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	27 (59.4)	
Packing Dimensions - HxWxD, m (ft)	2.77 x .40 x .26 (9.08 x 1.31 x 0.85)	
Packing Dimensions, HxWxD, mm (in)	2770 x 400 x 260 (109 x 15.75 x 10.2)	



Vertical Pattern



Horizontal Pattern

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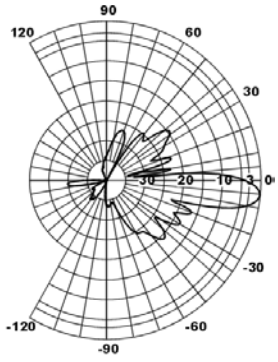
APXV86-90* Series 806-960 MHz

Optimizer® Broadband Antennas

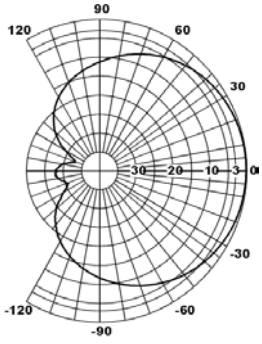
APXV86-909014-C

Horizontal Beamwidth, deg 88
Gain, dBi 15
Electrical Downtilt, deg 0-10

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	806-870	870-960
Horizontal Beamwidth, deg	88	
Vertical Beamwidth, deg	9.5	
Gain, dBi (dBd)	15.0 (12.9)	
1st Upper Sidelobe Suppression, dB	> 18	
Front-To-Back Ratio, dB	> 25	
VSWR	< 1.5:1	
Isolation between Ports, dB	> 30	
Maximum Power Input, W	500	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	2080 x 330 x 130 (81.89 x 13 x 5.12)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.7 (7.53)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	1050 (236)	
Front Thrust @ Rated Wind, N (lbf)	1050 (236)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	18.5 (40.7)	
Packing Dimensions - HxWxD, m (ft)	2.3 x 0.4 x 0.25 (7.6 x 1.32 x 0.83)	
Packing Dimensions, HxWxD, mm (in)	2255 x 400 x 250 (88.8 x 15.8 x 9.8)	



Vertical Pattern



Horizontal Pattern

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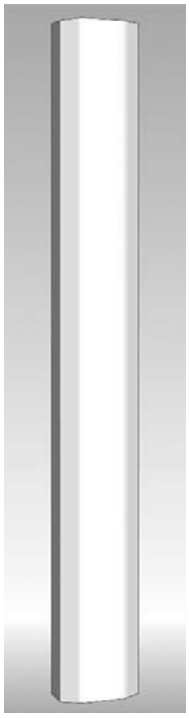
Broadband Fixed Tilt Antennas

Polarization: Dual ± 45°
Electrical Downtilt: Fixed
Horizontal beamwidth: 65° or 90°
Broadband



APX86-90* Series

Applications

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Trunking / SMR (806-824, 851-869MHz)
Cellular (824-849, 869-896 MHz)
GSM 900 / ETACS (872-915, 917-960MHz)
Trunking (896-901, 935-940MHz)

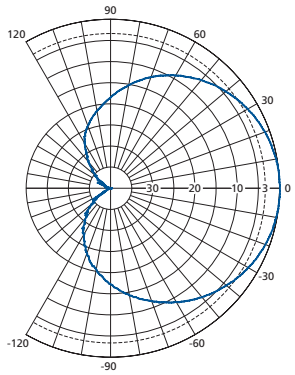
These high performance antennas have excellent upper sidelobe suppression, VSWR and front to back ratio. The antennas are available in a variety of gain options varying from 13.2 to 18.2dBi covered by a covered by an UV resistant ASA radome.

These antennas have two 7-16 connectors mounted at the bottom and are designed for use with our new APM40 Global Mount system / APM70-3C cluster kit.

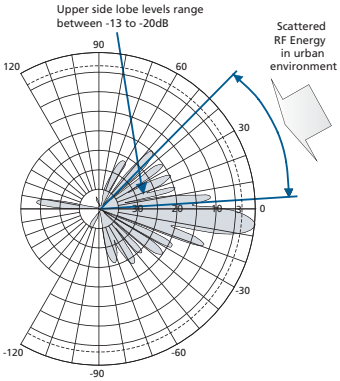
Performance Optimization Techniques

Fighting co-channel interferences is key to improve network performances. Suppressing side lobes reduces creation of co-channel interferences. Where once side lobe suppression was typically in the range of 12 dB, the target is now 18 to 20 dB—with RFS achieving typically better than 20 dB across the entire tilt range with its Optimizer antenna series.

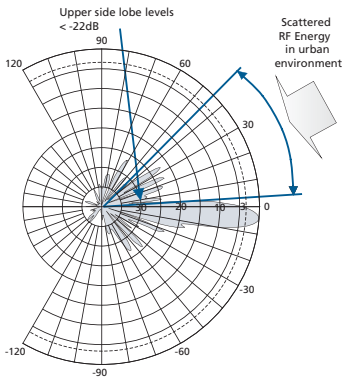
The smaller the side lobe compared with the main lobe, the better the antenna will fight co-channel interference, but if it's not the first upper side lobe that potentially interferes, it could always be the second – so every unwanted signal needs to be as small as possible.



Horizontal Pattern



Standard Performance Antenna



High Performance Antenna

Side lobe levels are suppressed to better than 20dB in high performance antennas as a means of reducing co-channel interference.

Features & Benefits

- Constant performance across frequency band for all tilt values
- At least 30 dB isolation between polarization's
- High gain
- Stable horizontal and vertical beamwidths
- Excellent upper sidelobe suppression
- Very low beam squint over frequency band
- Effective polarization diversity ensured by high cross polar discrimination
- Broadband design

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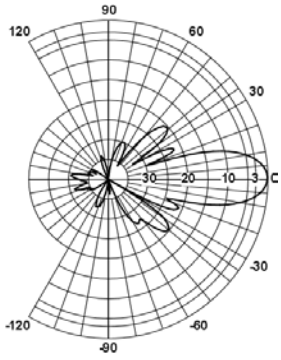
APX86-90* Series 806-960 MHz

Broadband Fixed Tilt Antennas

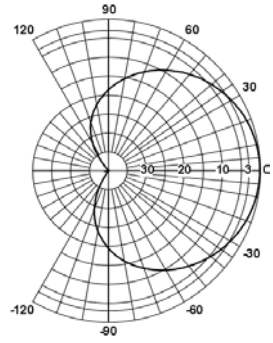
APX86-906513L-CT0

Horizontal Beamwidth, deg 65
Gain, dBi 15.0
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	806-870	870-960
Horizontal Beamwidth, deg	67	65
Vertical Beamwidth, deg	16	15
Gain, dBi (dBd)	14.5 (12.4)	15 (12.9)
Upper Sidelobe Suppression, dB	> 18 all (typically > 20)	
Front-To-Back Ratio, dB	> 25	
VSWR	< 1.5:1	
Isolation between Ports, dB	> 30	
Maximum Power Input, W	500	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	1319 x 312 x 120 (51.8 x 12.2 x 4.7)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.39 (4.1)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	479 (108)	
Front Thrust @ Rated Wind, N (lbf)	479 (108)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	ASA Plastic	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	9.0 (19.8)	
Packing Dimensions - HxWxD, m (ft)	1.5 x .37 x .23 (5.2 x 1.2 x 0.7)	
Packing Dimensions, HxWxD, mm (in)	1590 x 370 x 225 (62.5 x 14.5 x 8.8)	



Vertical Pattern

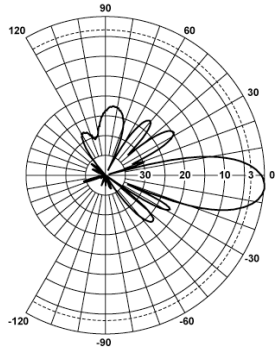


Horizontal Pattern

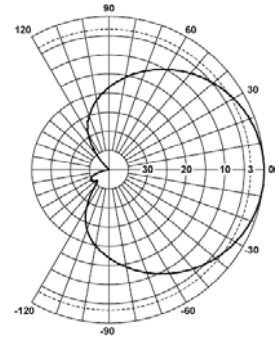
APX86-906513L-CT4

Horizontal Beamwidth, deg 65
Gain, dBi 15.0
Electrical Downtilt, deg 4

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	806-870	870-960
Horizontal Beamwidth, deg	65	
Vertical Beamwidth, deg	16	15
Gain, dBi (dBd)	14.3 (12.2)	15 (12.9)
Upper Sidelobe Suppression, dB	> 18 all (typically > 20)	
Front-To-Back Ratio, dB	> 30	
VSWR	< 1.35:1	< 1.3:1
Isolation between Ports, dB	> 30	
Maximum Power Input, W	500	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	1319 x 312 x 120 (51.8 x 12.2 x 4.7)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.39 (4.1)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	479 (108)	
Front Thrust @ Rated Wind, N (lbf)	479 (108)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	ASA Plastic	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	9.0 (19.8)	
Packing Dimensions - HxWxD, m (ft)	1.5 x .37 x .23 (5.2 x 1.2 x 0.7)	
Packing Dimensions, HxWxD, mm (in)	1590 x 370 x 225 (62.5 x 14.5 x 8.8)	



Vertical Pattern



Horizontal Pattern

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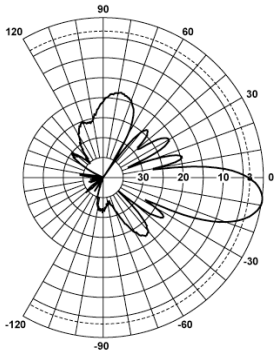
Broadband Fixed Tilt Antennas

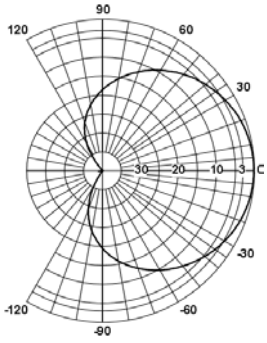
APX86-906513L-CT8

Horizontal Beamwidth, deg 65
Gain, dBi 14.8
Electrical Downtilt, deg 8

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	806-870	870-960
Horizontal Beamwidth, deg	65	
Vertical Beamwidth, deg	16	15.5
Gain, dBi (dBd)	14.3 (12.2)	14.8 (12.7)
Upper Sidelobe Suppression, dB	> 18 all (typically > 20)	
Front-To-Back Ratio, dB	> 30	
VSWR	< 1.3:1	
Isolation between Ports, dB	> 30	
Maximum Power Input, W	500	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	1319 x 312 x 120 (51.8 x 12.2 x 4.7)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.39 (4.1)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	479 (108)	
Front Thrust @ Rated Wind, N (lbf)	479 (108)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	ASA Plastic	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	9.0 (19.8)	
Packing Dimensions - HxWxD, m (ft)	1.5 x .37 x .23 (5.2 x 1.2 x 0.7)	
Packing Dimensions, HxWxD, mm (in)	1590 x 370 x 225 (62.5 x 14.5 x 8.8)	



Vertical Pattern

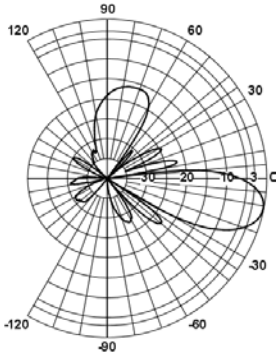


Horizontal Pattern

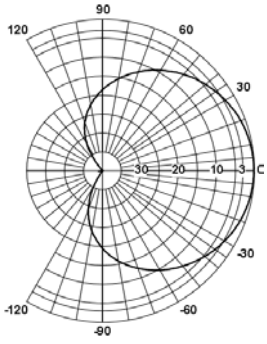
APX86-906513L-CT12

Horizontal Beamwidth, deg 65
Gain, dBi 14.7
Electrical Downtilt, deg 12

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	806-870	870-960
Horizontal Beamwidth, deg	67	65
Vertical Beamwidth, deg	16	15
Gain, dBi (dBd)	14.3 (12.2)	14.7 (12.6)
Upper Sidelobe Suppression, dB	> 18 all (typically > 20)	
Front-To-Back Ratio, dB	> 27	
VSWR	< 1.3:1	
Isolation between Ports, dB	> 30	
Maximum Power Input, W	500	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	1319 x 312 x 120 (51.8 x 12.2 x 4.7)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.39 (4.1)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	479 (108)	
Front Thrust @ Rated Wind, N (lbf)	479 (108)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	ASA Plastic	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	9.0 (19.8)	
Packing Dimensions - HxWxD, m (ft)	1.5 x .37 x .23 (5.2 x 1.2 x 0.7)	
Packing Dimensions, HxWxD, mm (in)	1590 x 370 x 225 (62.5 x 14.5 x 8.8)	



Vertical Pattern



Horizontal Pattern

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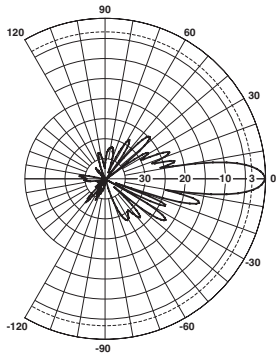
APX86-90* Series 806-960 MHz

Broadband Fixed Tilt Antennas

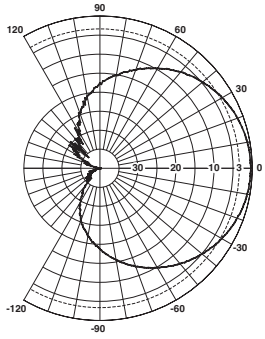
APX86-906515L-CT0

Horizontal Beamwidth, deg 65
Gain, dBi 17
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	806-870	870-960
Horizontal Beamwidth, deg	67	65
Vertical Beamwidth, deg	9.6	9
Gain, dBi (dBd)	16.5 (14.3)	17.0 (14.8)
Upper Sidelobe Suppression, dB	> 18 all (typically > 20)	
Front-To-Back Ratio, dB	> 30	
VSWR	< 1.4:1	< 1.3:1
Isolation between Ports, dB	> 30	
Maximum Power Input, W	500	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	2080 x 312 x 120 (81.8 x 12.3 x 5)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.66 (7.10)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	810 (182)	
Front Thrust @ Rated Wind, N (lbf)	810 (182)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	ASA Plastic	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	14 (31.2)	
Packing Dimensions - HxWxD, m (ft)	2.4 x .37 x .23 (7.8 x 1.2 x 0.75)	
Packing Dimensions, HxWxD, mm (in)	2400 x 370 x 230 (94.5 x 14.5 x 9.0)	



Vertical Pattern

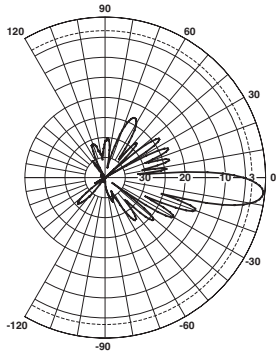


Horizontal Pattern

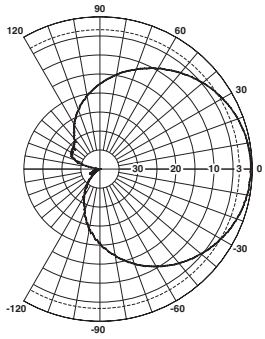
APX86-906515L-CT6

Horizontal Beamwidth, deg 65
Gain, dBi 17
Electrical Downtilt, deg 6

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	806-870	870-960
Horizontal Beamwidth, deg	67	65
Vertical Beamwidth, deg	9.6	9
Gain, dBi (dBd)	16.5 (14.3)	17.0 (14.8)
Upper Sidelobe Suppression, dB	> 18 all (typically > 20)	
Front-To-Back Ratio, dB	> 30	
VSWR	< 1.4:1	< 1.3:1
Isolation between Ports, dB	> 30	
Maximum Power Input, W	500	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	2080 x 312 x 120 (81.8 x 12.3 x 5)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.66 (7.10)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	810 (182)	
Front Thrust @ Rated Wind, N (lbf)	810 (182)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	ASA Plastic	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	14 (31.2)	
Packing Dimensions - HxWxD, m (ft)	2.4 x .37 x .23 (7.8 x 1.2 x 0.75)	
Packing Dimensions, HxWxD, mm (in)	2400 x 370 x 230 (94.5 x 14.5 x 9.0)	



Vertical Pattern



Horizontal Pattern

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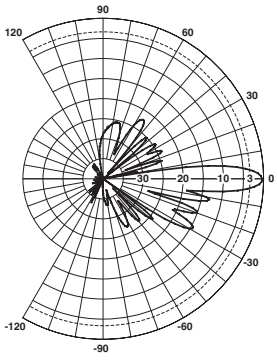
Broadband Fixed Tilt Antennas

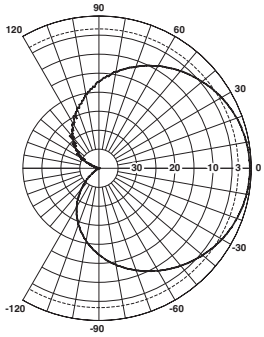
APX86-906516L-CT0

Horizontal Beamwidth, deg 65
Gain, dBi 18.0
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	806-870	870-960
Horizontal Beamwidth, deg	67	65
Vertical Beamwidth, deg	7.4	6.8
Gain, dBi (dBd)	17.5 (15.4)	18 (15.9)
Upper Sidelobe Suppression, dB	> 18 all (typically > 20)	
Front-To-Back Ratio, dB	> 30	
VSWR	< 1.35:1	
Isolation between Ports, dB	> 30	
Maximum Power Input, W	500	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	2600 x 312 x 120 (102.3 x 12.2 x 5)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.82 (8.82)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	1012 (228)	
Front Thrust @ Rated Wind, N (lbf)	1012 (228)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	ASA Plastic	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	17 (37.5)	
Packing Dimensions - HxWxD, m (ft)	2.9 x .37 x .23 (9.5 x 1.2 x 0.75)	
Packing Dimensions, HxWxD, mm (in)	2900 x 370 x 230 (114 x 14.5 x 9.0)	



Vertical Pattern

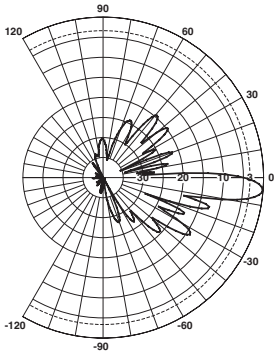


Horizontal Pattern

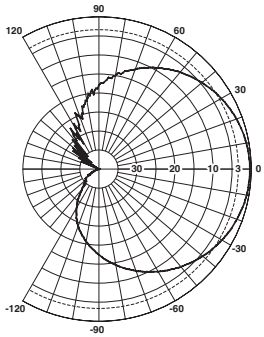
APX86-906516L-CT4

Horizontal Beamwidth, deg 65
Gain, dBi 17.8
Electrical Downtilt, deg 4

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	806-870	870-960
Horizontal Beamwidth, deg	67	64
Vertical Beamwidth, deg	7.4	6.8
Gain, dBi (dBd)	17.2 (15.0)	17.8 (15.6)
Upper Sidelobe Suppression, dB	> 18 all (typically > 20)	
Front-To-Back Ratio, dB	> 30	
VSWR	< 1.35:1	<1.3:1
Isolation between Ports, dB	> 30	
Maximum Power Input, W	500	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	2600 x 312 x 120 (102.3 x 12.2 x 5)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.82 (8.82)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	1012 (228)	
Front Thrust @ Rated Wind, N (lbf)	1012 (228)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	ASA Plastic	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	17 (37.5)	
Packing Dimensions - HxWxD, m (ft)	2.9 x .37 x .23 (9.5 x 1.2 x 0.75)	
Packing Dimensions, HxWxD, mm (in)	2900 x 370 x 230 (114 x 14.5 x 9.0)	



Vertical Pattern



Horizontal Pattern

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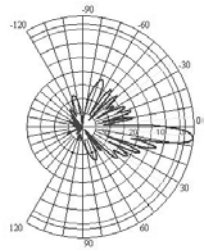
APX86-90* Series 806-960 MHz

Broadband Fixed Tilt Antennas

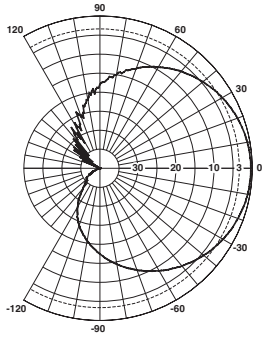
APX86-906516L-CT6

Horizontal Beamwidth, deg 65
Gain, dBi 17.5
Electrical Downtilt, deg 6

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	806-870	870-960
Horizontal Beamwidth, deg	68	65
Vertical Beamwidth, deg	7.4	6.8
Gain, dBi (dBd)	16.8 (14.7)	17.5 (15.4)
Upper Sidelobe Suppression, dB	> 18 all (typically > 20)	
Front-To-Back Ratio, dB	> 30	
VSWR	< 1.35:1	<1.3:1
Isolation between Ports, dB	> 30	
Maximum Power Input, W	500	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	2600 x 312 x 120 (102.3 x 12.2 x 5)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.82 (8.82)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	1012 (228)	
Front Thrust @ Rated Wind, N (lbf)	1012 (228)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	ASA Plastic	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	17 (37.5)	
Packing Dimensions - HxWxD, m (ft)	2.9 x .37 x .23 (9.5 x 1.2 x 0.75)	
Packing Dimensions, HxWxD, mm (in)	2900 x 370 x 230 (114 x 14.5 x 9.0)	



Vertical Pattern

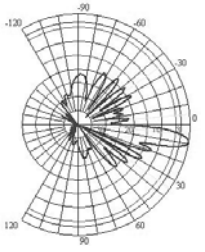


Horizontal Pattern

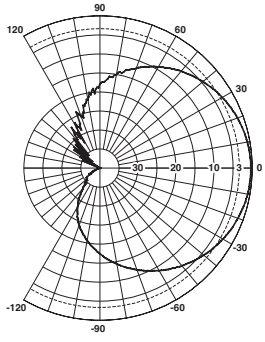
APX86-906516L-CT9

Horizontal Beamwidth, deg 65
Gain, dBi 17.3
Electrical Downtilt, deg 9

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	806-870	870-960
Horizontal Beamwidth, deg	68	65
Vertical Beamwidth, deg	7.4	6.8
Gain, dBi (dBd)	16.8 (14.7)	17.3 (15.2)
Upper Sidelobe Suppression, dB	> 18 all (typically > 20)	
Front-To-Back Ratio, dB	> 30	
VSWR	< 1.35:1	
Isolation between Ports, dB	> 30	
Maximum Power Input, W	500	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	2600 x 312 x 120 (102.3 x 12.2 x 5)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.82 (8.82)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	1012 (228)	
Front Thrust @ Rated Wind, N (lbf)	1012 (228)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	ASA Plastic	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	17 (37.5)	
Packing Dimensions - HxWxD, m (ft)	2.9 x .37 x .23 (9.5 x 1.2 x 0.75)	
Packing Dimensions, HxWxD, mm (in)	2900 x 370 x 230 (114 x 14.5 x 9.0)	



Vertical Pattern



Horizontal Pattern

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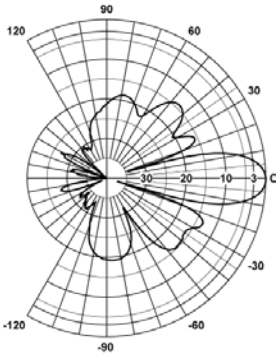
Broadband Fixed Tilt Antennas

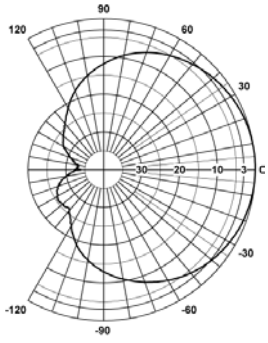
APX869011-CT0

Horizontal Beamwidth, deg 90
Gain, dBi 13.7
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	806-894
Horizontal Beamwidth, deg	90
Vertical Beamwidth, deg	15
Gain, dBi (dBd)	13.7 (11.6)
Front-To-Back Ratio, dB	> 20
VSWR	< 1.5:1
Isolation between Ports, dB	> 32 (typ.35)
Maximum Power Input, W	400
Polarization	Dual pol +/-45°
3rd Order IMP @ 2 x 43 dBm, dBc	> 150
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	1320 x 265 x 140 (51.94 x 10.43 x 5.51)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.35 (3.74)
Rated Wind Speed, km/h (mph)	160 (100)
Maximum Thrust @ Rated Wind, N (lbf)	319 (71)
Front Thrust @ Rated Wind, N (lbf)	319 (71)
Reflector Material	Aluminum
Radiating Element Material	Brass
Radome Material	UV resistant ASA
Radome Color	Light Grey RAL7035
Weight w/o Mtg Hardware, kg (lb)	8.6 (18.92)
Packing Dimensions - HxWxD, m (ft)	1.5 x 0.3 x 0.22 (4.95 x 0.99 x 0.75)
Packing Dimensions, HxWxD, mm (in)	1470 x 300 x 220 (57.84 x 11.81 x 8.66)



Vertical Pattern

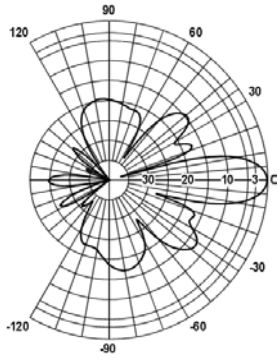


Horizontal Pattern

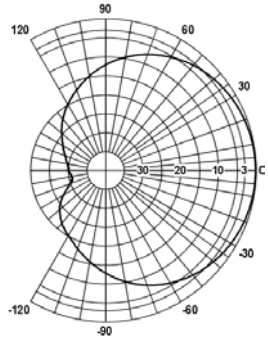
APX909011-CT0

Horizontal Beamwidth, deg 90
Gain, dBi 13.5
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	872-960	
Horizontal Beamwidth, deg	90	
Vertical Beamwidth, deg	13	
Gain, dBi (dBd)	13.5 (11.4)	
1st Upper Sidelobe Suppression, dB	> 14	
Front-To-Back Ratio, dB	> 20	
VSWR	< 1.5:1@RX	< 1.3:1@TX
Isolation between Ports, dB	> 30	
Maximum Power Input, W	400	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	1320 x 265 x 140 (51.94 x 10.43 x 5.51)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.35 (3.74)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	319 (71)	
Front Thrust @ Rated Wind, N (lbf)	319 (71)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	UV resistant ASA	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	8.6 (18.92)	
Packing Dimensions - HxWxD, m (ft)	1.5 x 0.3 x 0.22 (4.95 x 0.99 x 0.75)	
Packing Dimensions, HxWxD, mm (in)	1470 x 300 x 220 (57.84 x 11.81 x 8.66)	



Vertical Pattern



Horizontal Pattern

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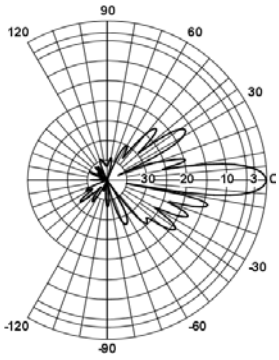
Broadband Fixed Tilt Antennas

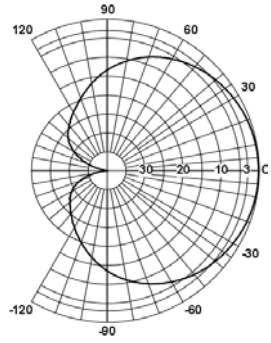
APX86-909014L-CT0

Horizontal Beamwidth, deg 88
Gain, dBi 15.5
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	806-870	870-960
Horizontal Beamwidth, deg	88	
Vertical Beamwidth, deg	9	
Gain, dBi (dBd)	15.2 (13.1)	15.5 (13.4)
1st Upper Sidelobe Suppression, dB	> 18	
Upper Sidelobe Suppression, dB	> 18 all (typically > 20)	
Front-To-Back Ratio, dB	> 22	> 23
VSWR	< 1.5:1	
Isolation between Ports, dB	> 30 (Typ.35)	
Maximum Power Input, W	500	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	2080 x 265 x 140 (82 x 10.43 x 5.51)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.55 (5.9)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	800 (180)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	UV resistant ASA	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	11.0 (24.2)	
Packing Dimensions - HxWxD, m (ft)	2.1 x 0.28 x 0.23 (6.93 x 0.92 x 0.76)	
Packing Dimensions, HxWxD, mm (in)	2100 x 280 x 230 (82.7 x 11 x 9)	



Vertical Pattern

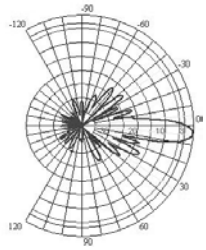


Horizontal Pattern

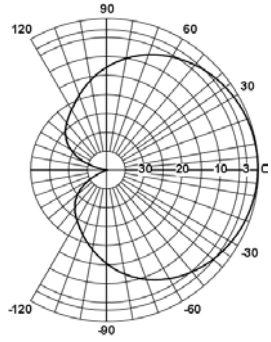
APX86-909014L-CT4

Horizontal Beamwidth, deg 88
Gain, dBi 15.7
Electrical Downtilt, deg 4

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	806-870	870-960
Horizontal Beamwidth, deg	88	
Vertical Beamwidth, deg	9.5	9
Gain, dBi (dBd)	15.3 (13.2)	15.7 (13.6)
1st Upper Sidelobe Suppression, dB	> 18	
Upper Sidelobe Suppression, dB	> 18 all (typically > 20)	
Front-To-Back Ratio, dB	> 22	> 23
VSWR	< 1.3:1	
Isolation between Ports, dB	> 30 (Typ.35)	
Maximum Power Input, W	500	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	2080 x 265 x 140 (82 x 10.43 x 5.51)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.55 (5.9)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	800 (180)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	UV resistant ASA	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	11.0 (24.2)	
Packing Dimensions - HxWxD, m (ft)	2.1 x 0.28 x 0.23 (6.93 x 0.92 x 0.76)	
Packing Dimensions, HxWxD, mm (in)	2100 x 280 x 230 (82.7 x 11 x 9)	



Vertical Pattern



Horizontal Pattern

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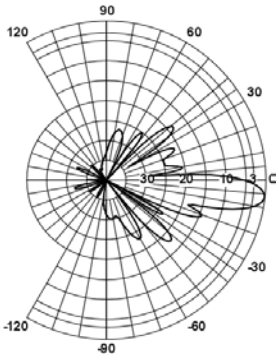
Broadband Fixed Tilt Antennas

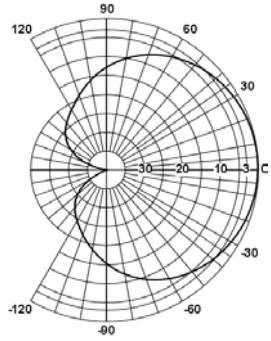
APX86-909014L-CT6

Horizontal Beamwidth, deg 88
Gain, dBi 15.6
Electrical Downtilt, deg 6

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	806-870	870-960
Horizontal Beamwidth, deg	88	
Vertical Beamwidth, deg	9	
Gain, dBi (dBd)	15.2 (13.1)	15.6 (13.5)
1st Upper Sidelobe Suppression, dB	> 18	
Upper Sidelobe Suppression, dB	> 18 all (typically > 20)	
Front-To-Back Ratio, dB	> 22	> 23
VSWR	< 1.3:1	
Isolation between Ports, dB	> 30 (Typ.35)	
Maximum Power Input, W	500	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	2080 x 265 x 140 (82 x 10.43 x 5.51)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.55 (5.9)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	800 (180)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	UV resistant ASA	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	11.0 (24.2)	
Packing Dimensions - HxWxD, m (ft)	2.1 x 0.28 x 0.23 (6.93 x 0.92 x 0.76)	
Packing Dimensions, HxWxD, mm (in)	2100 x 280 x 230 (82.7 x 11 x 9)	



Vertical Pattern

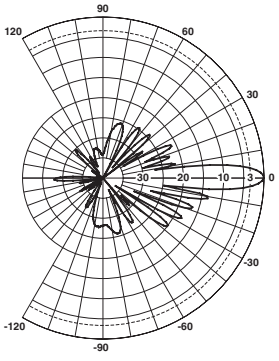


Horizontal Pattern

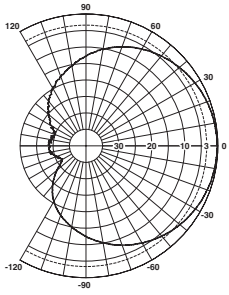
APX86-909015-CT0

Horizontal Beamwidth, deg 90
Gain, dBi 16.8
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	806-870	870-960
Horizontal Beamwidth, deg	87	85
Vertical Beamwidth, deg	7.5	7
Gain, dBi (dBd)	16.3 (14.2)	16.8 (14.7)
1st Upper Sidelobe Suppression, dB	> 18 (typically > 20)	
Upper Sidelobe Suppression, dB	> 18 all (typically > 20)	
Front-To-Back Ratio, dB	> 25	
VSWR	< 1.35:1	< 1.4:1
Isolation between Ports, dB	> 30	
Maximum Power Input, W	500	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	2600 x 312 x 120 (102.3 x 12.2 x 5)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.82 (8.82)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	1012 (228)	
Front Thrust @ Rated Wind, N (lbf)	1012 (228)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	ASA Plastic	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	19.0 (41.8)	
Packing Dimensions - HxWxD, m (ft)	2.9 x .37 x .23 (9.5 x 1.2 x 0.75)	
Packing Dimensions, HxWxD, mm (in)	2900 x 370 x 230 (114 x 14.5 x 9.0)	



Vertical Pattern



Horizontal Pattern

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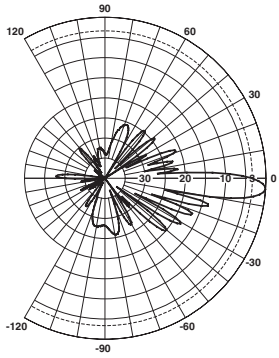
Broadband Fixed Tilt Antennas

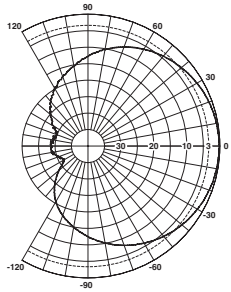
APX86-909015-CT4

Horizontal Beamwidth, deg 90
Gain, dBi 16.7
Electrical Downtilt, deg 4

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	806-870	870-960
Horizontal Beamwidth, deg	87	85
Vertical Beamwidth, deg	7.5	7
Gain, dBi (dBd)	16.3 (14.2)	16.7 (14.6)
1st Upper Sidelobe Suppression, dB	> 18 (typically > 20)	
Upper Sidelobe Suppression, dB	> 18 all (typically > 20)	
Front-To-Back Ratio, dB	> 25	
VSWR	< 1.35:1	< 1.4:1
Isolation between Ports, dB	> 30	
Maximum Power Input, W	500	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	2600 x 312 x 120 (102.3 x 12.2 x 5)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.82 (8.82)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	1012 (228)	
Front Thrust @ Rated Wind, N (lbf)	1012 (228)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	ASA Plastic	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	19.0 (41.8)	
Packing Dimensions - HxWxD, m (ft)	2.9 x .37 x .23 (9.5 x 1.2 x 0.75)	
Packing Dimensions, HxWxD, mm (in)	2900 x 370 x 230 (114 x 14.5 x 9.0)	



Vertical Pattern

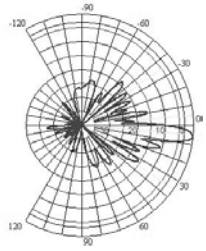


Horizontal Pattern

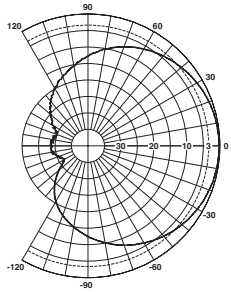
APX86-909015-CT6

Horizontal Beamwidth, deg 85
Gain, dBi 16.5
Electrical Downtilt, deg 6

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	806-870	870-960
Horizontal Beamwidth, deg	87	85
Vertical Beamwidth, deg	7.5	7
Gain, dBi (dBd)	16 (13.9)	16.5 (14.4)
1st Upper Sidelobe Suppression, dB	> 17	
Upper Sidelobe Suppression, dB	> 17	
Front-To-Back Ratio, dB	> 25	
VSWR	< 1.35:1	
Isolation between Ports, dB	> 30	
Maximum Power Input, W	500	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	2600 x 312 x 120 (102.3 x 12.2 x 5)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.82 (8.82)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	1012 (228)	
Front Thrust @ Rated Wind, N (lbf)	1012 (228)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	ASA Plastic	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	19.0 (41.8)	
Packing Dimensions - HxWxD, m (ft)	2.9 x .37 x .23 (9.5 x 1.2 x 0.75)	
Packing Dimensions, HxWxD, mm (in)	2900 x 370 x 230 (114 x 14.5 x 9.0)	



Vertical Pattern



Horizontal Pattern

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CELlite® Fixed Tilt Antennas

Polarization: Vertical
Electrical Downtilt: Fixed
Horizontal beamwidth: 65° or 90°

Applications

This well-known range of fixed tilt antennas are vertically polarized for space diversity with an option of 65° or 90 degree horizontal beamwidths for use in the following systems:

Trunking / SMR (806-824, 851-869MHz)

Cellular (824-849, 869-894MHz)

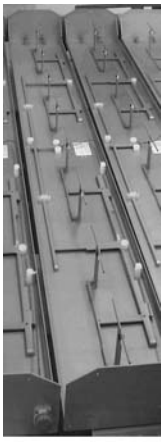
GSM900 / ETACS (872-915, 917-960MHz)

Due to its monolithic mechanical design these highly reliable antennas are IM3 free with extremely stable ageing. CELlite antennas are available in a variety of gain options varying from 14.5 to 17.5 dBi with mechanical downtilt mount option. These antennas are covered by a UV resistant ASA radome and have one 7-16 connectors mounted at the back. They are all designed for use with our new APM40 Global Mount system / APM70-3C cluster kit.

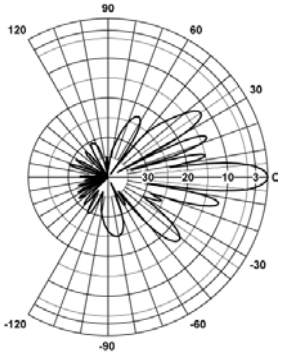
AP909016-T0 Series

Features & Benefits

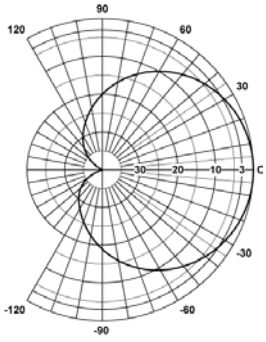
- High gain
- Stable horizontal and vertical beamwidths
- Optimized null fill
- Good Front-to-Back ratio
- Fast horizontal pattern roll-off
- Efficient co-site interference reduction
- Broadband bandwidth allowing installation on all cellular standards (AP90 Series)
- Very low visual impact
- Low wind load



Typical Patterns



Vertical Pattern



Horizontal Pattern

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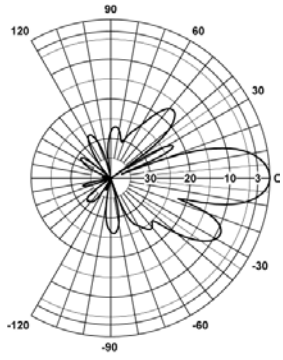
CELlite® Fixed Tilt Antennas

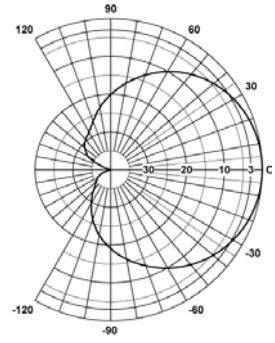
AP866513-CT0

Horizontal Beamwidth, deg 65
Gain, dBi 14.5
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	806-894
Horizontal Beamwidth, deg	65
Vertical Beamwidth, deg	18
Gain, dBi (dBd)	14.5 (12.4)
Front-To-Back Ratio, dB	> 30 (Typ.35)
VSWR	< 1.5:1
Maximum Power Input, W	1000
Polarization	Vertical
3rd Order IMP @ 2 x 43 dBm, dBc	> 150
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	987 x 265 x 130 (38.84 x 10.43 x 5.12)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.26 (2.8)
Rated Wind Speed, km/h (mph)	160 (100)
Maximum Thrust @ Rated Wind, N (lbf)	170 (38)
Front Thrust @ Rated Wind, N (lbf)	170 (38)
Reflector Material	Aluminum
Radiating Element Material	Aluminum
Radome Material	UV Resistant ASA
Radome Color	Light Grey RAL7035
Weight w/o Mtg Hardware, kg (lb)	5.5 (12.1)
Packing Dimensions - HxWxD, m (ft)	1.1 x 0.3 x 0.2 (3.6 x 0.99 x 0.73)
Packing Dimensions, HxWxD, mm (in)	1120 x 300 x 220 (44.07 x 11.81 x 8.66)



Vertical Pattern

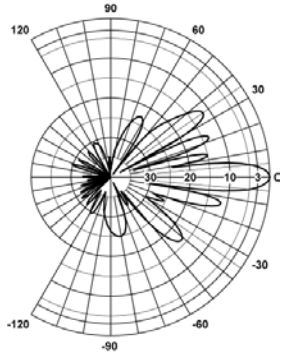


Horizontal Pattern

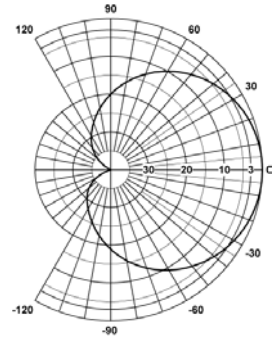
AP866516-CT0

Horizontal Beamwidth, deg 65
Gain, dBi 17
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	806-894
Horizontal Beamwidth, deg	65
Vertical Beamwidth, deg	9
Gain, dBi (dBd)	17 (14.9)
Front-To-Back Ratio, dB	> 30 (Typ.35)
VSWR	< 1.5:1
Maximum Power Input, W	1000
Polarization	Vertical
3rd Order IMP @ 2 x 43 dBm, dBc	> 150
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	1977 x 265 x 130 (77.79 x 10.43 x 5.12)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.52 (5.61)
Rated Wind Speed, km/h (mph)	160 (100)
Maximum Thrust @ Rated Wind, N (lbf)	555 (125)
Front Thrust @ Rated Wind, N (lbf)	555 (125)
Reflector Material	Aluminum
Radiating Element Material	Aluminum
Radome Material	UV Resistant ASA
Radome Color	Light Grey RAL7035
Weight w/o Mtg Hardware, kg (lb)	10.9 (23.98)
Packing Dimensions - HxWxD, m (ft)	2.1 x 0.3 x 0.2 (6.9 x 0.99 x 0.73)
Packing Dimensions, HxWxD, mm (in)	2115 x 300 x 220 (83.23 x 11.81 x 8.66)



Vertical Pattern



Horizontal Pattern

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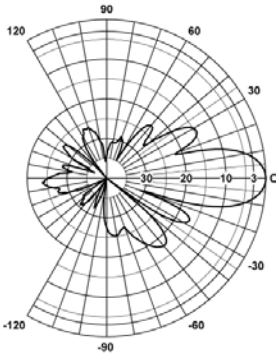
CELlite® Fixed Tilt Antennas

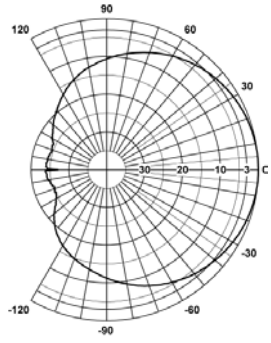
AP869011-CT0

Horizontal Beamwidth, deg 90
Gain, dBi 13.3
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	806-894
Horizontal Beamwidth, deg	90
Vertical Beamwidth, deg	17.5
Gain, dBi (dBd)	13.3 (11.2)
Front-To-Back Ratio, dB	> 25
VSWR	< 1.5:1
Maximum Power Input, W	1000
Polarization	Vertical
3rd Order IMP @ 2 x 43 dBm, dBc	> 150
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	987 x 265 x 130 (38.84 x 10.43 x 5.12)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.26 (2.8)
Rated Wind Speed, km/h (mph)	160 (100)
Maximum Thrust @ Rated Wind, N (lbf)	170 (38)
Front Thrust @ Rated Wind, N (lbf)	170 (38)
Reflector Material	Aluminum
Radiating Element Material	Aluminum
Radome Material	UV Resistant ASA
Radome Color	Light Grey RAL7035
Weight w/o Mtg Hardware, kg (lb)	5 (11)
Packing Dimensions - HxWxD, m (ft)	1.1 x 0.3 x 0.2 (3.6 x 0.99 x 0.73)
Packing Dimensions, HxWxD, mm (in)	1120 x 300 x 220 (44.07 x 11.81 x 8.66)



Vertical Pattern

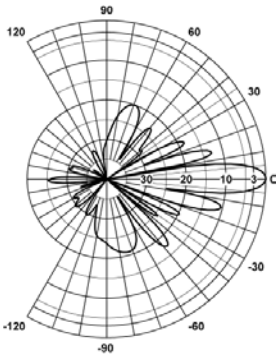


Horizontal Pattern

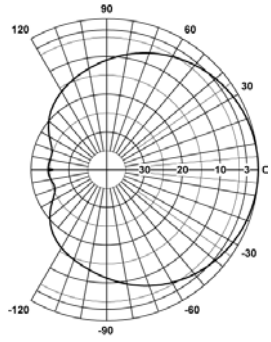
AP869014-CT0

Horizontal Beamwidth, deg 90
Gain, dBi 15.3
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	806-894
Horizontal Beamwidth, deg	90
Vertical Beamwidth, deg	9
Gain, dBi (dBd)	15.3 (13.2)
Front-To-Back Ratio, dB	> 25
VSWR	< 1.5:1
Maximum Power Input, W	1000
Polarization	Vertical
3rd Order IMP @ 2 x 43 dBm, dBc	> 150
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	1977 x 265 x 130 (77.79 x 10.43 x 5.12)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.52 (5.61)
Rated Wind Speed, km/h (mph)	160 (100)
Maximum Thrust @ Rated Wind, N (lbf)	555 (125)
Front Thrust @ Rated Wind, N (lbf)	555 (125)
Reflector Material	Aluminum
Radiating Element Material	Aluminum
Radome Material	UV Resistant ASA
Radome Color	Light Grey RAL7035
Weight w/o Mtg Hardware, kg (lb)	10.9 (23.98)
Packing Dimensions - HxWxD, m (ft)	2.1 x 0.3 x 0.2 (6.9 x 0.99 x 0.73)
Packing Dimensions, HxWxD, mm (in)	2115 x 300 x 220 (83.23 x 11.81 x 8.66)



Vertical Pattern



Horizontal Pattern

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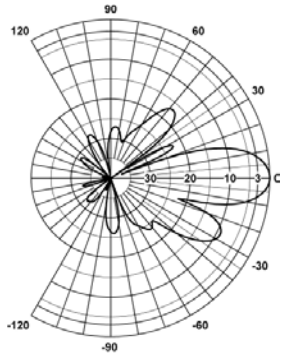
CELlite® Fixed Tilt Antennas

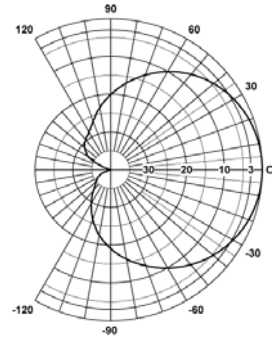
AP906513-CT0

Horizontal Beamwidth, deg 65
Gain, dBi 15.5
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	824-894	872-960
Horizontal Beamwidth, deg	65	
Vertical Beamwidth, deg	17	
Gain, dBi (dBd)	14.5 (12.4)	15.5 (13.4)
Front-To-Back Ratio, dB	> 30 (Typ.35)	
VSWR	< 1.5:1	< 1.3:1
Maximum Power Input, W	1000	
Polarization	Vertical	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	987 x 265 x 130 (38.84 x 10.43 x 5.12)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.26 (2.8)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	170 (38)	
Front Thrust @ Rated Wind, N (lbf)	170 (38)	
Reflector Material	Aluminum	
Radiating Element Material	Aluminum	
Radome Material	UV Resistant ASA	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	5.5 (12.1)	
Packing Dimensions - HxWxD, m (ft)	1.1 x 0.3 x 0.2 (3.6 x 0.99 x 0.73)	
Packing Dimensions, HxWxD, mm (in)	1120 x 300 x 220 (44.07 x 11.81 x 8.66)	



Vertical Pattern

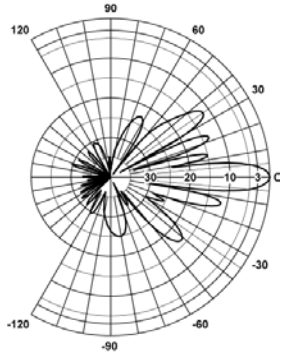


Horizontal Pattern

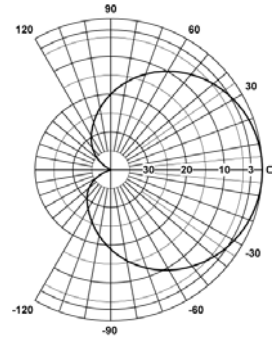
AP906516-CT0

Horizontal Beamwidth, deg 65
Gain, dBi 17.5
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	824-894	872-960
Horizontal Beamwidth, deg	65	
Vertical Beamwidth, deg	8.5	
Gain, dBi (dBd)	17 (14.9)	17.5 (15.4)
Front-To-Back Ratio, dB	> 30 (Typ.35)	
VSWR	< 1.5:1	< 1.3:1
Maximum Power Input, W	1000	
Polarization	Vertical	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	1977 x 265 x 130 (77.79 x 10.43 x 5.12)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.52 (5.61)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	555 (125)	
Front Thrust @ Rated Wind, N (lbf)	555 (125)	
Reflector Material	Aluminum	
Radiating Element Material	Aluminum	
Radome Material	UV Resistant ASA	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	10.9 (23.98)	
Packing Dimensions - HxWxD, m (ft)	2.1 x 0.3 x 0.2 (6.9 x 0.99 x 0.73)	
Packing Dimensions, HxWxD, mm (in)	2115 x 300 x 220 (83.23 x 11.81 x 8.26)	



Vertical Pattern



Horizontal Pattern

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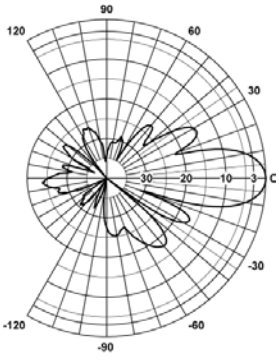
CELlite® Fixed Tilt Antennas

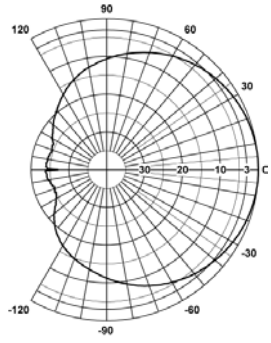
AP909011-CT0

Horizontal Beamwidth, deg 90
Gain, dBi 13.5
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	824-894	872-960
Horizontal Beamwidth, deg	90	
Vertical Beamwidth, deg	17.5	
Gain, dBi (dBd)	13.3 (11.2)	13.5 (11.4)
Front-To-Back Ratio, dB	> 25	
VSWR	< 1.5:1	< 1.3:1
Maximum Power Input, W	1000	
Polarization	Vertical	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	987 x 265 x 130 (38.84 x 10.43 x 5.12)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.26 (2.8)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	170 (38)	
Front Thrust @ Rated Wind, N (lbf)	170 (38)	
Reflector Material	Aluminum	
Radiating Element Material	Aluminum	
Radome Material	UV Resistant ASA	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	5 (11)	
Packing Dimensions - HxWxD, m (ft)	1.1 x 0.3 x 0.2 (3.6 x 0.99 x 0.73)	
Packing Dimensions, HxWxD, mm (in)	1120 x 300 x 220 (44.07 x 11.81 x 8.66)	



Vertical Pattern

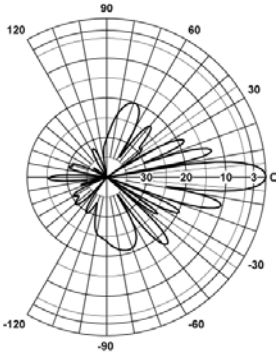


Horizontal Pattern

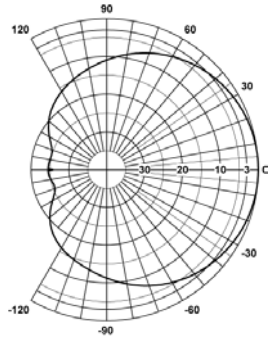
AP909014-CT0

Horizontal Beamwidth, deg 90
Gain, dBi 16
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	824-894	872-960
Horizontal Beamwidth, deg	90	
Vertical Beamwidth, deg	8.5	
Gain, dBi (dBd)	15.5 (13.4)	16 (13.9)
Front-To-Back Ratio, dB	> 25	
VSWR	< 1.5:1	< 1.3:1
Maximum Power Input, W	1000	
Polarization	Vertical	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	1977 x 265 x 130 (77.79 x 10.43 x 5.12)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.52 (5.61)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	555 (125)	
Front Thrust @ Rated Wind, N (lbf)	555 (125)	
Reflector Material	Aluminum	
Radiating Element Material	Aluminum	
Radome Material	UV Resistant ASA	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	10.9 (23.98)	
Packing Dimensions - HxWxD, m (ft)	2.1 x 0.3 x 0.2 (6.9 x 0.99 x 0.73)	
Packing Dimensions, HxWxD, mm (in)	2115 x 300 x 220 (83.23 x 11.81 x 8.66)	



Vertical Pattern



Horizontal Pattern

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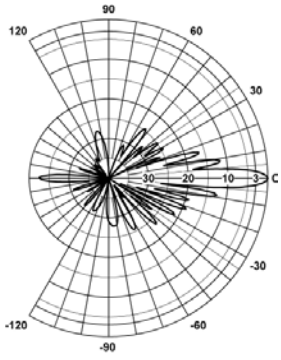
CELlite® Fixed Tilt Antennas

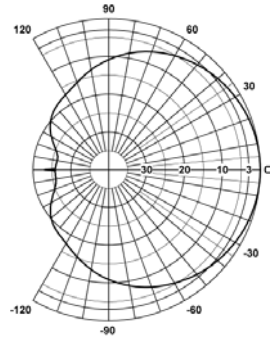
AP909016-CT0

Horizontal Beamwidth, deg 90
Gain, dBi 17.3
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	824-894	872-960
Horizontal Beamwidth, deg	90	
Vertical Beamwidth, deg	5.5	
Gain, dBi (dBd)	17.3 (15.2)	
Front-To-Back Ratio, dB	> 25	
VSWR	< 1.5:1	< 1.3:1
Maximum Power Input, W	1000	
Polarization	Vertical	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	2940 x 265 x 130 (115.7 x 10.43 x 5.12)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.78 (8.34)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	850 (191)	
Front Thrust @ Rated Wind, N (lbf)	850 (191)	
Reflector Material	Aluminum	
Radiating Element Material	Aluminum	
Radome Material	UV Resistant ASA	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	15 (33)	
Packing Dimensions - HxWxD, m (ft)	2.9 x 0.3 x 0.23 (9.6 x 0.99 x 0.76)	
Packing Dimensions, HxWxD, mm (in)	2975 x 300 x 250 (117.1 x 11.81 x 9.84)	



Vertical Pattern



Horizontal Pattern

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Maximizer® & Optimizer® Fixed Tilt Antennas

Polarization: Vertical
Electrical Downtilt: Fixed or Variable
Horizontal beamwidth: 65°, 80° or 90°

Applications

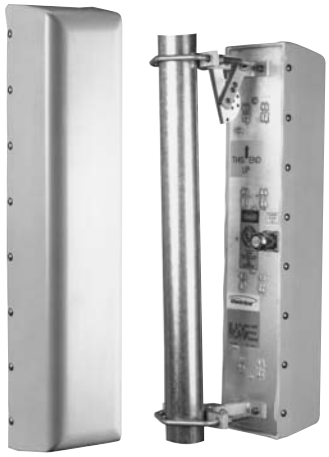
This well-known ranges of fixed or variable tilt antennas are vertically polarized for space diversity with an option of 65°, 80° or 90 degree horizontal beamwidths for use in the following systems:

Cellular (824-849, 869-894MHz)

Trunking / SMR (806-824, 851-869MHz)

Trunking (896-901, 935-940MHz)

Due to its monolithic mechanical design these highly reliable antennas are IM3 free with extremely stable ageing. Maximizer® or Optimizer® antennas are available in a variety of gain options varying from 11.1 to 18.1 dBi with with fixed or variable electrical tilt options. These antennas are covered by a UV stabilized high impact ABS radome and have one 7-16 connectors mounted at the back. They are all designed for use with either our APM18/19 fixed mount or our APM20/21 downtilt mount.

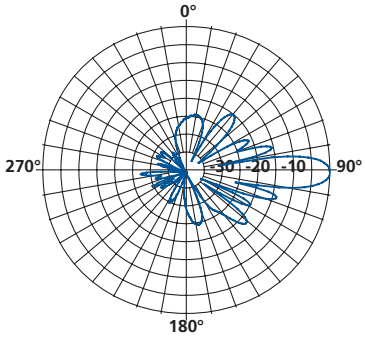


APL866516 Series

Features & Benefits

- High gain
- Stable horizontal and vertical beamwidths
- Optimized null fill
- 45 dB Front-to-Back ratio
- Fast horizontal pattern roll-off
- Efficient co-channel interference reduction
- High reliability no solder joints

VERTICAL PATTERN
APL866516 Series



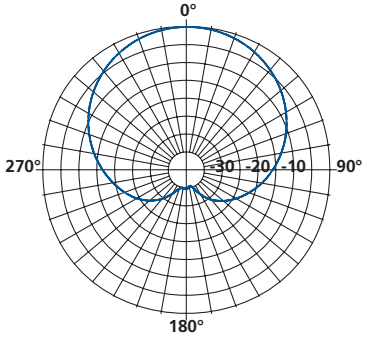
Performance Optimization Techniques

The RFS Maximizer® log periodic dipole array boasts the highest front-to-back ever achieved: 45dB.

The Maximizer's upper lobe suppression reduces co-channel interference in TDMA systems and its heavy null fill delivers exceptional close-in coverage. For CDMA systems the Maximizer helps to maximize capacity by minimizing the soft hand-off zone as well a pilot pollution.

The RFS Optimizer® allows a carrier to optimize system performance without service interruption, protecting the revenue stream. The continuous adjustable electrical down tilt feature and high front to back ratio reduces co-channel interference. The Optimizer offers the easiest and most cost effective solution to increase wireless capacity.

HORIZONTAL PATTERN
APL866516 Series



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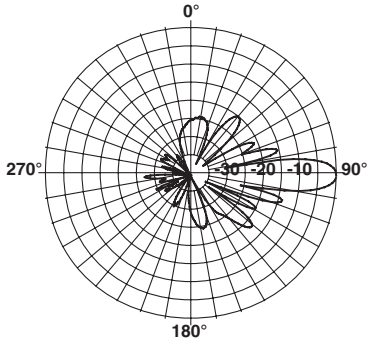
Maximizer® & Optimizer® Fixed Tilt Antennas

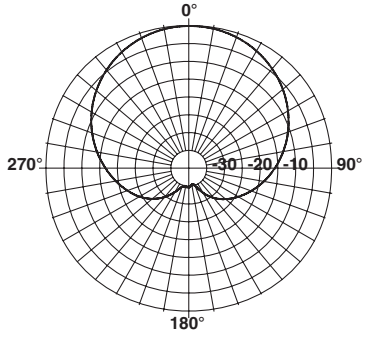
APL866513-42T0

Horizontal Beamwidth, deg 65
Gain, dBi 15.1
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	806-894
Horizontal Beamwidth, deg	65
Vertical Beamwidth, deg	15
Gain, dBi (dBd)	15.1 (13)
1st Upper Sidelobe Suppression, dB	> 20
Upper Sidelobe Suppression, dB	> 20
Front-To-Back Ratio, dB	45
VSWR	< 1.35:1
Maximum Power Input, W	500
Polarization	Vertical
3rd Order IMP @ 16 x 41 dBm, dBm	< -100
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	1219 x 234 x 203 (48 x 9.2 x 8)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.376 (4.05)
Rated Wind Speed, km/h (mph)	180 (112)
Maximum Thrust @ Rated Wind, N (lbf)	903 (203)
Reflector Material	5052-H32 Aluminum
Radiating Element Material	Aluminum Alloy
Radome Material	UV Stabilized High Impact ABS
Weight w/o Mtg Hardware, kg (lb)	7 (15.7)
Packing Dimensions, HxWxD, mm (in)	1594 x 343 x 349 (62.75 x 13.5 x 13.75)



Vertical Pattern

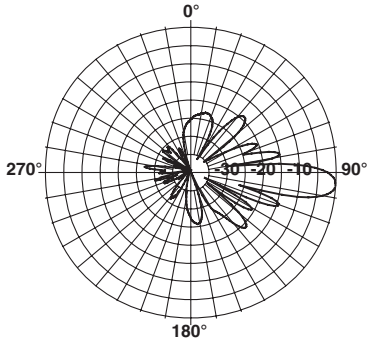


Horizontal Pattern

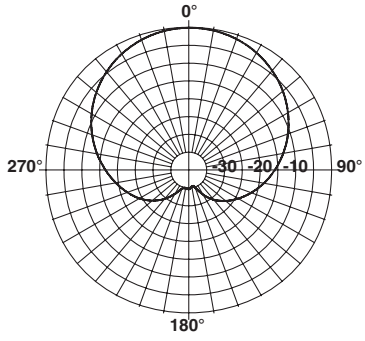
APL866513-42T6

Horizontal Beamwidth, deg 65
Gain, dBi 15.1
Electrical Downtilt, deg 6

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	806-894
Horizontal Beamwidth, deg	65
Vertical Beamwidth, deg	15
Gain, dBi (dBd)	15.1 (13)
1st Upper Sidelobe Suppression, dB	> 20
Upper Sidelobe Suppression, dB	> 20
Front-To-Back Ratio, dB	45
VSWR	< 1.35:1
Maximum Power Input, W	500
Polarization	Vertical
3rd Order IMP @ 16 x 41 dBm, dBm	< -100
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	1219 x 234 x 203 (48 x 9.2 x 8)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.376 (4.05)
Rated Wind Speed, km/h (mph)	180 (112)
Maximum Thrust @ Rated Wind, N (lbf)	903 (203)
Reflector Material	5052-H32 Aluminum
Radiating Element Material	Aluminum Alloy
Radome Material	UV Stabilized High Impact ABS
Weight w/o Mtg Hardware, kg (lb)	7 (15.7)
Packing Dimensions, HxWxD, mm (in)	1594 x 343 x 349 (62.75 x 13.5 x 13.75)



Vertical Pattern



Horizontal Pattern

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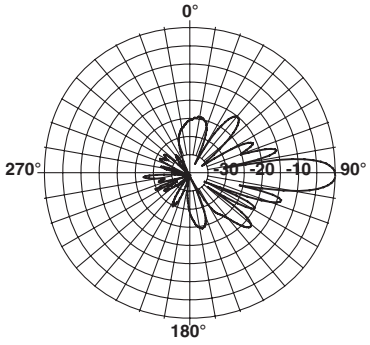
Maximizer® & Optimizer® Fixed Tilt Antennas

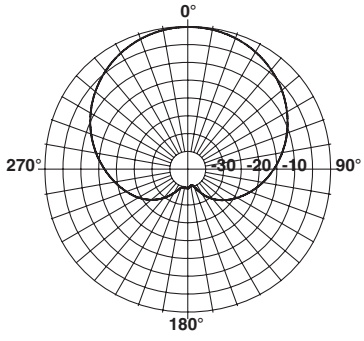
APL866516-42T0

Horizontal Beamwidth, deg 65
Gain, dBi 18.1
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	806-894
Horizontal Beamwidth, deg	65
Vertical Beamwidth, deg	8
Gain, dBi (dBd)	18.1 (16)
1st Upper Sidelobe Suppression, dB	> 20
Upper Sidelobe Suppression, dB	> 20
Front-To-Back Ratio, dB	45
VSWR	< 1.5:1
Maximum Power Input, W	500
Polarization	Vertical
3rd Order IMP @ 16 x 41 dBm, dBm	< -100
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	2362 x 234 x 203 (93 x 9.2 x 8)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.734 (7.9)
Rated Wind Speed, km/h (mph)	180 (112)
Maximum Thrust @ Rated Wind, N (lbf)	1761 (396)
Reflector Material	5052-H32 Aluminum
Radiating Element Material	Aluminum Alloy
Radome Material	UV Stabilized High Impact ABS
Weight w/o Mtg Hardware, kg (lb)	14 (31.4)
Packing Dimensions, HxWxD, mm (in)	2629 x 356 x 349 (103.5 x 14 x 13.75)



Vertical Pattern

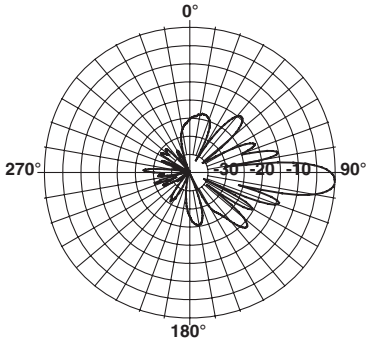


Horizontal Pattern

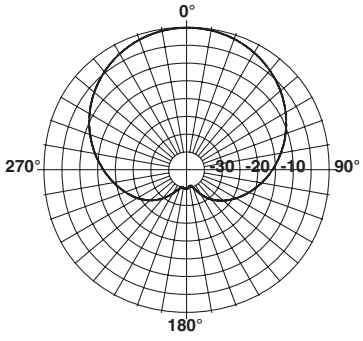
APL866516-42T4

Horizontal Beamwidth, deg 65
Gain, dBi 18.1
Electrical Downtilt, deg 4

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	806-894
Horizontal Beamwidth, deg	65
Vertical Beamwidth, deg	8
Gain, dBi (dBd)	18.1 (16)
1st Upper Sidelobe Suppression, dB	> 20
Upper Sidelobe Suppression, dB	> 20
Front-To-Back Ratio, dB	45
VSWR	< 1.5:1
Maximum Power Input, W	500
Polarization	Vertical
3rd Order IMP @ 16 x 41 dBm, dBm	< -100
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	2362 x 234 x 203 (93 x 9.2 x 8)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.734 (7.9)
Rated Wind Speed, km/h (mph)	180 (112)
Maximum Thrust @ Rated Wind, N (lbf)	1761 (396)
Reflector Material	5052-H32 Aluminum
Radiating Element Material	Aluminum Alloy
Radome Material	UV Stabilized High Impact ABS
Weight w/o Mtg Hardware, kg (lb)	14 (31.4)
Packing Dimensions, HxWxD, mm (in)	2629 x 356 x 349 (103.5 x 14 x 13.75)



Vertical Pattern



Horizontal Pattern

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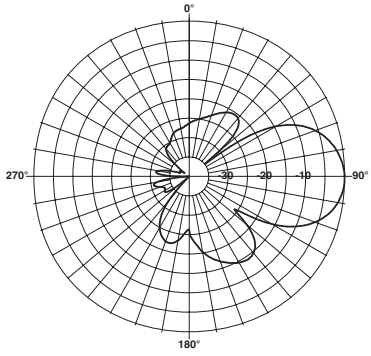
Maximizer® & Optimizer® Fixed Tilt Antennas

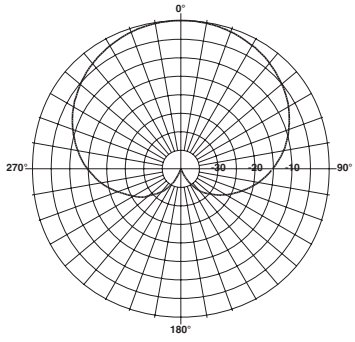
APL868010-42T0

Horizontal Beamwidth, deg 80
Gain, dBi 12.1
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	806-894
Horizontal Beamwidth, deg	80
Vertical Beamwidth, deg	30
Gain, dBi (dBd)	12.1 (10)
Front-To-Back Ratio, dB	45
VSWR	< 1.5:1
Maximum Power Input, W	500
Polarization	Vertical
3rd Order IMP @ 16 x 41 dBm, dBm	< -100
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	610 x 152 x 203 (24 x 6 x 8)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.093 (1)
Rated Wind Speed, km/h (mph)	200 (125)
Maximum Thrust @ Rated Wind, N (lbf)	280 (63)
Reflector Material	5052-H32 Aluminum
Radiating Element Material	Aluminum Alloy
Radome Material	UV Stabilized High Impact ABS
Weight w/o Mtg Hardware, kg (lb)	1.4 (3.27)
Packing Dimensions, HxWxD, mm (in)	813 x 330 x 254 (32 x 13 x 10)



Vertical Pattern

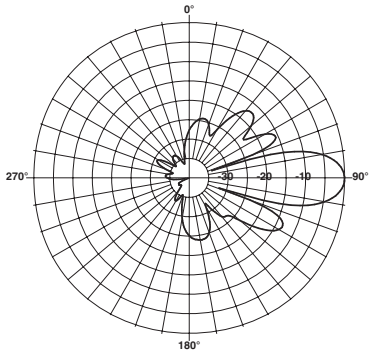


Horizontal Pattern

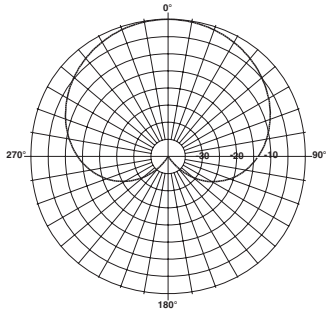
APL868013-42T0

Horizontal Beamwidth, deg 80
Gain, dBi 14.1
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	806-894
Horizontal Beamwidth, deg	80
Vertical Beamwidth, deg	15
Gain, dBi (dBd)	14.1 (12)
Front-To-Back Ratio, dB	45
VSWR	< 1.5:1
Maximum Power Input, W	500
Polarization	Vertical
3rd Order IMP @ 16 x 41 dBm, dBm	< -100
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	1219 x 152 x 203 (48 x 6 x 8)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.307 (3.3)
Rated Wind Speed, km/h (mph)	200 (125)
Maximum Thrust @ Rated Wind, N (lbf)	916 (206)
Reflector Material	5052-H32 Aluminum
Radiating Element Material	Aluminum Alloy
Radome Material	UV Stabilized High Impact ABS
Weight w/o Mtg Hardware, kg (lb)	2.8 (6.32)
Packing Dimensions, HxWxD, mm (in)	1270 x 305 x 203 (50 x 12 x 8)



Vertical Pattern



Horizontal Pattern

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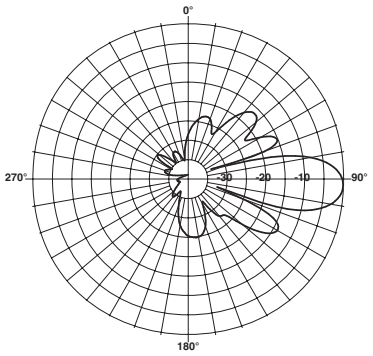
Maximizer® & Optimizer® Fixed Tilt Antennas

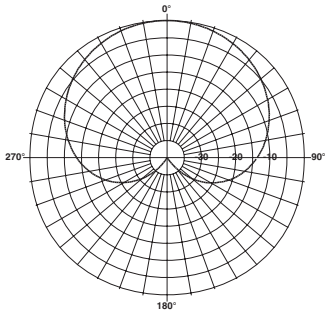
APL868013-42T4

Horizontal Beamwidth, deg 80
Gain, dBi 14.1
Electrical Downtilt, deg 4

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	806-894
Horizontal Beamwidth, deg	80
Vertical Beamwidth, deg	15
Gain, dBi (dBd)	14.1 (12)
Front-To-Back Ratio, dB	45
VSWR	< 1.5:1
Maximum Power Input, W	500
Polarization	Vertical
3rd Order IMP @ 16 x 41 dBm, dBm	< -100
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	1219 x 152 x 203 (48 x 6 x 8)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.307 (3.3)
Rated Wind Speed, km/h (mph)	200 (125)
Maximum Thrust @ Rated Wind, N (lbf)	916 (206)
Reflector Material	5052-H32 Aluminum
Radiating Element Material	Aluminum Alloy
Radome Material	UV Stabilized High Impact ABS
Weight w/o Mtg Hardware, kg (lb)	2.8 (6.32)
Packing Dimensions, HxWxD, mm (in)	1270 x 305 x 203 (50 x 12 x 8)



Vertical Pattern

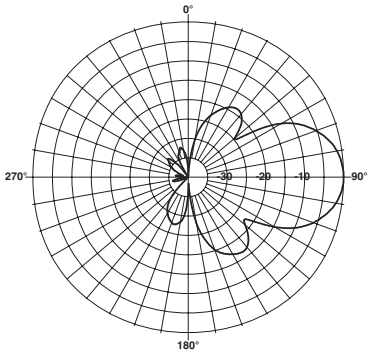


Horizontal Pattern

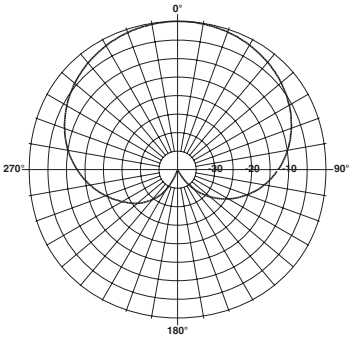
APL869009-42T0

Horizontal Beamwidth, deg 90
Gain, dBi 11.1
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	806-894
Horizontal Beamwidth, deg	90
Vertical Beamwidth, deg	30
Gain, dBi (dBd)	11.1 (9)
Front-To-Back Ratio, dB	45
VSWR	< 1.5:1
Maximum Power Input, W	500
Polarization	Vertical
3rd Order IMP @ 16 x 41 dBm, dBm	< -100
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	610 x 152 x 203 (24 x 6 x 8)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.093 (1)
Rated Wind Speed, km/h (mph)	200 (125)
Maximum Thrust @ Rated Wind, N (lbf)	280 (63)
Reflector Material	5052-H32 Aluminum
Radiating Element Material	Aluminum Alloy
Radome Material	UV Stabilized High Impact ABS
Weight w/o Mtg Hardware, kg (lb)	1.4 (3.27)
Packing Dimensions, HxWxD, mm (in)	660 x 305 x 203 (26 x 12 x 8)



Vertical Pattern



Horizontal Pattern

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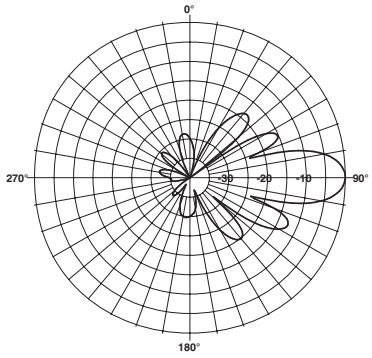
Maximizer® & Optimizer® Fixed Tilt Antennas

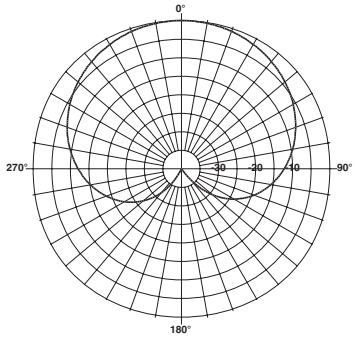
APL869012-42T0

Horizontal Beamwidth, deg 90
Gain, dBi 14.1
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	806-894
Horizontal Beamwidth, deg	90
Vertical Beamwidth, deg	15
Gain, dBi (dBd)	14.1 (12)
Front-To-Back Ratio, dB	45
VSWR	< 1.5:1
Maximum Power Input, W	500
Polarization	Vertical
3rd Order IMP @ 16 x 41 dBm, dBm	< -100
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	1219 x 152 x 203 (48 x 6 x 8)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.307 (3.3)
Rated Wind Speed, km/h (mph)	200 (125)
Maximum Thrust @ Rated Wind, N (lbf)	916 (206)
Reflector Material	5052-H32 Aluminum
Radiating Element Material	Aluminum Alloy
Radome Material	UV Stabilized High Impact ABS
Weight w/o Mtg Hardware, kg (lb)	3 (6.75)
Packing Dimensions, HxWxD, mm (in)	1270 x 305 x 203 (50 x 12 x 8)



Vertical Pattern

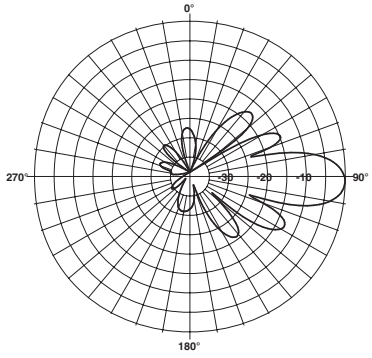


Horizontal Pattern

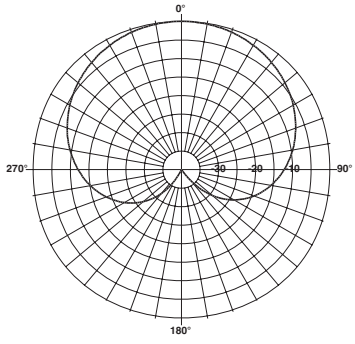
APL869012-42T3

Horizontal Beamwidth, deg 90
Gain, dBi 14.1
Electrical Downtilt, deg 3

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	806-894
Horizontal Beamwidth, deg	90
Vertical Beamwidth, deg	15
Gain, dBi (dBd)	14.1 (12)
Front-To-Back Ratio, dB	45
VSWR	< 1.5:1
Maximum Power Input, W	500
Polarization	Vertical
3rd Order IMP @ 16 x 41 dBm, dBm	< -100
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	1219 x 152 x 203 (48 x 6 x 8)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.307 (3.3)
Rated Wind Speed, km/h (mph)	200 (125)
Maximum Thrust @ Rated Wind, N (lbf)	916 (206)
Reflector Material	5052-H32 Aluminum
Radiating Element Material	Aluminum Alloy
Radome Material	UV Stabilized High Impact ABS
Weight w/o Mtg Hardware, kg (lb)	3 (6.75)
Packing Dimensions, HxWxD, mm (in)	1270 x 305 x 203 (50 x 12 x 8)



Vertical Pattern



Horizontal Pattern

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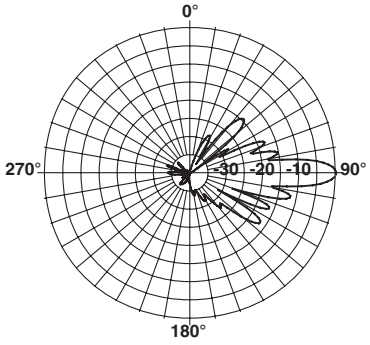
Maximizer® & Optimizer® Fixed Tilt Antennas

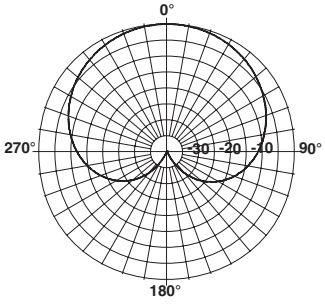
APL869014-42T0

Horizontal Beamwidth, deg 90
Gain, dBi 16.1
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	806-894
Horizontal Beamwidth, deg	90
Vertical Beamwidth, deg	7.8
Gain, dBi (dBd)	16.1 (14)
Front-To-Back Ratio, dB	45
VSWR	< 1.5:1
Maximum Power Input, W	500
Polarization	Vertical
3rd Order IMP @ 16 x 41 dBm, dBm	< -100
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	2337 x 152 x 203 (92 x 6 x 8)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.587 (6.32)
Rated Wind Speed, km/h (mph)	180 (112)
Maximum Thrust @ Rated Wind, N (lbf)	1409 (317)
Reflector Material	Aluminum Alloy
Radiating Element Material	Aluminum Alloy
Radome Material	Weather-Resistant Plastic
Weight w/o Mtg Hardware, kg (lb)	5.4 (12.11)
Packing Dimensions, HxWxD, mm (in)	2438 x 305 x 203 (96 x 12 x 8)



Vertical Pattern

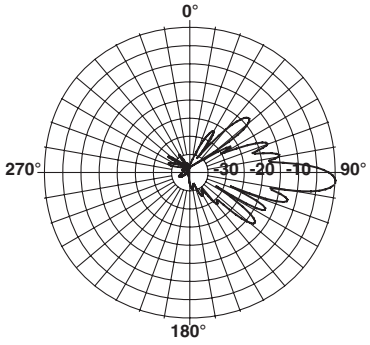


Horizontal Pattern

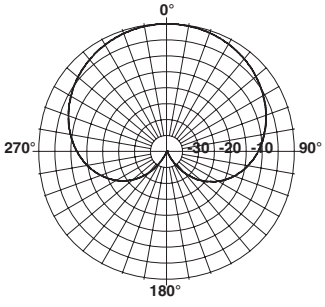
APL869014-42T6

Horizontal Beamwidth, deg 90
Gain, dBi 16.1
Electrical Downtilt, deg 6

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	806-894
Horizontal Beamwidth, deg	90
Vertical Beamwidth, deg	7.8
Gain, dBi (dBd)	16.1 (14)
Front-To-Back Ratio, dB	45
VSWR	< 1.5:1
Maximum Power Input, W	500
Polarization	Vertical
3rd Order IMP @ 16 x 41 dBm, dBm	< -100
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	2337 x 152 x 203 (92 x 6 x 8)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.587 (6.32)
Rated Wind Speed, km/h (mph)	180 (112)
Maximum Thrust @ Rated Wind, N (lbf)	1409 (317)
Reflector Material	Aluminum Alloy
Radiating Element Material	Aluminum Alloy
Radome Material	Weather-Resistant Plastic
Weight w/o Mtg Hardware, kg (lb)	5.4 (12.11)
Packing Dimensions, HxWxD, mm (in)	2438 x 305 x 203 (96 x 12 x 8)



Vertical Pattern



Horizontal Pattern

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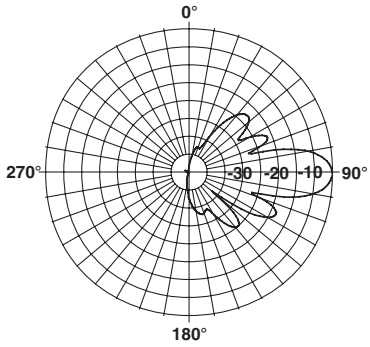
Maximizer® & Optimizer® Fixed Tilt Antennas

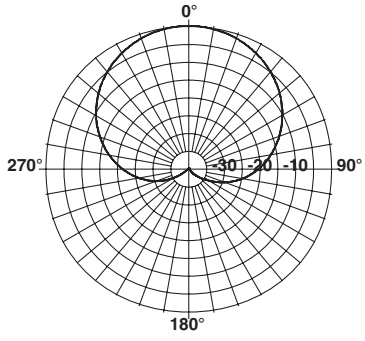
ALE866513-42T0

Horizontal Beamwidth, deg 65
Gain, dBi 15.1
Electrical Downtilt, deg 0-14

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	806-894
Horizontal Beamwidth, deg	65
Vertical Beamwidth, deg	17
Gain, dBi (dBd)	15.1 (13)
Front-To-Back Ratio, dB	40
VSWR	< 1.5:1
Maximum Power Input, W	500
Polarization	Vertical
3rd Order IMP @ 16 x 41 dBm, dBm	< -100
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	1219 x 254 x 234 (48 x 10 x 9.2)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.418 (4.5)
Rated Wind Speed, km/h (mph)	160 (100)
Maximum Thrust @ Rated Wind, N (lbf)	800 (180)
Reflector Material	Aluminum Alloy
Radiating Element Material	Aluminum Alloy
Radome Material	UV Resistant ABS
Weight w/o Mtg Hardware, kg (lb)	10 (21)
Packing Dimensions, HxWxD, mm (in)	1372 x 508 x 381 (54 x 20 x 15)



Vertical Pattern

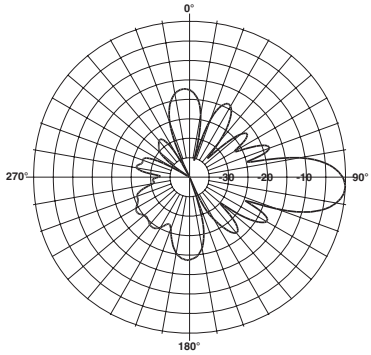


Horizontal Pattern

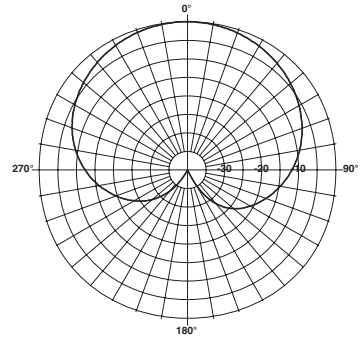
ALE859012-42T0

Horizontal Beamwidth, deg 90
Gain, dBi 13.6
Electrical Downtilt, deg 0-14

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	806-941
Horizontal Beamwidth, deg	90
Vertical Beamwidth, deg	16
Gain, dBi (dBd)	13.6 (11.5)
Front-To-Back Ratio, dB	40
VSWR	< 1.5:1
Maximum Power Input, W	500
Polarization	Vertical
3rd Order IMP @ 16 x 41 dBm, dBm	< -100
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	1227 x 257 x 197 (48.3 x 10.1 x 7.75)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.39 (4.2)
Rated Wind Speed, km/h (mph)	200 (125)
Maximum Thrust @ Rated Wind, N (lbf)	1169 (263)
Reflector Material	Aluminum Alloy
Radiating Element Material	Aluminum Alloy
Radome Material	UV Resistant ABS
Weight w/o Mtg Hardware, kg (lb)	8 (18)
Packing Dimensions, HxWxD, mm (in)	1448 x 406 x 305 (57 x 16 x 12)



Vertical Pattern



Horizontal Pattern

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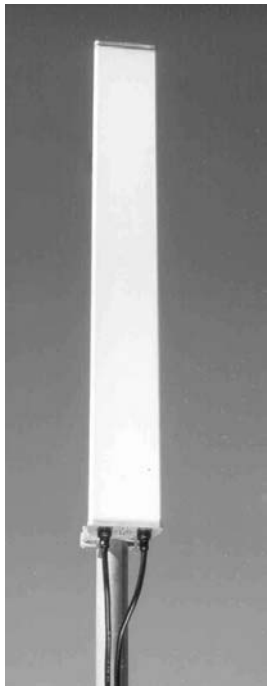
Optimizer® Broadband Antennas

Polarization: Dual ± 45° ***Broadband***
Electrical Downtilt: Adjustable ***Tilt range: 10°***
Horizontal beamwidth: 65° or 90°



APXV18-20* Series

Applications

This innovative range of broadband variable tilt antennas are cross-polarized, available in 65° or 90 degree horizontal beamwidths for use in the following systems:

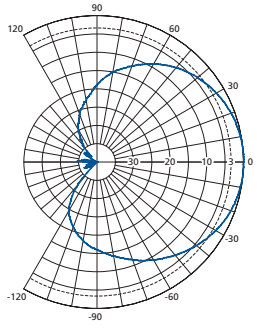
DCS1800 (1710-1785, 1805-1880MHz)
PCS (1850-1910, 1930-1990MHz)
UMTS (1920-1980, 2110-2170MHz)

These high performance antennas have excellent upper sidelobe suppression, VSWR and front to back ratio. The antennas are available in a variety of gain options varying from 14.7 to 19.2dBi covered by a UV resistant fiberglass radome. Having continuously adjustable electrical downtilt over the range of 10°. These antennas have two 7-16 connectors mounted at the bottom and are designed for use with our new APM40 Global Mount system / APM70-3C cluster kit.

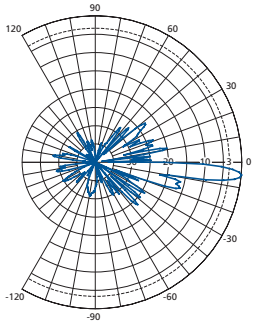
As with all our variable tilt antenna range they can be upgraded using our OPTIMIZER RT system for remote tilt control

Features & Benefits

- Constant performance across frequency band for all tilt values
- High gain
- High suppression of all upper sidelobes (typically <-20dB)
- Includes null fill of the 1st and 2nd lower nulls
- At least 30 dB isolation between polarization's
- Stable horizontal and vertical beamwidths
- Slanted Dual Polarization allows air combining, thus saving 3dB in power budget
- Effective polarization diversity ensured by high cross polar discrimination
- Broadband design
- Low wind load
- Optional remote tilt – can be retrofitted



Horizontal Pattern



Vertical Pattern

Performance Optimization Techniques

Fighting co-channel interferences is key to improving network performances. A tight control of the coverage by adjusting downtilt to the optimum value helps reducing co-channel interferences.

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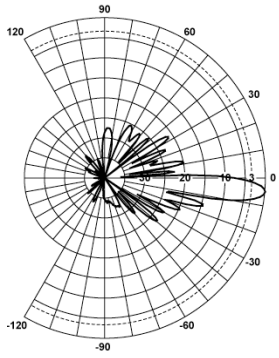
APXV18-20* Series 1710-2170 MHz

Optimizer® Broadband Antennas

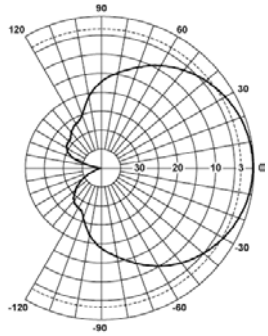
APXV18-206513-C

Horizontal Beamwidth, deg 65
Gain, dBi 15.1
Electrical Downtilt, deg 2-12

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	1710-1900	1900-2170
Horizontal Beamwidth, deg	68	63
Vertical Beamwidth, deg	15.3	13.6
Gain, dBi (dBd)	14.7 (12.6)	15.1 (13.0)
1st Upper Sidelobe Suppression, dB	> 18 (typically > 20)	
Upper Sidelobe Suppression, dB	>18 all (Typically >20)	
Front-To-Back Ratio, dB	> 28	
VSWR	< 1.5:1	
Isolation between Ports, dB	> 30	
Maximum Power Input, W	300	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 38 dBm, dBc	> 160	
7th Order IMP @ 2x46 dBm, dBc		> 170
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	700 x 175 x 80 (27.5 x 6.8 x 3.15)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.14 (1.47)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	180 (40.45)	
Front Thrust @ Rated Wind, N (lbf)	180 (40.45)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	6 (13.2)	
Packing Dimensions - HxWxD, m (ft)	0.86 x .26 x .20 (2.81 x 0.85 x 0.65)	
Packing Dimensions, HxWxD, mm (in)	860 x 260 x 200 (33.8 x 10.2 x 7.8)	



Vertical Pattern

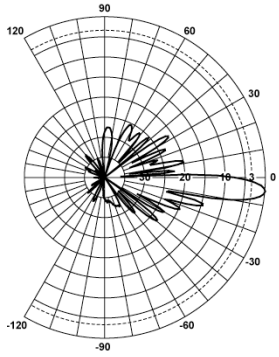


Horizontal Pattern

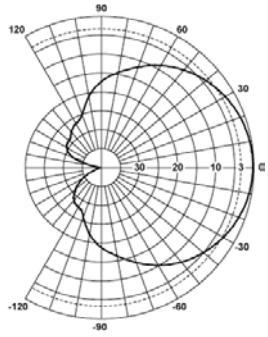
APXV18-206513T-C

Horizontal Beamwidth, deg 65
Gain, dBi 15.4
Electrical Downtilt, deg 0-10

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	1710-1900	1900-2170
Horizontal Beamwidth, deg	68	63
Vertical Beamwidth, deg	15.3	13.6
Gain, dBi (dBd)	14.9 (12.8)	15.4 (13.3)
1st Upper Sidelobe Suppression, dB	> 18	
Upper Sidelobe Suppression, dB	> 18	
Front-To-Back Ratio, dB	> 28	
VSWR	< 1.5:1	
Isolation between Ports, dB	> 30	
Maximum Power Input, W	300	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 38 dBm, dBc	> 160	
7th Order IMP @ 2x46 dBm, dBc		> 170
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	700 x 175 x 80 (27.5 x 6.8 x 3.15)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.14 (1.47)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	180 (40.45)	
Front Thrust @ Rated Wind, N (lbf)	180 (40.45)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	6 (13.2)	
Packing Dimensions - HxWxD, m (ft)	0.86 x .26 x .20 (2.81 x 0.85 x 0.65)	
Packing Dimensions, HxWxD, mm (in)	860 x 260 x 200 (33.8 x 10.2 x 7.8)	



Vertical Pattern



Horizontal Pattern

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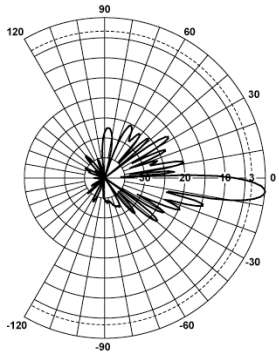
Optimizer® Broadband Antennas

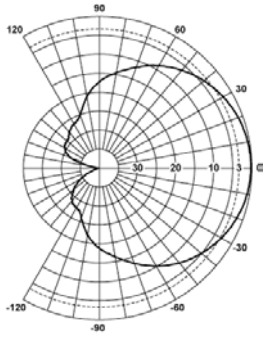
APXV18-206516L-C

Horizontal Beamwidth, deg 65
Gain, dBi 18
Electrical Downtilt, deg 0-10

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	1710-1900	1900-2170
Horizontal Beamwidth, deg	68	63
Vertical Beamwidth, deg	7	6.4
Gain, dBi (dBd)	17.6 (15.5)	18.0 (16.0)
Upper Sidelobe Suppression, dB	>17	>18 all (Typically >20)
Front-To-Back Ratio, dB	>28	>30
VSWR	< 1.5:1	
Isolation between Ports, dB	> 30	
Maximum Power Input, W	300	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 38 dBm, dBc	> 160	
7th Order IMP @ 2x46 dBm, dBc		> 170
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	1349 x 175 x 80 (53.0 x 6.8 x 3.15)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.31 (3.3)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	380 (185)	
Front Thrust @ Rated Wind, N (lbf)	380 (185)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	8.5 (18.7)	
Packing Dimensions - HxWxD, m (ft)	1.5 x .26 x .20 (4.9 x 0.85 x 0.65)	
Packing Dimensions, HxWxD, mm (in)	1520 x 260 x 200 (59.8 x 10.2 x 7.8)	



Vertical Pattern



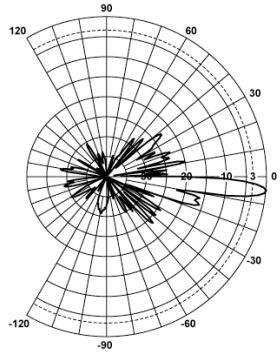
Horizontal Pattern

APXV18-206516T: Tilt range 4-14° upon request

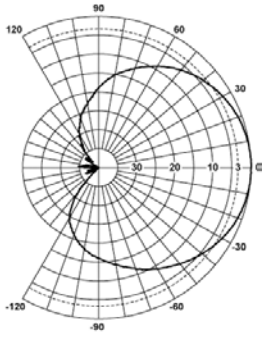
APXV18-206517-C

Horizontal Beamwidth, deg 65
Gain, dBi 19
Electrical Downtilt, deg 0-10

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	1710-1900	1900-2170
Horizontal Beamwidth, deg	67	63
Vertical Beamwidth, deg	5.0	4.6
Gain, dBi (dBd)	18.8 (16.7)	19.0 (16.9)
Upper Sidelobe Suppression, dB	>17	>18 all (Typically >20)
Front-To-Back Ratio, dB	> 30	
VSWR	< 1.5:1	
Isolation between Ports, dB	> 30	
Maximum Power Input, W	300	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 38 dBm, dBc	> 160	
7th Order IMP @ 2x46 dBm, dBc		> 170
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	1850 x 175 x 80 (72.0 x 6.8 x 3.15)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.45 (4.7)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	558 (125)	
Front Thrust @ Rated Wind, N (lbf)	558 (125)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	12 (26.4)	
Packing Dimensions - HxWxD, m (ft)	2.0 x 0.26 x 0.2 (6.6 x 0.85 x 0.65)	
Packing Dimensions, HxWxD, mm (in)	2021 x 260 x 200 (79.5 x 10.2 x 7.8)	



Vertical Pattern



Horizontal Pattern

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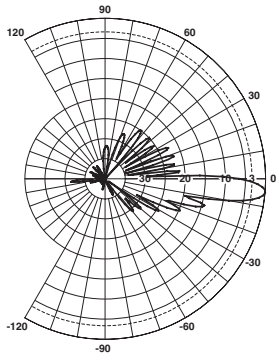
APXV18-20* Series 1710-2170 MHz

Optimizer® Broadband Antennas

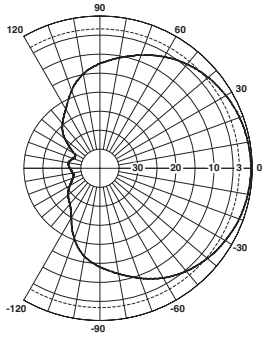
APXV18-209014-C

Horizontal Beamwidth, deg 90
Gain, dBi 16.5
Electrical Downtilt, deg 0-10

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	1710-1900	1900-2170
Horizontal Beamwidth, deg	88	
Vertical Beamwidth, deg	7.0	6.4
Gain, dBi (dBd)	16.5 (14.4)	16.5 (14.4)
1st Upper Sidelobe Suppression, dB	> 19 first (typically > 22)	
Upper Sidelobe Suppression, dB	> 17 all other (typically > 20)	
Front-To-Back Ratio, dB	> 26	
VSWR	< 1.5:1	
Isolation between Ports, dB	> 30	
Maximum Power Input, W	300	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 38 dBm, dBc	> 160	
7th Order IMP @ 2x46 dBm, dBc		> 170
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	1349 x 175 x 80 (53.0 x 6.8 x 3.15)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.29 (3.0)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	380 (85)	
Front Thrust @ Rated Wind, N (lbf)	380 (85)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	8.5 (18.7)	
Packing Dimensions - HxWxD, m (ft)	1.5 x .26 x .20 (4.9 x 0.85 x 0.65)	
Packing Dimensions, HxWxD, mm (in)	1520 x 260 x 200 (59.8 x 10.2 x 7.8)	



Vertical Pattern

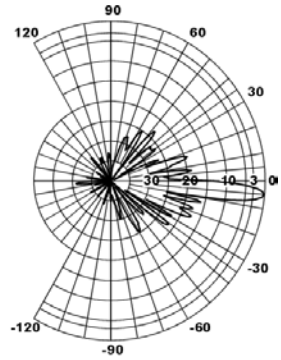


Horizontal Pattern

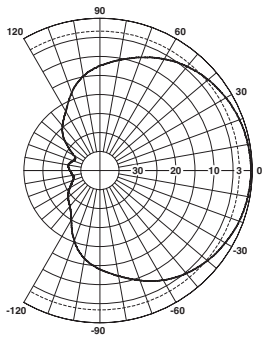
APXV18-209015-C

Horizontal Beamwidth, deg 90
Gain, dBi 17.7
Electrical Downtilt, deg 0-10

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	1710-1900	1900-2170
Horizontal Beamwidth, deg	88	
Vertical Beamwidth, deg	5.1	4.5
Gain, dBi (dBd)	17.9 (15.8)	17.7 (15.7)
1st Upper Sidelobe Suppression, dB	>18 first (typically >22)	
Upper Sidelobe Suppression, dB	>18 all (Typically >20)	
Front-To-Back Ratio, dB	> 28	
VSWR	< 1.5:1	
Isolation between Ports, dB	> 30	
Maximum Power Input, W	300	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 38 dBm, dBc	> 160	
7th Order IMP @ 2x46 dBm, dBc		> 170
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	1850 x 175 x 80 (72.0 x 6.8 x 3.15)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.45 (4.7)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	558 (125)	
Front Thrust @ Rated Wind, N (lbf)	558 (125)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	11.5 (25.3)	
Packing Dimensions - HxWxD, m (ft)	2.0 x 0.26 x 0.2 (6.6 x 0.85 x 0.65)	
Packing Dimensions, HxWxD, mm (in)	2021 x 260 x 200 (79.5 x 10.2 x 7.8)	



Vertical Pattern



Horizontal Pattern

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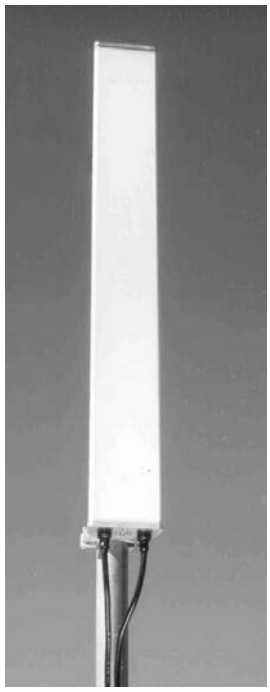
Broadband Fixed Tilt Antennas

Polarization: Dual ± 45°
Electrical Downtilt: Fixed
Horizontal beamwidth: 65° or 90°
Broadband
Tilt range: 2°, 5° & 6°



APX18-20* Series

Applications

This innovative range of broadband variable tilt antennas are cross-polarized, available in 65° or 90 degree horizontal beamwidths for use in the following systems:

DCS1800 (1710-1785, 1805-1880MHz)
PCS (1850-1910, 1930-1990MHz)
UMTS (1920-1980, 2110-2170MHz)

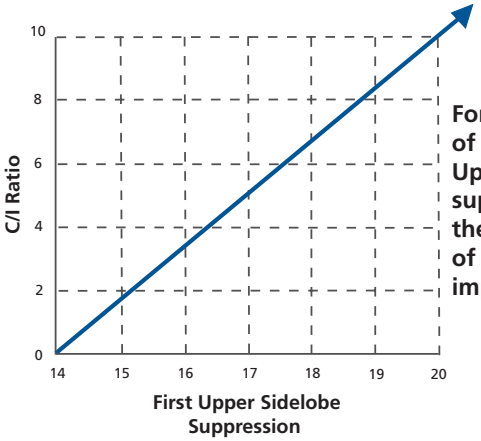
These high performance antennas have excellent upper sidelobe suppression, VSWR and front to back ratio. The antennas are available in a variety of gain options varying from 14.7 to 19.2 dBi with electrical downtilt option of 0°, 2°, 5° and 6°. These antennas are covered by a UV resistant fiberglass radome.

These antennas have two 7-16 connectors mounted at the bottom and are designed for use with our new APM40 Global Mount system/APM70-3C cluster kit.

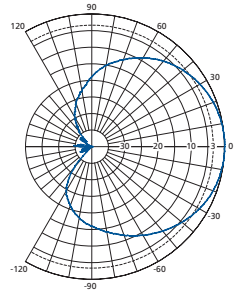
Performance Optimization Techniques

The need for improved control of RF energy has led to ongoing developments in antenna technology aimed at reducing spurious emissions and providing tighter control of the antenna footprint.

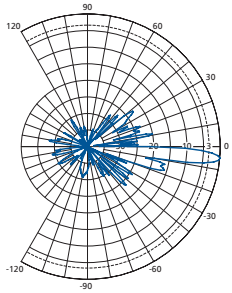
The impact of interference in GSM networks is generally measured as the ratio of carrier signal (C) to co-channel interference level (I)-or the C/I ratio-where minimum C/I values for acceptable voice quality are 9 to 10 decibels. It follows that reducing interference will improve C/I, and in turn yield improvements in audio quality and network capacity. Where once side lobe suppression was typically in the range of 12 dB, the target is now 18 to 20 dB—with RFS achieving typically better than 20 dB across the entire tilt range with its Optimizer antenna series.



For every dB of improved Upper sidelobe suppression there is a dB of C/I improvement.



Horizontal Pattern



Vertical Pattern

Features & Benefits

- High gain
- High suppression of all upper sidelobes (typically <-20dB)
- Includes null fill of the 1st and 2nd lower nulls
- At least 30 dB isolation between polarization's
- Stable horizontal and vertical beamwidths
- Very low beam squint over frequency band
- Effective polarization diversity ensured by high cross polar discrimination
- Broadband design
- Low wind load

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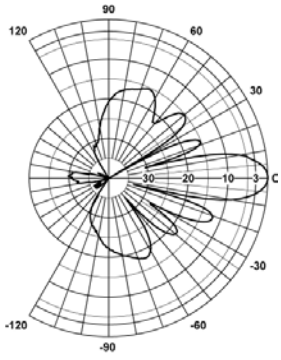
Broadband Fixed Tilt Antennas

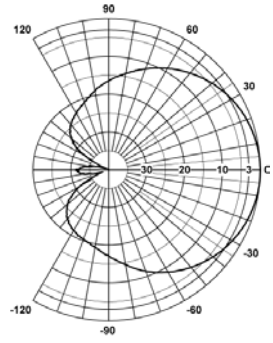
APX18-206513-CT0

Horizontal Beamwidth, deg 65
Gain, dBi 14.9
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	1710-1900	1900-2170
Horizontal Beamwidth, deg	65	63
Vertical Beamwidth, deg	13.5	12.5
Gain, dBi	14.7 (12.6)	14.9 (12.8)
Front-To-Back Ratio, dB	> 28	
VSWR	< 1.5:1	
Isolation between Ports, dB	> 30	
Maximum Power Input, W	300	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
7th Order IMP @ 2x46 dBm, dBc		> 170
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	668 x 198 x 50 (26.29 x 7.79 x 1.97)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.13 (1.42)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	210 (47)	
Front Thrust @ Rated Wind, N (lbf)	210 (47)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	3.4 (7.5)	
Packing Dimensions - HxWxD, m (ft)	0.77 x 0.3 x 0.17 (2.54 x 099 x 0.56)	
Packing Dimensions, HxWxD, mm (in)	770 x 300 x 170 (30.3 x 11.81 x 6.69)	



Vertical Pattern

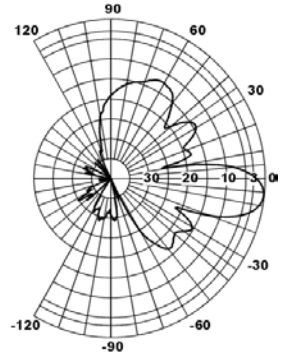


Horizontal Pattern

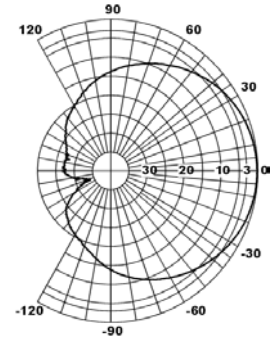
APX18-206513-CT6

Horizontal Beamwidth, deg 65
Gain, dBi 13.8
Electrical Downtilt, deg 6

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	1710-1900	1900-2170
Horizontal Beamwidth, deg	65	63
Vertical Beamwidth, deg	13.5	12.5
Gain, dBi (dBd)	13.8 (11.7)	
Front-To-Back Ratio, dB	> 28	
VSWR	< 1.5:1	
Isolation between Ports, dB	> 30	
Maximum Power Input, W	300	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
7th Order IMP @ 2x46 dBm, dBc		> 170
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	668 x 198 x 50 (26.29 x 7.79 x 1.97)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.13 (1.42)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	210 (47)	
Front Thrust @ Rated Wind, N (lbf)	210 (47)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	3.4 (7.5)	
Packing Dimensions - HxWxD, m (ft)	0.77 x 0.3 x 0.17 (2.54 x 099 x 0.56)	
Packing Dimensions, HxWxD, mm (in)	770 x 300 x 170 (30.3 x 11.81 x 6.69)	



Low Band Vertical Pattern



Horizontal Pattern

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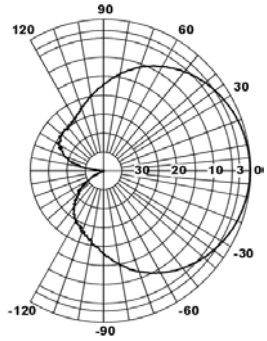
Broadband Fixed Tilt Antennas

APX18-206516L-CT0

Horizontal Beamwidth, deg 65
Gain, dBi 18
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	1710-1900	1900-2170
Horizontal Beamwidth, deg	65	63
Vertical Beamwidth, deg	7	6
Gain, dBi (dBd)	17.5 (15.4)	18 (15.9)
1st Upper Sidelobe Suppression, dB	> 20	
Front-To-Back Ratio, dB	> 27	
VSWR	< 1.4:1	
Isolation between Ports, dB	> 30 (typ 35)	
Maximum Power Input, W	300	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
7th Order IMP @ 2x46 dBm, dBc		> 170
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	1350 x 175 x 80 (53.15 x 6.8 x 3.15)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.24 (2.58)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	349 (113)	
Front Thrust @ Rated Wind, N (lbf)	349 (113)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	7.5 (16.55)	
Packing Dimensions - HxWxD, m (ft)	1.5 x 0.3 x 0.2 (4.95 x 0.99 x 0.66)	
Packing Dimensions, HxWxD, mm (in)	1465 x 275 x 160 (57.68 x 10.83 x 6.3)	

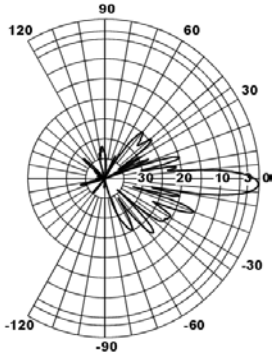


Low Band Horizontal Pattern

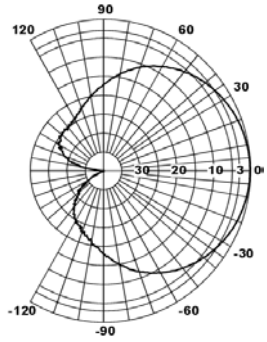
APX18-206516L-CT2

Horizontal Beamwidth, deg 65
Gain, dBi 18
Electrical Downtilt, deg 2

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	1710-1900	1900-2170
Horizontal Beamwidth, deg	65	63
Vertical Beamwidth, deg	7	6
Gain, dBi (dBd)	17.5 (15.4)	18 (15.9)
1st Upper Sidelobe Suppression, dB	> 20	
Front-To-Back Ratio, dB	> 27	
VSWR	< 1.4:1	
Isolation between Ports, dB	> 30 (typ 35)	
Maximum Power Input, W	300	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
7th Order IMP @ 2x46 dBm, dBc		> 170
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	1350 x 175 x 80 (53.15 x 6.8 x 3.15)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.24 (2.58)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	349 (113)	
Front Thrust @ Rated Wind, N (lbf)	349 (113)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	7.5 (16.55)	
Packing Dimensions - HxWxD, m (ft)	1.5 x 0.3 x 0.2 (4.95 x 0.99 x 0.66)	
Packing Dimensions, HxWxD, mm (in)	1465 x 275 x 160 (57.68 x 10.83 x 6.3)	



Low Band Vertical Pattern



Low Band Horizontal Pattern

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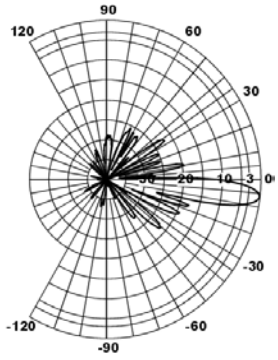
APX18-20* Series 1710-2170 MHz

Broadband Fixed Tilt Antennas

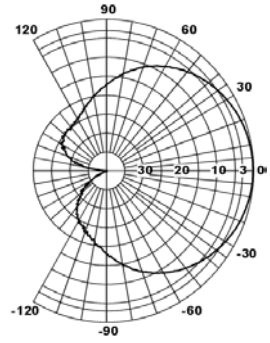
APX18-206516L-CT6

Horizontal Beamwidth, deg 65
Gain, dBi 18
Electrical Downtilt, deg 6

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	1710-1900	1900-2170
Horizontal Beamwidth, deg	65	63
Vertical Beamwidth, deg	7	6
Gain, dBi (dBd)	17.5 (15.4)	18 (15.9)
1st Upper Sidelobe Suppression, dB	> 22	> 18 (typ 20)
Front-To-Back Ratio, dB	> 27	
VSWR	< 1.4:1	
Isolation between Ports, dB	> 30 (typ 35)	
Maximum Power Input, W	300	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
7th Order IMP @ 2x46 dBm, dBc		> 170
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	1350 x 175 x 80 (53.15 x 6.8 x 3.15)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.24 (2.58)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	349 (113)	
Front Thrust @ Rated Wind, N (lbf)	349 (113)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	7.5 (16.55)	
Packing Dimensions - HxWxD, m (ft)	1.5 x 0.3 x 0.2 (4.95 x 0.99 x 0.66)	
Packing Dimensions, HxWxD, mm (in)	1465 x 275 x 160 (57.68 x 10.83 x 6.3)	



Low Band Vertical Pattern

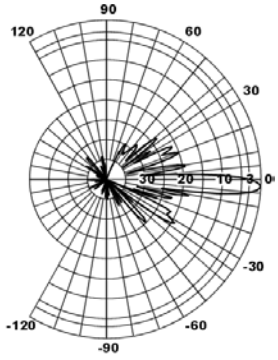


Low Band Horizontal Pattern

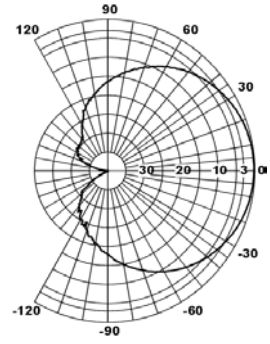
APX18-206517-CT2

Horizontal Beamwidth, deg 65
Gain, dBi 19
Electrical Downtilt, deg 2

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	1710-1900	1900-2170
Horizontal Beamwidth, deg	65	63
Vertical Beamwidth, deg	5	4.5
Gain, dBi (dBd)	18.5 (16.4)	19 (16.9)
1st Upper Sidelobe Suppression, dB	> 20	> 18 (typ 20)
Front-To-Back Ratio, dB	> 30	> 25
VSWR	< 1.4:1	
Isolation between Ports, dB	> 30 (typ 35)	
Maximum Power Input, W	300	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
7th Order IMP @ 2x46 dBm, dBc		> 170
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	1840 x 175 x 80 (72.44 x 6.8 x 3.15)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.32 (3.44)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	473 (106)	
Front Thrust @ Rated Wind, N (lbf)	473 (106)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	9.5 (20.95)	
Packing Dimensions - HxWxD, m (ft)	1.9 x 0.3 x 0.2 (6.27 x 0.99 x 0.66)	
Packing Dimensions, HxWxD, mm (in)	1965 x 275 x 160 (77.36 x 10.83 x 6.3)	



Low Band Vertical Pattern



Low Band Horizontal Pattern

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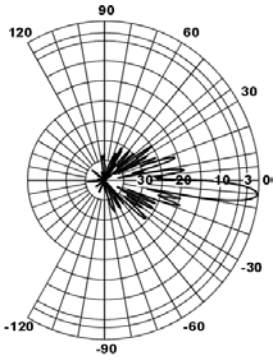
Broadband Fixed Tilt Antennas

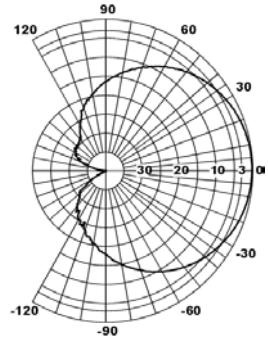
APX18-206517-CT5

Horizontal Beamwidth, deg 65
Gain, dBi 19
Electrical Downtilt, deg 5

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	1710-1900	1900-2170
Horizontal Beamwidth, deg	65	63
Vertical Beamwidth, deg	5	4.5
Gain, dBi (dBd)	18.5 (16.4)	19 (16.9)
1st Upper Sidelobe Suppression, dB	> 20	> 18 (typ 20)
Front-To-Back Ratio, dB	> 30	> 25
VSWR	< 1.4:1	
Isolation between Ports, dB	> 30 (typ 35)	
Maximum Power Input, W	300	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
7th Order IMP @ 2x46 dBm, dBc		> 170
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	1840 x 175 x 80 (72.44 x 6.8 x 3.15)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.32 (3.44)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	473 (106)	
Front Thrust @ Rated Wind, N (lbf)	473 (106)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	9.5 (20.95)	
Packing Dimensions - HxWxD, m (ft)	1.9 x 0.3 x 0.2 (6.27 x 0.99 x 0.66)	
Packing Dimensions, HxWxD, mm (in)	1965 x 275 x 160 (77.36 x 10.83 x 6.3)	



Low Band Vertical Pattern

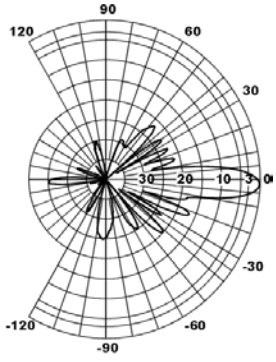


Low Band Horizontal Pattern

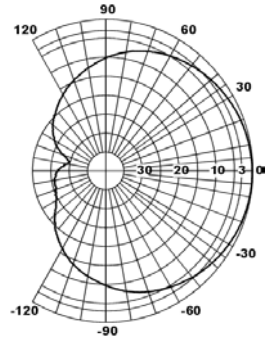
APX18-209014-CT2

Horizontal Beamwidth, deg 90
Gain, dBi 15.9
Electrical Downtilt, deg 2

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	1710-1900	1900-2170
Horizontal Beamwidth, deg	90	
Vertical Beamwidth, deg	8	7.5
Gain, dBi (dBd)	15.4 (13.3)	15.9 (13.8)
1st Upper Sidelobe Suppression, dB	> 20	
Front-To-Back Ratio, dB	> 28	
VSWR	< 1.4:1	
Isolation between Ports, dB	> 30	
Maximum Power Input, W	300	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
7th Order IMP @ 2x46 dBm, dBc		> 170
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	1220 x 175 x 80 (48.03 x 6.8 x 3.15)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.21 (2.26)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	316 (71)	
Front Thrust @ Rated Wind, N (lbf)	316 (71)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	6.5 (14.33)	
Packing Dimensions - HxWxD, m (ft)	1.5 x 0.3 x 0.2 (4.95 x 0.99 x 0.66)	
Packing Dimensions, HxWxD, mm (in)	1450 x 250 x 145 (57.09 x 9.84 x 5.71)	



Low Band Vertical Pattern



Low Band Horizontal Pattern

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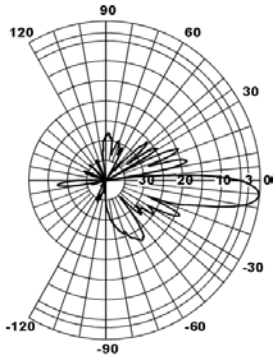
APX18-20* Series 1710-2170 MHz

Broadband Fixed Tilt Antennas

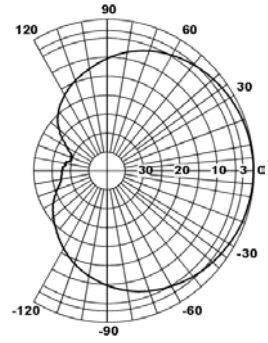
APX18-209014-CT5

Horizontal Beamwidth, deg 90
Gain, dBi 15.8
Electrical Downtilt, deg 5

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	1710-1900	1900-2170
Horizontal Beamwidth, deg	90	
Vertical Beamwidth, deg	8	7.5
Gain, dBi (dBd)	15.4 (13.3)	15.8 (13.7)
1st Upper Sidelobe Suppression, dB	> 20 (typ 23)	> 18 (typ 22)
Front-To-Back Ratio, dB	> 28	
VSWR	< 1.4:1	
Isolation between Ports, dB	> 35	
Maximum Power Input, W	300	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
7th Order IMP @ 2x46 dBm, dBc		> 170
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	1220 x 175 x 80 (48.03 x 6.8 x 3.15)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.21 (2.26)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	316 (71)	
Front Thrust @ Rated Wind, N (lbf)	316 (71)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	6.5 (14.33)	
Packing Dimensions - HxWxD, m (ft)	1.5 x 0.3 x 0.2 (4.95 x 0.99 x 0.66)	
Packing Dimensions, HxWxD, mm (in)	1450 x 250 x 145 (57.09 x 9.84 x 5.71)	



Low Band Vertical Pattern

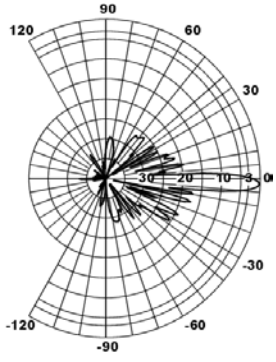


Low Band Horizontal Pattern

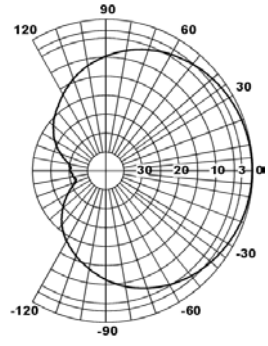
APX18-209015-CT2

Horizontal Beamwidth, deg 90
Gain, dBi 17.7
Electrical Downtilt, deg 2

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	1710-1900	1900-2170
Horizontal Beamwidth, deg	90	
Vertical Beamwidth, deg	5	4.5
Gain, dBi (dBd)	17.5 (15.4)	17.7 (15.6)
1st Upper Sidelobe Suppression, dB	> 18 (typ 20)	
Front-To-Back Ratio, dB	> 30	
VSWR	< 1.4:1	
Isolation between Ports, dB	> 30 (typ 35)	
Maximum Power Input, W	300	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
7th Order IMP @ 2x46 dBm, dBc		> 170
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	1845 x 175 x 80 (72.64 x 6.8 x 3.15)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.32 (3.44)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	473 (106)	
Front Thrust @ Rated Wind, N (lbf)	473 (106)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	9.2 (20.28)	
Packing Dimensions - HxWxD, m (ft)	1.9 x 0.3 x 0.2 (6.27 x 0.99 x 0.66)	
Packing Dimensions, HxWxD, mm (in)	1965 x 275 x 160 (77.36 x 10.83 x 6.3)	



Low Band Vertical Pattern



Low Band Horizontal Pattern

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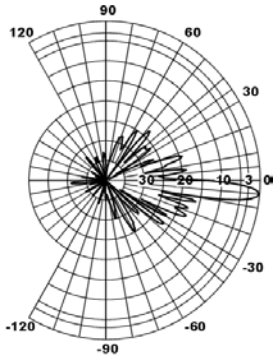
Broadband Fixed Tilt Antennas

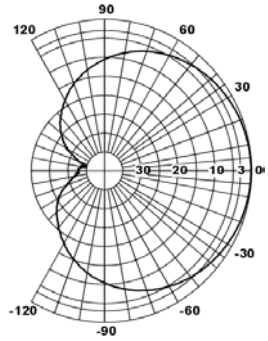
APX18-209015-CT5

Horizontal Beamwidth, deg 90
Gain, dBi 17.5
Electrical Downtilt, deg 5

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	1710-1900	1900-2170
Horizontal Beamwidth, deg	90	
Vertical Beamwidth, deg	5	4.5
Gain, dBi (dBd)	17.4 (15.3)	17.5 (15.4)
1st Upper Sidelobe Suppression, dB	> 18 (typ 20)	
Front-To-Back Ratio, dB	> 30	
VSWR	< 1.4:1	
Isolation between Ports, dB	> 30 (typ 35)	
Maximum Power Input, W	300	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	
7th Order IMP @ 2x46 dBm, dBc		> 170
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	1845 x 175 x 80 (72.64 x 6.8 x 3.15)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.32 (3.44)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	473 (106)	
Front Thrust @ Rated Wind, N (lbf)	473 (106)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	9.2 (20.28)	
Packing Dimensions - HxWxD, m (ft)	1.9 x 0.3 x 0.2 (6.27 x 0.99 x 0.66)	
Packing Dimensions, HxWxD, mm (in)	1965 x 275 x 160 (77.36 x 10.83 x 6.3)	



Low Band Vertical Pattern



Low Band Horizontal Pattern

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CELlite® Fixed Tilt Antennas

Polarization: Vertical
Electrical Downtilt: Fixed
Horizontal beamwidth: 65° or 90°

Applications

This well-known range of fixed tilt antennas are vertically polarized for space diversity with an option of 65° or 90 degree horizontal beamwidths for use in the following cellular standards:

GSM1800 (1710-1785, 1805-1880MHz)

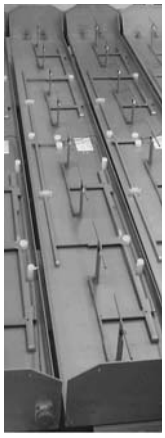
PCS1900 (1850-1910, 1930-1990MHz)

Due to its monolithic mechanical design these highly reliable antennas are IM3 free with extremely stable ageing. CELlite antennas are available in a variety of gain options varying from 16.0 to 17.5 dBi with electrical tilt and mechanical downtilt mount options. These antennas are covered by a UV resistant fiberglass radome and have one 7-16 connectors mounted at the bottom They are all designed for use with our new APM40 Global Mount system / APM70-3C cluster kit.

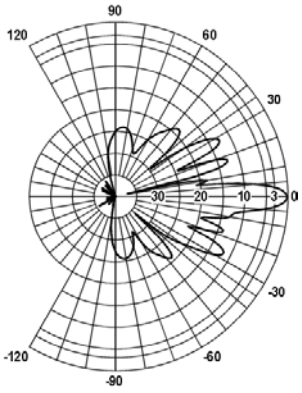
AP18 & AP19 Series

Features & Benefits

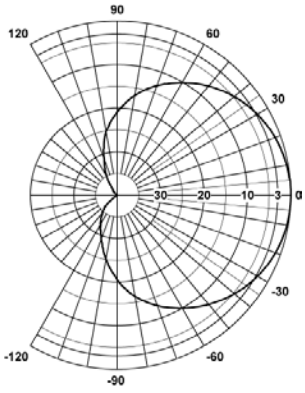
- High gain
- Stable horizontal and vertical beamwidths
- Optimized null fill
- Good Front-to-Back ratio
- Fast horizontal pattern roll-off
- Efficient Co-site interference reduction
- Broadband bandwidth allowing installation on all cellular standards (AP18 Series)
- Very low visual impact
- Low wind load



Typical Patterns



Vertical Pattern



Horizontal Pattern

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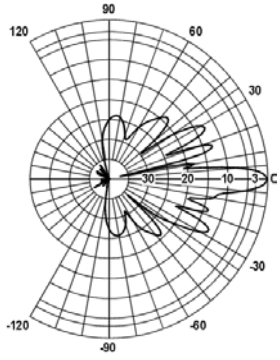
CELlite® Fixed Tilt Antennas

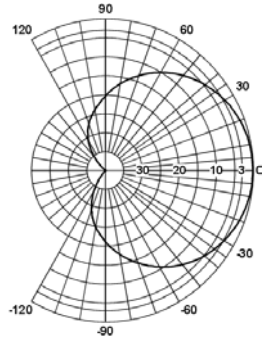
AP186516-CT0

Horizontal Beamwidth, deg 65
Gain, dBi 17
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	1710-1880
Horizontal Beamwidth, deg	65
Vertical Beamwidth, deg	7.5
Gain, dBi (dBd)	17 (14.9)
1st Upper Sidelobe Suppression, dB	> 14
Front-To-Back Ratio, dB	35 (typical 40)
VSWR	< 1.3:1
Maximum Power Input, W	400
Polarization	Vertical
3rd Order IMP @ 2 x 43 dBm, dBc	> 150
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	1310 x 198 x 50 (51.55 x 7.79 x 1.97)
Survival Wind Speed, km/h (mph)	160 (100)
Max Wind Loading Area, m² (ft²)	0.26 (2.78)
Rated Wind Speed, km/h (mph)	160 (100)
Maximum Thrust @ Rated Wind, N (lbf)	422 (95)
Front Thrust @ Rated Wind, N (lbf)	422 (95)
Reflector Material	Aluminum
Radiating Element Material	Aluminum
Radome Material	Fiberglass
Radome Color	Light Grey RAL7035
Weight w/o Mtg Hardware, kg (lb)	4.7 (10.34)
Packing Dimensions - HxWxD, m (ft)	1.4 x 0.3 x 0.17 (4.62 x 0.99 x 0.56)
Packing Dimensions, HxWxD, mm (in)	1410 x 300 x 170 (55.48 x 11.81 x 6.69)



Vertical Pattern

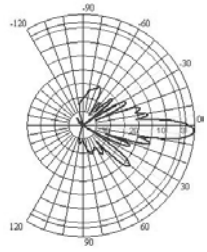


Horizontal Pattern

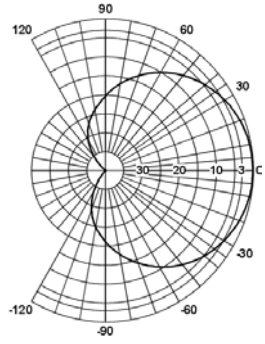
AP186516-CT2

Horizontal Beamwidth, deg 65
Gain, dBi 17
Electrical Downtilt, deg 2

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	1710-1880
Horizontal Beamwidth, deg	65
Vertical Beamwidth, deg	7.5
Gain, dBi (dBd)	17 (14.9)
1st Upper Sidelobe Suppression, dB	> 14
Front-To-Back Ratio, dB	35 (typical 40)
VSWR	< 1.3:1
Maximum Power Input, W	400
Polarization	Vertical
3rd Order IMP @ 2 x 43 dBm, dBc	> 150
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	1310 x 198 x 50 (51.55 x 7.79 x 1.97)
Survival Wind Speed, km/h (mph)	160 (100)
Max Wind Loading Area, m² (ft²)	0.26 (2.78)
Rated Wind Speed, km/h (mph)	160 (100)
Maximum Thrust @ Rated Wind, N (lbf)	422 (95)
Front Thrust @ Rated Wind, N (lbf)	422 (95)
Reflector Material	Aluminum
Radiating Element Material	Aluminum
Radome Material	Fiberglass
Radome Color	Light Grey RAL7035
Weight w/o Mtg Hardware, kg (lb)	4.7 (10.34)
Packing Dimensions - HxWxD, m (ft)	1.4 x 0.3 x 0.17 (4.62 x 0.99 x 0.56)
Packing Dimensions, HxWxD, mm (in)	1410 x 300 x 170 (55.48 x 11.81 x 6.69)



Vertical Pattern



Horizontal Pattern

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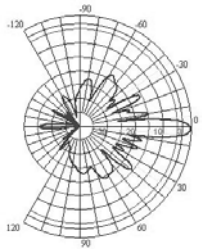
CELlite® Fixed Tilt Antennas

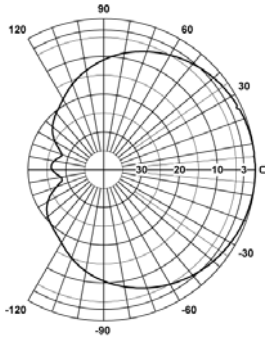
AP189014-CT0

Horizontal Beamwidth, deg 90
Gain, dBi 16.1
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	1710-1880
Horizontal Beamwidth, deg	90
Vertical Beamwidth, deg	7.5
Gain, dBi (dBd)	16.1 (14)
1st Upper Sidelobe Suppression, dB	> 14
Front-To-Back Ratio, dB	> 25
VSWR	< 1.3:1
Maximum Power Input, W	400
Polarization	Vertical
3rd Order IMP @ 2 x 43 dBm, dBc	> 150
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	1310 x 198 x 50 (51.55 x 7.79 x 1.97)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.26 (2.78)
Rated Wind Speed, km/h (mph)	160 (100)
Maximum Thrust @ Rated Wind, N (lbf)	422 (95)
Front Thrust @ Rated Wind, N (lbf)	422 (95)
Reflector Material	Aluminum
Radiating Element Material	Aluminum
Radome Material	Fiberglass
Radome Color	Light Grey RAL7035
Weight w/o Mtg Hardware, kg (lb)	4.2 (9.24)
Packing Dimensions - HxWxD, m (ft)	1.4 x 0.3 x 0.17 (4.62 x 0.99 x 0.56)
Packing Dimensions, HxWxD, mm (in)	1410 x 300 x 170 (55.48 x 11.81 x 6.69)



Vertical Pattern

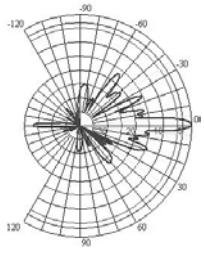


Horizontal Pattern

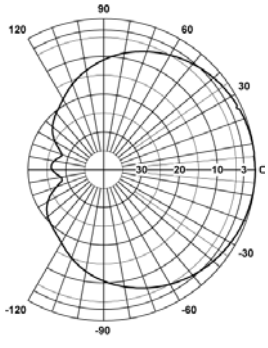
AP189016-CT0

Horizontal Beamwidth, deg 90
Gain, dBi 18
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	1710-1880
Horizontal Beamwidth, deg	90
Vertical Beamwidth, deg	5.5
Gain, dBi (dBd)	18 (15.9)
1st Upper Sidelobe Suppression, dB	> 14
Front-To-Back Ratio, dB	> 25
VSWR	< 1.3:1
Maximum Power Input, W	400
Polarization	Vertical
3rd Order IMP @ 2 x 43 dBm, dBc	> 150
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	1855 x 198 x 50 (72.99 x 7.79 x 1.97)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.37 (3.93)
Rated Wind Speed, km/h (mph)	160 (100)
Maximum Thrust @ Rated Wind, N (lbf)	595 (133)
Front Thrust @ Rated Wind, N (lbf)	595 (133)
Reflector Material	Aluminum
Radiating Element Material	Aluminum
Radome Material	Fiberglass
Radome Color	Light Grey RAL7035
Weight w/o Mtg Hardware, kg (lb)	6 (13.2)
Packing Dimensions - HxWxD, m (ft)	1.9 x 0.3 x 0.17 (6.27 x 0.99 x 0.56)
Packing Dimensions, HxWxD, mm (in)	1960 x 300 x 170 (77.13 x 11.81 x 6.69)



Vertical Pattern



Horizontal Pattern

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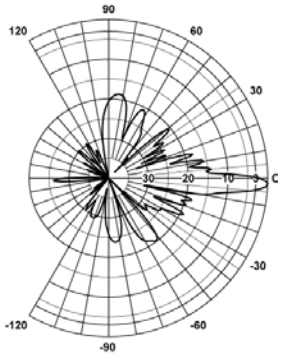
CELlite® Fixed Tilt Antennas

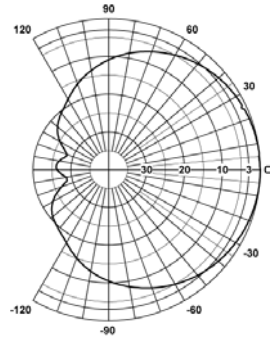
AP189016-CT2

Horizontal Beamwidth, deg 90
Gain, dBi 18
Electrical Downtilt, deg 2

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	1710-1880
Horizontal Beamwidth, deg	90
Vertical Beamwidth, deg	5.5
Gain, dBi (dBd)	18 (15.9)
1st Upper Sidelobe Suppression, dB	> 14
Front-To-Back Ratio, dB	> 25
VSWR	< 1.3:1
Maximum Power Input, W	400
Polarization	Vertical
3rd Order IMP @ 2 x 43 dBm, dBc	> 150
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	1855 x 198 x 50 (72.99 x 7.79 x 1.97)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.37 (3.93)
Rated Wind Speed, km/h (mph)	160 (100)
Maximum Thrust @ Rated Wind, N (lbf)	595 (133)
Front Thrust @ Rated Wind, N (lbf)	595 (133)
Reflector Material	Aluminum
Radiating Element Material	Aluminum
Radome Material	Fiberglass
Radome Color	Light Grey RAL7035
Weight w/o Mtg Hardware, kg (lb)	6 (13.2)
Packing Dimensions - HxWxD, m (ft)	1.9 x 0.3 x 0.17 (6.27 x 0.99 x 0.56)
Packing Dimensions, HxWxD, mm (in)	1960 x 300 x 170 (77.13 x 11.81 x 6.69)



Vertical Pattern

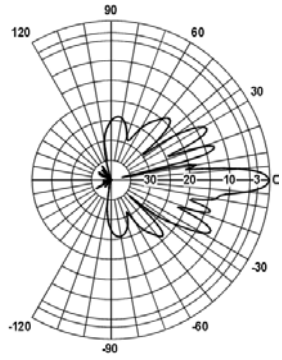


Horizontal Pattern

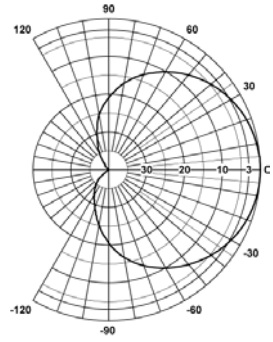
AP196516-CT0

Horizontal Beamwidth, deg 65
Gain, dBi 17.5
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	1850-1990
Horizontal Beamwidth, deg	65
Vertical Beamwidth, deg	7
Gain, dBi (dBd)	17.5 (15.4)
1st Upper Sidelobe Suppression, dB	> 14
Front-To-Back Ratio, dB	35 (typical 40)
VSWR	< 1.5:1
Maximum Power Input, W	400
Polarization	Vertical
3rd Order IMP @ 2 x 43 dBm, dBc	> 150
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	1310 x 198 x 50 (51.55 x 7.79 x 1.97)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.26 (2.78)
Rated Wind Speed, km/h (mph)	160 (100)
Maximum Thrust @ Rated Wind, N (lbf)	422 (95)
Front Thrust @ Rated Wind, N (lbf)	422 (95)
Reflector Material	Aluminum
Radiating Element Material	Aluminum
Radome Material	Fiberglass
Radome Color	Light Grey RAL7035
Weight w/o Mtg Hardware, kg (lb)	4.7 (10.34)
Packing Dimensions - HxWxD, m (ft)	1.4 x 0.3 x 0.17 (4.62 x 0.99 x 0.56)
Packing Dimensions, HxWxD, mm (in)	1410 x 300 x 170 (55.48 x 11.81 x 6.69)



Vertical Pattern



Horizontal Pattern

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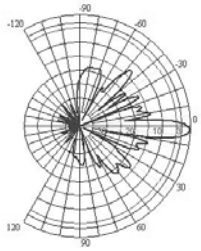
CELlite® Fixed Tilt Antennas

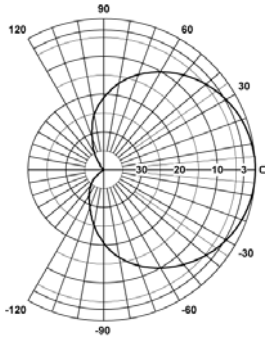
AP196516-CT2

Horizontal Beamwidth, deg 65
Gain, dBi 17.5
Electrical Downtilt, deg 2

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	1850-1990
Horizontal Beamwidth, deg	65
Vertical Beamwidth, deg	7
Gain, dBi (dBd)	17.5 (15.4)
1st Upper Sidelobe Suppression, dB	> 14
Front-To-Back Ratio, dB	35 (typical 40)
VSWR	< 1.5:1
Maximum Power Input, W	400
Polarization	Vertical
3rd Order IMP @ 2 x 43 dBm, dBc	> 150
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	1310 x 198 x 50 (51.55 x 7.79 x 1.97)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.26 (2.78)
Rated Wind Speed, km/h (mph)	160 (100)
Maximum Thrust @ Rated Wind, N (lbf)	422 (95)
Front Thrust @ Rated Wind, N (lbf)	422 (95)
Reflector Material	Aluminum
Radiating Element Material	Aluminum
Radome Material	Fiberglass
Radome Color	Light Grey RAL7035
Weight w/o Mtg Hardware, kg (lb)	4.7 (10.34)
Packing Dimensions - HxWxD, m (ft)	1.4 x 0.3 x 0.17 (4.62 x 0.99 x 0.56)
Packing Dimensions, HxWxD, mm (in)	1410 x 300 x 170 (55.48 x 11.81 x 6.69)



Vertical Pattern

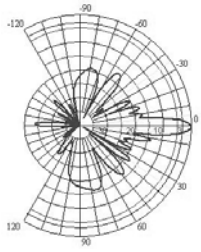


Horizontal Pattern

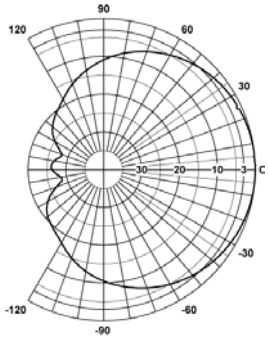
AP199014-CT0

Horizontal Beamwidth, deg 90
Gain, dBi 15.6
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	1850-1990
Horizontal Beamwidth, deg	90
Vertical Beamwidth, deg	7.5
Gain, dBi (dBd)	15.6 (13.5)
1st Upper Sidelobe Suppression, dB	> 14
Front-To-Back Ratio, dB	> 25
VSWR	< 1.5:1
Maximum Power Input, W	400
Polarization	Vertical
3rd Order IMP @ 2 x 43 dBm, dBc	> 150
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	1310 x 198 x 50 (51.55 x 7.79 x 1.97)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.26 (2.78)
Rated Wind Speed, km/h (mph)	160 (100)
Maximum Thrust @ Rated Wind, N (lbf)	422 (95)
Front Thrust @ Rated Wind, N (lbf)	422 (95)
Reflector Material	Aluminum
Radiating Element Material	Aluminum
Radome Material	Fiberglass
Radome Color	Light Grey RAL7035
Weight w/o Mtg Hardware, kg (lb)	4.2 (9.24)
Packing Dimensions - HxWxD, m (ft)	1.4 x 0.3 x 0.17 (4.62 x 0.99 x 0.56)
Packing Dimensions, HxWxD, mm (in)	1410 x 300 x 170 (55.48 x 11.81 x 6.69)



Vertical Pattern



Horizontal Pattern

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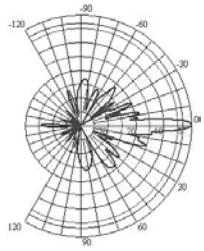
CELlite® Fixed Tilt Antennas

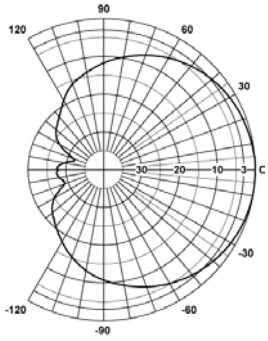
AP199016-CT0

Horizontal Beamwidth, deg 90
Gain, dBi 17.5
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	1850-1990
Horizontal Beamwidth, deg	90
Vertical Beamwidth, deg	5
Gain, dBi (dBd)	17.5 (15.4)
1st Upper Sidelobe Suppression, dB	> 14
Front-To-Back Ratio, dB	30
VSWR	< 1.3:1
Maximum Power Input, W	400
Polarization	Vertical
3rd Order IMP @ 2 x 43 dBm, dBc	> 150
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	1855 x 198 x 50 (72.99 x 7.79 x 1.97)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.37 (3.93)
Rated Wind Speed, km/h (mph)	160 (100)
Maximum Thrust @ Rated Wind, N (lbf)	595 (133)
Front Thrust @ Rated Wind, N (lbf)	595 (133)
Reflector Material	Aluminum
Radiating Element Material	Aluminum
Radome Material	Fiberglass
Radome Color	Light Grey RAL7035
Weight w/o Mtg Hardware, kg (lb)	6 (13.2)
Packing Dimensions - HxWxD, m (ft)	1.9 x 0.3 x 0.17 (6.27 x 0.99 x 0.56)
Packing Dimensions, HxWxD, mm (in)	1960 x 300 x 170 (77.13 x 11.81 x 6.69)



Vertical Pattern

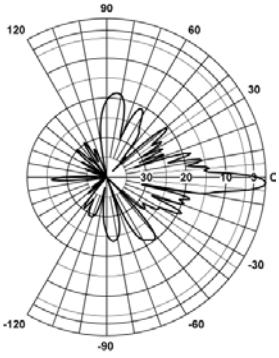


Horizontal Pattern

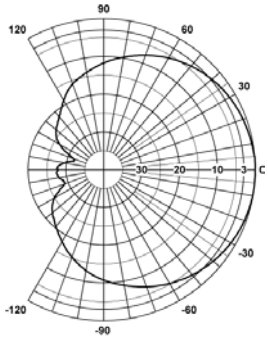
AP199016-CT2

Horizontal Beamwidth, deg 90
Gain, dBi 17.5
Electrical Downtilt, deg 2

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	1850-1990
Horizontal Beamwidth, deg	90
Vertical Beamwidth, deg	5
Gain, dBi (dBd)	17.5 (15.4)
1st Upper Sidelobe Suppression, dB	> 14
Front-To-Back Ratio, dB	30
VSWR	< 1.3:1
Maximum Power Input, W	400
Polarization	Vertical
3rd Order IMP @ 2 x 43 dBm, dBc	> 150
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	1855 x 198 x 50 (72.99 x 7.79 x 1.97)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.37 (3.93)
Rated Wind Speed, km/h (mph)	160 (100)
Maximum Thrust @ Rated Wind, N (lbf)	595 (133)
Front Thrust @ Rated Wind, N (lbf)	595 (133)
Reflector Material	Aluminum
Radiating Element Material	Aluminum
Radome Material	Fiberglass
Radome Color	Light Grey RAL7035
Weight w/o Mtg Hardware, kg (lb)	6 (13.2)
Packing Dimensions - HxWxD, m (ft)	1.9 x 0.3 x 0.17 (6.27 x 0.99 x 0.56)
Packing Dimensions, HxWxD, mm (in)	1960 x 300 x 170 (77.13 x 11.81 x 6.69)



Vertical Pattern



Horizontal Pattern

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Maximizer® Fixed Tilt Antennas

Polarization: Vertical
Electrical Downtilt: Fixed
Horizontal beamwidth: 65° or 90°

APL1990 Series

Applications

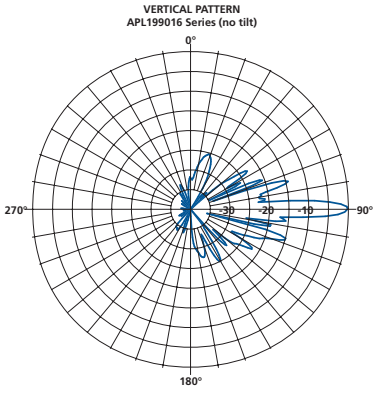
This well-known range of fixed tilt antennas are vertically polarized for space diversity with an option of 65° or 90 degree horizontal beamwidths for use in the following cellular standards:

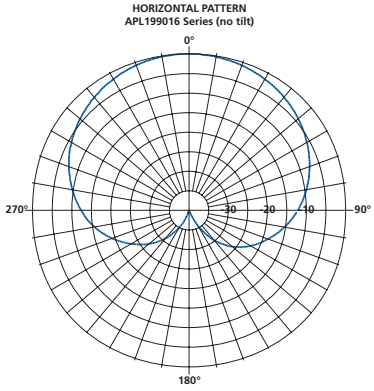
PCS1900 (1850-1910, 1930-1990MHz)

Due to its monolithic mechanical design these highly reliable antennas are IM3 free with extremely stable ageing. Maximizer® antennas are available in a variety of gain options varying from 13.6 to 18.1 dBi with with fixed tilt options. These antennas are covered by a UV stabilized high impact ABS radome and have one 7-16 connectors mounted at the back. They are all designed for use with either our APM18/19 fixed mount or our APM20/21 downtilt mount.

Features & Benefits

- High gain
- Stable horizontal and vertical beamwidths
- Optimized null fill
- 45 dB Front-to-Back ratio
- Fast horizontal pattern roll-off
- Efficient co-channel interference reduction
- High reliability no solder joints





Performance Optimization Techniques

The RFS Maximizer® log periodic dipole array boasts the highest front-to-back ever achieved: 45dB.

The Maximizer's upper lobe suppression reduces co-channel interference in TDMA systems and its heavy null fill delivers exceptional close-in coverage. For CDMA systems the Maximizer helps to maximize capacity by minimizing the soft hand-off zone as well a pilot pollution.

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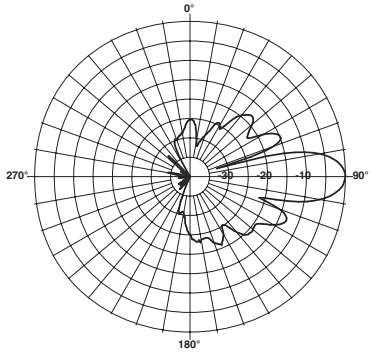
Maximizer® Fixed Tilt Antennas

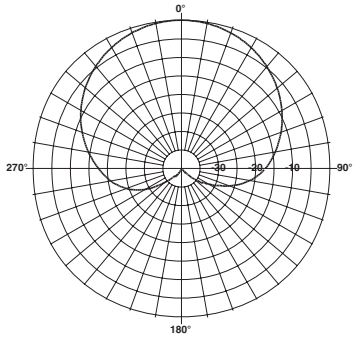
APL196513-42T0

Horizontal Beamwidth, deg 65
Gain, dBi 15.1
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	1850-1990
Horizontal Beamwidth, deg	65
Vertical Beamwidth, deg	15
Gain, dBi (dBd)	15.1 (13)
Front-To-Back Ratio, dB	45
VSWR	< 1.5:1
Maximum Power Input, W	500
Polarization	Vertical
3rd Order IMP @ 2 x 43 dBm, dBc	<-143
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	610 x 127 x 102 (24 x 5 x 4)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.077 (0.83)
Rated Wind Speed, km/h (mph)	200 (125)
Maximum Thrust @ Rated Wind, N (lbf)	231 (52)
Reflector Material	5032-H32 Aluminum
Radiating Element Material	Aluminum Alloy
Radome Material	UV-Stabilized High Impact ABS
Weight w/o Mtg Hardware, kg (lb)	2 (4)
Packing Dimensions, HxWxD, mm (in)	813 x 356 x 254 (32 x 14 x 10)



Vertical Pattern

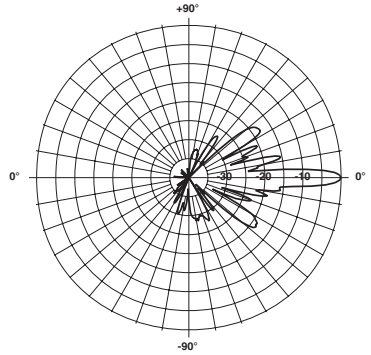


Horizontal Pattern

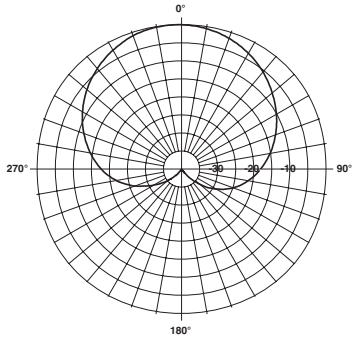
APL196516-42T0

Horizontal Beamwidth, deg 65
Gain, dBi 18.1
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	1850-1990
Horizontal Beamwidth, deg	65
Vertical Beamwidth, deg	6
Gain, dBi (dBd)	18.1 (16)
1st Upper Sidelobe Suppression, dB	> 18
Upper Sidelobe Suppression, dB	> 18
Front-To-Back Ratio, dB	45
VSWR	< 1.5:1
Maximum Power Input, W	500
Polarization	Vertical
3rd Order IMP @ 2 x 43 dBm, dBc	<-143
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	1600 x 127 x 102 (63 x 5 x 4)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.204 (2.2)
Rated Wind Speed, km/h (mph)	200 (125)
Maximum Thrust @ Rated Wind, N (lbf)	391 (88)
Reflector Material	5032-H32 Aluminum
Radiating Element Material	Aluminum Alloy
Radome Material	UV-Stabilized High Impact ABS
Weight w/o Mtg Hardware, kg (lb)	4 (8)
Packing Dimensions, HxWxD, mm (in)	2083 x 356 x 254 (82 x 14 x 10)



Vertical Pattern



Horizontal Pattern

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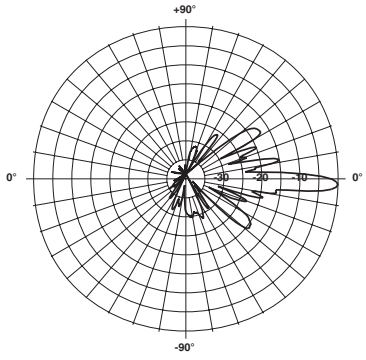
Maximizer® Fixed Tilt Antennas

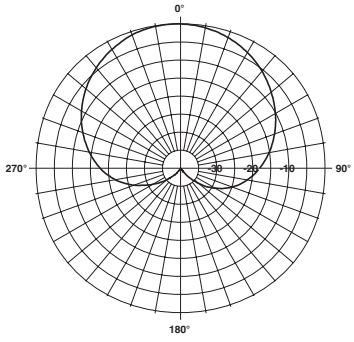
APL196516-42T2

Horizontal Beamwidth, deg 65
Gain, dBi 18.1
Electrical Downtilt, deg 2

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	1850-1990
Horizontal Beamwidth, deg	65
Vertical Beamwidth, deg	6
Gain, dBi (dBd)	18.1 (16)
1st Upper Sidelobe Suppression, dB	> 18
Upper Sidelobe Suppression, dB	> 18
Front-To-Back Ratio, dB	45
VSWR	< 1.5:1
Maximum Power Input, W	500
Polarization	Vertical
3rd Order IMP @ 2 x 43 dBm, dBc	<-143
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	1600 x 127 x 102 (63 x 5 x 4)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.204 (2.2)
Rated Wind Speed, km/h (mph)	200 (125)
Maximum Thrust @ Rated Wind, N (lbf)	391 (88)
Reflector Material	5032-H32 Aluminum
Radiating Element Material	Aluminum Alloy
Radome Material	UV-Stabilized High Impact ABS
Weight w/o Mtg Hardware, kg (lb)	4 (8)
Packing Dimensions, HxWxD, mm (in)	2083 x 356 x 254 (82 x 14 x 10)



Vertical Pattern

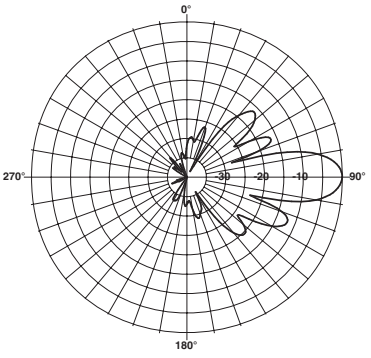


Horizontal Pattern

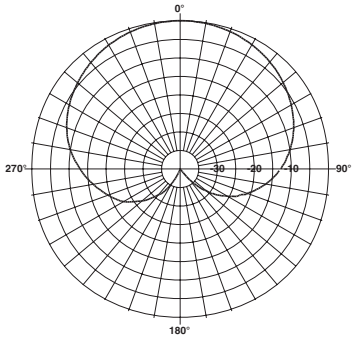
APL199012-42T0

Horizontal Beamwidth, deg 90
Gain, dBi 13.6
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	1850-1990
Horizontal Beamwidth, deg	90
Vertical Beamwidth, deg	15
Gain, dBi (dBd)	13.6 (11.5)
Front-To-Back Ratio, dB	45
VSWR	< 1.5:1
Maximum Power Input, W	500
Polarization	Vertical
3rd Order IMP @ 2 x 43 dBm, dBc	<-143
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	610 x 102 x 102 (24 x 4 x 4)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.046 (0.5)
Rated Wind Speed, km/h (mph)	200 (125)
Maximum Thrust @ Rated Wind, N (lbf)	119 (26.7)
Reflector Material	5052-H32 Aluminum
Radiating Element Material	Aluminum Alloy
Radome Material	UV Stabilized High Impact ABS
Weight w/o Mtg Hardware, kg (lb)	1 (3)
Packing Dimensions, HxWxD, mm (in)	813 x 305 x 203 (32 x 12 x 8)



Vertical Pattern



Horizontal Pattern

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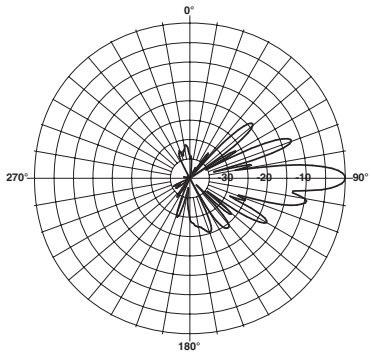
Maximizer® Fixed Tilt Antennas

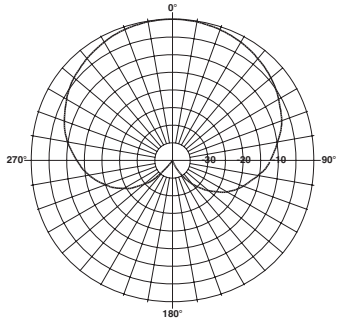
APL199014-42T0

Horizontal Beamwidth, deg 90
Gain, dBi 16.1
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	1850-1990
Horizontal Beamwidth, deg	90
Vertical Beamwidth, deg	7
Gain, dBi (dBd)	16.1 (14)
1st Upper Sidelobe Suppression, dB	> 18
Upper Sidelobe Suppression, dB	> 18
Front-To-Back Ratio, dB	45
VSWR	< 1.5:1
Maximum Power Input, W	500
Polarization	Vertical
3rd Order IMP @ 2 x 43 dBm, dBc	<-143
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	1219 x 102 x 102 (48 x 4 x 4)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.093 (1)
Rated Wind Speed, km/h (mph)	200 (125)
Maximum Thrust @ Rated Wind, N (lbf)	237 (53.3)
Reflector Material	5052-H32 Aluminum
Radiating Element Material	Aluminum Alloy
Radome Material	UV Stabilized High Impact ABS
Weight w/o Mtg Hardware, kg (lb)	3 (6)
Packing Dimensions, HxWxD, mm (in)	1422 x 305 x 203 (56 x 12 x 8)



Vertical Pattern

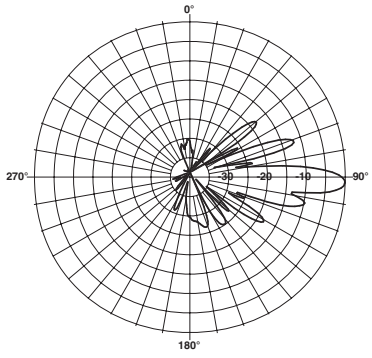


Horizontal Pattern

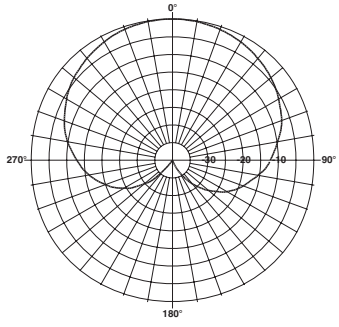
APL199014-42T2

Horizontal Beamwidth, deg 90
Gain, dBi 16.1
Electrical Downtilt, deg 2

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	1850-1990
Horizontal Beamwidth, deg	90
Vertical Beamwidth, deg	7
Gain, dBi (dBd)	16.1 (14)
1st Upper Sidelobe Suppression, dB	> 18
Upper Sidelobe Suppression, dB	> 18
Front-To-Back Ratio, dB	45
VSWR	< 1.5:1
Maximum Power Input, W	500
Polarization	Vertical
3rd Order IMP @ 2 x 43 dBm, dBc	<-143
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	1219 x 102 x 102 (48 x 4 x 4)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.093 (1)
Rated Wind Speed, km/h (mph)	200 (125)
Maximum Thrust @ Rated Wind, N (lbf)	237 (53.3)
Reflector Material	5052-H32 Aluminum
Radiating Element Material	Aluminum Alloy
Radome Material	UV Stabilized High Impact ABS
Weight w/o Mtg Hardware, kg (lb)	3 (6)
Packing Dimensions, HxWxD, mm (in)	1422 x 305 x 203 (56 x 12 x 8)



Vertical Pattern



Horizontal Pattern

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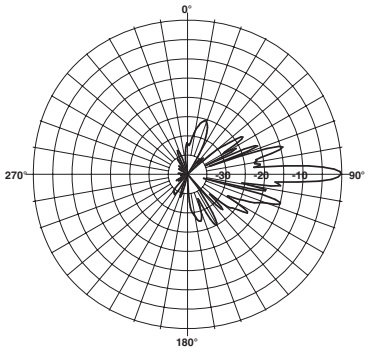
Maximizer® Fixed Tilt Antennas

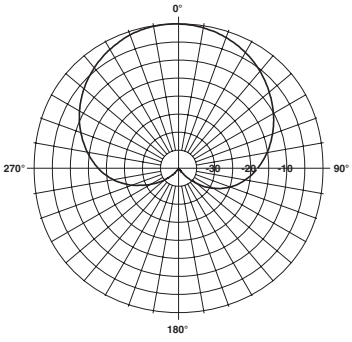
APL199016-42T0

Horizontal Beamwidth, deg 90
Gain, dBi 18.1
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	1850-1990
Horizontal Beamwidth, deg	90
Vertical Beamwidth, deg	4
Gain, dBi (dBd)	18.1 (16)
1st Upper Sidelobe Suppression, dB	> 18
Upper Sidelobe Suppression, dB	> 18
Front-To-Back Ratio, dB	45
VSWR	< 1.5:1
Maximum Power Input, W	500
Polarization	Vertical
3rd Order IMP @ 2 x 43 dBm, dBc	<-143
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	1829 x 127 x 102 (72 x 5 x 4)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.234 (2.5)
Rated Wind Speed, km/h (mph)	200 (125)
Maximum Thrust @ Rated Wind, N (lbf)	445 (100)
Reflector Material	5052-H32 Aluminum
Radiating Element Material	Aluminum Alloy
Radome Material	UV Stabilized High Impact ABS
Weight w/o Mtg Hardware, kg (lb)	4 (8)
Packing Dimensions, HxWxD, mm (in)	2083 x 356 x 254 (82 x 14 x 10)



Vertical Pattern

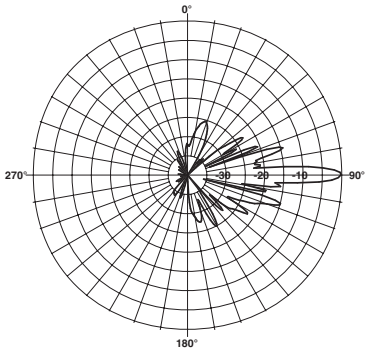


Horizontal Pattern

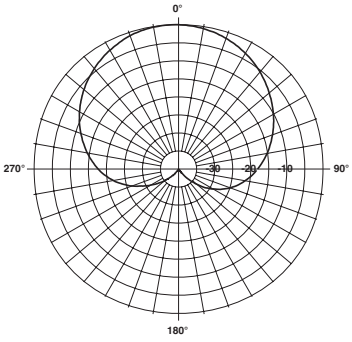
APL199016-42T2

Horizontal Beamwidth, deg 90
Gain, dBi 18.1
Electrical Downtilt, deg 2

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	1850-1990
Horizontal Beamwidth, deg	90
Vertical Beamwidth, deg	4
Gain, dBi (dBd)	18.1 (16)
1st Upper Sidelobe Suppression, dB	> 18
Upper Sidelobe Suppression, dB	> 18
Front-To-Back Ratio, dB	45
VSWR	< 1.5:1
Maximum Power Input, W	500
Polarization	Vertical
3rd Order IMP @ 2 x 43 dBm, dBc	<-143
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	1829 x 127 x 102 (72 x 5 x 4)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.234 (2.5)
Rated Wind Speed, km/h (mph)	200 (125)
Maximum Thrust @ Rated Wind, N (lbf)	445 (100)
Reflector Material	5052-H32 Aluminum
Radiating Element Material	Aluminum Alloy
Radome Material	UV Stabilized High Impact ABS
Weight w/o Mtg Hardware, kg (lb)	4 (8)
Packing Dimensions, HxWxD, mm (in)	2083 x 356 x 254 (82 x 14 x 10)



Vertical Pattern



Horizontal Pattern

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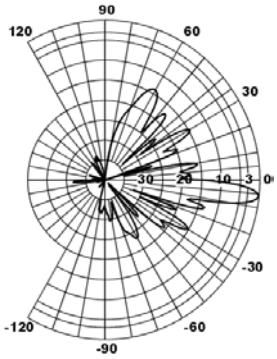
APV20* Series 1900-2170 MHz

Optimizer® Single Band Antenna

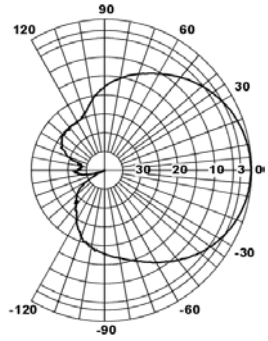
APV206515-C

Horizontal Beamwidth, deg 63
Gain, dBi 17.2
Electrical Downtilt, deg 0 - 7

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	1900-2170
Horizontal Beamwidth, deg	63
Vertical Beamwidth, deg	6.5
Gain, dBi (dBd)	17.2 (15.1)
Front-To-Back Ratio, dB	> 30
VSWR	< 1.5:1
Maximum Power Input, W	300
Polarization	Vertical
7th Order IMP @ 2x46 dBm, dBc	> 170
MECHANICAL SPECIFICATIONS	
Dimensions - HxWxD, mm (in)	1320 x 175 x 80 (52 x 6.89 x 3.15)
Survival Wind Speed, km/h (mph)	200 (125)
Max Wind Loading Area, m² (ft²)	0.26 (2.78)
Rated Wind Speed, km/h (mph)	160 (100)
Maximum Thrust @ Rated Wind, N (lbf)	507 (114)
Front Thrust @ Rated Wind, N (lbf)	507 (114)
Reflector Material	Aluminum
Radiating Element Material	Aluminum
Radome Material	Fiberglass
Radome Color	Light Grey RAL7035
Weight w/o Mtg Hardware, kg (lb)	8 (17.6)
Packing Dimensions - HxWxD, m (ft)	1.5 x 0.3 x 0.22 (4.95 x 0.99 x 0.75)
Packing Dimensions, HxWxD, mm (in)	1490 x 300 x 220 (58.63 x 11.81 x 8.66)



Vertical Pattern



Horizontal Pattern

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Broadband Side-by-Side Antennas

Polarization: Dual ± 45°
Electrical Downtilt: Adjustable
Horizontal beamwidth: 65°
Broadband
Tilt range: 10°

APX*DWV-*DWV* Series

Applications

This innovative range of broadband side-by-side variable tilt antennas are cross polarized, available in 65° horizontal beamwidths for use in the following systems:

DCS1800 (1710-1785, 1805-1880MHz)
PCS (1850-1910, 1930-1990MHz)
UMTS (1920-1980, 2110-2170MHz)

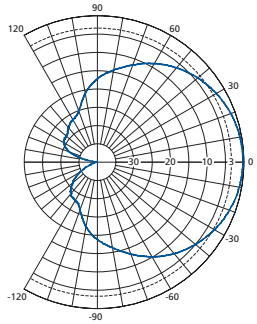
This antenna arrangement allows for two high performance variable tilt antennas to be mounted side-by-side in a single radome. This configuration provides an easy upgrade path for the addition of 3G as both antennas can be optimized separately. These high performance antennas have excellent upper sidelobe suppression, VSWR and front to back ratio. The antennas are available in a variety of gain options from 14.7 to 19.0 dBi.

The antennas are covered by a fiberglass radome with continuously adjustable electrical downtilt over the range of 0° to 10° for each antenna. Four 7-16 connectors mounted at the bottom and is designed for use with our APM40 global mount / APM70-3C cluster kit. As with all our variable tilt antenna range they can be upgraded using our OPTIMIZER RT system for remote tilt control.

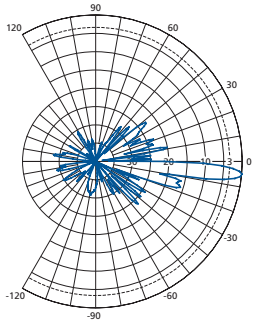
A combination of fixed and variable tilt antennas in the side-by-side configuration are available upon request.

Features & Benefits

- Constant performance across frequency band for all tilt values
- Side by side constructions allow independent tilt control of each antenna half
- High gain
- High suppression of all upper sidelobes (typically <-20 dB)
- Electrical downtilt in field adjustable in the range of 10° for each antenna
- At least 30 dB isolation between polarization's
- At least 30 dB isolation between band
- Stable horizontal and vertical beamwidths
- Slanted DP antenna allows air combining, thus 3dB saving in power budget
- Effective polarization diversity ensured by high cross polar discrimination
- Broadband design
- Low wind load
- Optional remote tilt – can be retrofitted



Horizontal Pattern



Vertical Pattern

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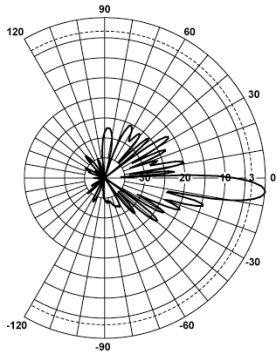
Broadband Side-by-Side Antennas

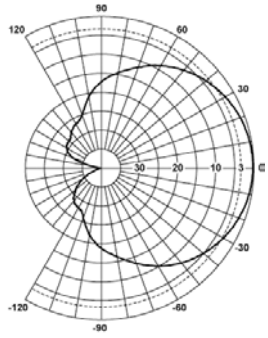
APX13DWV-13DWV-C

Horizontal Beamwidth, deg 65
Gain, dBi 15.1
Electrical Downtilt, deg 2-12 , 2-12

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	1710-1900	1900-2170
Horizontal Beamwidth, deg	68	63
Vertical Beamwidth, deg	15.3	13.6
Gain, dBi (dBd)	14.7 (12.6)	15.1 (13.0)
Upper Sidelobe Suppression, dB	>18 all (Typically >20)	
Front-To-Back Ratio, dB	> 28	
VSWR	< 1.5:1	
Isolation between Ports, dB	> 30	
Isolation Between Bands, dB	> 30	
Maximum Power Input, W	300	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 38 dBm, dBc	> 160	
7th Order IMP @ 2x46 dBm, dBc		> 170
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	700 x 330 x 80 (27.5 x 13 x 3.15)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.64 (6.6)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	787 (177)	
Front Thrust @ Rated Wind, N (lbf)	787 (177)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	18.0 (39.6)	
Packing Dimensions - HxWxD, m (ft)	0.86 x .42 x .21 (2.81 x 1.37 x 0.69)	
Packing Dimensions, HxWxD, mm (in)	860 x 420 x 210 (33.8 x 16.5 x 8.3)	



Vertical Pattern

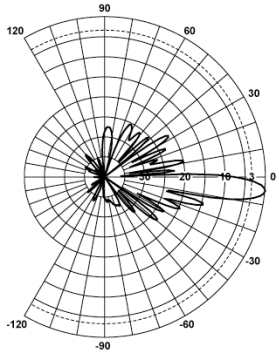


Horizontal Pattern

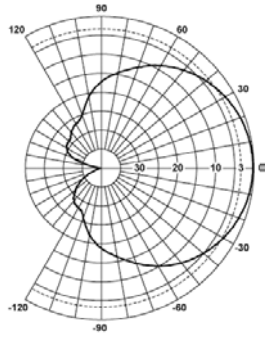
APX13DWV-13DWVT-C

Horizontal Beamwidth, deg 65
Gain, dBi 15.4
Electrical Downtilt, deg 0-10 , 0-10

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	1710-1900	1900-2170
Horizontal Beamwidth, deg	68	63
Vertical Beamwidth, deg	15.3	13.6
Gain, dBi (dBd)	14.9 (12.8)	15.4 (13.3)
Upper Sidelobe Suppression, dB	>18	
Front-To-Back Ratio, dB	> 28	
VSWR	< 1.5:1	
Isolation between Ports, dB	> 30	
Isolation Between Bands, dB	> 30	
Maximum Power Input, W	300	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 38 dBm, dBc	> 160	
7th Order IMP @ 2x46 dBm, dBc		> 170
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	700 x 330 x 80 (27.5 x 13 x 3.15)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.64 (6.6)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	787 (177)	
Front Thrust @ Rated Wind, N (lbf)	787 (177)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	18.0 (39.6)	
Packing Dimensions - HxWxD, m (ft)	0.86 x .42 x .21 (2.81 x 1.37 x 0.69)	
Packing Dimensions, HxWxD, mm (in)	860 x 420 x 210 (33.8 x 16.5 x 8.3)	



Vertical Pattern



Horizontal Pattern

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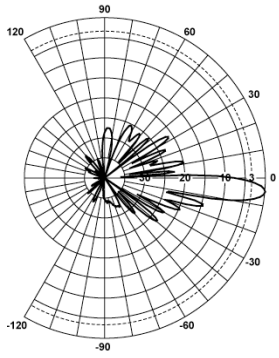
Broadband Side-by-Side Antennas

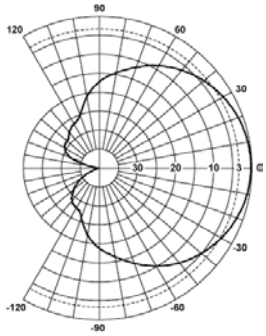
APX16DWV-16DWVL-C

Horizontal Beamwidth, deg 65
Gain, dBi 18.0
Electrical Downtilt, deg 0-10 , 0-10

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	1710-1900	1900-2170
Horizontal Beamwidth, deg	63	55
Vertical Beamwidth, deg	7	6.4
Gain, dBi (dBd)	17.6 (15.5)	18.0 (16.0)
Upper Sidelobe Suppression, dB	>17	>18 all (Typically >20)
Front-To-Back Ratio, dB	>28	>30
VSWR	< 1.5:1	
Isolation between Ports, dB	> 30	
Isolation Between Bands, dB	> 30	
Maximum Power Input, W	300	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 38 dBm, dBc	> 160	
7th Order IMP @ 2x46 dBm, dBc		> 170
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	1349 x 330 x 80 (53 x 13 x 3.15)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.64 (6.6)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	787 (177)	
Front Thrust @ Rated Wind, N (lbf)	787 (177)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	18.0 (39.6)	
Packing Dimensions - HxWxD, m (ft)	1.5 x .42 x .21 (5.08 x 1.37 x 0.69)	
Packing Dimensions, HxWxD, mm (in)	1550 x 420 x 210 (61 x 16.5 x 8.3)	



Vertical Pattern

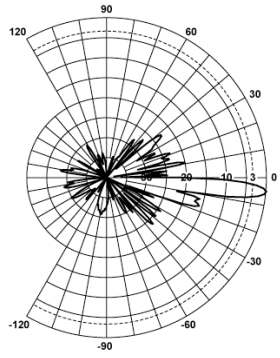


Horizontal Pattern

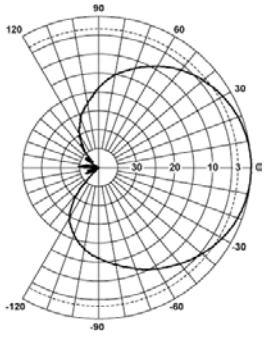
APX17DWV-17DWV-C

Horizontal Beamwidth, deg 65
Gain, dBi 19.0
Electrical Downtilt, deg 0-10 , 0-10

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	1710-1900	1900-2170
Horizontal Beamwidth, deg	64	58
Vertical Beamwidth, deg	5.5	5.0
Gain, dBi (dBd)	18.8 (16.7)	19.0 (16.9)
Upper Sidelobe Suppression, dB	>17	>18 all (Typically >20)
Front-To-Back Ratio, dB	> 30	
VSWR	< 1.5:1	
Isolation between Ports, dB	> 30	
Isolation Between Bands, dB	> 30	
Maximum Power Input, W	300	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 38 dBm, dBc	> 160	
7th Order IMP @ 2x46 dBm, dBc		> 170
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	1850 x 330 x 80 (73 x 13 x 3.15)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.64 (6.6)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	787 (177)	
Front Thrust @ Rated Wind, N (lbf)	787 (177)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	18.0 (39.6)	
Packing Dimensions - HxWxD, m (ft)	2.0 x .42 x .21 (5.08 x 1.37 x 0.69)	
Packing Dimensions, HxWxD, mm (in)	2021 x 420 x 210 (61 x 16.5 x 8.3)	



Vertical Pattern



Horizontal Pattern

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Optimizer® Dualband Antennas

Polarization: Dual ± 45°
Electrical Downtilt: Variable
Horizontal beamwidth: 65°
Tilt range: 10°

APXGV-DV* & APXGV-DWV* Series
APXCV-PV*

Applications

These new dual band GSM 900 / DCS 1800 and Cellular 800 / PCS 1900 and GSM 900 / DCS 1800 - UMTS variable tilt antennas are cross polarized with a 65° horizontal beamwidth for use in the following systems:

Low Band
Cellular 800 (824-849, 869-894 MHz) for APXCV-PV series
GSM 900 (872-915, 917-960MHz) for APXGV-DWV series

High Band
DCS1800 (1710-1785, 1805-1880MHz) for APXGV-DV series
PCS (1850-1910, 1930-1990MHz) for APXCV-PV series
UMTS (1920-1980, 2110-2170MHz) for APXG*-DW* series

These antennas have enhanced performance with excellent tilt range, gain, sidelobe suppression, VSWR and front to back ratio.

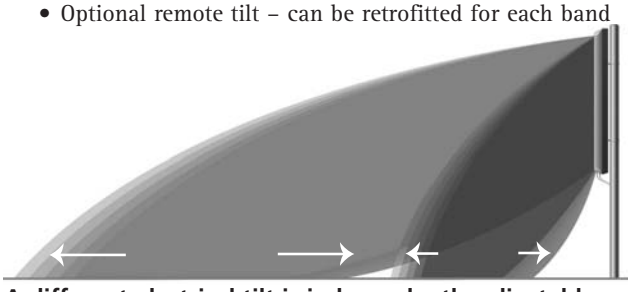
These antennas provide an easy upgrade path for the addition of 3G/UMTS as high band and low band can optimized separately. Antennas are available in two gain options 14/17 and 16/18 dBi.

Covered by a fiberglass radome, these antennas feature an independent continuously adjustable electrical downtilt for each band. Four 7-16 connectors are mounted at the bottom (two 7-16 connectors for duplexed model).

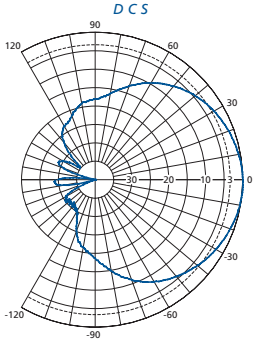
All antennas are designed for use with our APM40 global mount as well as the APM70- 3C cluster kit.

Features & Benefits

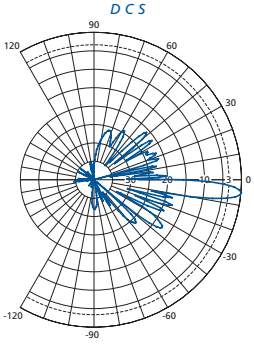
- Side by side construction allows independent adjustable tilt control of each antenna array
- High gain on both bands
- High suppression of all upper sidelobes
- At least 30 dB isolation between polarizations
- At least 30 dB isolation between bands
- Stable horizontal and vertical beamwidths
- Broadband design for high band
- Low wind load
- Optional remote tilt – can be retrofitted for each band



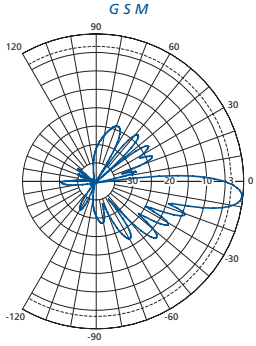
A different electrical tilt is independently adjustable for low band and high band allowing a tight control of both coverage footprints.



Horizontal Pattern



Vertical Pattern



Vertical Pattern

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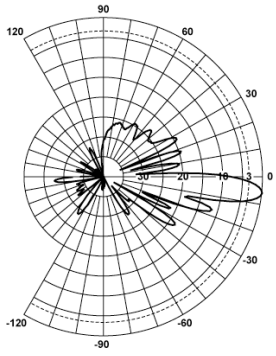
APXGV-DV* & APXGV-DWV* Series 870-2170 MHz

Optimizer® Dualband Antennas

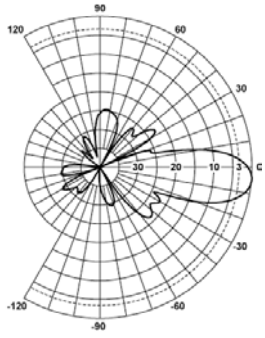
APX13GV-15DV-C

Horizontal Beamwidth, deg 65
Gain, dBi 13.9 , 16.5
Electrical Downtilt, deg 0-10 , 0-10
Diplexed Version

ELECTRICAL SPECIFICATIONS			
Frequency Range, MHz	870-960		1710-1880
Horizontal Beamwidth, deg	65		65
Vertical Beamwidth, deg	14.7		7.0
Gain, dBi (dBd)	13.9 (11.8)		16.5 (14.4)
1st Upper Sidelobe Suppression, dB	> 20		> 18 (typically > 20)
Upper Sidelobe Suppression, dB	> 16@T0	> 15@T5	> 14@T10
Front-To-Back Ratio, dB		> 25	
VSWR		< 1.5:1	
Isolation between Ports, dB		> 30	
Isolation Between Bands, dB		> 30	
Maximum Power Input, W	250		200
Polarization		Dual pol +/-45°	
3rd Order IMP @ 2 x 38 dBm, dBc			>160 (DCS)
3rd Order IMP @ 2 x 43 dBm, dBc	> 150 (GSM)		
MECHANICAL SPECIFICATIONS			
Dimensions - HxWxD, mm (in)	1549 x 330 x 130 (53 x 13 x 5.12)		
Survival Wind Speed, km/h (mph)	200 (125)		
Max Wind Loading Area, m² (ft²)	0.78 (8.23)		
Rated Wind Speed, km/h (mph)	160 (100)		
Maximum Thrust @ Rated Wind, N (lbf)	780 (175)		
Front Thrust @ Rated Wind, N (lbf)	780 (175)		
Reflector Material	Aluminum		
Radiating Element Material	Brass		
Radome Material	Fiberglass		
Radome Color	Light Grey RAL7035		
Weight w/o Mtg Hardware, kg (lb)	21 (46.2)		
Packing Dimensions - HxWxD, m (ft)	1.7 x .4 x .26 (5.61 x 1.3 x 0.85)		
Packing Dimensions, HxWxD, mm (in)	1720 x 400 x 260 (62.55 x 15.7 x 10.2)		



Vertical Pattern-DCS

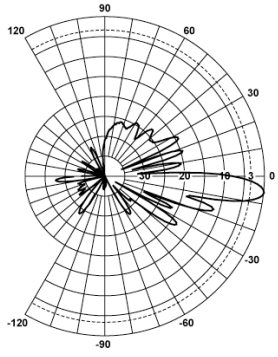


Vertical Pattern-GSM

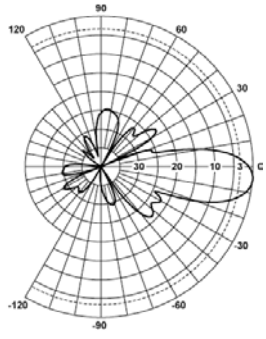
APX13GV-15DVB-C

Horizontal Beamwidth, deg 65
Gain, dBi 14.4 , 17.0
Electrical Downtilt, deg 0-10 , 0-10

ELECTRICAL SPECIFICATIONS			
Frequency Range, MHz	870-960		1710-1880
Horizontal Beamwidth, deg	65		65
Vertical Beamwidth, deg	14.7		7.0
Gain, dBi (dBd)	14.4 (12.3)		17.0 (14.9)
1st Upper Sidelobe Suppression, dB	> 20		> 18 (typically > 20)
Upper Sidelobe Suppression, dB	> 18@T0	> 17@T5	> 15.5@T10
Front-To-Back Ratio, dB		> 25	
VSWR		< 1.5:1	
Isolation between Ports, dB		> 30	
Isolation Between Bands, dB		> 30	
Maximum Power Input, W	500		300
Polarization		Dual pol +/-45°	
3rd Order IMP @ 2 x 38 dBm, dBc			>160 (DCS)
3rd Order IMP @ 2 x 43 dBm, dBc	> 150 (GSM)		
MECHANICAL SPECIFICATIONS			
Dimensions - HxWxD, mm (in)	1349 x 330 x 130 (53 x 13 x 5.12)		
Survival Wind Speed, km/h (mph)	200 (125)		
Max Wind Loading Area, m² (ft²)	0.54 (5.7)		
Rated Wind Speed, km/h (mph)	160 (100)		
Maximum Thrust @ Rated Wind, N (lbf)	663 (149)		
Front Thrust @ Rated Wind, N (lbf)	663 (149)		
Reflector Material	Aluminum		
Radiating Element Material	Brass		
Radome Material	Fiberglass		
Radome Color	Light Grey RAL7035		
Weight w/o Mtg Hardware, kg (lb)	18.0 (39.6)		
Packing Dimensions - HxWxD, m (ft)	1.5 x .26 x .20 (4.9 x 1.3 x 0.85)		
Packing Dimensions, HxWxD, mm (in)	1520 x 400 x 260 (59.8 x 15.7 x 10.2)		



Vertical Pattern-DCS



Vertical Pattern-GSM

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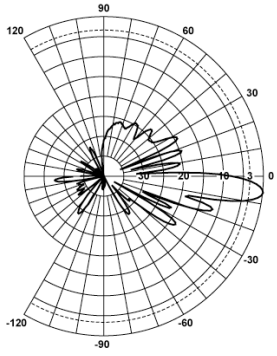
Optimizer® Dualband Antennas

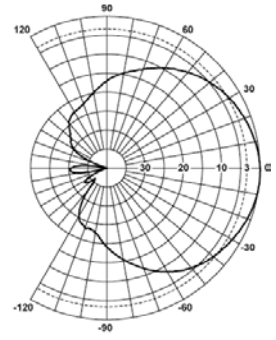
APX13GV-15DWV-C

Horizontal Beamwidth, deg 65
Gain, dBi 13.9 , 16.7
Electrical Downtilt, deg 0-10 , 2-10
Diplexed Version

ELECTRICAL SPECIFICATIONS			
Frequency Range, MHz	870-960	1710-1900	1900-2170
Horizontal Beamwidth, deg	65	64	60
Vertical Beamwidth, deg	14.7	7	6.8
Gain, dBi	13.9 (11.8)	16.7 (14.6)	16.7 (14.6)
1st Upper Sidelobe Suppression, dB	> 17.5 first GSM DCS > 17UMTS (typically > 20)		
Upper Sidelobe Suppression, dB	> 16 GSM DCS > 16 UMTS (typically > 20)		
Front-To-Back Ratio, dB	> 25		
VSWR	< 1.5:1		
Isolation between Ports, dB	> 30		
Isolation Between Bands, dB	> 30		
Maximum Power Input, W	250	200	200
Polarization	Dual pol +/-45°		
3rd Order IMP @ 2 x 38 dBm, dBc	>160		
3rd Order IMP @ 2 x 43 dBm, dBc	> 150 (GSM)		
7th Order IMP @ 2x46 dBm, dBc			> 170
MECHANICAL SPECIFICATIONS			
Dimensions - HxWxD, mm (in)	1549 x 330 x 130 (53 x 13 x 5.12)		
Survival Wind Speed, km/h (mph)	200 (125)		
Max Wind Loading Area, m² (ft²)	0.78 (8.23)		
Rated Wind Speed, km/h (mph)	160 (100)		
Maximum Thrust @ Rated Wind, N (lbf)	780 (175)		
Front Thrust @ Rated Wind, N (lbf)	780 (175)		
Reflector Material	Aluminum		
Radiating Element Material	Brass		
Radome Material	Fiberglass		
Radome Color	Light Grey RAL7035		
Weight w/o Mtg Hardware, kg (lb)	21 (46.2)		
Packing Dimensions - HxWxD, m (ft)	1.7 x .4 x .26 (5.61 x 1.3 x 0.85)		
Packing Dimensions, HxWxD, mm (in)	1720 x 400 x 260 (62.55 x 15.7 x 10.2)		



Vertical Pattern-DCS

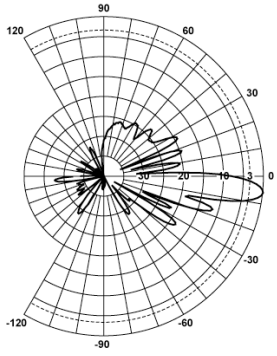


Horizontal Pattern

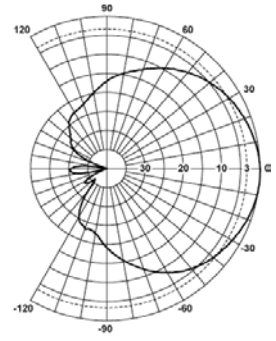
APX13GV-15DWVB-C

Horizontal Beamwidth, deg 65
Gain, dBi 14.4 , 17.0
Electrical Downtilt, deg 0-10 , 2-10

ELECTRICAL SPECIFICATIONS			
Frequency Range, MHz	870-960	1710-1900	1900-2170
Horizontal Beamwidth, deg	65	64	60
Vertical Beamwidth, deg	14.7	7	6.8
Gain, dBi (dBd)	14.4 (12.3)	17.0 (14.9)	17.0 (14.9)
1st Upper Sidelobe Suppression, dB	> 17.5 first GSM DCS > 17UMTS (typically > 20)		
Upper Sidelobe Suppression, dB	> 16 GSM DCS > 16 UMTS (typically > 20)		
Front-To-Back Ratio, dB	> 25		
VSWR	< 1.5:1		
Isolation between Ports, dB	> 30		
Isolation Between Bands, dB	> GSM - DCS >30	GSM - UMTS >27	GSM - UMTS >27
Maximum Power Input, W	500	300	300
Polarization	Dual pol +/-45°		
3rd Order IMP @ 2 x 38 dBm, dBc	>160		
3rd Order IMP @ 2 x 43 dBm, dBc	> 150 (GSM)		
7th Order IMP @ 2x46 dBm, dBc			> 170
MECHANICAL SPECIFICATIONS			
Dimensions - HxWxD, mm (in)	1349 x 330 x 130 (53 x 13 x 5.12)		
Survival Wind Speed, km/h (mph)	200 (125)		
Max Wind Loading Area, m² (ft²)	0.54 (5.7)		
Rated Wind Speed, km/h (mph)	160 (100)		
Maximum Thrust @ Rated Wind, N (lbf)	663 (149)		
Front Thrust @ Rated Wind, N (lbf)	663 (149)		
Reflector Material	Aluminum		
Radiating Element Material	Brass		
Radome Material	Fiberglass		
Radome Color	Light Grey RAL7035		
Weight w/o Mtg Hardware, kg (lb)	18.0 (39.6)		
Packing Dimensions - HxWxD, m (ft)	1.5 x .26 x .20 (4.9 x 0.85 x 0.65)		
Packing Dimensions, HxWxD, mm (in)	1520 x 400 x 260 (59.8 x 15.7 x 10.2)		



Vertical Pattern-DCS



Horizontal Pattern

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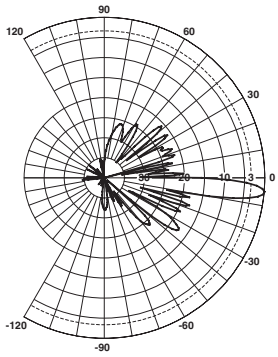
Optimizer® Dualband Antennas

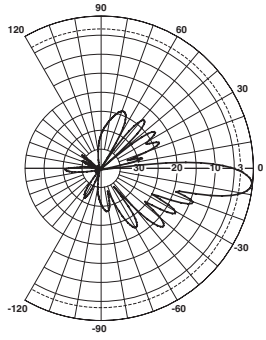
APX15GV-15DV-C

Horizontal Beamwidth, deg 65
Gain, dBi 15.9 , 17.5
Electrical Downtilt, deg 0-10 , 0-10
Diplexed Version

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	870-960	1710-1880
Horizontal Beamwidth, deg	65	66
Vertical Beamwidth, deg	9	5
Gain, dBi (dBd)	15.9 (13.8)	17.5 (15.4)
1st Upper Sidelobe Suppression, dB	> 18 (typically > 20)	
Upper Sidelobe Suppression, dB	> 17 all other (typically > 20)	
Front-To-Back Ratio, dB	> 25	
VSWR	< 1.5:1	
Isolation between Ports, dB	> 30	
Isolation Between Bands, dB	> 30	
Maximum Power Input, W	250	200
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 38 dBm, dBc		>160 (DCS)
3rd Order IMP @ 2 x 43 dBm, dBc	> 150 (GSM)	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	2280 x 330 x 130 (53 x 13 x 5.12)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.99 (9.4)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	1220 (274)	
Front Thrust @ Rated Wind, N (lbf)	1220 (274)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	31.0 (68.2)	
Packing Dimensions - HxWxD, m (ft)	2.4 x .40 x .26 (7.92 x 1.3 x 0.85)	
Packing Dimensions, HxWxD, mm (in)	2450 x 400 x 260 (89.1 x 15.7 x 10.2)	



Vertical Pattern-DCS

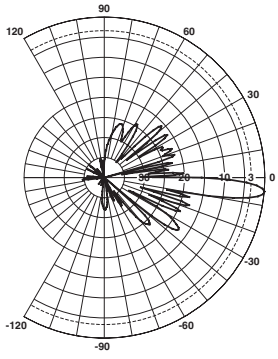


Vertical Pattern-GSM

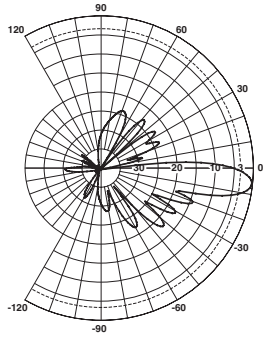
APX15GV-15DVB-C

Horizontal Beamwidth, deg 65
Gain, dBi 16.0 , 18.0
Electrical Downtilt, deg 0-10 , 0-10

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	870-960	1710-1880
Horizontal Beamwidth, deg	65	66
Vertical Beamwidth, deg	9	5
Gain, dBi (dBd)	16.0 (13.9)	18.0 (16.0)
1st Upper Sidelobe Suppression, dB	> 18 first (typically > 20)	
Upper Sidelobe Suppression, dB	> 17 all other (typically > 20)	
Front-To-Back Ratio, dB	> 25	
VSWR	< 1.5:1	
Isolation between Ports, dB	> 30	
Isolation Between Bands, dB	> 30	
Maximum Power Input, W	500	300
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 38 dBm, dBc		>160 (DCS)
3rd Order IMP @ 2 x 43 dBm, dBc	> 150 (GSM)	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	2080 x 330 x 130 (53 x 13 x 5.12)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.89 (9.4)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	1095 (246)	
Front Thrust @ Rated Wind, N (lbf)	1095 (246)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	28.0 (61.6)	
Packing Dimensions - HxWxD, m (ft)	2.2 x .40 x .26 (7.3x 1.3 x 0.85)	
Packing Dimensions, HxWxD, mm (in)	2250 x 400 x 260 (88.5 x 15.7 x 10.2)	



Vertical Pattern-DCS



Vertical Pattern-GSM

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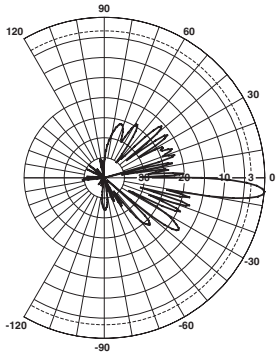
Optimizer® Dualband Antennas

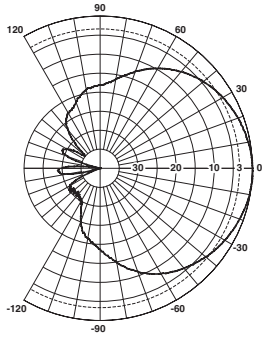
APX15GV-15DWV-C

Horizontal Beamwidth, deg 65
Gain, dBi 15.5 , 17.7
Electrical Downtilt, deg 0-10 , 2-10 , 2-10
Diplexed Version

ELECTRICAL SPECIFICATIONS			
Frequency Range, MHz	870-960	1710-1900	1900-2170
Horizontal Beamwidth, deg	65	64	60
Vertical Beamwidth, deg	9	5	5
Gain, dBi (dBd)	15.5 (13.4)	17.7 (15.6)	17.7 (15.6)
1st Upper Sidelobe Suppression, dB	> 18 first GSM DCS > 17UMTS (typically > 20)		
Upper Sidelobe Suppression, dB	> 16 GSM DCS > 15.5 UMTS (typically > 20)		
Front-To-Back Ratio, dB	> 25		
VSWR	< 1.5:1		
Isolation between Ports, dB	> 30		
Isolation Between Bands, dB	> 30		
Maximum Power Input, W	250	200	200
Polarization	Dual pol +/-45°		
3rd Order IMP @ 2 x 38 dBm, dBc	>160 (DCS)		
3rd Order IMP @ 2 x 43 dBm, dBc	> 150 (GSM)		
7th Order IMP @ 2x46 dBm, dBc			> 170
MECHANICAL SPECIFICATIONS			
Dimensions - HxWxD, mm (in)	2280 x 330 x 130 (81.8 x 13 x 5.12)		
Survival Wind Speed, km/h (mph)	200 (125)		
Max Wind Loading Area, m² (ft²)	0.99 (9.4)		
Rated Wind Speed, km/h (mph)	160 (100)		
Maximum Thrust @ Rated Wind, N (lbf)	1220 (274)		
Front Thrust @ Rated Wind, N (lbf)	1220 (274)		
Reflector Material	Aluminum		
Radiating Element Material	Brass		
Radome Material	Fiberglass		
Radome Color	Light Grey RAL7035		
Weight w/o Mtg Hardware, kg (lb)	31.0 (68.2)		
Packing Dimensions - HxWxD, m (ft)	2.4 x .40 x .26 (7.92 x 1.3 x 0.85)		
Packing Dimensions, HxWxD, mm (in)	2450 x 400 x 260 (89.1 x 15.7 x 10.2)		



Vertical Pattern-DCS

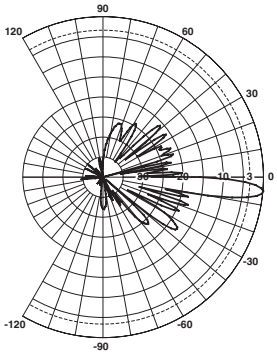


Horizontal Pattern

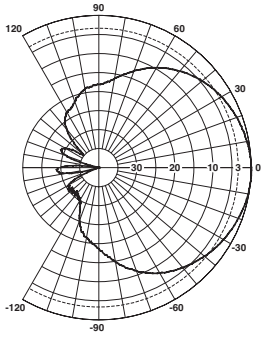
APX15GV-15DWVB-C

Horizontal Beamwidth, deg 65
Gain, dBi 16.0 , 18.5
Electrical Downtilt, deg 0-10 , 2-10 , 2-10

ELECTRICAL SPECIFICATIONS			
Frequency Range, MHz	870-960	1710-1900	1900-2170
Horizontal Beamwidth, deg	65	64	60
Vertical Beamwidth, deg	9	5	5
Gain, dBi (dBd)	16.0 (13.9)	18.3 (16.3)	18.5 (16.5)
1st Upper Sidelobe Suppression, dB	> 18 first GSM DCS > 17UMTS (typically > 20)		
Upper Sidelobe Suppression, dB	> 16 GSM DCS > 15.5 UMTS (typically > 20)		
Front-To-Back Ratio, dB	> 25		
VSWR	< 1.5:1		
Isolation between Ports, dB	> 30		
Isolation Between Bands, dB	> GSM - DCS >30	GSM - UMTS>27	DCS - UMTS >30
Maximum Power Input, W	500		300
Polarization	Dual pol +/-45°		
3rd Order IMP @ 2 x 38 dBm, dBc	>160 (DCS)		
3rd Order IMP @ 2 x 43 dBm, dBc	> 150 (GSM)		
7th Order IMP @ 2x46 dBm, dBc			> 170
MECHANICAL SPECIFICATIONS			
Dimensions - HxWxD, mm (in)	2080 x 330 x 130 (81.8 x 13 x 5.12)		
Survival Wind Speed, km/h (mph)	200 (125)		
Max Wind Loading Area, m² (ft²)	0.89 (9.4)		
Rated Wind Speed, km/h (mph)	160 (100)		
Maximum Thrust @ Rated Wind, N (lbf)	1095 (246)		
Front Thrust @ Rated Wind, N (lbf)	1095 (246)		
Reflector Material	Aluminum		
Radiating Element Material	Brass		
Radome Material	Fiberglass		
Radome Color	Light Grey RAL7035		
Weight w/o Mtg Hardware, kg (lb)	28.0 (61.6)		
Packing Dimensions - HxWxD, m (ft)	2.2 x .40 x .26 (7.3x 1.3 x 0.85)		
Packing Dimensions, HxWxD, mm (in)	2250 x 400 x 260 (88.5 x 15.7 x 10.2)		



Vertical Pattern-DCS



Horizontal Pattern

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Optimizer® Dualband Antennas

Polarization: Dual ± 45°
Electrical Downtilt: Fixed
Horizontal beamwidth: 65°

APXG*-D* & APXG*-DW* Series

Applications

These new dual band GSM 900 / DCS 1800 and GSM 900 / DCS 1800 - UMTS fixed tilt antennas are cross polarized with a 65° horizontal beamwidth for use in the following systems:

Low Band
GSM 900 (872-915, 917-960MHz)

High Band
DCS1800 (1710-1785, 1805-1880MHz)
PCS (1850-1910, 1930-1990MHz) (APXG*-DW* series)
UMTS (1920-1980, 2110-2170MHz) (APXG*-DW* series)

These antennas have enhanced performance with multiple tilt values, gain, sidelobe suppression, VSWR and front to back ratio.

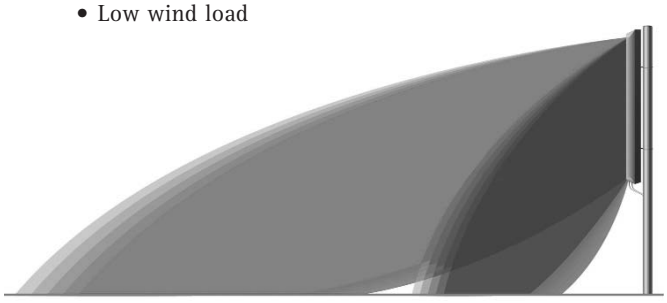
These antennas provide an easy upgrade path for the addition of high band or 3G/UMTS as each band can used a different tilt value ranging from 0°, 2°, 6° and 8° for the low band and 6° and 8° for the high band.

Antennas are available in two gain options 14.5/17 and 16.5/18dBi. The antennas are covered by a fiberglass radome and equipped with four 7-16 connectors mounted at the bottom (two 7-16 connectors for duplexed model).

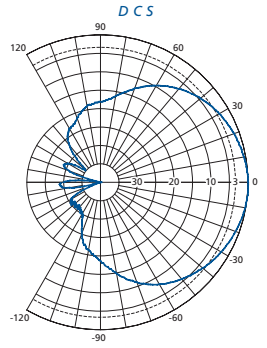
All antennas are designed for use with our APM40 global mount as well as the APM70- 3C cluster kit.

Features & Benefits

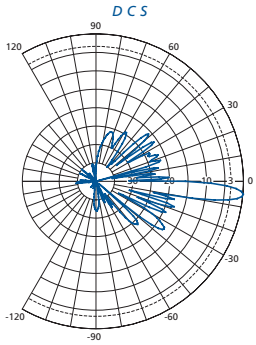
- Side by side construction allows independent tilt value of each antenna array
- High gain on both bands
- High suppression of all upper sidelobes
- At least 30 dB isolation between polarizations
- At least 30 dB isolation between bands
- Stable horizontal and vertical beamwidths
- Broadband design for high band
- Low wind load



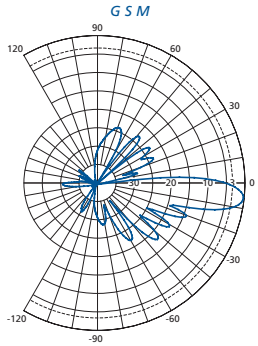
A different electrical tilt value can be selected independently for low band and high band allowing a tight control of both coverage footprints.



Horizontal Pattern



Vertical Pattern



Vertical Pattern

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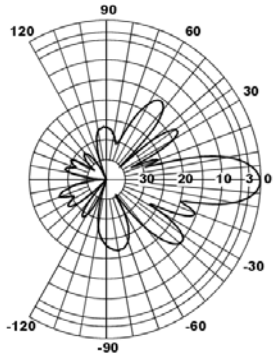
APXG*-D* & APXG*-DW* Series 870-2170 MHz

Optimizer® Dual-Band Panel Dual Polarized Antennas

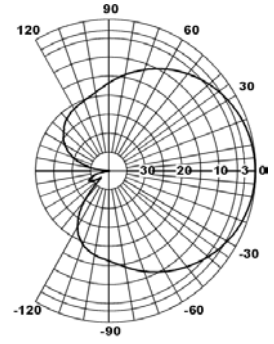
APX13G0-15D2L-C

Horizontal Beamwidth, deg 65
Gain, dBi 14.4 , 16.6
Electrical Downtilt, deg 0 , 2
Diplexed Version

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	870-960	1710-1880
Horizontal Beamwidth, deg	65	65
Vertical Beamwidth, deg	13.5	7
Gain, dBi (dBd)	14.4 (12.3)	16.6 (14.5)
1st Upper Sidelobe Suppression, dB	> 18	
Front-To-Back Ratio, dB	> 27	
VSWR	< 1.5:1	
Isolation between Ports, dB	> 30	
Isolation Between Bands, dB	> 30	
Maximum Power Input, W	500	300
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	> 150
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	1350 x 330 x 130 (53.15 x 13 x 5.12)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.45 (4.81)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	685 (154)	
Front Thrust @ Rated Wind, N (lbf)	685 (154)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	12 (26.4)	
Packing Dimensions - HxWxD, m (ft)	1.5 x 0.4 x 0.25 (4.95 x 1.32 x 0.83)	
Packing Dimensions, HxWxD, mm (in)	1520 x 400 x 250 (59.8 x 15.75 x 9.84)	



Low Band Vertical Pattern

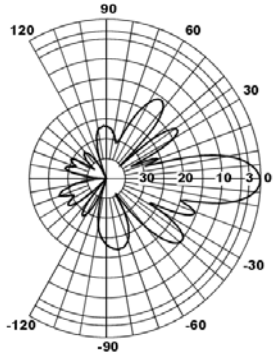


Low Band Horizontal Pattern

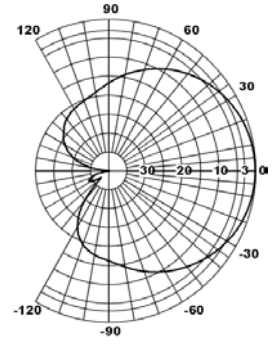
APX13G0-15D2BL-C

Horizontal Beamwidth, deg 65
Gain, dBi 14.6 , 16.8
Electrical Downtilt, deg 0 , 2

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	870-960	1710-1880
Horizontal Beamwidth, deg	65	65
Vertical Beamwidth, deg	13.5	7
Gain, dBi (dBd)	14.6 (12.5)	16.8 (14.7)
1st Upper Sidelobe Suppression, dB	> 18	
Front-To-Back Ratio, dB	> 27	
VSWR	< 1.5:1	
Isolation between Ports, dB	> 30	
Isolation Between Bands, dB	> 30	
Maximum Power Input, W	500	300
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	> 150
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	1350 x 330 x 130 (53.15 x 13 x 5.12)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.45 (4.81)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	685 (154)	
Front Thrust @ Rated Wind, N (lbf)	685 (154)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	12 (26.4)	
Packing Dimensions - HxWxD, m (ft)	1.5 x 0.4 x 0.25 (4.95 x 1.32 x 0.83)	
Packing Dimensions, HxWxD, mm (in)	1520 x 400 x 250 (59.8 x 15.75 x 9.84)	



Low Band Vertical Pattern



Low Band Horizontal Pattern

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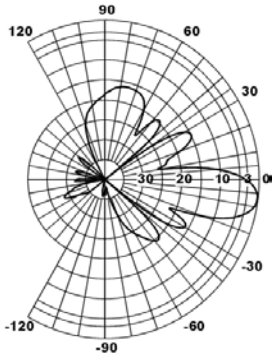
Optimizer® Dual-Band Panel Dual Polarized Antennas

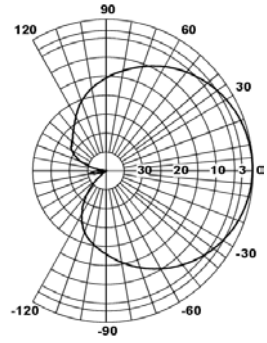
APX13G8-15D6L-C

Horizontal Beamwidth, deg 65
Gain, dBi 14.4 , 16.6
Electrical Downtilt, deg 8 , 6
Diplexed Version

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	870-960	1710-1880
Horizontal Beamwidth, deg	65	65
Vertical Beamwidth, deg	14	7
Gain, dBi (dBd)	14.4 (12.3)	16.6 (14.5)
1st Upper Sidelobe Suppression, dB	> 18 (typ 20)	
Front-To-Back Ratio, dB	> 27	
VSWR	< 1.4:1	
Isolation between Ports, dB	> 30	
Isolation Between Bands, dB	> 30	
Maximum Power Input, W	500	300
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	> 150
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	1350 x 330 x 130 (53.15 x 13 x 5.12)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.45 (4.81)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	685 (154)	
Front Thrust @ Rated Wind, N (lbf)	685 (154)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	12 (26.4)	
Packing Dimensions - HxWxD, m (ft)	1.5 x 0.4 x 0.25 (4.95 x 1.32 x 0.83)	
Packing Dimensions, HxWxD, mm (in)	1520 x 400 x 250 (59.8 x 15.75 x 9.84)	



Low Band Vertical Pattern

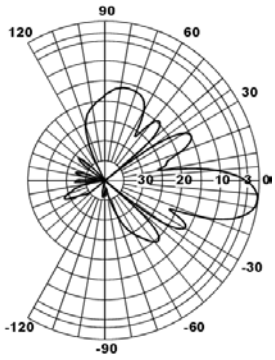


Low Band Horizontal Pattern

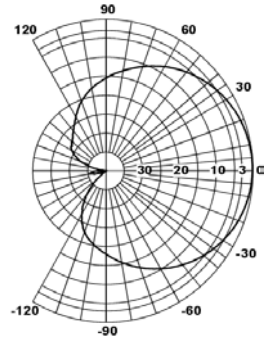
APX13G8-15D6BL-C

Horizontal Beamwidth, deg 65
Gain, dBi 14.6 , 16.8
Electrical Downtilt, deg 8 , 6

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	870-960	1710-1880
Horizontal Beamwidth, deg	65	65
Vertical Beamwidth, deg	14	7
Gain, dBi (dBd)	14.6 (12.5)	16.8 (14.7)
1st Upper Sidelobe Suppression, dB	> 18 (typ 20)	
Front-To-Back Ratio, dB	> 27	
VSWR	< 1.4:1	
Isolation between Ports, dB	> 30	
Isolation Between Bands, dB	> 30	
Maximum Power Input, W	500	300
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	> 150
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	1350 x 330 x 130 (53.15 x 13 x 5.12)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.45 (4.81)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	685 (154)	
Front Thrust @ Rated Wind, N (lbf)	685 (154)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	12 (26.4)	
Packing Dimensions - HxWxD, m (ft)	1.5 x 0.4 x 0.25 (4.95 x 1.32 x 0.83)	
Packing Dimensions, HxWxD, mm (in)	1520 x 400 x 250 (59.8 x 15.75 x 9.84)	



Low Band Vertical Pattern



Low Band Horizontal Pattern

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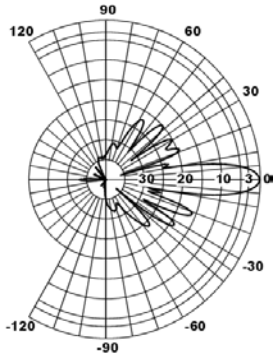
Optimizer® Dual-Band Panel Dual Polarized Antennas

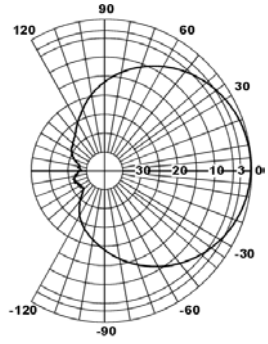
APX15G0-16D2-C

Horizontal Beamwidth, deg 65
Gain, dBi 15.8 , 17.6
Electrical Downtilt, deg 0 , 2
Diplexed Version

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	870-960	1710-1880
Horizontal Beamwidth, deg	65	65
Vertical Beamwidth, deg	9	5
Gain, dBi (dBd)	15.8 (13.7)	17.6 (15.5)
1st Upper Sidelobe Suppression, dB	> 20	> 17 (typ 20)
Front-To-Back Ratio, dB	> 30	
VSWR	< 1.5:1	
Isolation between Ports, dB	> 30	
Isolation Between Bands, dB	> 30	
Maximum Power Input, W	500	300
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	> 150
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	2080 x 330 x 130 (81.89 x 13 x 5.12)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.7 (7.53)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	1050 (236)	
Front Thrust @ Rated Wind, N (lbf)	1050 (236)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	23.4 (51.6)	
Packing Dimensions - HxWxD, m (ft)	2.3 x 0.4 x 0.25 (7.59 x 1.32 x 0.83)	
Packing Dimensions, HxWxD, mm (in)	2255 x 400 x 250 (88.78 x 15.75 x 9.84)	



Vertical Pattern

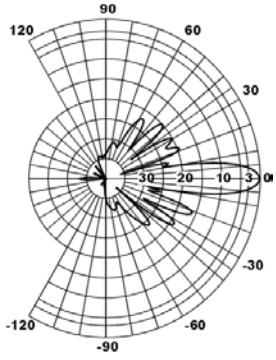


Horizontal Pattern

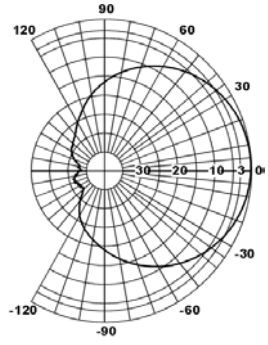
APX15G0-16DW2B-C

Horizontal Beamwidth, deg 65
Gain, dBi 16 , 17.8
Electrical Downtilt, deg 0 , 2

ELECTRICAL SPECIFICATIONS			
Frequency Range, MHz	870-960	1710-1900	1900-2170
Horizontal Beamwidth, deg	65	65	65
Vertical Beamwidth, deg	9	5	5
Gain, dBi (dBd)	16 (13.9)	17.8 (15.7)	17.8 (15.7)
1st Upper Sidelobe Suppression, dB	> 20	> 17 (typ 20)	> 17 (typ 20)
Front-To-Back Ratio, dB		> 30	
VSWR		< 1.5:1	
Isolation between Ports, dB		> 30	
Isolation Between Bands, dB		> 30	
Maximum Power Input, W	500		300
Polarization		Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150		> 150
MECHANICAL SPECIFICATIONS			
Dimensions - HxWxD, mm (in)		2080 x 330 x 130 (81.89 x 13 x 5.12)	
Survival Wind Speed, km/h (mph)		200 (125)	
Max Wind Loading Area, m² (ft²)		0.7 (7.53)	
Rated Wind Speed, km/h (mph)		160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)		1050 (236)	
Front Thrust @ Rated Wind, N (lbf)		1050 (236)	
Reflector Material		Aluminum	
Radiating Element Material		Brass	
Radome Material		Fiberglass	
Radome Color		Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)		23.4 (51.6)	
Packing Dimensions - HxWxD, m (ft)		2.3 x 0.4 x 0.25 (7.59 x 1.32 x 0.83)	
Packing Dimensions, HxWxD, mm (in)		2255 x 400 x 250 (88.78 x 15.75 x 9.84)	



Vertical Pattern



Horizontal Pattern

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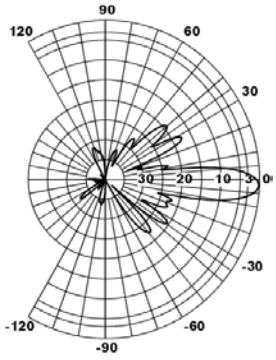
Optimizer® Dual-Band Panel Dual Polarized Antennas

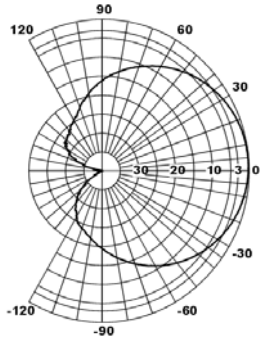
APX15G2-16D2-C

Horizontal Beamwidth, deg 65
Gain, dBi 16.3 , 17.8
Electrical Downtilt, deg 2 , 2
Diplexed Version

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	870-960	1710-1880
Horizontal Beamwidth, deg	65	65
Vertical Beamwidth, deg	9	5
Gain, dBi (dBd)	16.3 (14.2)	17.8 (15.7)
1st Upper Sidelobe Suppression, dB	> 20	> 17 (typ 20)
Front-To-Back Ratio, dB	> 30	
VSWR	< 1.5:1	
Isolation between Ports, dB	> 30	
Isolation Between Bands, dB	> 30	
Maximum Power Input, W	500	300
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	> 150
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	2080 x 330 x 130 (81.89 x 13 x 5.12)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.7 (7.53)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	1050 (236)	
Front Thrust @ Rated Wind, N (lbf)	1050 (236)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	23.4 (51.6)	
Packing Dimensions - HxWxD, m (ft)	2.3 x 0.4 x 0.25 (7.59 x 1.32 x 0.83)	
Packing Dimensions, HxWxD, mm (in)	2255 x 400 x 250 (88.78 x 15.75 x 9.84)	



Low Band Vertical Pattern

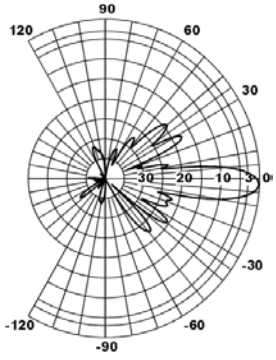


Low Band Horizontal Pattern

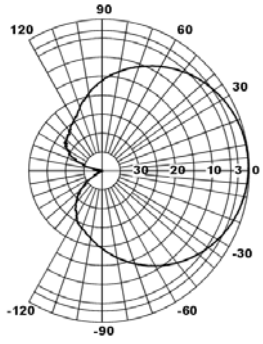
APX15G2-16DW2B-C

Horizontal Beamwidth, deg 65
Gain, dBi 16.5 , 18.3
Electrical Downtilt, deg 2 , 2

ELECTRICAL SPECIFICATIONS			
Frequency Range, MHz	870-960	1710-1900	1900-2170
Horizontal Beamwidth, deg	65	65	65
Vertical Beamwidth, deg	9	5	5
Gain, dBi (dBd)	16.5 (14.4)	18.0 (15.9)	18.3 (16.2)
1st Upper Sidelobe Suppression, dB	> 20	> 17 (typ 20)	> 17 (typ 20)
Front-To-Back Ratio, dB		> 30	
VSWR		< 1.5:1	
Isolation between Ports, dB		> 30	
Isolation Between Bands, dB		> 30	
Maximum Power Input, W	500		300
Polarization		Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150		> 150
MECHANICAL SPECIFICATIONS			
Dimensions - HxWxD, mm (in)		2080 x 330 x 130 (81.89 x 13 x 5.12)	
Survival Wind Speed, km/h (mph)		200 (125)	
Max Wind Loading Area, m² (ft²)		0.7 (7.53)	
Rated Wind Speed, km/h (mph)		160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)		1050 (236)	
Front Thrust @ Rated Wind, N (lbf)		1050 (236)	
Reflector Material		Aluminum	
Radiating Element Material		Brass	
Radome Material		Fiberglass	
Radome Color		Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)		23.4 (51.6)	
Packing Dimensions - HxWxD, m (ft)		2.3 x 0.4 x 0.25 (7.59 x 1.32 x 0.83)	
Packing Dimensions, HxWxD, mm (in)		2255 x 400 x 250 (88.78 x 15.75 x 9.84)	



Low Band Vertical Pattern



Low Band Horizontal Pattern

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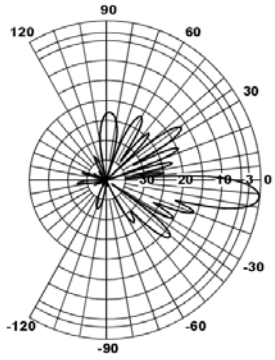
APXG*-D* & APXG*-DW* Series 870-2170 MHz

Optimizer® Dual-Band Panel Dual Polarized Antennas

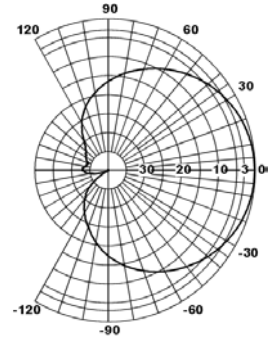
APX15G6-16D2-C

Horizontal Beamwidth, deg 65
Gain, dBi 16.4 , 17.8
Electrical Downtilt, deg 6 , 2
Diplexed Version

ELECTRICAL SPECIFICATIONS			
Frequency Range, MHz	870-960		1710-1880
Horizontal Beamwidth, deg	65		65
Vertical Beamwidth, deg	9		5
Gain, dBi (dBd)	16.4 (14.3)		17.8 (15.7)
1st Upper Sidelobe Suppression, dB	> 20		> 18 (typ 20)
Front-To-Back Ratio, dB		> 30	
VSWR	< 1.4:1		< 1.5:1
Isolation between Ports, dB		> 30	
Isolation Between Bands, dB		> 30	
Maximum Power Input, W	500		300
Polarization		Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150		> 150
MECHANICAL SPECIFICATIONS			
Dimensions - HxWxD, mm (in)		2080 x 330 x 130 (81.89 x 13 x 5.12)	
Survival Wind Speed, km/h (mph)		200 (125)	
Max Wind Loading Area, m² (ft²)		0.7 (7.53)	
Rated Wind Speed, km/h (mph)		160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)		1050 (236)	
Front Thrust @ Rated Wind, N (lbf)		1050 (236)	
Reflector Material		Aluminum	
Radiating Element Material		Brass	
Radome Material		Fiberglass	
Radome Color		Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)		23.4 (51.6)	
Packing Dimensions - HxWxD, m (ft)		2.3 x 0.4 x 0.25 (7.59 x 1.32 x 0.83)	
Packing Dimensions, HxWxD, mm (in)		2255 x 400 x 250 (88.78 x 15.75 x 9.84)	



Low Band Vertical Pattern

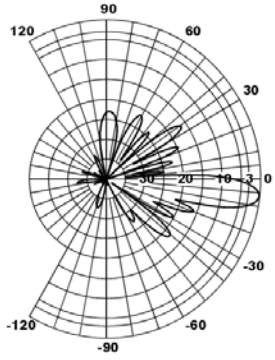


Low Band Horizontal Pattern

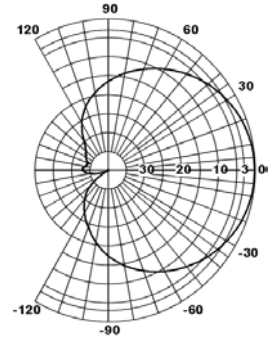
APX15G6-16DW2B-C

Horizontal Beamwidth, deg 65
Gain, dBi 16.6 , 18.3
Electrical Downtilt, deg 6 , 2

ELECTRICAL SPECIFICATIONS			
Frequency Range, MHz	870-960	1710-1900	1900-2170
Horizontal Beamwidth, deg	65	65	65
Vertical Beamwidth, deg	9	5	5
Gain, dBi (dBd)	16.5 (14.4)	18.0 (15.9)	18.3 (16.2)
1st Upper Sidelobe Suppression, dB	> 20	> 18 (typ 20)	> 18 (typ 20)
Front-To-Back Ratio, dB		> 30	
VSWR		< 1.5:1	
Isolation between Ports, dB		> 30	
Isolation Between Bands, dB		> 30	
Maximum Power Input, W	500		300
Polarization		Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150		> 150
MECHANICAL SPECIFICATIONS			
Dimensions - HxWxD, mm (in)		2080 x 330 x 130 (81.89 x 13 x 5.12)	
Survival Wind Speed, km/h (mph)		200 (125)	
Max Wind Loading Area, m² (ft²)		0.7 (7.53)	
Rated Wind Speed, km/h (mph)		160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)		1050 (236)	
Front Thrust @ Rated Wind, N (lbf)		1050 (236)	
Reflector Material		Aluminum	
Radiating Element Material		Brass	
Radome Material		Fiberglass	
Radome Color		Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)		23.4 (51.6)	
Packing Dimensions - HxWxD, m (ft)		2.3 x 0.4 x 0.25 (7.59 x 1.32 x 0.83)	
Packing Dimensions, HxWxD, mm (in)		2255 x 400 x 250 (88.78 x 15.75 x 9.84)	



Low Band Vertical Pattern



Low Band Horizontal Pattern

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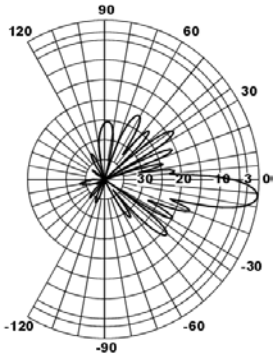
Optimizer® Dual-Band Panel Dual Polarized Antennas

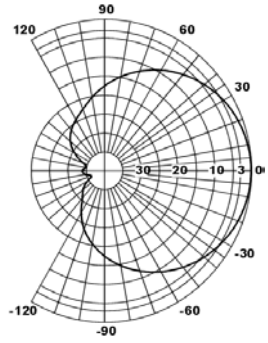
APX15G6-16D6-C

Horizontal Beamwidth, deg 65
Gain, dBi 16.3 , 17.4
Electrical Downtilt, deg 6 , 6
Diplexed Version

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	870-960	1710-1880
Horizontal Beamwidth, deg	65	65
Vertical Beamwidth, deg	9	5
Gain, dBi (dBd)	16.3 (14.2)	17.4 (15.3)
1st Upper Sidelobe Suppression, dB	> 20	> 17 (typ 20)
Front-To-Back Ratio, dB	> 30	
VSWR	< 1.4:1	
Isolation between Ports, dB	> 30	
Isolation Between Bands, dB	> 30	
Maximum Power Input, W	500	300
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	> 150
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	2080 x 330 x 130 (81.89 x 13 x 5.12)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.7 (7.53)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	1050 (236)	
Front Thrust @ Rated Wind, N (lbf)	1050 (236)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/o Mtg Hardware, kg (lb)	23.4 (51.6)	
Packing Dimensions - HxWxD, m (ft)	2.3 x 0.4 x 0.25 (7.59 x 1.32 x 0.83)	
Packing Dimensions, HxWxD, mm (in)	2255 x 400 x 250 (88.78 x 15.75 x 9.84)	



Vertical Pattern

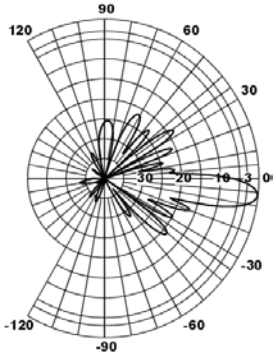


Horizontal Pattern

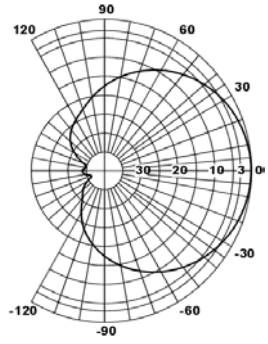
APX15G6-16DW6B-C

Horizontal Beamwidth, deg 65
Gain, dBi 16.5 , 17.6
Electrical Downtilt, deg 6 , 6

ELECTRICAL SPECIFICATIONS			
Frequency Range, MHz	870-960	1710-1900	1900-2170
Horizontal Beamwidth, deg	65	65	65
Vertical Beamwidth, deg	9	5	5
Gain, dBi (dBd)	16.5 (14.4)	17.6 (15.5)	17.6 (15.5)
1st Upper Sidelobe Suppression, dB	> 20	> 17 (typ 20)	> 17 (typ 20)
Front-To-Back Ratio, dB		> 30	
VSWR		< 1.4:1	
Isolation between Ports, dB		> 30	
Isolation Between Bands, dB		> 30	
Maximum Power Input, W	500		300
Polarization	Dual pol +/-45°		
3rd Order IMP @ 2 x 43 dBm, dBc	> 150		> 150
MECHANICAL SPECIFICATIONS			
Dimensions - HxWxD, mm (in)	2080 x 330 x 130 (81.89 x 13 x 5.12)		
Survival Wind Speed, km/h (mph)	200 (125)		
Max Wind Loading Area, m² (ft²)	0.7 (7.53)		
Rated Wind Speed, km/h (mph)	160 (100)		
Maximum Thrust @ Rated Wind, N (lbf)	1050 (236)		
Front Thrust @ Rated Wind, N (lbf)	1050 (236)		
Reflector Material	Aluminum		
Radiating Element Material	Brass		
Radome Material	Fiberglass		
Radome Color	Light Grey RAL7035		
Weight w/o Mtg Hardware, kg (lb)	23.4 (51.6)		
Packing Dimensions - HxWxD, m (ft)	2.3 x 0.4 x 0.25 (7.59 x 1.32 x 0.83)		
Packing Dimensions, HxWxD, mm (in)	2255 x 400 x 250 (88.78 x 15.75 x 9.84)		



Vertical Pattern



Horizontal Pattern

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Dualband Vertical Polarized Antenna

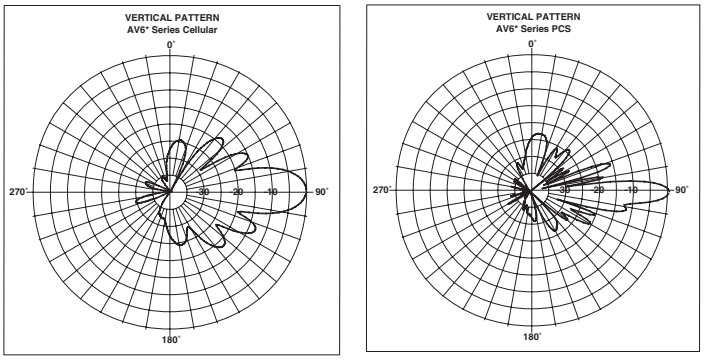
Applications

The Combi panel antennas are ideal for co-location applications where a cellular operator needs to co-locate with either a PCS or DCS operator. One version operates over the 824-960 MHz cellular band and the 1850-1990 MHz PCS band. The other version operates over the 824-960 MHz cellular band and the 1710-1880 DCS band. These antennas have been used all over the world for applications that require a 60° beamwidth in co-location situations. These antennas use our most rugged construction, CELlite, and are manufactured with premium quality materials. With the use of a cross-band coupler and the number of cables running up the tower can be reduced as well.

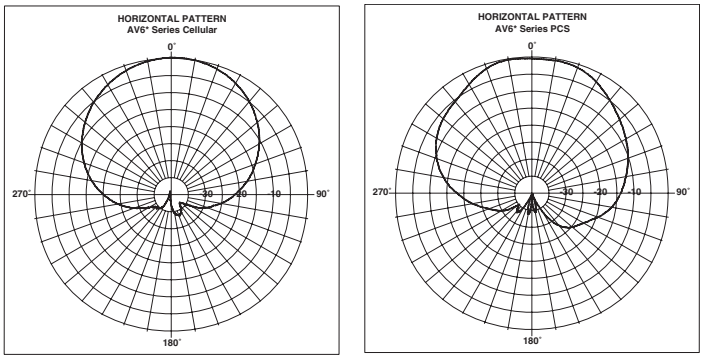
AV6B13C0 Series

Features & Benefits

- Dual-Band operation is ideal for co-location sites where antenna count needs to be kept to a minimum.
- Elimination of internal cables or solder joints reduces potential for intermodulation problems.
- UV stabilized radome protects radiating structure year after year.
- Surface treated components prevent galvanic corrosion.



Vertical Pattern



Horizontal Pattern

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AV6B13-15P0* Series 806-1990 MHz

Dualband Vertical Polarized Antenna

AV6B13C0-15P0-2

Horizontal Beamwidth, deg 65
Gain, dBi 15.1, 17.2
Electrical Downtilt, deg 0

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	806-894	1850-1990
Horizontal Beamwidth, deg	65	
Vertical Beamwidth, deg	15.5	7
Gain, dBi (dBd)	15.1(13)	17.2(15)
Front-To-Back Ratio, dB	35	
VSWR	< 1.4:1	
Isolation between Ports, dB	30	
Maximum Power Input, W	500	
Polarization	Vertical	
3rd Order IMP @ 16 x 41 dBm, dBm	< -100	
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	1219 x 356 x 127 (48 x 14 x 5)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.434 (4.67)	
Rated Wind Speed, km/h (mph)	160 (100)	
Front Thrust @ Rated Wind, N (lbf)	934 (210)	
Reflector Material	5032-H32 Aluminum	
Radiating Element Material	Aluminum Alloy	
Radome Material	UV Stabilized High Impact ABS	
Weight w/o Mtg Hardware, kg (lb)	9 (20)	

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Optimizer® Triple-band Antennas

Polarization: Dual ± 45°
Electrical Downtilt: Fixed or Variable
Horizontal beamwidth: 65°
Tilt range: 8°

Applications

These new triple band GSM 900 / DCS 1800 / UMTS fixed or variable tilt antennas are cross polarized with a 65° horizontal beamwidth for use in the following systems:

GSM 900 (872-915, 917-960MHz)

DCS1800 (1710-1785, 1805-1880MHz)

UMTS (1920-1980, 2110-2170MHz)

These antennas have enhanced performance with great tilt range (variable tilt), gain, sidelobe suppression, VSWR and front to back ratio. These antennas provide an easy upgrade path for the addition of 3G/UMTS on existing dualband antenna sites.

Antennas are available in two versions:

- fixed tilt with gain of 15.5/16.5/16.5 dBi
- variable tilt with two gain options 15.2/16.8/17.5 and 16/16.9/17.5 dBi

Covered by a fiberglass radome, the fixed tilt series feature tilt values of 2° and 6° for GSM 900 and 2° for DCS1800 and 2° for UMTS.

Variable tilt series are equipped with three independent continuously adjustable 2° to 10° electrical downtilt for each of the three bands.

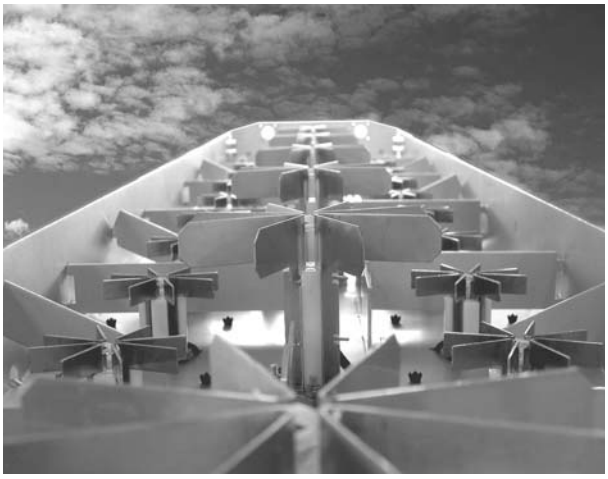
Six 7-16 connectors are mounted at the bottom. All antennas are designed for use with our APM40 global mount as well as the APM70- 3C cluster kit.

APX15G2-15D2-15W2B Series

APX*GV-15DWV-15DWB Series

Features & Benefits

- Side by side construction allows independent control of each antenna array
- High suppression of upper sidelobes
- 30 dB isolation between polarizations
- 30 dB isolation between bands
- Stable horizontal and vertical beamwidths
- Broadband design for high band (varitilt)
- Low wind load



Triple band radiating structure

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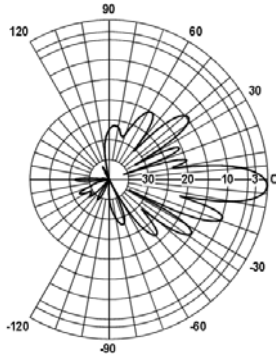
APXG-D-W* Series 880-2170 MHz

Optimizer® Triple-band Dual Polarized Antennas

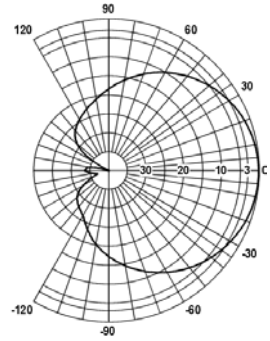
APX15G2-15D2-15W2B-C

Horizontal Beamwidth, deg 65, 65, 60
Gain, dBi 15.5, 16.5, 16.5
Electrical Downtilt, deg 2 , 2 , 2

ELECTRICAL SPECIFICATIONS			
Frequency Range, MHz	880-960	1710-1880	1920-2170
Horizontal Beamwidth, deg	65	65	60
Vertical Beamwidth, deg	10	7.5	6.5
Gain, dBi (dBd)	15.5 (13.4)	16.5 (14.4)	16.5 (14.4)
1st Upper Sidelobe Suppression, dB	> 15 (typ18)	> 16 (typ18)	> 16 (typ17)
Front-To-Back Ratio, dB	> 25	> 25	> 30
VSWR		< 1.5:1	
Isolation between Ports, dB	> 30	> 30	> 30
Isolation Between Bands, dB		> 30	
Maximum Power Input, W	400	200	200
Polarization		Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	> 150	
7th Order IMP @ 2x46 dBm, dBc			> 170
MECHANICAL SPECIFICATIONS			
Dimensions - HxWxD, mm (in)	1920 x 328 x 128 (69.83 x 11.93 x 4.66)		
Survival Wind Speed, km/h (mph)	200 (125)		
Max Wind Loading Area, m² (ft²)	0.63 (6.87)		
Rated Wind Speed, km/h (mph)	160 (100)		
Maximum Thrust @ Rated Wind, N (lbf)	998 (224)		
Front Thrust @ Rated Wind, N (lbf)	998 (224)		
Reflector Material	Aluminum		
Radiating Element Material	Brass		
Radome Material	Fiberglass		
Radome Color	Light Grey RAL7035		
Weight w/o Mtg Hardware, kg (lb)	22.6 (49.7)		
Packing Dimensions - HxWxD, m (ft)	2.1 x 0.43 x 0.32 (6.93 x 1.42 x 1.06)		
Packing Dimensions, HxWxD, mm (in)	2090 x 435 x 320 (76 x 15.8 x 11.6)		



Low Band Vertical Pattern

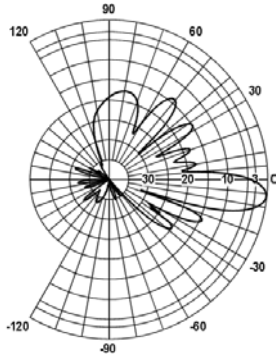


Low Band Horizontal Pattern

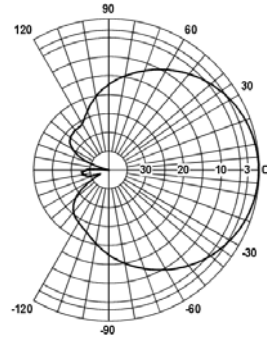
APX15G6-15D2-15W2B-C

Horizontal Beamwidth, deg 65, 65, 60
Gain, dBi 15.5, 16.5, 16.5
Electrical Downtilt, deg 6 , 2 , 2

ELECTRICAL SPECIFICATIONS			
Frequency Range, MHz	880-960	1710-1880	1920-2170
Horizontal Beamwidth, deg	65	65	60
Vertical Beamwidth, deg	10	7.5	6.5
Gain, dBi (dBd)	15.5 (13.4)	16.5 (14.4)	16.5 (14.4)
1st Upper Sidelobe Suppression, dB	> 15	> 17	> 17
Front-To-Back Ratio, dB	> 25	> 25	> 30
VSWR		< 1.5:1	
Isolation between Ports, dB	> 30	> 30	> 30
Isolation Between Bands, dB		> 30	
Maximum Power Input, W	400	200	200
Polarization		Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150	> 150	
7th Order IMP @ 2x46 dBm, dBc			> 170
MECHANICAL SPECIFICATIONS			
Dimensions - HxWxD, mm (in)	1920 x 328 x 128 (69.83 x 11.93 x 4.66)		
Survival Wind Speed, km/h (mph)	200 (125)		
Max Wind Loading Area, m² (ft²)	0.63 (6.87)		
Rated Wind Speed, km/h (mph)	160 (100)		
Maximum Thrust @ Rated Wind, N (lbf)	998 (224)		
Front Thrust @ Rated Wind, N (lbf)	998 (224)		
Reflector Material	Aluminum		
Radiating Element Material	Brass		
Radome Material	Fiberglass		
Radome Color	Light Grey RAL7035		
Weight w/o Mtg Hardware, kg (lb)	22.6 (49.7)		
Packing Dimensions - HxWxD, m (ft)	2.1 x 0.43 x 0.32 (6.93 x 1.42 x 1.06)		
Packing Dimensions, HxWxD, mm (in)	2090 x 435 x 320 (76 x 15.8 x 11.6)		



Low Band Vertical Pattern



Low Band Horizontal Pattern

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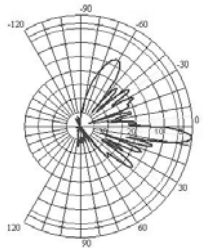
Optimizer® Triple-band Dual Polarized Antennas

APX13GV-15DWV-15DWVB-C

Horizontal Beamwidth, deg 69, 65, 60
Gain, dBi 15.2, 16.8, 17.5
Electrical Downtilt, deg 2-10

ELECTRICAL SPECIFICATIONS			
Frequency Range, MHz	880-960	1710-1900	1900-2170
Horizontal Beamwidth, deg	69	65	60
Vertical Beamwidth, deg	8	6.5	6
Gain, dBi (dBd)	15.2 (13.1)	16.8 (14.7)	17.5 (15.4)
1st Upper Sidelobe Suppression, dB	> 15	> 12	> 12
Front-To-Back Ratio, dB	> 25	> 25	> 25
VSWR		< 1.5:1	
Isolation between Ports, dB	> 26	> 30	> 30
Isolation Between Bands, dB		> 30	
Maximum Power Input, W		500	
Polarization		Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150		
7th Order IMP @ 2x46 dBm, dBc			> 170
MECHANICAL SPECIFICATIONS			
Dimensions - HxWxD, mm (in)	2120 x 270 x 145 (77.1 x 9.82 x 5.27)		
Survival Wind Speed, km/h (mph)	200 (125)		
Max Wind Loading Area, m² (ft²)	0.57 (6.21)		
Rated Wind Speed, km/h (mph)	160 (100)		
Maximum Thrust @ Rated Wind, N (lbf)	500 (112)		
Front Thrust @ Rated Wind, N (lbf)	500 (112)		
Reflector Material	Aluminum		
Radiating Element Material	Diecast Zamach		
Radome Material	Polycarbonate		
Radome Color	Light Grey RAL7035		
Weight w/o Mtg Hardware, kg (lb)	27 (59.4)		
Packing Dimensions - HxWxD, m (ft)	2.5 x 0.4 x 0.4 (8.25 x 1.32 x 1.32)		
Packing Dimensions, HxWxD, mm (in)	2500 x 400 x 400 (90.9 x 14.55 x 14.55)		

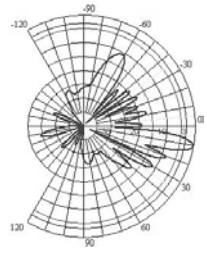


High Band Vertical Pattern

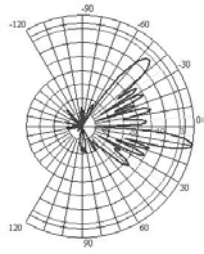
APX14GV-15DWV-15DWVB-C

Horizontal Beamwidth, deg 69, 65, 60
Gain, dBi 16, 16.9, 17.5
Electrical Downtilt, deg 2-10

ELECTRICAL SPECIFICATIONS			
Frequency Range, MHz	880-960	1710-1900	1900-2170
Horizontal Beamwidth, deg	69	65	60
Vertical Beamwidth, deg	6.8	6.5	6
Gain, dBi (dBd)	16 (13.9)	16.9 (14.8)	17.5 (15.4)
1st Upper Sidelobe Suppression, dB	> 15	> 14	> 14
Front-To-Back Ratio, dB	> 25	> 25	> 25
VSWR		< 1.5:1	
Isolation between Ports, dB	> 26	> 30	> 30
Isolation Between Bands, dB		> 30	
Maximum Power Input, W		500	
Polarization		Dual pol +/-45°	
3rd Order IMP @ 2 x 43 dBm, dBc	> 150		
7th Order IMP @ 2x46 dBm, dBc			> 170
MECHANICAL SPECIFICATIONS			
Dimensions - HxWxD, mm (in)	2620 x 270 x 145 (95.3 x 9.82 x 5.27)		
Survival Wind Speed, km/h (mph)	200 (125)		
Max Wind Loading Area, m² (ft²)	0.7 (7.63)		
Rated Wind Speed, km/h (mph)	160 (100)		
Maximum Thrust @ Rated Wind, N (lbf)	581 (130)		
Front Thrust @ Rated Wind, N (lbf)	581 (130)		
Reflector Material	Aluminum		
Radiating Element Material	Diecast Zamach		
Radome Material	Polycarbonate		
Radome Color	Light Grey RAL7035		
Weight w/o Mtg Hardware, kg (lb)	32 (70.4)		
Packing Dimensions - HxWxD, m (ft)	3 x 0.4 x 0.4 (9.9 x 1.32 x 1.32)		
Packing Dimensions, HxWxD, mm (in)	3000 x 400 x 400 (109.1 x 14.55 x 14.55)		



Low Band Vertical Pattern



High Band Vertical Pattern

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Cluster Antenna Systems

Polarization: Dual ± 45°
Electrical Downtilt: Adjustable
Horizontal beamwidth: 65°
Azimuth Adjustment: ± 20°

Broadband
Tilt Range 10°

Applications

Environmental issues pose a dilemma to cellular network planners in many parts of the world. While more prominent antenna site locations often offer the best performance, they can also attract higher levels of opposition.

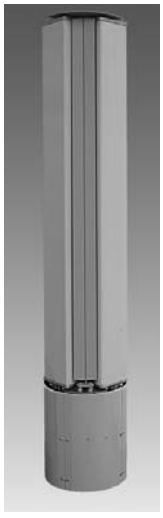
RFS has developed a range of environmentally friendly antenna systems to reduce the impact of cellular rollouts. The RFS range of cluster systems provides the industries most innovative tower top antenna mounting arrangements. This unique cluster mount fits all RFS high band FET & VET antennas. Available with a 65° degree horizontal beamwidth for use in the following systems:

DCS1800 (1710-1785, 1805-1880MHz)
PCS (1850-1910, 1930-1990MHz)
UMTS (1920-1980, 2110-2170MHz)

These high performance antennas have excellent upper sidelobe suppression, VSWR and front to back ratio. The antennas are available in a variety of gain options varying from 14.7 to 19.2dBi covered by a UV resistant fiberglass radome.

The clusters can be supplied either with fixed tilt antennas or adjustable tilt models as required.

The variable tilt model has continuously adjustable electrical downtilt over the range of 0° to 10°. As with all our variable tilt antenna range they can be upgraded using our OPTIMIZER RT system for remote tilt control.



UMTS Cluster with standard mounting interface module attached

UMTS cluster with optional TMA module attached (covers removed).

Attaching optional Optimizer RT remote tilt units

Individual azimuth panning for each antenna

Features & Benefits

- Low profile for low visual impact
- At least 30 dB isolation between polarization's
- High gain
- High front to back ratio
- Stable horizontal and vertical beamwidths
- Excellent upper sidelobe suppression
- Very low beam squint over frequency band
- Effective polarization diversity ensured by high cross polar discrimination
- Broadband design
- Azimuth adjustable +/-20° for each sector
- Optional remote tilt – can be retrofitted on each sector

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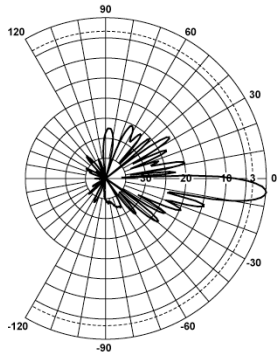
Cluster Antenna Systems

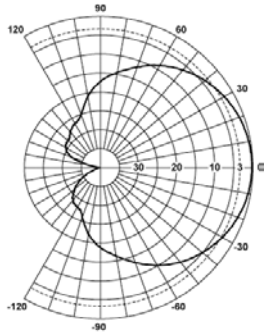
ACXV18-206513

Horizontal Beamwidth, deg 65
Gain, dBi 15.1
Electrical Downtilt, deg 2-12

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	1710-1900	1900-2170
Horizontal Beamwidth, deg	68	64
Vertical Beamwidth, deg	15.3	13.6
Gain, dBi (dBd)	14.7 (12.6)	15.1 (13.0)
Upper Sidelobe Suppression, dB	>18 all (Typically >20)	
Front-To-Back Ratio, dB	> 28	
VSWR	< 1.5:1	
Isolation between Ports, dB	> 30	
Maximum Power Input, W	300	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 38 dBm, dBc	> 160	
7th Order IMP @ 2x46 dBm, dBc		> 170
MECHANICAL SPECIFICATIONS		
Cluster Dimensions - HxW, mm (in)	1218 x 376 (48.0 x 14.8)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.47 (5)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	537 (176)	
Front Thrust @ Rated Wind, N (lbf)	537 (176)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/ Mtg Hardware, kg (lb)	60 (132)	
Shipping Weight, kg (lb)	80 (176)	
Packing Dimensions - HxWxD, m (ft)	1@1.1 x .46 x .53 (4.3 x 1.25 x 1.75); 3@0.86 x .26 x .20 (2.81 x 0.7 x 0.54); 1@1.12 x .48 x .55 (3.7 x 1.25 x 1.5)	
Packing Dimensions, HxWxD, mm (in)	1@1100 x 460 x 530 (43.22 x 15 x 21); 3@860 x 260 x 200 (33.8 x 8.5 x 6.5); 1@1115 x 480 x 550 (43.8 x 15 x 18)	



Vertical Pattern

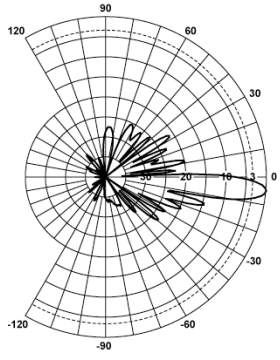


Horizontal Pattern

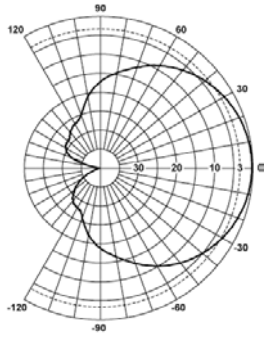
ACXV18-206513T

Horizontal Beamwidth, deg 65
Gain, dBi 15.4
Electrical Downtilt, deg 0-10

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	1710-1900	1900-2170
Horizontal Beamwidth, deg	68	64
Vertical Beamwidth, deg	15.3	13.6
Gain, dBi (dBd)	14.9 (12.8)	15.4 (13.3)
Upper Sidelobe Suppression, dB	>18 all (Typically >20)	
Front-To-Back Ratio, dB	> 28	
VSWR	< 1.5:1	
Isolation between Ports, dB	> 30	
Maximum Power Input, W	300	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 38 dBm, dBc	> 160	
7th Order IMP @ 2x46 dBm, dBc		> 170
MECHANICAL SPECIFICATIONS		
Cluster Dimensions - HxW, mm (in)	1218 x 376 (48.0 x 14.8)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.47 (5)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	537 (176)	
Front Thrust @ Rated Wind, N (lbf)	537 (176)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/ Mtg Hardware, kg (lb)	60 (132)	
Shipping Weight, kg (lb)	80 (176)	
Packing Dimensions - HxWxD, m (ft)	1@1.1 x .46 x .53 (4.3 x 1.25 x 1.75); 3@0.86 x .26 x .20 (2.81 x 0.7 x 0.54); 1@1.12 x .48 x .55 (3.7 x 1.25 x 1.5)	
Packing Dimensions, HxWxD, mm (in)	1@1100 x 460 x 530 (43.22 x 15 x 21); 3@860 x 260 x 200 (33.8 x 8.5 x 6.5); 1@1115 x 480 x 550 (43.8 x 15 x 18)	



Vertical Pattern



Horizontal Pattern

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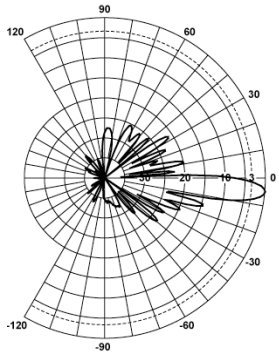
Cluster Antenna Systems

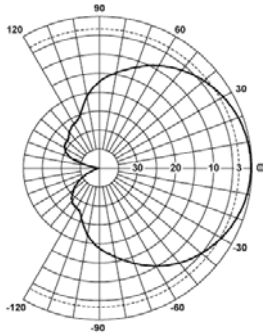
ACXV18-206516L

Horizontal Beamwidth, deg 65
Gain, dBi 18
Electrical Downtilt, deg 0-10

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	1710-1900	1900-2170
Horizontal Beamwidth, deg	68	63
Vertical Beamwidth, deg	7	6.4
Gain, dBi (dBd)	17.6 (15.5)	18 (15.9)
Upper Sidelobe Suppression, dB	>17	>18 all (Typically >20)
Front-To-Back Ratio, dB	> 28	> 30
VSWR	< 1.5:1	
Isolation between Ports, dB	> 30	
Maximum Power Input, W	300	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 38 dBm, dBc	> 160	
7th Order IMP @ 2x46 dBm, dBc		> 170
MECHANICAL SPECIFICATIONS		
Cluster Dimensions - HxW, mm (in)	1857 x 376 (73.1 x 14.8)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.72 (7.7)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	819 (184)	
Front Thrust @ Rated Wind, N (lbf)	819 (184)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/ Mtg Hardware, kg (lb)	72 (158.4)	
Shipping Weight, kg (lb)	95 (209)	
Packing Dimensions - HxWxD, m (ft)	1@2.4 x .46 x .53 (6.6 x 1.25 x 1.75); 3@1.46 x .26 x .20 (3.9 x 0.7x 0.54); 1@1.15 x .48 x .55 (2.6 x 1.3 x 1.5)	
Packing Dimensions, HxWxD, mm (in)	1@2400 x 460 x 530 (80 x 15 x 21); 3@1460 x 260 x 200 (47.9 x 8.5 x 6.5); 1@1150 x 480 x 550 (32 x 15 x 18)	



Vertical Pattern

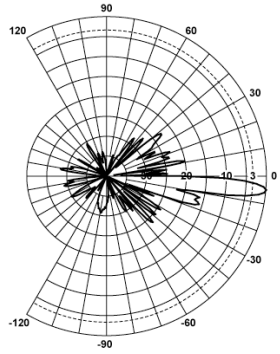


Horizontal Pattern

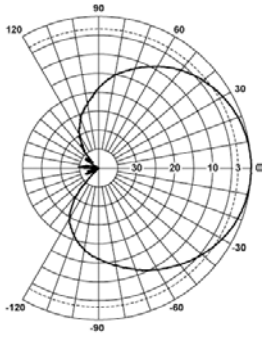
ACXV18-206517

Horizontal Beamwidth, deg 65
Gain, dBi 19
Electrical Downtilt, deg 0-10

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	1710-1900	1900-2170
Horizontal Beamwidth, deg	67	63
Vertical Beamwidth, deg	5.0	4.6
Gain, dBi (dBd)	18.8 (16.7)	19.0 (16.9)
Upper Sidelobe Suppression, dB	>17	>18 all (Typically >20)
Front-To-Back Ratio, dB	> 30	
VSWR	< 1.5:1	
Isolation between Ports, dB	> 30	
Maximum Power Input, W	300	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 38 dBm, dBc	> 160	
7th Order IMP @ 2x46 dBm, dBc		> 170
MECHANICAL SPECIFICATIONS		
Cluster Dimensions - HxW, mm (in)	2332 x 376 (91.8 x 14.8)	
Survival Wind Speed, km/h (mph)	200 (125)	
Max Wind Loading Area, m² (ft²)	0.89 (9.5)	
Rated Wind Speed, km/h (mph)	160 (100)	
Maximum Thrust @ Rated Wind, N (lbf)	1032 (234)	
Front Thrust @ Rated Wind, N (lbf)	1032 (234)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	
Weight w/ Mtg Hardware, kg (lb)	90 (198)	
Shipping Weight, kg (lb)	111 (244)	
Packing Dimensions - HxWxD, m (ft)	1@2.4 x .46 x .53 (6.6 x 1.25 x 1.75); 3@1.9 x .26 x .20 (5.3 x 0.7 x 0.54); 1@1.15 x .48 x .55 (2.6 x 1.25 x 1.5)	
Packing Dimensions, HxWxD, mm (in)	1@2400 x 460 x 530 (80 x 15 x 21); 3@1940 x 260 x 200 (64 x 8.5 x 6.5); 1@1150 x 480 x 550 (32 x 15 x 18)	



Vertical Pattern



Horizontal Pattern

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Cluster Antenna Systems

ACX16DWV-16DWVL

Horizontal Beamwidth, deg 65
Gain, dBi 18
Electrical Downtilt, deg 0-10

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	1710-1900	1900-2170
Horizontal Beamwidth, deg	68	63
Vertical Beamwidth, deg	7	6.4
Gain, dBi (dBd)	17.6 (15.5)	18.0 (16.0)
Upper Sidelobe Suppression, dB	>17	>18 all (Typically >20)
Front-To-Back Ratio, dB	>28	>30
VSWR	< 1.5:1	
Isolation between Ports, dB	> 30	
Maximum Power Input, W	300	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 38 dBm, dBc	> 160	
7th Order IMP @ 2x46 dBm, dBc		> 170
MECHANICAL SPECIFICATIONS		
Survival Wind Speed, km/h (mph)	200 (125)	
Rated Wind Speed, km/h (mph)	160 (100)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	

ACX17DWV-17DWV

Horizontal Beamwidth, deg 65
Gain, dBi 19
Electrical Downtilt, deg 0-10

ELECTRICAL SPECIFICATIONS		
Frequency Range, MHz	1710-1900	1900-2170
Horizontal Beamwidth, deg	67	63
Vertical Beamwidth, deg	5.0	4.6
Gain, dBi (dBd)	18.8 (16.7)	19.0 (16.9)
Upper Sidelobe Suppression, dB	>17	>18 all (Typically >20)
Front-To-Back Ratio, dB	> 30	
VSWR	< 1.5:1	
Isolation between Ports, dB	> 30	
Maximum Power Input, W	300	
Polarization	Dual pol +/-45°	
3rd Order IMP @ 2 x 38 dBm, dBc	> 160	
7th Order IMP @ 2x46 dBm, dBc		> 170
MECHANICAL SPECIFICATIONS		
Survival Wind Speed, km/h (mph)	200 (125)	
Rated Wind Speed, km/h (mph)	160 (100)	
Reflector Material	Aluminum	
Radiating Element Material	Brass	
Radome Material	Fiberglass	
Radome Color	Light Grey RAL7035	

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Omni Antennas

25-1990 MHz

Applications

Omnidirectional antennas radiate maximum power uniformly in all directions, in the horizontal plane. These center-fed collinear antennas ensure consistent gain and impedance across the frequency band for a wide variety of applications, including land mobile radio services from 806-960 MHz. RFS has been supplying omni antennas since the early days of radio communication. The portfolio includes antennas for extensive rural coverage.

Antenna Brands:

- Super Stationmaster™
- Stationmaster II®
- Storm Chief™

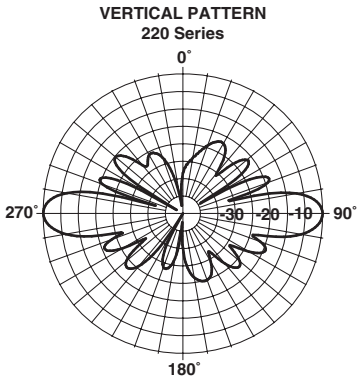
Tower with RFS Omni Antennas

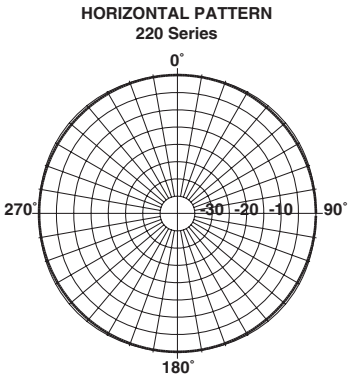
Features & Benefits

- Rugged construction assures system reliability in most environments
- Broad range of product families from 25 MHz to 1990 MHz
- Broadband options reduce backup inventory and the need for multiple antennas
- Careful choice of materials maximize system performance while minimizing the possibility of intermod.

220 Series

Typical Patterns





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Omni Antennas

Selection Guide by Frequency Range

Antenna Series	Model Number	Frequency Range, MHz	Gain, dBi (dBd)	Overall Length, m (ft)	Vertical Beamwidth, deg	Connector Type
25-88 MHz OMNIDIRECTIONAL ANTENNAS						
1142 Series	1142-1N	25-30	2.1 (0)	5.73 (18.8)	75	N Female
1142 Series	1142-2AN	30-35	2.1 (0)	4.88 (16)	75	N Female
1142 Series	1142-2BN	35-42	2.1 (0)	4.27 (14)	75	N Female
1142 Series	1142-2CN	42-54	2.1 (0)	3.84 (12.6)	75	N Female
1142 Series	1142-3N	66-88	2.1 (0)	2.62 (8.6)	75	N Female
114-174 MHz OMNIDIRECTIONAL ANTENNAS						
BA1010 Series	BA1010-1	146-164	2.1 (0)	1.43 (4.7)	80	N Female
BA1010 Series	BA1010-2	154-174	2.1 (0)	1.4 (4.6)	80	N Female
BA1010 Series	BA1010-4	114-125	2.1 (0)	1.86 (6.1)	80	N Female
BA1010 Series	BA1010-5	120-132	2.1 (0)	1.52 (5)	80	N Female
118-174 MHz OMNIDIRECTIONAL ANTENNAS						
BA1012 Series	BA1012-0	118-174	2.1 (0)	1.43 (4.7)	80	N Female
BA1012 Series	BA1012-1	144-162	2.1 (0)	1.34 (4.4)	80	N Female
BA1012 Series	BA1012-2	154-174	2.1 (0)	1.13 (3.7)	80	N Female
118-174 MHz OMNIDIRECTIONAL ANTENNAS						
BA1312 Series	BA1312-0	118-174	5.1 (3)	2.68 (8.8)	35	N Female
BA1312 Series	BA1312-1	149-156	5.1 (3)	2.62 (8.6)	35	N Female
BA1312 Series	BA1312-2	156-163	5.1 (3)	2.62 (8.6)	35	N Female
BA1312 Series	BA1312-3	163-171	5.1 (3)	2.62 (8.6)	35	N Female
120-174 MHz STATIONMASTER II® OMNI ANTENNAS						
200N	200N	120-174	7.6 (5.5)	6.34 (20.8)	18	N Female
136-174 MHz SUPER STATIONMASTER™ OMNI ANTENNAS						
620 Series	620-3D	150-159	7.4 (5.25)	6.3 (20.6)	18	7-16 DIN Female
620 Series	620-3N	150-159	7.4 (5.25)	6.3 (20.6)	18	N Female
620 Series	620-6D	160-169	7.4 (5.25)	6.0 (19.7)	18	7-16 DIN Female
620 Series	620-6N	160-169	7.4 (5.25)	6.0 (19.7)	18	N Female
136-281 MHz SUPER STATIONMASTER™ OMNI ANTENNAS						
220 Series	220-1D	136-141	7.4 (5.25)	6.1 (20)	18	7-16 DIN Female
220 Series	220-1N	136-141	7.4 (5.25)	6.1 (20)	18	N Female
220 Series	220-2D	142-150	7.4 (5.25)	5.85 (19.2)	18	7-16 DIN Female
220 Series	220-2N	142-150	7.4 (5.25)	5.85 (19.2)	18	N Female
220 Series	220-3AD	150.5-158.5	7.4 (5.25)	6.31 (20.7)	18	7-16 DIN Female
220 Series	220-3AN	150.5-158.5	7.4 (5.25)	6.31 (20.7)	18	N Female
220 Series	220-3BD	151.5-159.5	7.4 (5.25)	6.34 (20.8)	18	7-16 DIN Female
220 Series	220-3BN	151.5-159.5	7.4 (5.25)	6.34 (20.8)	18	N Female
220 Series	220-4D	155-163	7.4 (5.25)	6.16 (20.2)	18	7-16 DIN Female
220 Series	220-4N	155-163	7.4 (5.25)	6.16 (20.2)	18	N Female
220 Series	220-5D	157-165	7.4 (5.25)	6.1 (20)	18	7-16 DIN Female
220 Series	220-5N	157-165	7.4 (5.25)	6.1 (20)	18	N Female
220 Series	220-6D	160-169	7.4 (5.25)	5.94 (19.5)	18	7-16 DIN Female
220 Series	220-6N	160-169	7.4 (5.25)	5.94 (19.5)	18	N Female
220 Series	220-7D	165-174	7.4 (5.25)	5.79 (19)	18	7-16 DIN Female
220 Series	220-7N	165-174	7.4 (5.25)	5.79 (19)	18	N Female
220 Series	220-8BD	220-225	8.1 (6)	5.73 (18.8)	16	7-16 DIN Female
220 Series	220-8BN	220-225	8.1 (6)	5.73 (18.8)	16	N Female
220 Series	220-8D	216-225	8.1 (6)	5.73 (18.8)	16	7-16 DIN Female
220 Series	220-8N	216-225	8.1 (6)	5.73 (18.8)	16	N Female
220 Series	220-9D	279-281	8.1 (6)	4.6 (15.1)	16	7-16 DIN Female
220 Series	220-9N	279-281	8.1 (6)	4.6 (15.1)	16	N Female
380-512 MHz OMNIDIRECTIONAL ANTENNAS						
BA6110 Series	BA6110-1	400-470	2.1 (0)	1.01 (3.3)	78	N Female
BA6110 Series	BA6110-2	450-512	2.1 (0)	0.94 (3.1)	78	N Female
BA6110 Series	BA6110-3	380-420	2.1 (0)	1.01 (3.3)	78	N Female

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Omni Antennas

Selection Guide by Frequency Range

Antenna Series	Model Number	Frequency Range, MHz	Gain, dBi (dBd)	Overall Length, m (ft)	Vertical Beamwidth, deg	Connector Type
380-512 MHz OMNIDIRECTIONAL ANTENNAS						
BA6312 Series	BA6312-0	406-512	5.1 (3)	1.43 (4.7)	29	N Female
BA6312 Series	BA6312-1	449-467	5.1 (3)	1.34 (4.4)	29	N Female
BA6312 Series	BA6312-2	467-485	5.1 (3)	1.34 (4.4)	29	N Female
BA6312 Series	BA6312-5	380-400	5.1 (3)	1.34 (4.4)	29	N Female
BA6312 Series	BA6312-6	410-430	5.1 (3)	1.34 (4.4)	29	N Female
406-512 MHz SUPER STATIONMASTER™ OMNI ANTENNAS						
1151 Series	1151-1D	406-420	10.1 (8)	5.03 (16.5)	12	7-16 DIN Female
1151 Series	1151-1N	406-420	10.1 (8)	5.03 (16.5)	12	N Female
1151 Series	1151-2D	440-450	10.1 (8)	4.72 (15.5)	12	7-16 DIN Female
1151 Series	1151-2N	440-450	10.1 (8)	4.72 (15.5)	12	N Female
1151 Series	1151-3D	450-460	10.1 (8)	4.63 (15.2)	12	7-16 DIN Female
1151 Series	1151-3N	450-460	10.1 (8)	4.63 (15.2)	12	N Female
1151 Series	1151-4D	460-470	10.1 (8)	4.54 (14.9)	12	7-16 DIN Female
1151 Series	1151-4N	460-470	10.1 (8)	4.54 (14.9)	12	N Female
1151 Series	1151-5D	470-482	10.1 (8)	4.42 (14.5)	12	7-16 DIN Female
1151 Series	1151-5N	470-482	10.1 (8)	4.42 (14.5)	12	N Female
1151 Series	1151-6D	482-494	10.1 (8)	4.36 (14.3)	12	7-16 DIN Female
1151 Series	1151-6N	482-494	10.1 (8)	4.36 (14.3)	12	N Female
1151 Series	1151-7D	494-506	10.1 (8)	4.27 (14)	12	7-16 DIN Female
1151 Series	1151-7N	494-506	10.1 (8)	4.27 (14)	12	N Female
1151 Series	1151-8D	500-512	10.1 (8)	4.21 (13.8)	12	7-16 DIN Female
1151 Series	1151-8N	500-512	10.1 (8)	4.21 (13.8)	12	N Female
406-512 MHz STATIONMASTER II® OMNI ANTENNAS						
201 Series	201-1	406-426	7.1 (5)	2.73 (8.97)	18	N Female
201 Series	201-7	450-470	7.1 (5)	2.53 (8.3)	18	N Female
201 Series	201-8	470-490	7.1 (5)	2.46 (8.08)	18	N Female
406-512 MHz SUPER STATIONMASTER™ OMNI ANTENNAS						
455 Series	455-1D	406-413	12.1 (10)	6.52 (21.4)	7	7-16 DIN Female
455 Series	455-1N	406-413	12.1 (10)	6.52 (21.4)	7	N Female
455 Series	455-2D	412-420	12.1 (10)	6.55 (21.5)	7	7-16 DIN Female
455 Series	455-2N	412-420	12.1 (10)	6.55 (21.5)	7	N Female
455 Series	455-3D	420-430	12.1 (10)	6.34 (20.8)	7	7-16 DIN Female
455 Series	455-3N	420-430	12.1 (10)	6.34 (20.8)	7	N Female
455 Series	455-4D	430-440	12.1 (10)	6.34 (20.8)	7	7-16 DIN Female
455 Series	455-4N	430-440	12.1 (10)	6.34 (20.8)	7	N Female
455 Series	455-5D	440-450	12.1 (10)	6.16 (20.2)	7	7-16 DIN Female
455 Series	455-5N	440-450	12.1 (10)	6.16 (20.2)	7	N Female
455 Series	455-6D	450-460	12.1 (10)	6.1 (20)	7	7-16 DIN Female
455 Series	455-6N	450-460	12.1 (10)	6.1 (20)	7	N Female
455 Series	455-7D	460-470	12.1 (10)	5.94 (19.5)	7	7-16 DIN Female
455 Series	455-7N	460-470	12.1 (10)	5.94 (19.5)	7	N Female
455 Series	455-8D	470-482	12.1 (10)	5.79 (19)	7	7-16 DIN Female
455 Series	455-8N	470-482	12.1 (10)	5.79 (19)	7	N Female
455 Series	455-9D	480-490	12.1 (10)	5.73 (18.8)	7	7-16 DIN Female
455 Series	455-9N	480-490	12.1 (10)	5.73 (18.8)	7	N Female
455 Series	455-10D	494-506	12.1 (10)	5.73 (18.8)	7	7-16 DIN Female
455 Series	455-10N	494-506	12.1 (10)	5.73 (18.8)	7	N Female
455 Series	455-11D	500-512	12.1 (10)	5.73 (18.8)	7	7-16 DIN Female
455 Series	455-11N	500-512	12.1 (10)	5.73 (18.8)	7	N Female
406-512 MHz STORM CHIEF™ RUGGED BROADBAND OMNI						
458 Series	458-1D	406-420	10.1 (8)	4.39 (14.4)	12	7-16 DIN Female
458 Series	458-1N	406-420	10.1 (8)	4.39 (14.4)	12	N Female
458 Series	458-2D	450-470	10.1 (8)	4.05 (13.3)	12	7-16 DIN Female
458 Series	458-2N	450-470	10.1 (8)	4.05 (13.3)	12	N Female
458 Series	458-3D	470-494	10.1 (8)	3.9 (12.8)	12	7-16 DIN Female
458 Series	458-3N	470-494	10.1 (8)	3.9 (12.8)	12	N Female

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Omni Antennas

Selection Guide by Frequency Range

Antenna Series	Model Number	Frequency Range, MHz	Gain, dBi (dBd)	Overall Length, m (ft)	Vertical Beamwidth, deg	Connector Type
406-512 MHz OMNIDIRECTIONAL ANTENNAS						
BA6012 Series	BA6012-0	406-512	2.1 (0)	1.13 (3.7)	67	N Female
BA6012 Series	BA6012-1	449-471	2.1 (0)	0.82 (2.7)	67	N Female
BA6012 Series	BA6012-2	468-492	2.1 (0)	0.82 (2.7)	67	N Female
746-960 MHz SUPER STATIONMASTER™ OMNI ANTENNAS						
AO7606 Series	AO7606-24T0	746-776	8.1 (6.0)	2.62 (8.6)	12	N Female
AO7606 Series	AO7606-54T0	746-776	8.1 (6.0)	2.62 (8.6)	12	7-16 DIN Female
AO7806 Series	AO7806-24T0	764-806	8.1 (6.0)	2.62 (8.6)	12	N Female
AO7806 Series	AO7806-54T0	764-806	8.1 (6.0)	2.62 (8.6)	12	7-16 DIN Female
10017 Series	10017-1	800-836	12.1 (10)	4.56 (14.96)	5.5	N Female
10017 Series	10017-2	820-855	12.1 (10)	4.47 (14.67)	6	N Female
10017 Series	10017-3	845.5-880.5	12.1 (10)	4.36 (14.29)	6	N Female
10017 Series	10017-4	865-900	12.1 (10)	4.29 (14.06)	6	N Female
10017 Series	10017-4E	865-900	12.1 (10)	4.29 (14.06)	6	7/8 EIA Flange
10017 Series	10017-5	862-898	12.1 (10)	4.29 (14.06)	6	N Female
10017 Series	10017-6	925-960	12.1 (10)	4.05 (13.28)	6	N Female
10017 Series	10017-7	806-841	12.1 (10)	4.53 (14.87)	6	N Female
10017 Series	10017-8	900-935	12.1 (10)	4.14 (13.58)	6	N Female
10017 Series	10017-9	831-866	12.1 (10)	4.42 (14.5)	6	N Female
1108 Series	1108-1	806-869	8.1 (6)	2.47 (8.09)	12	N Female
1108 Series	1108-3	900-960	8.1 (6)	2.27 (7.46)	12	N Female
1109 Series	1109-1	806-869	10.1 (8)	3.14 (10.3)	8	N Female
1109 Series	1109-6	895-960	10.1 (8)	2.89 (9.47)	8	N Female
1110 Series	1110-1	800-836	11.1 (9)	3.54 (11.61)	6	N Female
1110 Series	1110-5	925-960	11.1 (9)	3.46 (11.34)	6	N Female
1110 Series	1110-6	806-841	11.1 (9)	3.86 (12.65)	6	N Female
1110 Series	1110-7	831-866	11.1 (9)	3.76 (12.34)	6	N Female
1110 Series	1110-8	862-898	11.1 (9)	3.65 (11.98)	6	N Female
1110 Series	1110-11	890-960	11.1 (9)	3.54 (11.61)	6	N Female
AO8410M Series	AO8410M-24T0	806-869	12.1 (10)	4.72 (15.5)	5.5	N Female
AO8410M Series	AO8410M-24T3	806-869	12.1 (10)	4.72 (15.5)	5.5	N Female
AO8410M Series	AO8410M-54T0	806-869	12.1 (10)	4.72 (15.5)	5.5	7-16 DIN Female
AO8410M Series	AO8410M-54T3	806-869	12.1 (10)	4.72 (15.5)	5.5	7-16 DIN Female
AO8609 Series	AO8609-24T0	824-894	11.1 (9)	3.69 (12.1)	6	N Female
AO8609 Series	AO8609-54T0	824-894	11.1 (9)	3.69 (12.1)	6	7-16 DIN Female
806-960 MHz OMNIDIRECTIONAL ANTENNAS						
AO8610 Series	AO8610-2T0	824-894	12.1 (10)	5.03 (16.5)	4.5	N Female
AO8610 Series	AO8610-5T0	824-894	12.1 (10)	5.03 (16.5)	4.5	7-16 DIN Female
10022 Series	10022-1	806-880	2.1 (0)	0.52 (1.7)	80	N Female
10022 Series	10022-2	836-896	2.1 (0)	0.52 (1.7)	80	N Female
10022 Series	10022-3	880-960	2.1 (0)	0.52 (1.7)	80	N Female
AO9009-3	AO9009-3	890-960	10.5 (8.4)	3.11 (10.2)	6.5	7-16 DIN Female
806-960 MHz OMNIDIRECTIONAL COLLINEAR ANTENNAS						
1610 Series	1610-1	806-866	6.1 (4)	1.07 (3.5)	25	N Female
1610 Series	1610-2	820-880	6.1 (4)	1.04 (3.4)	25	N Female
1610 Series	1610-3	836-896	6.1 (4)	1.01 (3.3)	25	N Female
1610 Series	1610-4	896-960	6.1 (4)	0.94 (3.1)	25	N Female
1710-1880 MHZ OMNIDIRECTIONAL ANTENNAS						
AO1803-1	AO1803-1	1710-1880	5.5 (3.4)	0.63 (2.08)	20	N Female
AO1809-3	AO1809-3	1710-1880	10.5 (8.4)	1.8 (5.9)	6.5	7-16 DIN Female
1850-1990 MHZ OMNIDIRECTIONAL ANTENNAS						
AO1903-1	AO1903-1	1850-1990	5.5 (3.4)	0.63 (2.08)	20	N Female
AO1909-3	AO1909-3	1850-1990	11.1 (9)	1.71 (5.6)	6.5	7-16 DIN Female

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Applications

The Penetrator™ is a unique and patented omni antenna design that delivers high gain and significant null fill for exceptional close-in (near field) as well as far-out (far field) coverage.

The Penetrator™ is available for 700-960 MHz applications, in a variety of gains and horizontal radiation pattern configurations.

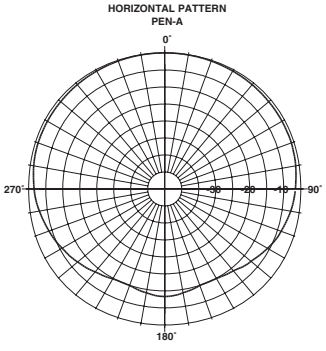
Gain options range from 6-12 dBd, with bandwidths of 32 MHz, electrical downtilt, and null fill. The Penetrator™ can able be configured as a directional antenna with a front-to-back ratio of 15 dB.

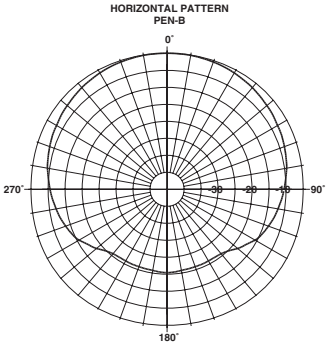
BCR* Series

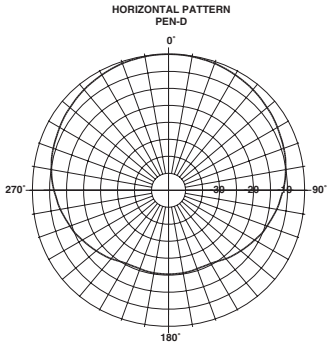
Features & Benefits

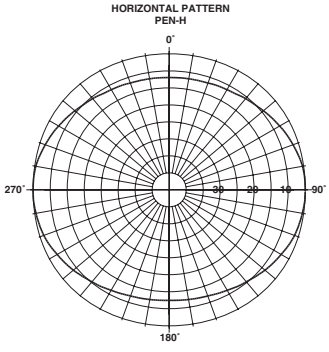
- High gain maximizes ERP
- Heavy null fill enhances close-in coverage
- Customized beamtilt minimizes interference to and from adjacent systems
- Various radiation patterns are available to efficiently cover the target area

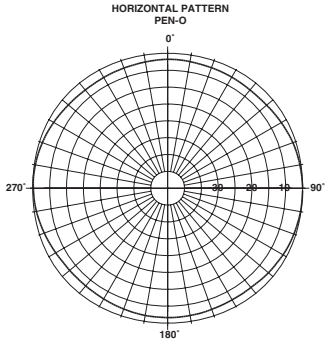
Typical Horizontal Patterns











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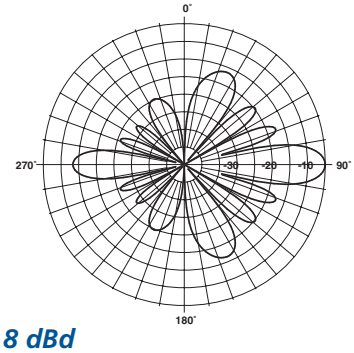
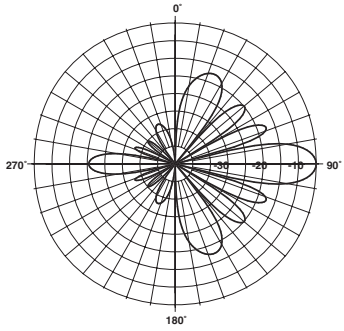
Vertical Patterns

6 dBd

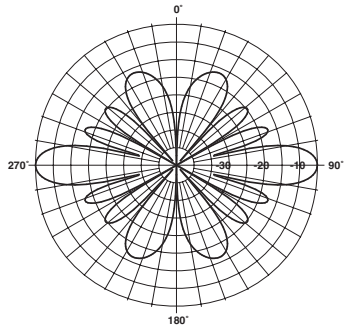
VERTICAL PATTERN
6-A



VERTICAL PATTERN
6-B or 6-D

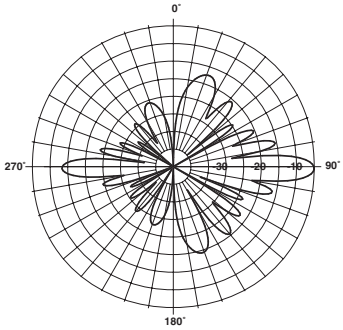


VERTICAL PATTERN
6-H or 6-O

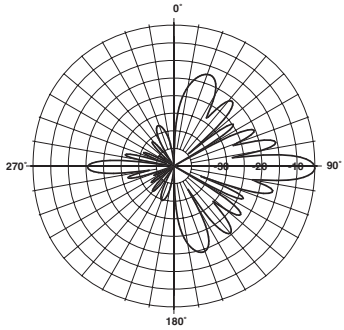


8 dBd

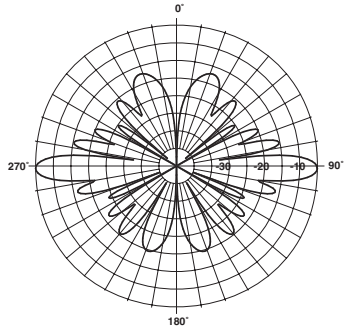
VERTICAL PATTERN
8-A



VERTICAL PATTERN
8-B or 8-D

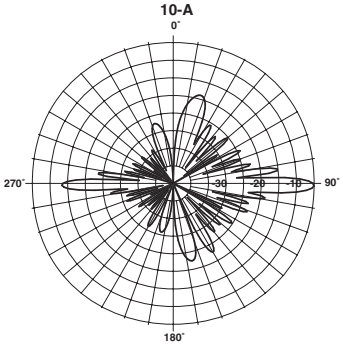


VERTICAL PATTERN
8-H or 8-O

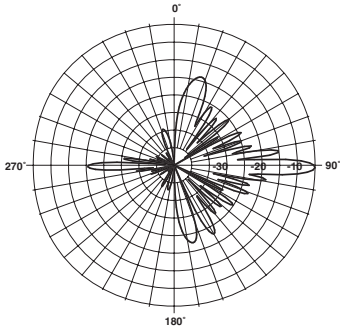


10 dBd

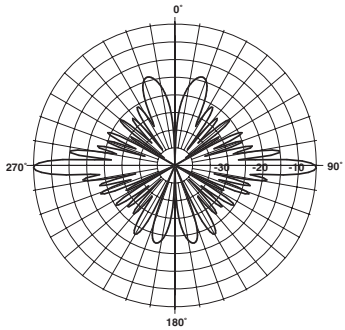
VERTICAL PATTERN
10-A



VERTICAL PATTERN
10-B or 10-D

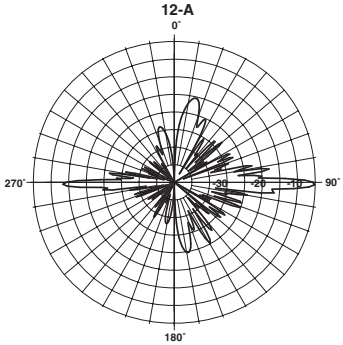


VERTICAL PATTERN
10-H or 10-O

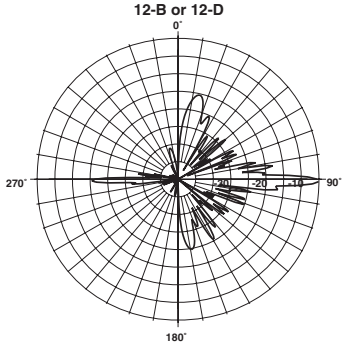


12 dBd

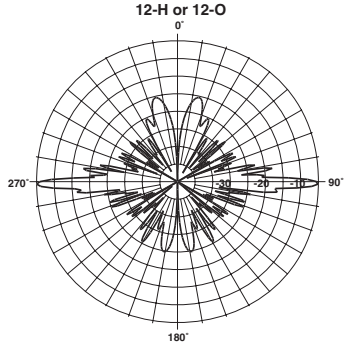
VERTICAL PATTERN
12-A



VERTICAL PATTERN
12-B or 12-D



VERTICAL PATTERN
12-H or 12-O



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BPS10 Series — 746-806 MHz

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	746-806
Horizontal Pattern	OmniDirectional
Antenna Type	Fiberglass Omni
Polarization	Vertical
Vertical Beamwidth, deg	5.0
Electrical Downtilt, deg	0.75
Null Fill, dB	Included
VSWR	< 1.5:1
Maximum Power Input, W	500
Lightning protection	Top Rod Grounded to Base Mount
Connector Type	N Female

MECHANICAL SPECIFICATIONS	
Overall Length, m (ft)	4.26 (14)
Diameter, mm (in)	168.3 (6.625)
Weight, kg (lb)	25 (55)
Weight with B1 Bracket, kg (lb)	39 (87)
Max Wind Loading Area, m² (ft²)	0.446 (4.8)
Rated Wind Speed, km/h (mph)	160 (100)
Radiating Element Material	Aluminum
Element Housing Material	Fiberglass
Mount Type	Bracket
Mounting Hardware	B1 Bracket

ORDERING INFORMATION

Model Number	Horizontal Beamwidth, deg	Gain, dBi (dBd)	Front-To-Back Ratio, dB
BPS10-O-B1	360	12.1 (10)	Omni

BCR6 Series — 824-894 MHz

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	824-894
Horizontal Pattern	Directional
Antenna Type	Fiberglass Omni
Polarization	Vertical
Vertical Beamwidth, deg	13
Electrical Downtilt, deg	0
Null Fill, dB	Included
VSWR	< 1.5:1
Maximum Power Input, W	500
Lightning protection	Top Rod Grounded to Base Mount
Connector Type	N Female

MECHANICAL SPECIFICATIONS	
Overall Length, m (ft)	1.68 (5.5)
Diameter, mm (in)	168.3 (6.625)
Weight, kg (lb)	12 (26)
Weight with B1 Bracket, kg (lb)	26 (58)
Max Wind Loading Area, m² (ft²)	0.195 (2.1)
Rated Wind Speed, km/h (mph)	160 (100)
Radiating Element Material	Aluminum
Element Housing Material	Fiberglass
Mount Type	Bracket
Mounting Hardware	B1 Bracket

ORDERING INFORMATION

Model Number	Horizontal Beamwidth, deg	Gain, dBi (dBd)	Front-To-Back Ratio, dB
BCR6-A-B1	220	10.4 (8.3)	8
BCR6-B-B1	140	12.1 (10)	15
BCR6-D-B1	120	12.4 (10.3)	15
BCR6-H-B1	Dual	11.5 (9.4)	Bi-Directional
BCR6-O-B1	360	8.1 (6)	Omni

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Penetrator™ Antennas

BCR8 Series — 824-894 MHz

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	824-894
Horizontal Pattern	Directional
Antenna Type	Fiberglass Omni
Polarization	Vertical
Vertical Beamwidth, deg	8.5
Electrical Downtilt, deg	0.75
Null Fill, dB	Included
VSWR	< 1.5:1
Maximum Power Input, W	500
Lightning protection	Top Rod Grounded to Base Mount
Connector Type	N Female

MECHANICAL SPECIFICATIONS	
Overall Length, m (ft)	2.44 (8)
Diameter, mm (in)	168.3 (6.625)
Weight, kg (lb)	16 (36)
Weight with B1 Bracket, kg (lb)	31 (68)
Max Wind Loading Area, m² (ft²)	0.279 (3)
Rated Wind Speed, km/h (mph)	160 (100)
Radiating Element Material	Aluminum
Element Housing Material	Fiberglass
Mount Type	Bracket
Mounting Hardware	B1 Bracket

ORDERING INFORMATION

Model Number	Horizontal Beamwidth, deg	Gain, dBi (dBd)	Front-To-Back Ratio, dB
BCR8-A-B1	220	12.4 (10.3)	8
BCR8-B-B1	140	14.1 (12)	15
BCR8-D-B1	120	14.4 (12.3)	15
BCR8-H-B1	Dual	13.5 (11.4)	Bi-Directional

BCR10 Series — 824-894 MHz

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	824-894
Horizontal Pattern	Directional
Antenna Type	Fiberglass Omni
Polarization	Vertical
Vertical Beamwidth, deg	5.0
Electrical Downtilt, deg	0.75
Null Fill, dB	Included
VSWR	< 1.5:1
Maximum Power Input, W	500
Lightning protection	Top Rod Grounded to Base Mount
Connector Type	N Female

MECHANICAL SPECIFICATIONS	
Overall Length, m (ft)	3.96 (13)
Diameter, mm (in)	168.3 (6.625)
Weight, kg (lb)	25 (55)
Weight with B1 Bracket, kg (lb)	39 (87)
Max Wind Loading Area, m² (ft²)	0.446 (4.8)
Rated Wind Speed, km/h (mph)	160 (100)
Radiating Element Material	Aluminum
Element Housing Material	Fiberglass
Mount Type	Bracket
Mounting Hardware	B1 Bracket

ORDERING INFORMATION

Model Number	Horizontal Beamwidth, deg	Gain, dBi (dBd)	Front-To-Back Ratio, dB
BCR10-A-B1	220	14.4 (12.3)	8
BCR10-B-B1	140	16.1 (14)	15
BCR10-D-B1	120	16.4 (14.3)	15
BCR10-H-B1	Dual	15.5 (13.4)	Bi-Directional
BCR10-O-B1	360	12.1 (10)	Omni

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BCR12 Series — 824-894 MHz

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	824-894
Horizontal Pattern	Directional
Antenna Type	Fiberglass Omni
Polarization	Vertical
Vertical Beamwidth, deg	3.5
Electrical Downtilt, deg	0.75
Null Fill, dB	Included
VSWR	< 1.5:1
Maximum Power Input, W	500
Lightning protection	Top Rod Grounded to Base Mount
Connector Type	N Female

MECHANICAL SPECIFICATIONS	
Overall Length, m (ft)	6.1 (20)
Diameter, mm (in)	168.3 (6.625)
Weight, kg (lb)	42 (92)
Weight with B1 Bracket, kg (lb)	56 (124)
Max Wind Loading Area, m² (ft²)	0.706 (7.6)
Rated Wind Speed, km/h (mph)	160 (100)
Radiating Element Material	Aluminum
Element Housing Material	Fiberglass
Mount Type	Bracket
Mounting Hardware	B1 Bracket

ORDERING INFORMATION

Model Number	Horizontal Beamwidth, deg	Gain, dBi (dBd)	Front-To-Back Ratio, dB
BCR12-A-B1	220	16.4 (14.3)	8
BCR12-B-B1	140	18.1 (16)	15
BCR12-D-B1	120	18.4 (16.3)	15
BCR12-H-B1	Dual	17.5 (15.4)	Bi-Directional
BCR12-O-B1	360	14.1 (12)	Omni

BMR6 Series — 806-869 MHz

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	806-869
Horizontal Pattern	Directional
Antenna Type	Fiberglass Omni
Polarization	Vertical
Vertical Beamwidth, deg	13
Electrical Downtilt, deg	0
Null Fill, dB	Included
VSWR	< 1.5:1
Maximum Power Input, W	500
Lightning protection	Top Rod Grounded to Base Mount
Connector Type	N Female

MECHANICAL SPECIFICATIONS	
Overall Length, m (ft)	1.68 (5.5)
Diameter, mm (in)	168.3 (6.625)
Weight, kg (lb)	12 (26)
Weight with B1 Bracket, kg (lb)	26 (58)
Max Wind Loading Area, m² (ft²)	0.195 (2.1)
Rated Wind Speed, km/h (mph)	160 (100)
Radiating Element Material	Aluminum
Element Housing Material	Fiberglass
Mount Type	Bracket
Mounting Hardware	B1 Bracket

ORDERING INFORMATION

Model Number	Horizontal Beamwidth, deg	Gain, dBi (dBd)	Front-To-Back Ratio, dB
BMR6-A-B1	220	10.4 (8.3)	8
BMR6-B-B1	140	12.1 (10)	15
BMR6-D-B1	120	12.4 (10.3)	15
BMR6-H-B1	Dual	11.5 (9.4)	Bi-Directional
BMR6-O-B1	360	8.1 (6)	Omni

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BMR8 Series — 806-869 MHz

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	806-869
Horizontal Pattern	Directional
Antenna Type	Fiberglass Omni
Polarization	Vertical
Vertical Beamwidth, deg	8.5
Electrical Downtilt, deg	0.75
Null Fill, dB	Included
VSWR	< 1.5:1
Maximum Power Input, W	500
Lightning protection	Top Rod Grounded to Base Mount
Connector Type	N Female

MECHANICAL SPECIFICATIONS	
Overall Length, m (ft)	2.44 (8)
Diameter, mm (in)	168.3 (6.625)
Weight, kg (lb)	16 (36)
Weight with B1 Bracket, kg (lb)	31 (68)
Max Wind Loading Area, m² (ft²)	0.195 (2.1)
Rated Wind Speed, km/h (mph)	160 (100)
Radiating Element Material	Aluminum
Element Housing Material	Fiberglass
Mount Type	Bracket
Mounting Hardware	B1 Bracket

ORDERING INFORMATION

Model Number	Horizontal Beamwidth, deg	Gain, dBi (dBd)	Front-To-Back Ratio, dB
BMR8-A-B1	220	12.4 (10.3)	8
BMR8-B-B1	140	14.1 (12)	15
BMR8-D-B1	120	14.4 (12.3)	15
BMR8-H-B1	Dual	13.5 (11.4)	Bi-Directional
BMR8-O-B1	360	10.1 (8)	Omni

BMR10 Series — 806-869 MHz

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	806-869
Horizontal Pattern	Directional
Antenna Type	Fiberglass Omni
Polarization	Vertical
Vertical Beamwidth, deg	5.0
Electrical Downtilt, deg	0.75
Null Fill, dB	Included
VSWR	< 1.5:1
Maximum Power Input, W	500
Lightning protection	Top Rod Grounded to Base Mount
Connector Type	N Female

MECHANICAL SPECIFICATIONS	
Overall Length, m (ft)	3.96 (13)
Diameter, mm (in)	168.3 (6.625)
Weight, kg (lb)	25 (55)
Weight with B1 Bracket, kg (lb)	39 (87)
Max Wind Loading Area, m² (ft²)	0.446 (4.8)
Rated Wind Speed, km/h (mph)	160 (100)
Radiating Element Material	Aluminum
Element Housing Material	Fiberglass
Mount Type	Bracket
Mounting Hardware	B1 Bracket

ORDERING INFORMATION

Model Number	Horizontal Beamwidth, deg	Gain, dBi (dBd)	Front-To-Back Ratio, dB
BMR10-A-B1	220	14.4 (12.3)	8
BMR10-B-B1	140	16.1 (14)	15
BMR10-D-B1	120	16.4 (14.3)	15
BMR10-H-B1	Dual	15.5 (13.4)	Bi-Directional
BMR10-O-B1	360	12.1 (10)	Omni

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BMR12 Series — 806-869 MHz

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	806-869
Horizontal Pattern	Directional
Antenna Type	Fiberglass Omni
Polarization	Vertical
Vertical Beamwidth, deg	3.5
Electrical Downtilt, deg	0.75
Null Fill, dB	Included
VSWR	< 1.5:1
Maximum Power Input, W	500
Lightning protection	Top Rod Grounded to Base Mount
Connector Type	N Female

MECHANICAL SPECIFICATIONS	
Overall Length, m (ft)	6.1 (20)
Diameter, mm (in)	168.3 (6.625)
Weight, kg (lb)	42 (92)
Weight with B1 Bracket, kg (lb)	56 (124)
Max Wind Loading Area, m² (ft²)	0.706 (7.6)
Rated Wind Speed, km/h (mph)	160 (100)
Radiating Element Material	Aluminum
Element Housing Material	Fiberglass
Mount Type	Bracket
Mounting Hardware	B1 Bracket

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Model Number	Horizontal Beamwidth, deg	Gain, dBi (dBd)	Front-To-Back Ratio, dB
BMR12-A-B1	220	16.4 (14.3)	8
BMR12-B-B1	140	18.1 (16)	15
BMR12-D-B1	120	18.4 (16.3)	15
BMR12-H-B1	Dual	17.5 (15.4)	Bi-Directional
BMR12-O-B1	360	14.1 (12)	Omni

BMSL10 Series — 806-950 MHz

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	806-906
Horizontal Pattern	Directional
Antenna Type	Penetrator
Polarization	Vertical
Vertical Beamwidth, deg	5.0
Electrical Downtilt, deg	0.75
Null Fill, dB	Included
VSWR	< 1.5:1
Maximum Power Input, W	500
Lightning protection	Top Rod Grounded to Base Mount
Connector Type	N Female

MECHANICAL SPECIFICATIONS	
Overall Length, m (ft)	3.96 (13)
Diameter, mm (in)	168.3 (6.625)
Weight, kg (lb)	25 (55)
Weight with B1 Bracket, kg (lb)	39 (87)
Rated Wind Speed, km/h (mph)	160 (100)
Radiating Element Material	Aluminum
Element Housing Material	Fiberglass
Mount Type	Bracket
Mounting Hardware	B1 Bracket

ORDERING INFORMATION

Model Number	Horizontal Beamwidth, deg	Gain, dBi (dBd)	Front-To-Back Ratio, dB
BMSL10-A-B1	220	14.4 (12.3)	8
BMSL10-B-B1	140	16.1 (14)	15
BMSL10-D-B1	120	16.4 (14.3)	15
BMSL10-H-B1	Dual	15.5 (13.4)	Bi-Directional
BMSL10-O-B1	360	12.1 (10)	Omni-Directional

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BMSL12 Series — 806-950 MHz

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	806-906
Horizontal Pattern	Directional
Antenna Type	Penetrator
Polarization	Vertical
Vertical Beamwidth, deg	3.5
Electrical Downtilt, deg	0.75
Null Fill, dB	Included
VSWR	< 1.5:1
Maximum Power Input, W	500
Lightning protection	Top Rod Grounded to Base Mount
Connector Type	N Female

MECHANICAL SPECIFICATIONS	
Overall Length, m (ft)	6.1 (20)
Diameter, mm (in)	168.3 (6.625)
Weight, kg (lb)	42 (92)
Weight with B1 Bracket, kg (lb)	56 (124)
Rated Wind Speed, km/h (mph)	160 (100)
Radiating Element Material	Aluminum
Element Housing Material	Fiberglass
Mount Type	Bracket
Mounting Hardware	B1 Bracket

ORDERING INFORMATION

Model Number	Horizontal Beamwidth, deg	Gain, dBi (dBd)	Front-To-Back Ratio, dB
BMSL12-A-B1	220	16.4 (14.3)	8
BMSL12-B-B1	140	18.1 (16)	15
BMSL12-D-B1	120	18.4 (16.3)	15
BMSL12-H-B1	Dual	17.5 (15.4)	Bi-Directional
BMSL12-O-B1	360	14.1 (12)	Omni-Directional

BPR6 Series — 928-960 MHz

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	928-960
Horizontal Pattern	Directional
Antenna Type	Penetrator
Polarization	Vertical
Vertical Beamwidth, deg	13
Electrical Downtilt, deg	0
Null Fill, dB	Included
VSWR	< 1.5:1
Maximum Power Input, W	500
Lightning protection	Top Rod Grounded to Base Mount
Connector Type	N Female

MECHANICAL SPECIFICATIONS	
Overall Length, m (ft)	1.68 (5.5)
Diameter, mm (in)	168.3 (6.625)
Weight, kg (lb)	12 (26)
Weight with B1 Bracket, kg (lb)	26 (58)
Rated Wind Speed, km/h (mph)	160 (100)
Radiating Element Material	Aluminum
Element Housing Material	Fiberglass
Mount Type	Bracket
Mounting Hardware	B1 Bracket

ORDERING INFORMATION

Model Number	Horizontal Beamwidth, deg	Gain, dBi (dBd)	Front-To-Back Ratio, dB
BPR6-A-B1	220	10.4 (8.3)	8
BPR6-B-B1	140	12.1 (10)	15
BPR6-D-B1	120	12.4 (10.3)	15
BPR6-H-B1	Dual	11.5 (9.4)	Bi-Directional
BPR6-O-B1	360	8.1 (6)	Omni-Directional

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BPR8 Series — 928-960 MHz

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	928-960
Horizontal Pattern	Directional
Antenna Type	Penetrator
Polarization	Vertical
Vertical Beamwidth, deg	8.5
Electrical Downtilt, deg	0.75
Null Fill, dB	Included
VSWR	< 1.5:1
Maximum Power Input, W	500
Lightning protection	Top Rod Grounded to Base Mount
Connector Type	N Female

MECHANICAL SPECIFICATIONS	
Overall Length, m (ft)	2.44 (8)
Diameter, mm (in)	168.3 (6.625)
Weight, kg (lb)	16 (36)
Weight with B1 Bracket, kg (lb)	31 (68)
Rated Wind Speed, km/h (mph)	160 (100)
Radiating Element Material	Aluminum
Element Housing Material	Fiberglass
Mount Type	Bracket
Mounting Hardware	B1 Bracket

ORDERING INFORMATION

Model Number	Horizontal Beamwidth, deg	Gain, dBi (dBd)	Front-To-Back Ratio, dB
BPR8-A-B1	220	12.4 (10.3)	8
BPR8-D-B1	120	14.4 (12.3)	15
BPR8-H-B1	Dual	13.5 (11.4)	Bi-Directional
BPR8-O-B1	360	10.1 (8)	Omni-Directional

BPR10 Series — 928-960 MHz

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	928-960
Horizontal Pattern	Directional
Antenna Type	Penetrator
Polarization	Vertical
Vertical Beamwidth, deg	5.0
Electrical Downtilt, deg	0.75
Null Fill, dB	Included
VSWR	< 1.5:1
Maximum Power Input, W	500
Lightning protection	Top Rod Grounded to Base Mount
Connector Type	N Female

MECHANICAL SPECIFICATIONS	
Overall Length, m (ft)	3.96 (13)
Diameter, mm (in)	168.3 (6.625)
Weight, kg (lb)	25 (55)
Weight with B1 Bracket, kg (lb)	39 (87)
Rated Wind Speed, km/h (mph)	160 (100)
Radiating Element Material	Aluminum
Element Housing Material	Fiberglass
Mount Type	Bracket
Mounting Hardware	B1 Bracket

ORDERING INFORMATION

Model Number	Horizontal Beamwidth, deg	Gain, dBi (dBd)	Front-To-Back Ratio, dB
BPR10-A-B1	220	14.4 (12.3)	8
BPR10-B-B1	140	16.1 (14)	15
BPR10-H-B1	Dual	15.5 (13.4)	Bi-Directional
BPR10-O-B1	360	12.1 (10)	Omni-Directional

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BPR12 Series — 928-960 MHz

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	928-960
Horizontal Pattern	Directional
Antenna Type	Penetrator
Polarization	Vertical
Vertical Beamwidth, deg	3.5
Electrical Downtilt, deg	0.75
Null Fill, dB	Included
VSWR	< 1.5:1
Maximum Power Input, W	500
Lightning protection	Top Rod Grounded to Base Mount
Connector Type	N Female

MECHANICAL SPECIFICATIONS	
Overall Length, m (ft)	6.1 (20)
Diameter, mm (in)	168.3 (6.625)
Weight, kg (lb)	42 (92)
Weight with B1 Bracket, kg (lb)	56 (124)
Rated Wind Speed, km/h (mph)	160 (100)
Radiating Element Material	Aluminum
Element Housing Material	Fiberglass
Mount Type	Bracket
Mounting Hardware	B1 Bracket

ORDERING INFORMATION

Model Number	Horizontal Beamwidth, deg	Gain, dBi (dBd)	Front-To-Back Ratio, dB
BPR12-A-B1	220	16.4 (14.3)	8
BPR12-H-B1	Dual	17.5 (15.4)	Bi-Directional
BPR12-O-B1	360	14.1 (12)	Omni-Directional

ALG6 Series — 450-470 MHz

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	450-470
Horizontal Pattern	OmniDirectional
Antenna Type	Fiberglass Omni,Penetrator
Polarization	Vertical
Vertical Beamwidth, deg	13.0
Electrical Downtilt, deg	0.75
Null Fill, dB	Included
VSWR	< 1.5:1
Maximum Power Input, W	500
Lightning protection	Top Rod Grounded to Base Mount
Connector Type	N Female

MECHANICAL SPECIFICATIONS	
Overall Length, m (ft)	2.44 (8)
Diameter, mm (in)	168.3 (6.625)
Weight, kg (lb)	16 (36)
Weight with B1 Bracket, kg (lb)	31 (68)
Max Wind Loading Area, m² (ft²)	0.28 (3.0)
Rated Wind Speed, km/h (mph)	160 (100)
Radiating Element Material	Aluminum
Element Housing Material	Fiberglass
Mount Type	Bracket
Mounting Hardware	B1HD Bracket

ORDERING INFORMATION

Model Number	Horizontal Beamwidth, deg	Gain, dBi (dBd)	Front-To-Back Ratio, dB
ALG6-A-B1	220	10.4 (8.3)	8
ALG6-B-B1	140	12.1 (10)	15
ALG6-O-B1	360	8.1 (6)	Omni

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ALG8 Series — 450-470 MHz

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	450-470
Horizontal Pattern	Directional
Antenna Type	Penetrator
Polarization	Vertical
Vertical Beamwidth, deg	8.5
Electrical Downtilt, deg	0.75
Null Fill, dB	Included
VSWR	< 1.5:1
Maximum Power Input, W	500
Lightning protection	Top Rod Grounded to Base Mount
Connector Type	N Female

MECHANICAL SPECIFICATIONS	
Overall Length, m (ft)	4.0 (13)
Diameter, mm (in)	168.3 (6.625)
Weight, kg (lb)	23 (52)
Weight with B1 Bracket, kg (lb)	37.8 (84)
Max Wind Loading Area, m² (ft²)	0.46 (4.9)
Rated Wind Speed, km/h (mph)	160 (100)
Radiating Element Material	Aluminum
Element Housing Material	Fiberglass
Mount Type	Bracket
Mounting Hardware	B1HD Bracket

ORDERING INFORMATION

Model Number	Horizontal Beamwidth, deg	Gain, dBi (dBd)	Front-To-Back Ratio, dB
ALG8-A-B1	220	12.4 (10.3)	8
ALG8-B-B1	140	14.1 (12)	15
ALG8-O-B1	360	10.1 (8)	Omni

ALG10 Series — 450-470 MHz

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	450-470
Horizontal Pattern	Directional
Antenna Type	Penetrator
Polarization	Vertical
Vertical Beamwidth, deg	5.0
Electrical Downtilt, deg	0.75
Null Fill, dB	Included
VSWR	< 1.5:1
Maximum Power Input, W	500
Lightning protection	Top Rod Grounded to Base Mount
Connector Type	N Female

MECHANICAL SPECIFICATIONS	
Overall Length, m (ft)	6.1 (20)
Diameter, mm (in)	168.3 (6.625)
Weight, kg (lb)	41 (92)
Weight with B1 Bracket, kg (lb)	55.8 (124)
Max Wind Loading Area, m² (ft²)	0.71 (7.6)
Rated Wind Speed, km/h (mph)	160 (100)
Radiating Element Material	Aluminum
Element Housing Material	Fiberglass
Mount Type	Bracket
Mounting Hardware	B1HD Bracket

ORDERING INFORMATION

Model Number	Horizontal Beamwidth, deg	Gain, dBi (dBd)	Front-To-Back Ratio, dB
ALG10-A-B1	220	14.4 (12.3)	8
ALG10-B-B1	140	16.1 (14)	15
ALG10-O-B1	360	12.1 (10)	Omni

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Penetrator™ Antennas

AMG6 Series — 470-494 MHz

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	470-494
Horizontal Pattern	OmniDirectional
Antenna Type	Fiberglass Omni,Penetrator
Polarization	Vertical
Vertical Beamwidth, deg	13.0
Electrical Downtilt, deg	0.75
Null Fill, dB	Included
VSWR	< 1.5:1
Maximum Power Input, W	500
Lightning protection	Top Rod Grounded to Base Mount
Connector Type	N Female

MECHANICAL SPECIFICATIONS	
Overall Length, m (ft)	2.44 (8)
Diameter, mm (in)	168.3 (6.625)
Weight, kg (lb)	16 (36)
Weight with B1 Bracket, kg (lb)	31 (68)
Max Wind Loading Area, m² (ft²)	0.28 (3.0)
Rated Wind Speed, km/h (mph)	160 (100)
Radiating Element Material	Aluminum
Element Housing Material	Fiberglass
Mount Type	Bracket
Mounting Hardware	B1HD Bracket

ORDERING INFORMATION

Model Number	Horizontal Beamwidth, deg	Gain, dBi (dBd)	Front-To-Back Ratio, dB
AMG6-A-B1	220	10.4 (8.3)	8
AMG6-B-B1	140	12.1 (10)	15
AMG6-O-B1	360	8.1 (6)	Omni

AMG8 Series — 470-494 MHz

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	470-494
Horizontal Pattern	Directional
Antenna Type	Penetrator
Polarization	Vertical
Vertical Beamwidth, deg	8.5
Electrical Downtilt, deg	0.75
Null Fill, dB	Included
VSWR	< 1.5:1
Maximum Power Input, W	500
Lightning protection	Top Rod Grounded to Base Mount
Connector Type	N Female

MECHANICAL SPECIFICATIONS	
Overall Length, m (ft)	4.0 (13)
Diameter, mm (in)	168.3 (6.625)
Weight, kg (lb)	23 (52)
Weight with B1 Bracket, kg (lb)	37.8 (84)
Max Wind Loading Area, m² (ft²)	0.46 (4.9)
Rated Wind Speed, km/h (mph)	160 (100)
Radiating Element Material	Aluminum
Element Housing Material	Fiberglass
Mount Type	Bracket
Mounting Hardware	B1HD Bracket

ORDERING INFORMATION

Model Number	Horizontal Beamwidth, deg	Gain, dBi (dBd)	Front-To-Back Ratio, dB
AMG8-A-B1	220	12.4 (10.3)	8
AMG8-B-B1	140	14.1 (12)	15
AMG8-O-B1	360	10.1 (8)	Omni

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AMG10 Series — 470-494 MHz

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	470-494
Horizontal Pattern	Directional
Antenna Type	Penetrator
Polarization	Vertical
Vertical Beamwidth, deg	5.0
Electrical Downtilt, deg	0.75
Null Fill, dB	Included
VSWR	< 1.5:1
Maximum Power Input, W	500
Lightning protection	Top Rod Grounded to Base Mount
Connector Type	N Female

MECHANICAL SPECIFICATIONS	
Overall Length, m (ft)	6.1 (20)
Diameter, mm (in)	168.3 (6.625)
Weight, kg (lb)	41 (92)
Weight with B1 Bracket, kg (lb)	55.8 (124)
Max Wind Loading Area, m² (ft²)	0.71 (7.6)
Rated Wind Speed, km/h (mph)	160 (100)
Radiating Element Material	Aluminum
Element Housing Material	Fiberglass
Mount Type	Bracket
Mounting Hardware	B1HD Bracket

ORDERING INFORMATION

Model Number	Horizontal Beamwidth, deg	Gain, dBi (dBd)	Front-To-Back Ratio, dB
AMG10-A-B1	220	14.4 (12.3)	8
AMG10-B-B1	140	16.1 (14)	15
AMG10-O-B1	360	12.1 (10)	Omni

AHG6 Series — 494-512 MHz

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	494-512
Horizontal Pattern	OmniDirectional
Antenna Type	Fiberglass Omni,Penetrator
Polarization	Vertical
Vertical Beamwidth, deg	13.0
Electrical Downtilt, deg	0.75
Null Fill, dB	Included
VSWR	< 1.5:1
Maximum Power Input, W	500
Lightning protection	Top Rod Grounded to Base Mount
Connector Type	N Female

MECHANICAL SPECIFICATIONS	
Overall Length, m (ft)	2.44 (8)
Diameter, mm (in)	168.3 (6.625)
Weight, kg (lb)	16 (36)
Weight with B1 Bracket, kg (lb)	31 (68)
Max Wind Loading Area, m² (ft²)	0.28 (3.0)
Rated Wind Speed, km/h (mph)	160 (100)
Radiating Element Material	Aluminum
Element Housing Material	Fiberglass
Mount Type	Bracket
Mounting Hardware	B1HD Bracket

ORDERING INFORMATION

Model Number	Horizontal Beamwidth, deg	Gain, dBi (dBd)	Front-To-Back Ratio, dB
AHG6-A-B1	220	10.4 (8.3)	8
AHG6-B-B1	140	12.1 (10)	15
AHG6-O-B1	360	8.1 (6)	Omni

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Penetrator™ Antennas

AHG8 Series — 494-512 MHz

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	494-512
Horizontal Pattern	OmniDirectional
Antenna Type	Fiberglass Omni,Penetrator
Polarization	Vertical
Vertical Beamwidth, deg	8.5
Electrical Downtilt, deg	0.75
Null Fill, dB	Included
VSWR	< 1.5:1
Maximum Power Input, W	500
Lightning protection	Top Rod Grounded to Base Mount
Connector Type	N Female

MECHANICAL SPECIFICATIONS	
Overall Length, m (ft)	4.0 (13)
Diameter, mm (in)	168.3 (6.625)
Weight, kg (lb)	23 (52)
Weight with B1 Bracket, kg (lb)	37.8 (84)
Max Wind Loading Area, m² (ft²)	0.46 (4.9)
Rated Wind Speed, km/h (mph)	160 (100)
Radiating Element Material	Aluminum
Element Housing Material	Fiberglass
Mount Type	Bracket
Mounting Hardware	B1HD Bracket

ORDERING INFORMATION

Model Number	Horizontal Beamwidth, deg	Gain, dBi (dBd)	Front-To-Back Ratio, dB
AHG8-A-B1	220	12.4 (10.3)	8
AHG8-B-B1	140	14.1 (12)	15
AHG8-O-B1	360	10.1 (8)	Omni

AHG10 Series — 494-512 MHz

ELECTRICAL SPECIFICATIONS	
Frequency Range, MHz	494-512
Horizontal Pattern	Directional
Antenna Type	Penetrator
Polarization	Vertical
Vertical Beamwidth, deg	5.0
Electrical Downtilt, deg	0.75
Null Fill, dB	Included
VSWR	< 1.5:1
Maximum Power Input, W	500
Lightning protection	Top Rod Grounded to Base Mount
Connector Type	N Female

MECHANICAL SPECIFICATIONS	
Overall Length, m (ft)	6.1 (20)
Diameter, mm (in)	168.3 (6.625)
Weight, kg (lb)	41 (92)
Weight with B1 Bracket, kg (lb)	55.8 (124)
Max Wind Loading Area, m² (ft²)	0.71 (7.6)
Rated Wind Speed, km/h (mph)	160 (100)
Radiating Element Material	Aluminum
Element Housing Material	Fiberglass
Mount Type	Bracket
Mounting Hardware	B1HD Bracket

ORDERING INFORMATION

Model Number	Horizontal Beamwidth, deg	Gain, dBi (dBd)	Front-To-Back Ratio, dB
AHG10-A-B1	220	14.4 (12.3)	8
AHG10-B-B1	140	16.1 (14)	15
AHG10-O-B1	360	12.1 (10)	Omni

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Notes and Mount Outlines

Mounting Brackets:

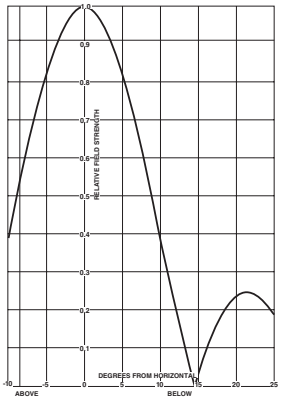
B1 B1 bracket for standard mounting

B1HD B1 bracket for heavy duty

Example: B( )R8C-A-B1

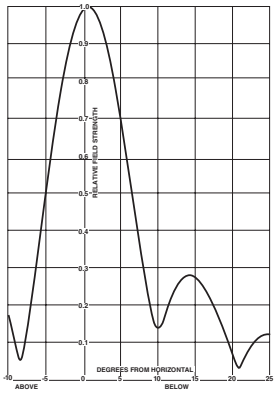
Frequency Gain Options Pattern Mounting Bracket

Vertical Patterns



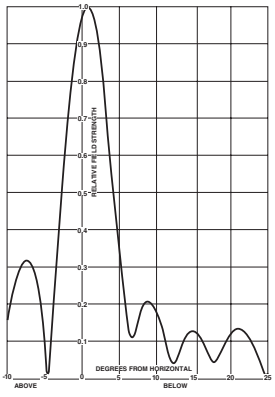
VERTICAL PATTERN A( )R6

Beam Tilt - 0.0°
Gain (Main Lobe) - 6.0 dB
Vertical Beamwidth - 13°



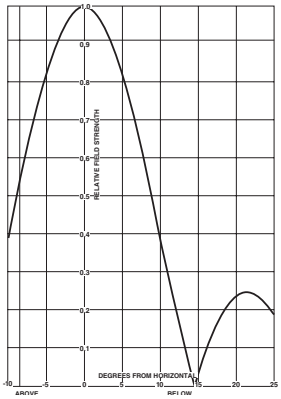
VERTICAL PATTERN A( )R8

Beam Tilt - 0.75°
Gain (Main Lobe) - 8.0 dB
Vertical Beamwidth - 8.5°



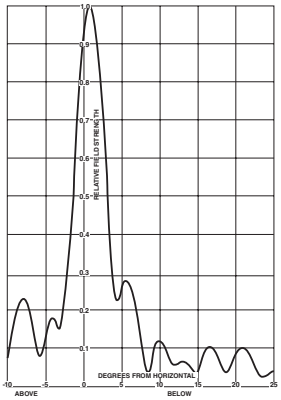
VERTICAL PATTERN A( )R10

Beam Tilt-0.75°
Gain (Main Lobe) - 10.0 dB
Vertical Beamwidth - 5.0°



VERTICAL PATTERN B( )R6

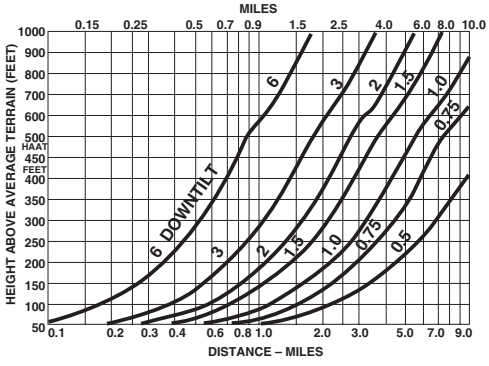
Beam Tilt - 0.0°
Gain (Main Lobe) - 6.0 dB
Vertical Beamwidth - 13°



VERTICAL PATTERN B( )R12

Beam Tilt - 0.75°
Gain (Main Lobe) - 12.0 dB
Vertical Beamwidth - 3.5°

Downtilt vs. Antenna Height & Distance



ORDERING INFORMATION
To Order, Specify the Following;
1. Frequency- Model (ALR, AHR, BMR, BCR, BPR, BMS)
2. Gain- Use omnidirectional gain (6, 8, 9, 10, 12)
3. Options- (See option list)*
4. Pattern- A,B,D,H or O
5. Mounting Bracket- B1
6. Specify beamtilt.

PENETRATOR™ OPTIONS*	
Option	
L	Gain compensation due to downtilt
J	Field adjustable tilt
E	7/8" EIA Connector
C	LC Connector
S	7-16 DIN Connector
I	Inverted mounting
W	High wind rating
K	High power (1 KW)
3K	High power (3 KW)

*Not all options available on some models.

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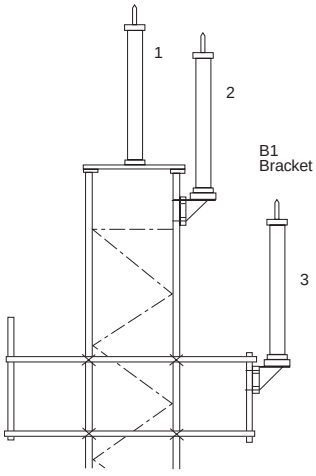
Notes and Mount Outlines

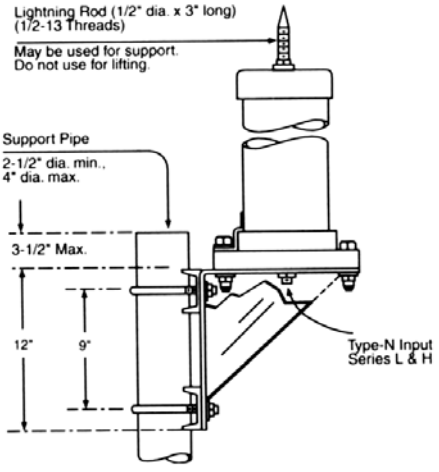
Typical Mounting Configurations

1. Flange Top Mount
   Mount directly to tower top with eight 3/4 diameter bolts on a 9-1/2" bolt circle. (B1 Bracket).
2. Tower Leg Top Mount
   Mount directly to tower leg 2-1/2" to 4" in diameter with antenna above top of tower.
3. Vertical Pole Side Mounts*
   Mount to 2-1/2" to 4" diameter pole.
4. 800 MHz Models
   When side mounting this series, a minimum of 4 feet
   from any metal is required.
5. 400 MHz Models
   When side mounting this series, a minimum of 6 feet from any metal is required.
6. Side mounting assemblies are not available; contact customer service for details.

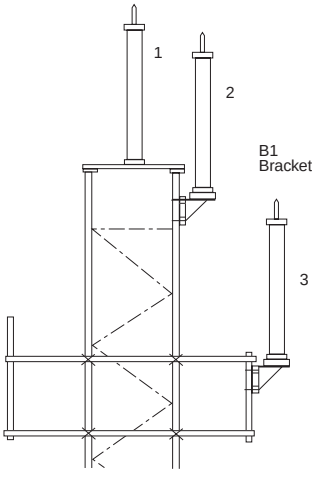
Typical Mounting For 400-500 MHz Models



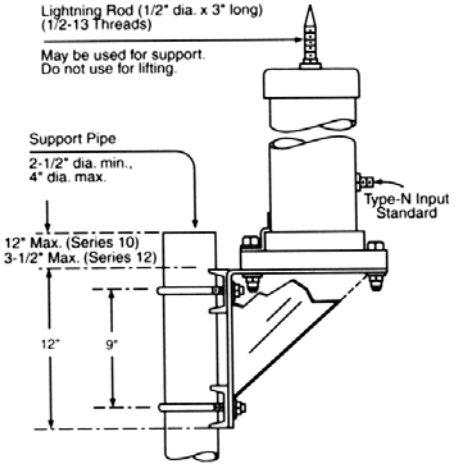
B1 Mounting Bracket



Typical Mounting For 800 MHz Models



B1 Mounting Bracket



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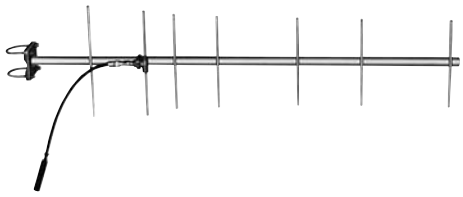
Other Directional Antennas

In this section you'll find directional antennas for special applications such as:

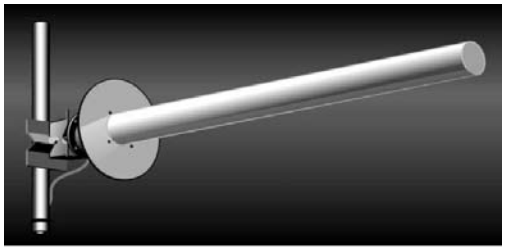
- The yagi antennas series available in various gains for 406 - 512MHz and 806 - 960MHz bands
- The APV series with field adjustable horizontal beamwidth designed to fill multiple horizontal pattern coverage requirements. This flexibility allows custom tailoring of cell coverage and avoids antenna replacement as sectors change. The reflector can be easily adjusted and provides coverage in six different settings; 46°, 60°, 78°, 90°, 105°, and 110° horizontal beamwidth.
- The AH series specially design for tunnel coverage thanks to the circular polarization. Antennas are available for cellular networks in low band, high band and dual band applications

For indoor antennas please refer to the WINS (Wireless Indoor Solutions) product line.

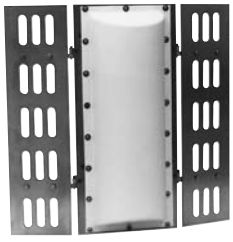


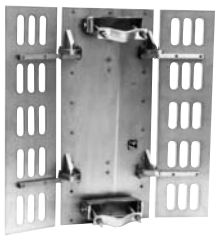
688* Series

10212 Series



AH18-203013 Series





APV8646* Series

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Directional Yagi Antenna 406-512 MHz

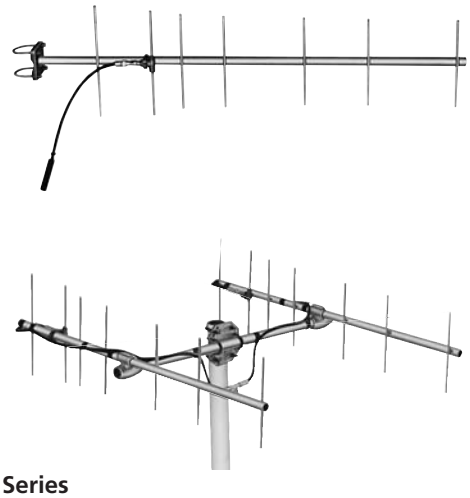
688* Series

These Yagi Antennas are constructed using 6061-T6 aluminum rod and pipe. Solid director and solid reflector elements are precision welded to their main boom, effectively eliminating misalignment problems during shipping, installation, or in service. Provision has been made in the mounting hardware for either vertical or horizontal polarization and stacking.

- Versatile

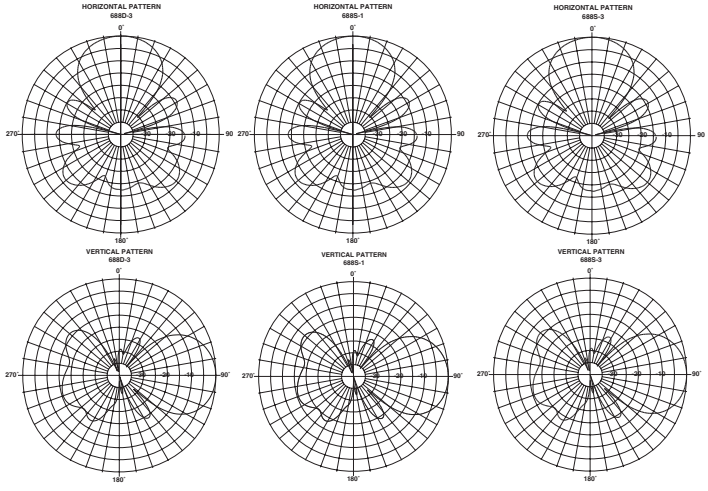
  Ideal for point-to-point and SCADA systems.

ORDERING INFORMATION	
Model Number	**Frequency Range, MHz**
688D-3	450-470
688S-1	406-420
688S-3	450-470



688* Series

ELECTRICAL SPECIFICATIONS	688D-3	688S-1	688S-3
Frequency Range, MHz	450-470	406-420	450-470
Horizontal Pattern	Directional	Directional	Directional
Antenna Type	Yagi/Corner	Yagi/Corner	Yagi/Corner
Polarization	Vertical	Vertical	Vertical
Horizontal Beamwidth, deg	24	50	50
Vertical Beamwidth, deg	40	40	40
Electrical Downtilt, deg	0	0	0
Gain, dBi (dBd)	15.1 (13)	12.1 (10)	12.1 (10)
Front-To-Back Ratio, dB	15 (min.)	15 (min.)	15 (min.)
Bandwidth for 1.5:1 VSWR, MHz	20	20	20
Maximum Power Input, W	250	250	250
Lightning Protection	Direct Ground	Direct Ground	Direct Ground
Connector Type	RG8A/U N Male	RG8A/U N Male	RG8A/U N Male
Mount Type	Fixed	Fixed	Fixed
Mounting Hardware	237 Crossover Plate	U Bolts .3125 in. (.008 m)	U Bolts .3125 in. (.008 m)
MECHANICAL SPECIFICATIONS			
Dimensions - HxWxD, mm (in)	914 x 1041 x 102 (36 x 41 x 4)	406 x 1397 x 102 (16 x 55 x 4)	343 x 1270 x 102 (13.5 x 50 x 4)
Weight, kg (lb)	4 (8)	2 (3.75)	2 (3.75)
Max Wind Loading Area, m2 (ft2)	0.07 (0.75)	0.033 (0.35)	0.033 (0.35)
Rated Wind Speed, km/h (mph)	160 (100)	160 (100)	160 (100)
Side Thrust @ Rated Wind, N (lbf)	133 (30)	62 (14)	62 (14)
Torsional Moment @ Rated Wind on support pipe, N m (ft lbf)		33 (24.5)	33 (24.5)
Element Material	0.375 in. (10 mm) 6061 - T6 Aluminum Rod	0.375 in. (10 mm) 6061 - T6 Aluminum Rod	0.375 in. (10 mm) 6061 - T6 Aluminum Rod



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Directional Yagi Antenna 806-960 MHz

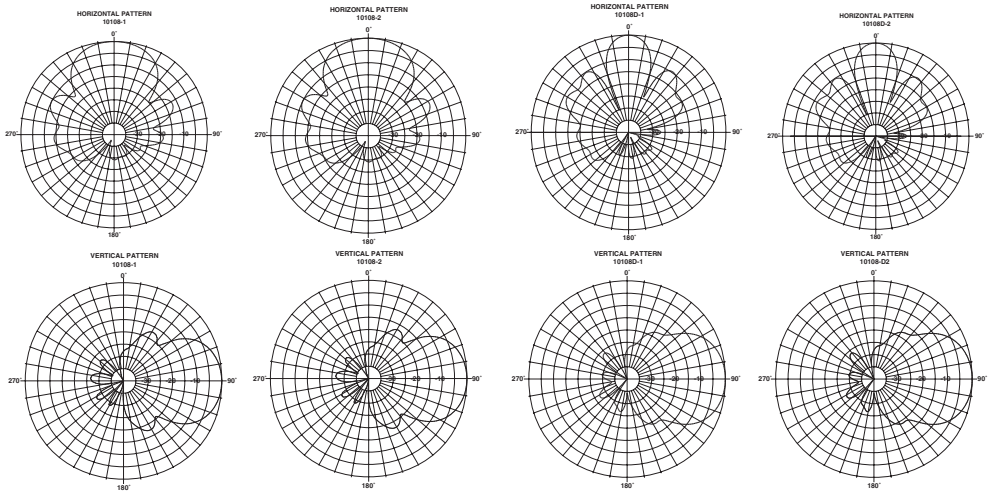
10108* Series

- 6061-T6 Aluminum elements – welded solid rod for high strength, low weight and corrosion resistance.
- Broadband – duplex operation for cellular and trunking applications.
- Weatherproof radome – protects elements against severe weather conditions.

10108* Series

ORDERING INFORMATION	
Model Number	**Frequency Range, MHz**
10108-1	806-896
10108-2	880-960
10108D-1	806-896
10108D-2	880-960

ELECTRICAL SPECIFICATIONS	10108-1	10108-2	10108D-1	10108D-2
Frequency Range, MHz	806-896	880-960	806-896	880-960
Horizontal Pattern	Directional	Directional	Directional	Directional
Antenna Type	Yagi/Corner	Yagi/Corner	Yagi/Corner	Yagi/Corner
Polarization	Vertical	Vertical	Vertical	Vertical
Horizontal Beamwidth, deg	50	50	22	22
Vertical Beamwidth, deg	42	42	42	42
Electrical Downtilt, deg	0	0	0	0
Gain, dBi (dBd)	12.1 (10)	12.1 (10)	15.1 (13)	15.1 (13)
Front-To-Back Ratio, dB	20	20	20	20
Bandwidth for 1.5:1 VSWR, MHz	80+	80+	80+	80+
Maximum Power Input, W	150	150	300	300
Lightning Protection	Direct Ground	Direct Ground	Direct Ground	Direct Ground
Connector Type	N Female	N Female	N Female	N Female
Mount Type	Fixed	Fixed	Fixed	Fixed
Mounting Hardware	Integral Plate w/U-bolts	Integral Plate w/U-bolts	Integral Plate w/U-bolts	Integral Plate w/U-bolts
MECHANICAL SPECIFICATIONS				
Dimensions - HxWxD, mm (in)	889 x 203 x 102 (35 x 8 x 4)	838 x 203 x 102 (33 x 8 x 4)	897 x 584 x 203 (35.3 x 23 x 8)	886 x 584 x 203 (34.9 x 23 x 8)
Weight, kg (lb)	2 (5)	2 (5)	6 (13)	6 (13)
Max Wind Loading Area, m2 (ft2)	0.017 (0.18)	0.017 (0.18)	0.035 (0.38)	0.035 (0.38)
Rated Wind Speed, km/h (mph)	241 (150)	241 (150)	241 (150)	241 (150)
Side Thrust @ Rated Wind, N (lbf)	32 (7.2)	32 (7.2)	68 (15.2)	68 (15.2)
Torsional Moment @ Rated Wind on support pipe, N m (ft lbf)	13 (9.3)	13 (9.3)		
Element Material	6061 - T6 Aluminum	6061 - T6 Aluminum	6061 - T6 Aluminum	6061 - T6 Aluminum



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Directional Low Gain Yagi Antenna 806-960 MHz

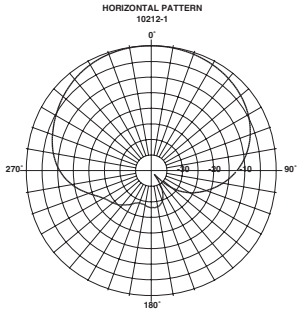
10212 Series

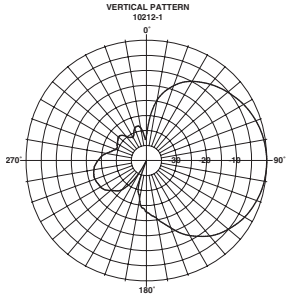
- Aluminum elements – welded solid rod for high strength, low weight and corrosion resistance.
- Broadband – duplex operation for cellular and trunking applications.
- ABS radome – protects the radiating elements against severe weather conditions.
- Small surface area – minimizes wind resistance and conserves tower loading capacity.

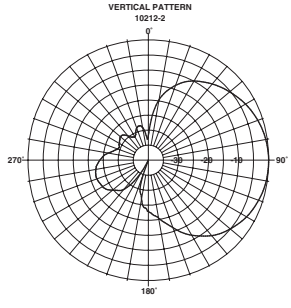
10212 Series

ORDERING INFORMATION	
Model Number	**Frequency Range, MHz**
10212-1	806-896
10212-2	900-960

ELECTRICAL SPECIFICATIONS	10212-1	10212-2
Frequency Range, MHz	806-896	900-960
Horizontal Pattern	Directional	Directional
Antenna Type	Yagi/Corner	Yagi/Corner
Polarization	Vertical	Vertical
Horizontal Beamwidth, deg	105	105
Vertical Beamwidth, deg	66	66
Electrical Downtilt, deg	0	0
Gain, dBi (dBd)	7.6 (5.5)	7.6 (5.5)
Front-To-Back Ratio, dB	20	20
Bandwidth for 1.5:1 VSWR, MHz	60+	60+
Maximum Power Input, W	150	150
Lightning Protection	Direct Ground	Direct Ground
Connector Type	N Female	N Female
Mount Type	Fixed	Fixed
Mounting Hardware	Integral Plate w/U-bolts	Integral Plate w/U-bolts
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	356 x 203 x 102 (14 x 8 x 4)	356 x 203 x 102 (14 x 8 x 4)
Weight, kg (lb)	1 (3)	1 (3)
Max Wind Loading Area, m2 (ft2)	0.017 (0.18)	0.017 (0.18)
Rated Wind Speed, km/h (mph)	241 (150)	241 (150)
Side Thrust @ Rated Wind, N (lbf)	72 (16.2)	72 (16.2)
Torsional Moment @ Rated Wind on support pipe, N m (ft lbf)	9 (6.6)	9 (6.6)
Element Material	.3125 in. 6061 - T6 Aluminum	.3125 in. 6061 - T6 Aluminum







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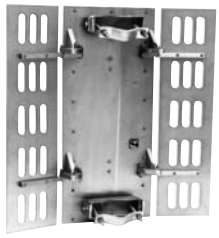
Directional Panel Antenna 806-894 MHz

APV8646* Series

- Flexibility – easily adapts to changing pattern needs without costly material and labor for antenna replacement.
- Extends asset life – expensive antenna “swapouts” are eliminated.
- Numbered holes in reflector – allows easy, precise field adjustments.
- Superior mechanical design – provides excellent IM protection.
- Front-to-back ratio – The high 35 dB front-to-back ratio is maintained at all H-plane settings.

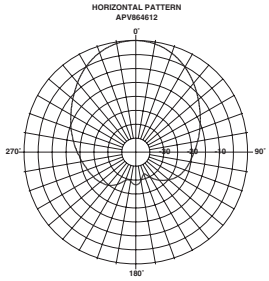


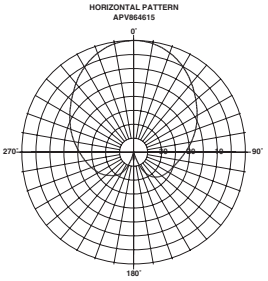
APV8646* Series

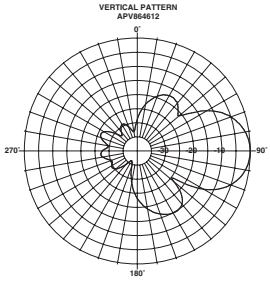
ORDERING INFORMATION	
Model Number	Frequency Range, MHz
APV864612	806-894
APV864615	806-894

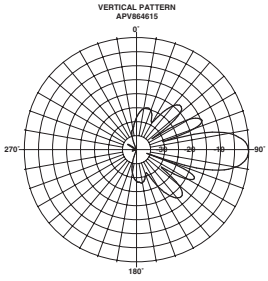
ELECTRICAL SPECIFICATIONS	APV864612	APV864615
Frequency Range, MHz	806-894	806-894
Horizontal Pattern	Directional Variable	Directional Variable
Antenna Type	Panel Vertical Polarized	Panel Vertical Polarized
Polarization	Vertical	Vertical
Horizontal Beamwidth, deg	46, 60, 78, 90, 105, 110	46, 60, 78, 90, 105, 110
Vertical Beamwidth, deg	32	16
Electrical Downtilt, deg	0	0
Gain, dBi (dBd)	13.6,12.4,11.6,10.8,10.3,10.1 (11.5, 10.3, 9.5, 8.7, 8.2, 8.0)	16.6,15.5,14.7,13.9,13.4,13.1 (14.5, 13.4, 12.6, 11.8, 11.3, 11.0)
Front-To-Back Ratio, dB	35	35
Bandwidth for 1.5:1 VSWR, MHz	88	88
Maximum Power Input, W	500	500
3rd Order IMP @ 16 x 41 dBm, dBm	< -100	< -100
Lightning Protection	Direct Ground	Direct Ground
Connector Type	N Female	N Female
Mount Type	Fixed	Fixed
Mounting Hardware	10238-2 Clamp Set	10238-2 Clamp Set
MECHANICAL SPECIFICATIONS		
Dimensions - HxWxD, mm (in)	610 x 635 x 114 (24 x 25 x 4.5)	1219 x 635 x 114 (48 x 25 x 4.5)
Weight w/o Mtg. Hardware, kg (lb)	Integral w/antenna	Integral w/antenna
Weight w/ Mtg. Hardware, kg (lb)	5.4 (12)	10.9 (24)
Max Wind Loading Area, m2 (ft2)	0.387 (4.17)	0.743 (8)
Rated Wind Speed, km/h (mph)	160 (100)	160 (100)
Maximum Thrust @ Rated Wind, N (lbf)	741 (166.67)	1423 (320)
Side Wind Loading Area, m2 (ft2)	0.07 (0.75)	0.387 (4.17)
Side Thrust @ Rated Wind, N (lbf)	133 (30)	743 (167)
Reflector Material	5052-H32 Aluminum Alloy	5052-H32 Aluminum Alloy
Radiating Element Material	5052-H32 Aluminum Alloy	5052-H32 Aluminum Alloy
Radome Material	Weather-Resistant Plastic	Weather-Resistant Plastic

* Note - The APV Series has adjustable side panels. See Table View for resulting Beamwidths and Gains.









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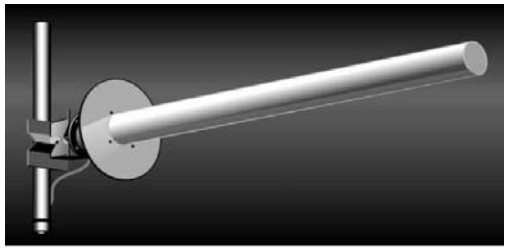
AH* Series

Applications

Repeater site configurations, tunnels and underground coverage, or difficult propagation environment

Benefits

- Ideal for repeater site managing tunnel coverage
- Ensures homogeneous coverage in tunnel independent of vehicular traffic
- Easy to hide in road environment
- Easy installation allows tight schedule installation
- To be preferred to YAGI solution because of sidelobe level suppression
- Very directive pattern eases isolation from mother cell antenna
- +/-6° vertical mechanical tilt for adaptation to special sites



Note:
Mounting pipe diameter – AH18-203013:
2 U-clamps of 35-65mm with FIX11.
2 U-clamps of 60-115 mm with FIX54.
For mechanical downtilt option, add FIX7.Electrical

Mounting pipe diameter – AH900:
FIX11 35-65mm, FIX7 option for mechanical downtilt.
FIX54 60-115mm, FIX7 option for mechanical downtilt.

ELECTRICAL SPECIFICATIONS	AH900	AH90-1811B	AH18-203013
Frequency Range, MHz	824-894 , 872-960	880-960 , 1710-1880	1710-1900 , 1900-2170
Polarization	Circular	Circular	Circular
Horizontal Beamwidth, deg	28	40 , 25	30 , 25
Vertical Beamwidth, deg	28		30 , 25
Electrical Downtilt, deg	0	0	+/-6
Gain, dBi (dBd)	15 (12.9) , 15.5 (13.4)	11.1 (9) , 13.5 (11.4)	13.7 (11.6) , 13.9 (11.8)
Front-To-Back Ratio, dB	> 20 (Typ.25)	> 20	> 25
VSWR	< 1.5:1	< 1.5:1	< 1.5:1
Maximum Power Input, W	400	200	400
Impedance	50	50	50
3rd Order IMP @ 2 x 43 dBm, dBc		> 150, > 150	> 150
Connector Type	7-16 DIN Female	(2) 7-16 DIN Female	7-16 DIN Female
Connector Location	Back	Back	Back
Mount Type	Fixed	Fixed	Fixed
Mounting Hardware	Fix 11	Fix 12	Fix 11
MECHANICAL SPECIFICATIONS			
Dimensions - HxWxD, mm (in)	1640 x 115 (64.53 x 4.53)	210 x 310 x 720 (8.26 x 12.2 x 28.33)	700 x 115 (27.55 x 4.53)
Weight w/o Mtg. Hardware, kg (lb)	5 (11)	8 (17.6)	3 (6.6)
Rated Wind Speed, km/h (mph)	160 (100)		160 (100)
Max Wind Loading Area, m2 (ft2)	0.19 (2.02)	0.07 (0.7)	0.08 (0.86)
Survival Wind Speed, km/h (mph)	200 (125)	200 (125)	200 (125)
Maximum Thrust @ Rated Wind, N (lbf)	18.6 (4.2)		18.6 (4.2)
Radiating Element	Copper	Cylindrical Support	Cylindrical Support
Material		Copper Wire Rolled	Copper Wire Rolled
Radome Material	Fiberglass	Fiberglass	Fiberglass
Radome Color	White, RAL9010	Black	Light Grey, RAL 7035
Packing Dimensions, HxWxD, mm (in)		980 x 435 x 335 (38.56 x 17.12 x 13.18)	

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Antenna Mounting Hardware and Accessories

This section describes all mounting hardware available for base station antennas.

RFS introduced a new universal mount applicable to most panel antennas and available in multiple upgradable configurations:

- fixed or wall mount,
- fixed or wall mount with azimuth adjustment,
- mechanical downtilt mount,
- mechanical downtilt mount with azimuth adjustment,
- mechanical downtilt mount with scissor kit,
- mechanical downtilt mount with scissor kit and azimuth adjustment.

A standard cluster mount is also described allowing to fix around a pole 3 panel antennas.

To adjust correctly both azimuth and elevation (downtilt), RFS has developed a special tool the CELaligner presented at the end of this section.

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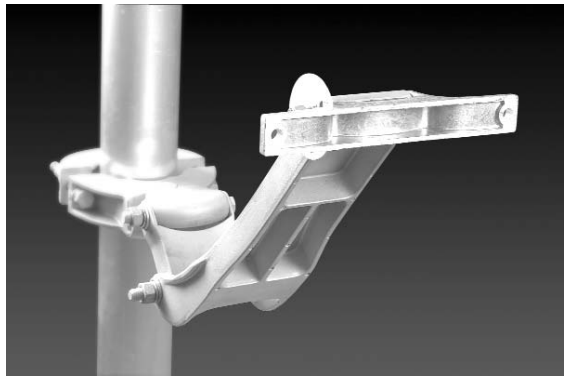
Global Mounting Hardware

APM40 Series

The RFS APM40 series mounting kits are suitable for all base station antennas up to 2.6m in length.



Benefits

- One mount kit fits all.

  This standard downtilt mount kit can be used on the RFS range of single and multiband panel antennas.

- Convenient, one handed adjustment.

  This new design incorporates self-captivated bolts to allow a rigger to easily adjust using one hand.

- A single flexible mount system.

  The standard version can be upgraded using option for optimal adjustment flexibility.

Features

- The standard downtilt mount kit can be used for
  - mechanical downtilt using a sliding beam
  - direct mount on pole or wall-mounted
- Optional azimuth adjustment or scissors are available to upgrade the standard down tilt kit.
- Pipe diameter: 60 - 120 mm
- Mechanical downtilt range:

  0-10° for 2m antennas

  0-15° for 1.3m antennas
- Azimuth adjustment up to +/- 30°
- Downtilt angle indicator
- Suitable for industrial and marine environments

MOUNT ORDERING INFORMATION		
Antenna Suffix	**Type of Mounting**	**Mounting Kit**
C	Downtilt	APM40-2
D	Downtilt with azimuth upgrade	APM40-2 & APM40-3
E	Downtilt with scissor upgrade	APM40-2 & APM40-E2
F	Downtilt with scissor and azimuth upgrades	APM40-2 & APM40-E2 & APM40-E3

MECHANICAL SPECIFICATIONS	
Weight of standard configuration, kg (lb)	2.8 (6.2) tilt kit
Mounting kit material	Aluminum, Galvanized steel
Packed size, H x W x D, mm (inches)	1250 x 200 x 70 (49.2 x 7.9 x 2.7) tilt kit
Packaging material	Plastic sleeve
Tools required	18mm (0.75”) AF Socket (3/8” drive recommended), 10mm (0.4”) AF spanner or socket

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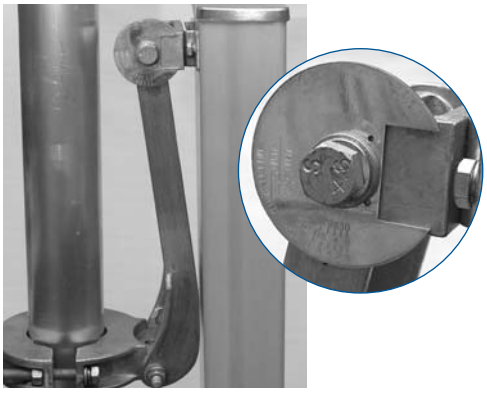
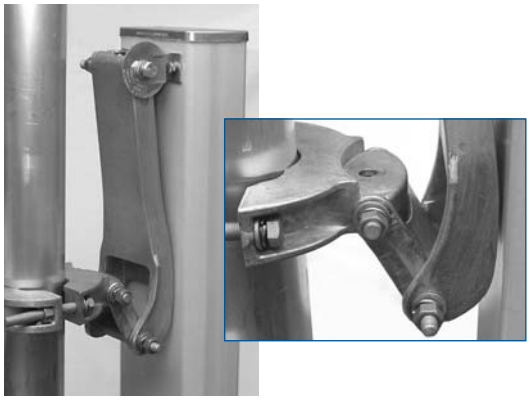
Global Mounting Hardware

Standard Configuration Mechanical Downtilt APM40-2 (Antenna "-C")



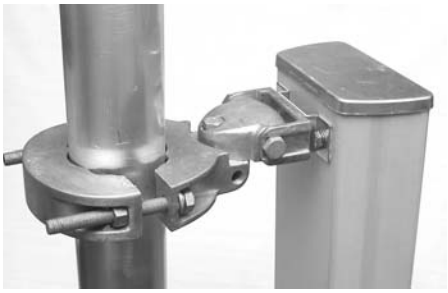
Beam tilt configuration at 0 deg. Pole or Wall mount.

Standard Configuration with Scissor Upgrade APM40-2+APM40-E2



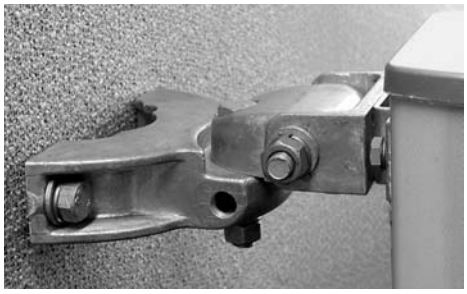
Beam tilt configuration with scissor kit. Pole or Wall mount.

Standard Configuration Direct Mount with Azimuth upgrade APM40-2+APM40-E3



Direct Mount configuration with Azimuth adjustment. Pole mounted.

Standard Configuration Wall Mount with Azimuth upgrade APM40-2+APM40-E3



Direct Mount configuration with Azimuth adjustment. Wall mounted.

Standard Configuration with Azimuth Upgrade APM40-2+APM40-E3

Beam tilt configuration at 0 deg with Azimuth adjustment. Pole or Wall mount.

Standard Configuration with Scissor Upgrade and Azimuth Upgrade APM40-2+APM40-E2+APM40-E3

Beam tilt configuration at 0 deg with scissor kit and azimuth adjustment. Pole or Wall mount.

Beam tilt configuration at 6 deg with scissor kit and azimuth adjustment. Pole or Wall mount.

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3-Sector Cluster Mount Kit

APM70-3C Series

The RFS APM70-3C mounting kits are suitable for all base station 3-sector cluster type antennas up to 2.6m in length.

Cluster antennas are used on sites where low impact aesthetics are required for site approval.

BENEFITS

- One mount kit fits all.

  This single mount kit can be used on the RFS range of CDMA800, GSM900, GSM1800, PCS1900, UMTS2100 and all multiband antennas.
- Low profile for minimal visual impact.
- Reduction of site costs due to easy and fast installation.

FEATURES

- Individual azimuth adjustment for each antenna
- Fits to mounting pipe 75 – 120 mm diameter.
- Direct mount or upgradable for mechanical downtilt.
- Suitable for industrial and marine environments.

MOUNTING OPTIONS

- **Direct Mount (Standard)**

When used as a direct mount the antennas are connected to the APM70-3C mount kit. This attachment occurs via the standard global interface brackets on the back of the antenna.

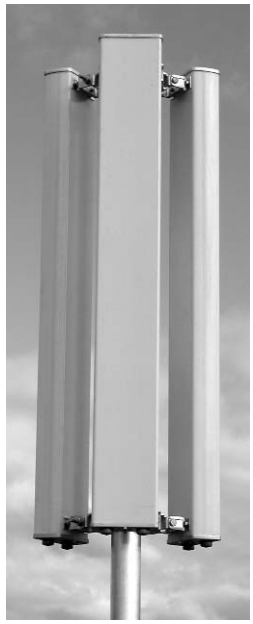
Parts requirement:
1x APM70-3C Mount Kit
3x APM40-E4 Interface kits for High band antennas. (normally supplied with antenna)

- **Downtilt Mount (Optional) – ordered separately**

Full downtilt adjustment can be provided by use of the optional APM40-E1 beam upgrade kit and APM40-E2 scissor kits in conjunction with the APM70-3C mount kit.

Tilt ranges achievable are as follows:
0° - 7.5° for 2.6m antenna
0° - 10° for 2m antenna
0° - 15° for 1.3m antenna

Parts requirements:
1x APM70-3C Mount Kit
3x APM40-E1 Beam upgrade kits (order separately).
3x APM40-E2 Scissor upgrade kits (order separately).



High band Antenna cluster with APM70-3C direct mount kit with optional APM40-E4 interface kit attached to antennas.

Dualband GSM/DCS Antenna cluster with APM70-3C direct mount kit.

APM40-E4 Interface bracket assembly (highlighted) for high band antennas.

Dualband Antenna at 5deg tilt using APM70-3C plus optional APM40-E1 and APM40-E2 mounting kits

MECHANICAL SPECIFICATIONS

Model	APM70-3C	APM40-E1	APM40-E2
Weight of kit, kg (lb)	2.0 (4.4)	1.0 (2.2)	0.3 (0.7)
Mounting Pipe, mm (in)	75-120 (2.9x4.7)	N/A	N/A
Mounting kit material	Aluminum	Aluminum	Aluminum
Packed size, H x W x D, mm (in)	270 x 150 x 60 (10.6 x 5.9 x 2.4)	550 x 200 x 70 (21.6 x 7.9 x 2.7)	250 x 200 x35 (9.8 x 7.9x 1.4)
Packaging material	Cardboard carton	Plastic sleeve	Plastic sleeve
Tools required	18mm (3/4") AF Socket		

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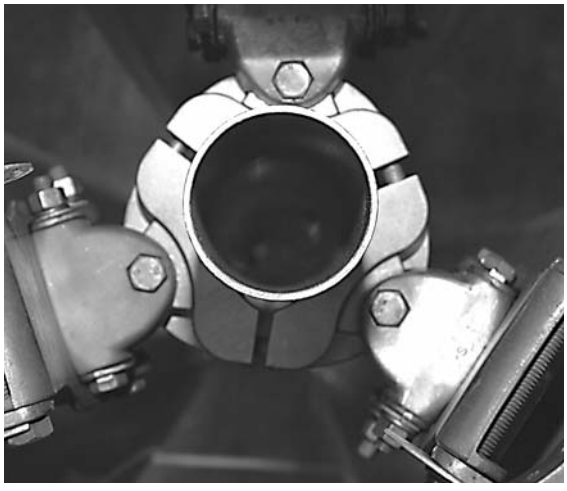
3-Sector Cluster Mount Kit

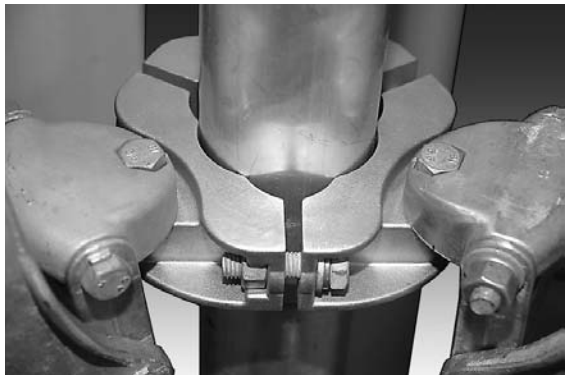
APM70-3C Series

APM70-3C with standard direct mount (top section view)

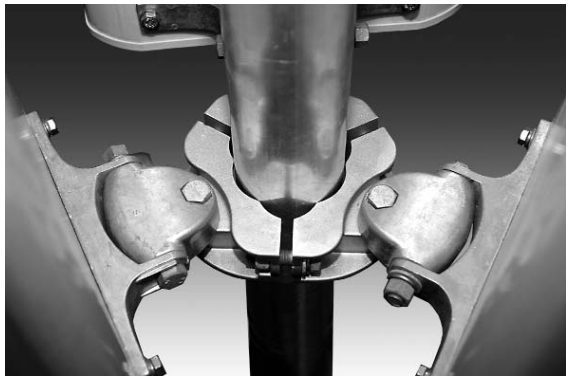
APM70-3C with downtilt option (top section)



APM70-3C with downtilt option (viewed from above)

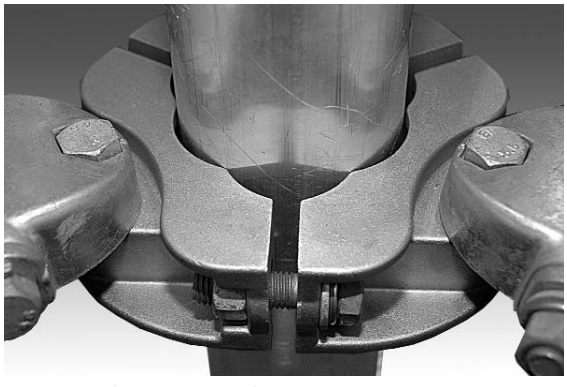


APM70-3C with downtilt option (top section) - zoom view

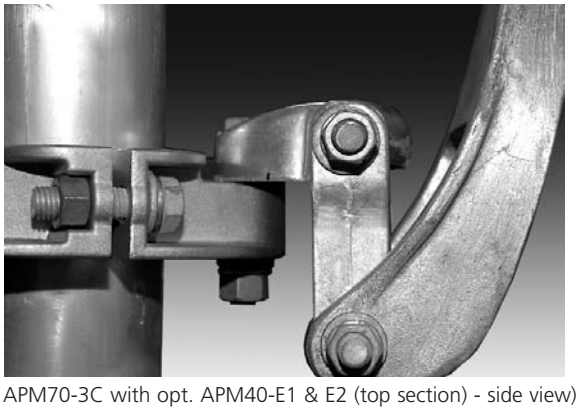


APM70-3C (bottom section)

APM70-3C with optional APM40-E1 & E2 scissor upgrade kit



APM70-3C (bottom section) - zoom view



APM70-3C with opt. APM40-E1 & E2 (top section) - side view)

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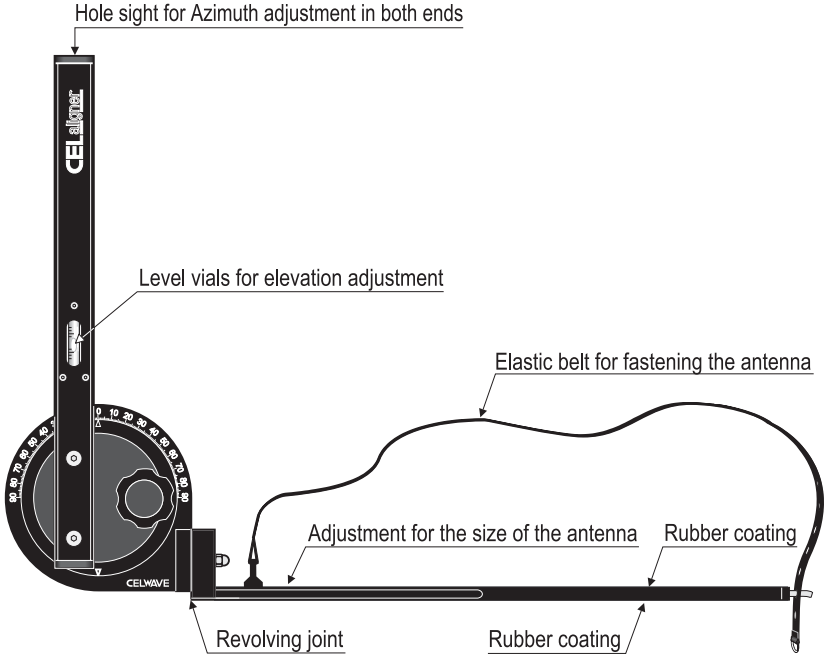
CELaligner APT1-1

The CELaligner is a dual functional tool for alignment of panel antennas. It can be used for adjusting both the elevation (downtilt) and the azimuth. The CELaligner is supplied in a handy carrying bag, to wear over the shoulder, when climbing an antenna mast or tower.



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RF Conditioning

70 Years of Experience in Wireless Communications

As a leader in the supply of RF Conditioning products to worldwide wireless carriers and original equipment manufacturers, RFS offers customers the professional experience of many years of service to the industry while remaining on the cutting edge of wireless developments.

RFS offers RF Conditioning products such as combiners, co-location filters, duplexers and diplexers, Tower-Mounted Amplifiers (TMA) and Boosters (TMB), that are designed as part of systems or subsystems or available separately.

RFS specializes in design, engineering and production, and offers unique reliable solutions. All of our RF Conditioning products utilize RFS' technical expertise to satisfy our customers' unique needs.

Technical Excellence

The design and engineering of RF Conditioning products is carried out using innovative methods. Designs are simulated and optimised utilising proprietary software solutions. After submitting the simulations to the customer for approval, the products are prototyped in our lab.

Research into new materials has led to the development of innovative products such as polymeric filters and multimode ceramic filters. Research into new active devices and their characterization yields optimised designs for low noise amplification for emerging UMTS and CDMA2000 applications.

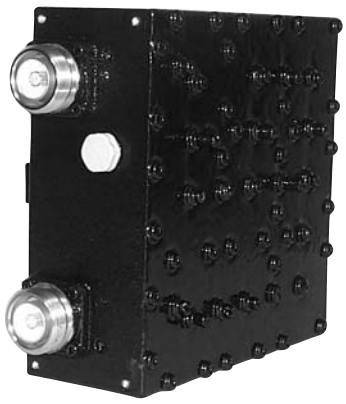
A Leading Global Supplier

With engineering and production locations in the USA, Denmark, China and Brazil, and in conjunction with a worldwide sales and marketing network, RFS provides customers all the advantages of a close contact with the support of highly skilled engineering teams and of local manufacturing and shipping.

For high volume manufacturing, RFS utilizes castings and moulding of aluminium and of advanced materials such as polymeric plastics.

Robotic tuning systems are in place to offer quality and flexibility in medium and large volume production runs.

RFS is committed to supplying products and systems solutions that meet the most stringent customer's expectations for reliability and maintenance-free performance.



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RF Conditioning

Listening to Our Customers

RFS recognizes its role as a provider of custom solutions. RFS' expertise is an invaluable resource to our customers, helping them solve problems in difficult operating environments.

Our local teams of engineers, product managers and technical sales support can be addressed any technical questions. In addition, we carefully evaluate our customers' feedback, which serves as a stimulant for further improvement of our products and product portfolio.

Quality Management

All engineered parts used in the RF Conditioning products supplied by RFS are designed, manufactured, tested and packaged by RFS.

The RFS quality management system at all the manufacturing facilities and customer service centers fulfils the requirements of ISO 9000 certified by accredited and independent certification bodies.

RFS is actively engaged in the global adherence to safe environmental practices. Some manufacturing facilities are already ISO 14000 certified.

Product Selection Matrix

	PAGE NUMBERS						
	Co-location Interference Protection Filters	Receiver Multicouplers	Duplexers	Diplexers/ Triplexers	Tower-Mount Amplifiers	Combiners and Cavities	Tower-Mounted Boosters
PMR/SMR	238, 254	252, 254	252, 256-258	260-262	244	247-250, 252	
CDMA850	238-239		256	260-262	243		
GSM850	238-239		256	260-262	243		
GSM900	238-239		256	260-262	243		264
GSM1800	239		256	260-262	243		264
GSM1900	239		256	260-262	243		
UMTS1900	239		256	260-262	243		
UMTS2100	239			260-262	244		

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Co-location Interference Protection Filters

Application

Interferences are likely to exist when RF base stations are co-located. That may cause receiver desensitization, overload and/or intermodulation product (IMP) interference, thereby degrading their system performances and increasing dropped calls.

Co-location filters are used to prevent wideband noise and spurious signals to interfere from one system transmitter band into another system receiver band.

Some examples of applications of the co-location filters are:

- GSM900 is co-located with 800 MHz cellular equipment
- PCS is co-located with GSM 1800 MHz equipment
- UMTS is co-located with PCS equipment, etc

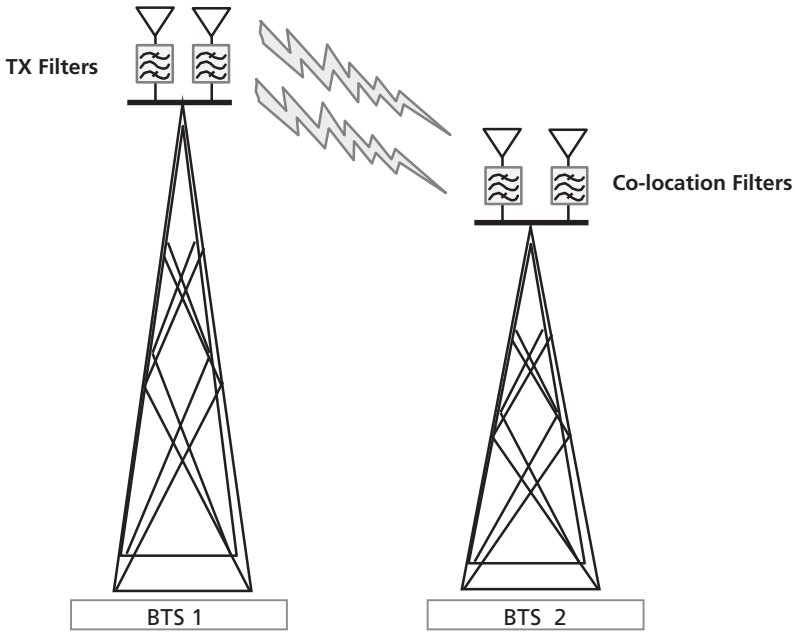
Features & Benefits

- Suppression of out-of-band noise and spurious emission signals of a transmitter.
- Protection of the receiver from overload.
- Protection of the receiver sensitivity.
- Reduction of dropped calls.
- Maintain an appropriate isolation between the co-located base stations.

5044-4 Series Cellular Band Transmit Filter

MF08-61X-2 Bandpass Filter

FB907-9605008 GSM 900MHz Co-location Filter



Insertion of co-location filters and Tx filters will eliminate the interference caused in BTS 2 by BTS1

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Co-location Interference Protection Filters

Cellular 800MHz Receive Filters

The 5478 and 5198 series of filters provide passbands for Cellular 800 MHz A and B bands. They protect the respective receiver band from interference from mobiles and portables in other bands.

	5478	5198	5198-6
Frequency Range, MHz	824-835; 845-846,5	835-849	835-849
Insertion Loss, dB	1.9 (typ)	1.6 (max)	1.6 (max)
Rejection, dB @ F, MHz	35 (min) @ 821 35 (min) @ 837 35 (min) @ 844.2 35 (min) @ 847.3	35 (min) > 851	35 (min) > 851
Indoor/Outdoor	Indoor	Indoor	Indoor
Special Features	Dual Window Filter	N/A	Six 5198 filters in a 19" tray

GSM 900MHz Receive Filters

Featuring low insertion loss and compact size they improve system performance by rejecting all interference signals outside the GSM 900 Rx band, like CDMA transmitter frequencies.

	FLG851045	FLG078040-1	FLG078040-2
Frequency Range, MHz	885-910	907-915	907-915
Insertion Loss, dB	1.5 (max)	1.3 (max)	1.3 (max)
Rejection, dB @ F, MHz	45 (min) @ <880 and > 915	40 (min) @ 850 - 894	40 (min) @ 850 - 894
		60 (min) @ 935 - 2750	60 (min) @ 935 - 2750
Indoor/Outdoor	Indoor	Indoor	Outdoor

UHF Transmit Filters

The 5044-4 filter provide band pass characteristics for both transmitter and receiver applications in the UHF frequency band.

	5044-4-1	5044-4-2
Frequency Range, MHz	406-512	406-512
BandWidth, MHz	2	4
Insertion Loss, dB	1.5 (max)	1.0 (max)
Rejection, dB @ F, MHz	60 (min) @ fc ± 3	60 (min) @ fc± 6
Indoor/Outdoor	Indoor	Indoor
Average Continuous Power, W	250	250

Cellular Band Transmit Filters

	5044-8-1	5044-8-2	5044-8-4	5044-8-5
Frequency Range, MHz	806-880	880-960	880-960	806-960
BandWidth, MHz	5	5	10	20
Insertion Loss, dB	1.5 (max)	1.5 (max)	1.2 (max)	0.8 (max)
Rejection, dB @ F, MHz	30 (min) @ fc± 8	30 (min) @ fc± 8	30 (min) @ fc± 15	30 (min) @ fc± 30
Indoor/Outdoor	Indoor	Indoor	Indoor	Indoor
Average Continuous Power, W	400	400	600	600

	5605
Frequency Range, MHz	869-880
BandWidth, MHz	11
Insertion Loss, dB	1.0 (max)
Rejection, dB @ F, MHz	60 (min) @ 890-915
Indoor/Outdoor	Indoor and Outdoor
Average Continuous Power, W	100

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GSM 900MHz Co-location Filters

Designed for use in GSM 900MHz applications, these compact filters have very low insertion loss and high rejection of unwanted signals.

	FLG908045/1V-0	FLG928840/1V-0	FLG969430S-3	FLG989430D-3
Frequency Range, MHz	890 - 960	892 - 960	896-960	898.5 - 960
Insertion Loss, dB	1.0 (max)	1.0 (max)	1.5 (max)	1.1 (max)
Rejection, dB @ F, MHz	45 (min) @ 850-880	40 (min) @ 850-888	30 (min) @ 824-894	30 (min) @ 850-894
Indoor/Outdoor	Indoor	Indoor	Indoor	Outdoor
Average Continuous Power, W	240	240	240	240
Special Features	Double Filter for 19" Rack	Double Filter for 19" Rack	Single Filter	Double Filter for Outdoor Installation
	FLG989450D-3	**FLG029450/1V-0**	**FLG059430/1V-0**	**FB907-9605008**
Frequency Range, MHz	898.5 - 960	902 - 960	905 - 960	907-960
Insertion Loss, dB	1.1 (max)	0.8 (max)	1.0 (max)	0.5 (max)
Rejection, dB @ F, MHz	50 (min) @ 850-894	50 (min) @ 850-894	30 (min) @ 850-894	50 (min) @ 850-894
Indoor/Outdoor	Outdoor	Indoor	Indoor	Outdoor
Average Continuous Power, W	240	240	240	250
Special Features	Double Filter for Outdoor Installation	Double Filter for 19" Rack	Double Filter for 19" Rack	Single Filter

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Tower Mount Amplifiers

Application

A high BTS sensitivity is the key parameter to a better transmission quality. The BTS up-link sensitivity is significantly improved when using Tower Mounted Amplifiers (TMA) with low noise figure. The large improvements of the BTS sensitivity lead also to a better voice quality and improved dropped call rate.

TMAs are used to optimize the balance between the uplink and downlink RF paths, compensating for the feeder losses from antenna to the base station. Up- and down-link balancing is a key factor for better and sharper cell hand-over.

In the case of 3G, the extra amplification of the up-link signals will ensure a better bit rate coverage for data transmission, hence a significant improvement of the network quality.

Cell enlargement can also be achieved using TMA. This gives the operators the benefit of serving more subscribers from the same BTS site. This leads to less base stations needed, faster roll-out time and more BTS revenue.

RFS offers TMAs developed for SMR, cellular 850, GSM 900 and 1800, PCS 1900 and UMTS. Monitoring of the TMA system can be performed in two different ways, either by measuring the current level at the BTS level or by having an intelligent interface like the AISG protocol.

Features & Benefits

- Compact design and low weight
- Current alarm monitoring or AISG interface
- Low noise figure
- Low downlink insertion loss
- Easy access for RET option
- Optimization of the cell capacity and of the coverage
- Ability of serving more subscribers from the same site
- Reduction of drop call rate and better transmission call quality
- More BTS revenue
- Re-balancing the up- and downlink signals

1900 TMA with current alarm detection

AISG in-line UMTS TMA

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Tower Mount Amplifiers

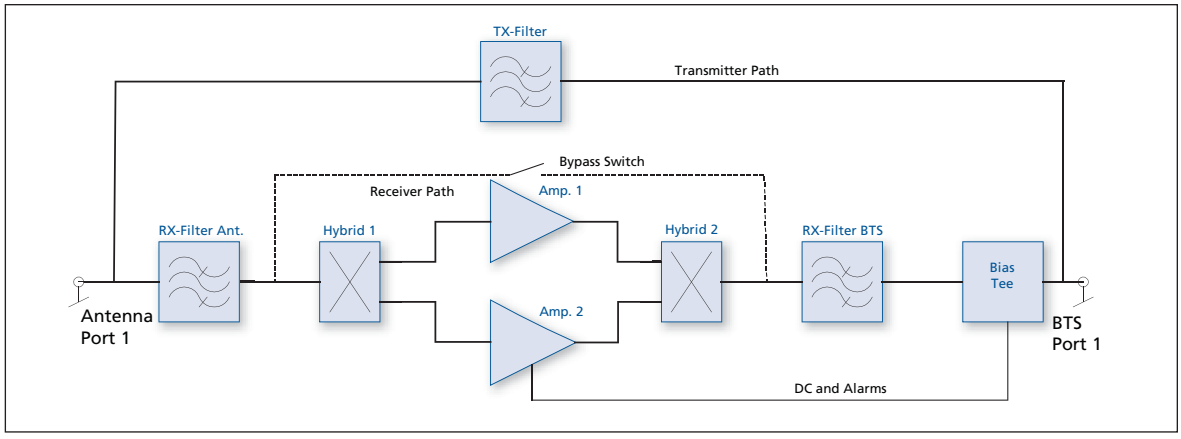
Product Overview

The Standard TMA

The TMA separates the RF uplink (Rx) and downlink (Tx) signals through RF filters. In the uplink path the signal is amplified by redundant low noise amplifiers. If a malfunction occurs, the auto-bypass function is activated and an alarm is reported, ensuring system reliability at all times.

The TMA includes a bias-tee function that injects the DC supply voltage into the amplifier from the inner conductor of the feeder cable.

Standard TMA block diagram for a single TMA



The AISG TMA

The AISG TMA features the same RF functionalities and specifications as the standard TMA and includes communications features compliant with the AISG protocol that allow a remote monitoring of the equipment.

All the AISG TMAs include an AISG output connector to an Antenna Control Unit (ACU) for Remote Electrical Tilt (RET).

The complete AISG TMA system, including the control network interface unit (CNI) and the Bias-T, provides the DC feed and the alarm reporting at the Node B level or the OMC.

The CNI

The Control Network Interface and Power Distribution Unit (CNI-P) is used for the supply of the DC-current and for the reporting of the alarms of the Antenna Line devices (ALD). The CNI-P supports the AISG signalling protocol between the node-B and the ALDs such as AISG TMAs and ACUs.

The CNI-P unit reports the failure of each TMA and provides a summing alarm. Designed as an AISG primary station, the CNI-P can be set up and controlled locally or remotely by software. The Network Element Management software (NEM-ALD) is used for supervision of the ALD and of the antenna tilt.

The CNI-P has PPP or Ethernet output ports for connection to a local PC or to the site Local Area Network (LAN).

The AISG Bias-T

The RFS Bias-T, model number BITA2S, is used to inject or to extract DC currents and the AISG communication signal into the RF feeders. It includes an AISG modem that converts the 2.176 MHz on/off shift keying signal (OOSK) to an RS485 compatible signal.

This Bias-T is compatible with the AISG Protocol.

RFS is a member of the Antenna Interface Standards Group.

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Tower Mount Amplifiers

Power Supplies – Compatibility Matrix

	PDU1906	PDU1906-4	PDU1912-0	PDU1912-1	
Type (No of TMA)	For 6 TMAs	For 6 TMAs	For 6 TMA	For 6 TMAs, low current	
External Interface	output summing relay	output summing relay	output summing relay	output summing relay	
Input Voltage	48 VDC	48 VDC	48 VDC	48 VDC	
ATM901815S-3	•				
ATM901815D-3	•				
ATM181812S-3	•				
ATM181812D-3	•				
ATM801712-0			•		
ATM192012-0			•		
ATM201812D-3P		•			
ATM192012-1				•	
ATM192012T-0			•		
ATM19801712-0			•		
ATM19801712-1			•		
ATM192012B-0			•		
ATM192012BD-0			•		
	PDU2435-1	**PDU2435-2**	**CNI-P1A11**	**CNI-P2A11**	**RMC80**
Type (No of TMA)	For three branch TMA	For three branch TMA	For three dual TMA	For three dual TMA	For one TTA
External Interface	none	none	AISG 1.1, PPP	AISG 1.1, Ethernet	one output alarm
Input Voltage	48 VDC	48 VDC	48 VDC	48 VDC	48 VDC / 120-240 VAC
ATM201812D-3A11			•	•	
ATM201831D-3A11			•	•	
490104	•	•			
490114	•	•			
TTAS80-0281-24					•

Bias-T – Compatibility Matrix

	716-UC90-07	716-UC90-09	BIT1	BITA2S
Type (No of TMA)	For one TMA	For one TMA	For one TMA	For two TMA
External Interface	standard	standard	standard	AISG 1.1
Input Voltage	12 VDC	12 VDC	12 VDC	24 VDC
ATM901815S-3			•	
ATM901815D-3			•	
ATM181812S-3			•	
ATM181812D-3			•	
ATM801712-0	•	•		
ATM192012-0	•	•		
ATM192012-1	•	•		
ATM192012T-0	•	•		
ATM19801712-0	•	•		
ATM19801712-1	•	•		
ATM192012B-0	•	•		
ATM192012BD-0	•	•		
ATM201812D-3A11				•
ATM201831D-3A11				•
ATM201812D-3P			•	
490104*				
490114*				
TTAS80-0281-24*				

*Bias-T included in the base equipment

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TMA for GSM 900 and 1800

	ATM901815S-3	ATM901815D-3	ATM181812S-3	ATM181812D-3
Frequency Band, MHz	880-960	880-960	1710-1880	1710-1880
Bandwidth, MHz	8 to 25	8 to 25	15, 25 or 30	15, 25 or 30
Gain, dB	15 ± 1	15 ± 1	12 ± 1	12 ± 1
Noise Figure, typ @ 25°C, dB	1.6	1.6	1.5	1.5
Tx Insertion Loss, typ, dB	0.5	0.5	0.4	0.4
OIP3, dBm	20	20	20	20
Automatic By-Pass Function	Yes	Yes	Yes	Yes
Connector Placement	Bottom	Bottom	Bottom	Bottom
Weight, kg (lb)	3.1 (6.5)	6.2 (13.0)	2.5 (5.5)	4.0 (8.8)

Single band TMA for cellular 850 and PCS 1900

	ATM801712-0	ATM192012-0	ATM192012-1	ATM192012T-0
TMA types	Single TMA	Single TMA	Single TMA, low current	Twin TMA
Frequency Band, MHz	824-894	1850-1990	1850-1990	1850-1990
Bandwidth, MHz	25	60	60	60
Gain, dB	12 ± 1	12 ± 1	12 ± 1	12 ± 1
Noise Figure, typ @ 25°C, dB	1.4	1.6	1.6	1.6
Tx Insertion Loss, typ, dB	0.5	0.5	0.5	0.5
Peak Tx Power, W	5000	3000	3000	3000
OIP3, dBm	25	25	25	25
Automatic By-Pass Function	Yes	Yes	Yes	Yes
Connector Placement	Bottom	Bottom	Bottom	Bottom
Weight, kg (lb)	5.9 (13.0)	5.0 (11.0)	5.0 (11.0)	8.6 (19)

Dual band TMA for cellular 850 and PCS 1900 band

	ATM19801712-0	ATM19801712-1
TMA types	Diplexed dual band	Dual band
Frequency Band one, MHz	824-894	824-894
Frequency Band two, MHz	1850-1990	1850-1990
Gain, dB	12 ± 1	12 ± 1
Noise Figure, typ @ 25°C, dB	1.4 & 1.6	1.4 & 1.6
Tx Insertion Loss, typ, dB	0.5	0.5
Peak Tx Power, W	3000	3000
OIP3, dBm	25	25
Automatic By-Pass Function	Yes	Yes
Connector Placement	Bottom	Bottom
Weight, kg (lb)	8.6 (19.0)	8.6 (19.0)

TMA for PCS band with cellular 850 bypass

	ATM192012B-0	ATM192012BD-0
TMA types	Single TMA	Twin TMA
Frequency Band, main, MHz	1850-1990	1850-1990
Frequency Band, bypass, MHz	824-894	824-894
Gain, dB	12 ± 1	12 ± 1
Cellular 850 bypass loss, dB	< 0.4	< 0.4
Noise Figure, typ @ 25°C, dB	1.6	1.6
Tx Insertion Loss, typ, dB	0.5	0.5
Peak Tx Power, W	3000	3000
OIP3, dBm	25	25
Automatic By-Pass Function	Yes	Yes
Connector Placement	Bottom	Bottom
Weight, kg (lb)	5.0 (11.0)	8.6 (19)

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Tower Mount Amplifiers

TMA for UMTS band

	ATM201812D-3A11	ATM201831D-3A11	ATM201812D-3P
Frequency Band, MHz	1920-2170	1920-2170	1920-2170
Bandwidth, MHz	60	60	60
Gain, dB	12 ± 1	31 ± 1	12 ± 1
Noise Figure, typ @ 25°C, dB	1.8	1.8	1.8
Tx Insertion Loss, typ, dB	0.4	0.4	0.4
Peak Tx Power, W	4000	4000	4000
OIP3, dBm	25	34	25
Alarm system	AISG 1.1	AISG 1.1	Standard
Automatic By-Pass Function	Yes	Yes	Yes
Connector placement	In-Line	In-Line	In-Line
Weight, kg (lb)	3.3 (7.3)	3.3 (7.3)	3.3 (7.3)

Three branch TTA for SMR

	490104	490114
Frequency Band, MHz	806 - 866	806 - 824
Bandwidth, MHz	18	18
Gain, dB	15.3	16.5
Noise Figure, typ @ 25°C, dB	2.8	2.2
Tx Insertion Loss, typ, dB	1.5	no TX pass
Tx Power handling, W	400	
OIP3, dBm	+36	17
Automatic By-Pass Function	No	Yes
Test Signal Port	Yes	No
Connector placement	Bottom	Bottom
Weight, kg (lb)	49.9(110)	25.9(57)

TMA for SMR

	490144	TTAS80-0281-24
Frequency Band, MHz	806 - 824	806 - 824
Bandwidth, MHz	18	18
Gain, dB	16	21
Noise Figure, typ @ 25°C, dB	2.2	2.0
OIP3, dBm	33	35.5
Automatic By-Pass Function	Yes	No
Test Signal Port	Yes	Yes
Connector placement	Bottom	Bottom
Weight, kg (lb)	16(35)	8(18)

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Combiners

Combiners are used to combine two or more transmitters so that a single feed and antenna can be used for the radiating the signals. Based on the frequency and frequency separation between the transmitters a choice of cavity or hybrid combining may be made.

Combiners reduce the number of antennas and feeders at a small additional insertion loss.

WIJD862 Series

These extremely compact combiners use a “shared wall” waveguide cavity assembly with an integrated antenna port junction, in combination with a dual isolators for each channel. The isolators have integrated loads. Each isolator has a built-in sampling port to allow measurements of reflected power, particularly useful when retuning the combiner. A patented temperature compensation scheme gives these combiners excellent frequency stability over the complete operating temperature and power ranges. The WIJD862-02S model is recommended for field expansion only.

- Low loss - Maximizes system performance.
- High isolation - Minimizes possibility of intermodulation.
- Modular - Compact design minimizes rack-mounting footprint.
- Fully temperature compensated - Ensures consistent performance across temperature and power range.
- Expandable - Up to 20 channels.

WIJD862 Series

SJD* Series

The SJD Series coaxial cavity-ferrite combiners operate in the 380-512 MHz band. These combiners use low-loss, low IM dual stage isolators with integrated coaxial cavities. They are capable of handling 150 Watts forward and reflected power. No interconnecting cables are used. The 4-channel unit requires 10 vertical rack spaces (17.5”). Optional offset mounting brackets are available. The 8-channel combiner consists of two 4-channel units and a harness kit occupying 20 vertical rack spaces (35”).These combiners offer a solution to your 450 MHz land mobile needs. Their low-loss characteristic maximizes system performance while their high isolation minimizes the possibility of intermodulation.

- Low loss - Maximizes system performance.
- High isolation - Minimizes possibility of intermodulation.
- Modular - Easily expandable in the field.
- Fully temperature compensated - Ensures consistent performance across temperature and power range.
- Field Expansion - To combine multiple cavities requires additional modules and frequency dependent cable harness. Both new and old frequencies must be specified.

SJD* Series

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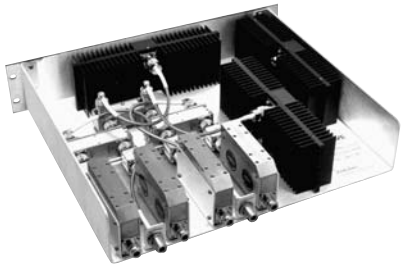
Combiners

Hybrid Combiners

The TCD860-6D combiner is an extremely compact and versatile unit. The hybrid/isolator shelf occupies only one vertical rack space (1-3/4" of vertical rack space), while the load tray, which is remoteable for efficient thermal management, is two rack spaces high. This load panel may be located up to 4 feet from the hybrid/isolator shelf and may be mounted at the top rear of the rack or on any other vertical surface such as a wall where the heat can be dissipated through unconstrained air flow. This unit may be configured as a dual 2-channel, dual 3-channel, single 4-channel, or single 6-channel combiner through changing the configuration of a few cables. However, insertion loss is not compromised. In the 2-channel case, the insertion loss per channel is slightly less than 4 dB, while the 3-channel configuration has less than 6 dB loss per channel. The 4-channel configuration has about 7 dB insertion loss per channel, and the fully expanded 6-channel variant is less than 9 dB per channel.

Rugged isolators capable of 200 Watt operation – Maximize combiner reliability.Two-channel compact combiners with loads built into the unit are the other variations of the hybrid combiner that are shown below.



TCD860 Series

- High isolation – Minimizes possibility of intermodulation.
- Low profile integrated hybrid (TCD860-6D) – Minimizes rack-mounting footprint, only one vertical rack space.
- Remotable load tray (TCD860-6D) – Minimizes rack-mounting footprint, enchances thermal management.
- Easily reconfigurable (TCD860-6D) – Allows dual 2-channel, dual 3-channel, 4-channel, or 6-channel operation.

ATC860R-6

The ATC860R-6 is a six channel SMR auto tuned cavity combiner which tracks changes in base radio transmitters and continuously optimizes itself. It has integral alarm and RS232 status reporting and fits into 3 rack unit spaces.

- Continuously monitors and self-tunes to transmitter frequencies
- Reports status and alarm conditions
- Designed for any SMR base radio including iDEN

ATC860R-6

CPR Series

The CPR range of parallel Tx combiners couple up to 12 transmitters into a common antenna to maximize the use of expensive tower space and reduce the otherwise direct cost of multiple antennas, dedicated cable and installation expense. The parallel configuration allows all channels to be tuned to any frequency within a limited bandwidth. Additional channels may be fitted on-site as required, provided they fall within the bandwidth limitation. While the summary specifications are shown here for up to 6 channels, these combiners are available in up to 12 channels.

CXR Series

The CXR range of parallel Tx combiners couple up to 12 transmitters into a common antenna to maximize the use of expensive tower space and reduce the otherwise direct cost of multiple antennas, dedicated cable and installation expense. The cascaded architecture is used where channels may be allocated from a wider frequency range. Additional channels may be fitted onsite, however if retuning of existing channels is required alteration of existing intercavity cables may be necessary. While the summary specificatins are shown here for up to 6 channels, these combiners are available in up to 12 channels.

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SMR Waveguide 800 MHz

	WIJD862-02S	WIJD862-04S	WIJD862-06S	WIJD862-08S
Frequency range, MHz	851-869	851-869	851-869	851-869
Number of Channels	2	4	6	8
Minimum Channel Spacing, KHz	150	150	150	150
Tx-Tx isolation, dB	60	60	60	60
Tx-Antenna isolation, dB	50	50	50	50
Insertion loss per channel, dB	4	4.3	4.6	4.7
Continuous Power, W (max)	150	150	150	150
Connectors	7/16 Female	7/16 Female	7/16 Female	7/16 Female
Temperature Range, Deg C	0 to +50	0 to +50	0 to +50	0 to +50
	WIJD862-10S	WIJD862-12S	WIJD862-16S	WIJD862-20S
Frequency range, MHz	851-869	851-869	851-869	851-869
Number of Channels	10	12	16	20
Minimum Channel Spacing, KHz	150	150	150	150
Tx-Tx isolation, dB	60	60	60	60
Tx-Antenna isolation, dB	50	50	50	50
Insertion loss per channel, dB	4.9	5	5.5	5.6
Continuous Power, W (max)	150	150	150	150
Connectors	7/16 Female	7/16 Female	7/16 Female	7/16 Female
Temperature Range, Deg C	0 to +50	0 to +50	0 to +50	0 to +50
Temperature Range, Deg C	0 to +50	0 to +50	0 to +50	0 to +50

SMR UHF Cavity

	SJD390-4T-716	SJD390-4T-716	SJD420-4T-716	SJD420-8T
Frequency range, MHz	380-403	380-403	403-433	403-433
Number of Channels	4	8	4	8
Minimum Channel Spacing, KHz	125	125	150	150
Tx-Tx isolation, dB	60	60	60	60
Tx-Antenna isolation, dB	50	50	50	50
Insertion loss per channel, dB	3.7	4.4	3.5	4.4
Continuous Power, W (max)	150	150	150	150
Connectors	7/16 Female	7/16 Female	7/16 Female	7/16 Female
Temperature Range, Deg C	0 to +50	0 to +50	0 to +50	0 to +50
	SJD455-4T-716	SJD455-8T	SJD480-4T-716	SJD480-8T
Frequency range, MHz	438-470	438-470	470-494	470-494
Number of Channels	4	8	4	8
Minimum Channel Spacing, KHz	150	150	150	150
Tx-Tx isolation, dB	60	60	60	60
Tx-Antenna isolation, dB	50	50	50	50
Insertion loss per channel, dB	3.5	4.4	3.5	4.4
Continuous Power, W (max)	150	150	150	150
Connectors	7/16 Female	7/16 Female	7/16 Female	7/16 Female
Temperature Range, Deg C	0 to +50	0 to +50	0 to +50	0 to +50
	SJD500-4T-716	SJD500-8T		
Frequency range, MHz	494-512	494-512		
Number of Channels	4	8		
Minimum Channel Spacing, KHz	150	150		
Tx-Tx isolation, dB	60	60		
Tx-Antenna isolation, dB	50	50		
Insertion loss per channel, dB	3.5	4.4		
Continuous Power, W (max)	150	150		
Connectors	7/16 Female	7/16 Female		
Temperature Range, Deg C	0 to +50	0 to +50		

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Combiners

CPR145 Series of Highband VHF Parallel Tx Combiners

	CPR145-2	CPR150B-3	CPR150B-4	CPR150B-5
Frequency range, MHz	145-174	145-174	145-174	145-174
Bandwidth, MHz	20	20	20	20
Number of Channels	2	3	4	5
Minimum Channel Spacing, KHz	75	75	75	75
Tx-Tx isolation, dB	70	70	70	70
Tx-Antenna isolation, dB	50	50	50	50
Insertion loss per channel, dB	3.9	5.5	6.4	7.1
Continuous Power, W (max)	100	100	100	100
Connectors	N Skt	N Skt	N Skt	N Skt
Temperature Range, Deg C	0 to +50	0 to +50	0 to +50	0 to +50

	CPR150B-6
Frequency range, MHz	145-174
Bandwidth, MHz	20
Number of Channels	6
Minimum Channel Spacing, KHz	75
Tx-Tx isolation, dB	70
Tx-Antenna isolation, dB	50
Insertion loss per channel, dB	7.5
Continuous Power, W (max)	100
Connectors	N Skt
Temperature Range, Deg C	0 to +50

CXR145 Series of Highband VHF Cascaded Tx Combiners

	CXR145-2	CXR145-3	CXR145-4	CXR145-5
Frequency range, MHz	145-174	145-174	145-174	145-174
Bandwidth MHz	29	29	29	29
Number of Channels	2	3	4	5
Minimum Channel Spacing, KHz	75	75	75	75
Tx-Tx isolation, dB	70	70	70	70
Tx-Antenna isolation, dB	50	50	50	50
Insertion loss per channel, dB	4.4	5.7	6.2	6.7
Continuous Power, W (max)	100	100	100	100
Connectors	N Skt	N Skt	N Skt	N Skt
Temperature Range, Deg C	0 to +50	0 to +50	0 to +50	0 to +50

	CXR145-6
Frequency range, MHz	145-174
Bandwidth MHz	29
Number of Channels	6
Minimum Channel Spacing, KHz	75
Tx-Tx isolation, dB	70
Tx-Antenna isolation, dB	50
Insertion loss per channel, dB	7.1
Continuous Power, W (max)	100
Connectors	N Skt
Temperature Range, Deg C	0 to +50

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CPR400C Series of UHF Parallel Tx Combiners

	CPR400C-2	CPR400C-3	CPR400C-4	CPR400C-5
Frequency range, MHz	400-520	400-520	400-520	400-520
Bandwidth MHz	20	20	20	20
Number of Channels	2	3	4	5
Minimum Channel Spacing, KHz	75	75	75	75
Tx-Tx isolation, dB	70	70	70	70
Tx-Antenna isolation, dB	50	50	50	50
Insertion loss per channel, dB	4.0	6.0	7.3	8.2
Continuous Power, W (max)	100	100	100	100
Connectors	N Skt	N Skt	N Skt	N Skt
Temperature Range, Deg C	0 to +50	0 to +50	0 to +50	0 to +50

	CPR400C-6
Frequency range, MHz	400-520
Bandwidth MHz	20
Number of Channels	6
Minimum Channel Spacing, KHz	75
Tx-Tx isolation, dB	70
Tx-Antenna isolation, dB	50
Insertion loss per channel, dB	9.0
Continuous Power, W (max)	100
Connectors	N Skt
Temperature Range, Deg C	0 to +50

CXR400C Series of UHF Cascaded Tx Combiners

	CXR400C-2	CXR400C-3	CXR400C-4	CXR400C-5
Frequency range, MHz	400-520	400-520	400-520	400-520
Bandwidth MHz	30	30	30	30
Number of Channels	2	3	4	5
Minimum Channel Spacing, KHz	75	75	75	75
Tx-Tx isolation, dB	70	70	70	70
Tx-Antenna isolation, dB	50	50	50	50
Insertion loss per channel, dB	4.4	6.2	7.1	7.9
Continuous Power, W (max)	100	100	100	100
Connectors	N Skt	N Skt	N Skt	N Skt
Temperature Range, Deg C	0 to +50	0 to +50	0 to +50	0 to +50

	CXR400C-6
Frequency range, MHz	400-520
Bandwidth MHz	30
Number of Channels	6
Minimum Channel Spacing, KHz	75
Tx-Tx isolation, dB	70
Tx-Antenna isolation, dB	50
Insertion loss per channel, dB	8.3
Continuous Power, W (max)	100
Connectors	N Skt
Temperature Range, Deg C	0 to +50

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Combiners

Hybrid Combiners

	TCD860-6D	TCD860-(2+2)T	TCD860(2X3)T
Frequency range, MHz	851-869	851-869	851-869
Number of Channels	6	2	2
Minimum Channel Spacing, KHz	25	25	25
Tx-Tx isolation, dB	70	70	70
Tx-Antenna isolation, dB	50	50	50
Insertion loss per channel, dB	3.8, 5.8, 7.0	3.9	3.9
Continuous Power, W (max)	100	100	100
Connectors	N Female	N Female	N Female
Temperature Range, Deg C	-30 to +60	-30 to +60	-30 to +60
Special Features	Can be configured as dual 2-channel, dual 3-channel, single 4-channel or single 6-channel unit	Dual 2-channel	Triple 2-channel

Autotune Combiners

	ATC860R-6	ATC860R-DUAL-4
Frequency range, MHz	851-869	851-869
Number of Channels	6	Dual 4
Minimum Channel Spacing, KHz	150	150
Tx-Tx isolation, dB	63	35
Tx-Antenna isolation, dB	52	25
Insertion loss per channel, dB	3.6	.3.0
Continuous Power , Max W	75	75
Connectors-input	N Female	N Female
Connectors-Output	7/16 Female	7/16 Female (Two)
Temperature Range, Deg C	-10 to + 60	-10 to + 60
Harness for Expansion	HRN-ATC860R-12	HRN-ATC860R-8

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VHF/UHF Cavities

These versatile multicouplers permit the connection of a number of transmitters, receivers, or transmitter-receiver combinations, operating on different frequencies, to a common broadband antenna, radiating cable or distributed antenna system.

They feature temperature compensated resonators and are mounted vertically in a 19" rack.

The multi-couplers can also be used as bandpass cavity diplexers. Customised solutions are available for special Tx/Rx frequency combiners.

Isolators can be fitted to the Tx port to increase isolation from adjacent transmitters (Suffix F). Wide band versions are available (Suffix W)

A number of standard filter configurations are described. However, since requirements for isolation between channels, insertion loss, and channel separation are variable and depend upon individual installations, filter characteristics, number of resonators, etc. will vary accordingly, if economical multicoupling systems are to be acheived.

RFS LMR systems engineers will be pleased to advise on the most suitable combination for your requirements.

Features

- **Highly stable temperature compensated resonators**
- **Frequency drift less than .00015% per °C**
- **Techniques suitable for frequency spacing as close as 0.10% of Fc**
- **Minimum insertion loss filter design**
- **Vertical 19 inch rack mounting**

Ordering Information

The following information is needed when ordering these cavities:

a. The type of cavity.

b. Number of channels.

c. The frequencies for each channel.

d. Pass band and insertion loss required.

e. Selectivity and attenuation required outside the passband.

GENERAL SPECIFICATIONS	
Impedence	50 ohms unbalanced
Maximum System VSWR	Less than 1.3:1 (4-channel)

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CP115 Series VHF Cavities used as combiners/RMC's or duplexers

	CP115-422	CP115-423	CP115-424
Frequency range, MHz	115-140	115-140	115-140
Number of Channels	2	3	4
Minimum Channel Spacing, KHz	900	900	900
Tx-Tx isolation, dB	30	30	30
Insertion loss per channel dB	2.0	2.0	2.0
Continuous Power , Max W	100	100	100
Connectors	N Skt	N Skt	N Skt
Temperature Range Deg C	-10 to + 60	-10 to + 60	-10 to + 60

CP145 Series VHF Cavities used as combiners/RMC's or duplexers

	CP145-432	CP145-423	CP145-434
Frequency range, MHz	148-174	148-174	148-174
Number of Channels	2	3	4
Minimum Channel Spacing, KHz	700	900	700
Tx-Tx isolation, dB	30	30	30
Insertion loss per channel dB	2.0	2.0	2.0
Continuous Power , Max W	100	100	100
Connectors	N Skt	N Skt	N Skt
Temperature Range Deg C	-10 to + 60	-10 to + 60	-10 to + 60

CP225 Series VHF Cavities used as combiners/RMC's or duplexers

	CP225-422	CP225-423	CP225-424
Frequency range, MHz	225-360	225-360	225-360
Number of Channels	2	3	4
Minimum Channel Spacing, KHz	1500	1500	1500
Tx-Tx isolation, dB	30	30	30
Insertion loss per channel dB	2.0	2.0	2.0
Continuous Power , Max W	100	100	100
Connectors	N Skt	N Skt	N Skt
Temperature Range Deg C	-10 to + 60	-10 to + 60	-10 to + 60

CP270 Series VHF Cavities used as combiners/RMC's or duplexers

	CP270-422	CP270-423	CP270-424
Frequency range, MHz	270-420	270-420	270-420
Number of Channels	2	3	4
Minimum Channel Spacing, KHz	1500	1500	1500
Tx-Tx isolation, dB	30	30	30
Insertion loss per channel dB	2.0	2.0	2.0
Continuous Power , Max W	100	100	100
Connectors	N Skt	N Skt	N Skt
Temperature Range Deg C	-10 to + 60	-10 to + 60	-10 to + 60

CP225 Series VHF Cavities used as combiners/RMC's or duplexers

	CP450-422	CP450-423	CP450-424
Frequency range, MHz	450-520	450-520	450-520
Number of Channels	2	3	4
Minimum Channel Spacing, KHz	2000	2000	2000
Tx-Tx isolation, dB	30	30	30
Insertion loss per channel dB	2.0	2.0	2.0
Continuous Power , Max W	100	100	100
Connectors	N Skt	N Skt	N Skt
Temperature Range Deg C	-10 to + 60	-10 to + 60	-10 to + 60

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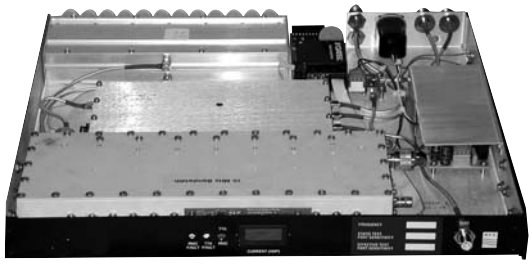
RMC80-0184-24

RFS's QuikWave SMR receiver multicoupler consists of a front-end low noise amplifier, full band 18 MHz filter and splitters to provide 24 outputs. It is built with a universal power supply unit, which can work from various AC & DC inputs. It is ideal to use in SMR base station sites where feeder lengths are short and a TTA is not necessary. Optional filter kit maximizes site optimization, reducing interference.

- Improved system noise figure and sensitivity provides wider coverage
- Quadrature amplifier design gives high reliability and minimal degradation on failure
- Built-in test port allows for rapid on-site testing
- Optional filter kits optimize site performance minimizing interference.
- Universal AC-DC power supply simplifies ordering and installation.
- Isolated receiver output ports mean that unused ports can be left un-terminated reducing costs



RMC80-0184-24

Preselection Filters

A wide range of preselector filters are available for SMR, UHF and VHF bands for covering different bandwidths as required.

911-PB4 Series Filter

941-PB4 Series Filter

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Receiver Multicoupler & Optional Filters

SMR Receiver Multicoupler

	RMC80-184-24
Frequency band, MHz	806-824
Bandwidth, MHz	18
Gain, dB	18
Gain, adjustment range, dB	10 in 1 dB steps
Number of outputs	24
Noise Figure, dB	2
IIP3	12
Power required	20-75VDC/ 110VAC/220VAC
Rack mounting	Yes

Preselection Filters 800 MHz SMR

	RMC80-OPF03	RMC80-OPF05	RMC80-OPF10
Frequency band, MHz	806-824	806-824	806-824
Bandwidth, MHz	3	5	10
Connectors	N Female	N Female	N Female
Mounting	Fits in RMC 80-184-24	Fits in RMC 80-184-24	Fits in RMC 80-184-24
Insertion Loss, dB	1.2	1.2	1.2

	RMC80-OPF15	RMC80-OPF18
Frequency band, MHz	806-824	806-824
Bandwidth, MHz	15	18
Connectors	N Female	N Female
Mounting	Fits in RMC 80-184-24	Fits in RMC 80-184-24
Insertion Loss, dB	1.2	1.2

Expansion Kit

	RMC80-EXP24
Frequency band, MHz	806-824
Isolation between Rx Ports, dB	20
Rack Mountable	Yes
Number of outputs	24
Connector - Antenna Input	N Female
Connector - Receiver Outputs	BNC Female
Power Required	No

Preselection Filters VHF

	911-PB4-1-2	911-PB4-1-4	911-PB4-2-2	911-PB4-2-4
Frequency band, MHz	144-174	144-174	160-174	160-174
Bandwidth, MHz	2	2	2	2
Connectors	BNC Female	BNC Female	BNC Female	BNC Female
Insertion Loss, dB	2.25	2.25	2.25	2.25
VSWR	1.5:1	1.5:1	1.5:1	1.5:1

Preselection Filters UHF

	941-PB4-1-3	911-PB4-2-3
Frequency band, MHz	406-440	440-474
Bandwidth, MHz	3	3
Connectors	BNC Female	BNC Female
Insertion Loss, dB	2.25	2.25
VSWR	1.5:1	1.5:1

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Duplexers

Application

Duplexers are used to simultaneously transmit and receive from a single antenna. They are three-port devices comprising a combination of transmit and receive filters with a common antenna port.

Duplexers are designed for various application based on operational frequency and utility. As an example, mobile duplexers are designed to handle low power and are very compact in size. Base station duplexers are designed to handle higher base radio power and generally designed to be mountable in standard equipment racks.

All RFS duplexers are designed to provide high isolation between the transmit and receive ports.

5597 Series

Features & Benefits

- Low insertion loss ensures that transmitter power is not reduced for transmission.
- High isolation avoids receiver desensitization
- Mobile duplexers are compact and easy to integrate and use with mobile repeaters.
- High Q design ensures low intermodulation

633-6A Series

MD Series

FD90* Series

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Duplexers

Cellular 850 & 1900 MHz PCS Duplexers

	5597-25BK	5597-14BK	FD193005-1	FD193005-2
Rx Frequency, MHz	824-849	835-849	1850-1910	1850-1910
Tx Frequency, MHz	859-894	880-894	1930-1990	1930-1990
Rx Insertion loss, dB	0.5	0.5	0.5	0.5
Tx Insertion loss, dB	0.5	0.5	0.5	0.5
Tx/Rx isolation, dB	60	60	30	30
Connector type	N	N	N & 7/16	N
Average Power, W	500	500	250	250
Rack mountable	Yes	Yes	Yes	Yes

	FD193005-3
Rx Frequency, MHz	1850-1910
Tx Frequency, MHz	1930-1990
Rx Insertion loss, dB	0.5
Tx Insertion loss, dB	0.5
Tx/Rx isolation, dB	30
Connector type	7/16
Average Power, W	250
Rack mountable	Yes

GSM 900 & 1800 MHz Duplexers

	FD183005	FD904510	FD906005
Rx Frequency, MHz	1710-1785	880-915	890-915
Tx Frequency, MHz	1805-1880	925-960	935-960
Rx Insertion loss, dB	0.5	1.0	0.5
Tx Insertion loss, dB	0.5	1.0	0.5
Tx/Rx isolation, dB	30	45	60
Connector type	N & 7/16	N & 7/16	N & 7/16
Average Power, W	250	350	350
Rack mountable	Yes	Yes	Yes

PMR & iDEN Applications

	5134-10BK	5134-18BK
Rx Frequency, MHz	806-824	806-824
Tx Frequency, MHz	851-869	851-869
Rx Insertion loss, dB	1.0	1.2
Tx Insertion loss, dB	1.0	1.2
Tx/Rx isolation, dB	85	75
Connector type	N	N
Average Power, W	400	400
Rack mountable	Yes	Yes

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Duplexers

UHF Mobile Duplexers (Fixed Frequency Spacing)

	633-A-1*	633-A-2*	633-A-3*	633-A-4*
Frequency band, MHz	406-440	440-470	470-512	406-470
Tx-Rx spacing, MHz	5	5	5	10
Rx Insertion loss, dB	1.2	1.2	1.2	0.8
Tx Insertion loss, dB	1.2	1.2	1.2	0.8
Tx/Rx isolation, dB	50	50	50	60
Connector type	BNC/N	BNC/N	BNC/N	BNC/N
Tx/Rx Bandwidth, KHz	25	25	25	25
Max Power, W	50	50	50	50

	633-A-5*	633-A-7*
Frequency band, MHz	470-512	406-470
Tx-Rx spacing, MHz	10	10
Rx Insertion loss, dB	0.8	0.8
Tx Insertion loss, dB	0.8	0.8
Tx/Rx isolation, dB	60	60
Connector type	BNC/N	BNC/N
Tx/Rx Bandwidth, KHz	25	25
Max Power, W	50	50

* Additional character indicating type of connectors

UHF Mobile Duplexers (Variable Frequency Spacing - Higher Isolation)

	633-6A-1*	633-6A-2*	633-6A-5*	633-6A-6*
Frequency band, MHz	406-450	450-470	406-450	450-470
Tx-Rx spacing, MHz	4 to 7	4 to 8	7 to 15	9 to 15
Rx Insertion loss, dB	1.4	1.4	1.2	1.2
Tx Insertion loss, dB	1.4	1.4	1.2	1.2
Tx/Rx isolation, dB	75	75	80	80
Connector type	BNC/N	BNC/N	BNC/N	BNC/N
Tx/Rx Bandwidth, KHz	25	25	25	25
Max Power, W	50	50	50	50

	633-6A-7*	633-6A-8*	633-6A-9*	633-6A-11N
Frequency band, MHz	470-512	355-406	470-512	355-406
Tx-Rx spacing, MHz	8 to 12	7 to 16	3 to 5	4.5to 7
Rx Insertion loss, dB	1.2	1.2	1.4	1.4
Tx Insertion loss, dB	1.2	1.2	1.4	1.4
Tx/Rx isolation, dB	80	80	70	75
Connector type	BNC/N	BNC/N	BNC/N	N
Tx/Rx Bandwidth, KHz	25	25	25	25
Max Power, W	50	50	50	50

* Additional character indicating type of connectors

UHF Compact Base Station Duplexers

	5085-1	5085-2	5085-3	5085-5
Frequency band, MHz	138-150	138-150	150-162	162-174
Tx-Rx spacing, MHz	3	5	3	3
Rx Insertion loss, dB	1.4	1.4	1.4	1.4
Tx Insertion loss, dB	1.4	1.4	1.4	1.4
Tx/Rx isolation, dB	75	75	75	75
Connector type	N Female	N Female	N Female	N Female
Tx/Rx Bandwidth, KHz	25	25	25	25
Max Power, W	100	100	100	100

	5085-6
Frequency band, MHz	162-174
Tx-Rx spacing, MHz	5
Rx Insertion loss, dB	1.4
Tx Insertion loss, dB	1.4
Tx/Rx isolation, dB	75
Connector type	N Female
Tx/Rx Bandwidth, KHz	25
Max Power, W	100

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Duplexers

UHF Base Station Duplexers

	526-4-1	526-4-2	526-5-1	526-5-2
Frequency band, MHz	406-440	440-470	470-490	490-512
Tx-Rx spacing, MHz	3	3	3	3
Rx Insertion loss, dB	1.0	1.0	1.0	1.0
Tx Insertion loss, dB	1.0	1.0	1.0	1.0
Tx/Rx isolation, dB	75	75	80	80
Connector type	N	N	N	N
Tx/Rx Bandwidth, KHz	25	25	25	25
Max Power, W	250	250	250	250

VHF Mobile Duplexers

	636-6A-1*	636-6A-2*	636-6A-3*	636A-1*
Frequency band, MHz	144-154	154-164	164-174	144-155
Tx-Rx spacing, MHz	4.5 to 6	4.5 to 6	4.5 to 6	4.5
Rx Insertion loss, dB	1.2	1.2	1.2	0.8
Tx Insertion loss, dB	1.2	1.2	1.2	0.8
Tx/Rx isolation, dB	80	80	80	60
Connector type	BNC/N	BNC/N	BNC/N	BNC/N
Tx/Rx Bandwidth, KHz	25	25	25	25
Max Power, W	50	50	50	50

	636A-2*	636A-3*
Frequency band, MHz	155-162	162-174
Tx-Rx spacing, MHz	4.5	4.5
Rx Insertion loss, dB	0.8	0.8
Tx Insertion loss, dB	0.8	0.8
Tx/Rx isolation, dB	60	60
Connector type	BNC/N	BNC/N
Tx/Rx Bandwidth, KHz	25	25
Max Power, W	50	50

* Additional character indicating type of connectors

MD Duplexers

	MDX03-1M	MDX04-1M	MD08-1R	MD09-1R
Frequency band, MHz	330-400	400-470	805-890	850-960
Tx-Rx spacing, MHz	9.45	9.45	45	45
Rx Insertion loss, dB	2.0	1.7	1.7	1.7
Tx Insertion loss, dB	2.0	1.7	1.7	1.7
Tx/Rx isolation, dB	85	85	80	80
Connector type	SMA	SMA	SMA/N	SMA/N
Tx/Rx Bandwidth, MHz	2	2	3.5	3.5
Max Power, W	10	10	10	10

	MD18-1L	MD21-1R	MD25-1A
Frequency band, MHz	1710-1910	2000-2305	2300-2700
Tx-Rx spacing, MHz	90	91	94
Rx Insertion loss, dB	1.5	1.7	1.5
Tx Insertion loss, dB	1.5	1.7	1.5
Tx/Rx isolation, dB	70	75	75
Connector type	SMA/N	SMA/N	SMA/N
Tx/Rx Bandwidth, MHz	8.6	7	16
Max Power, W	10	10	10

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Diplexer/Triplexer

Application

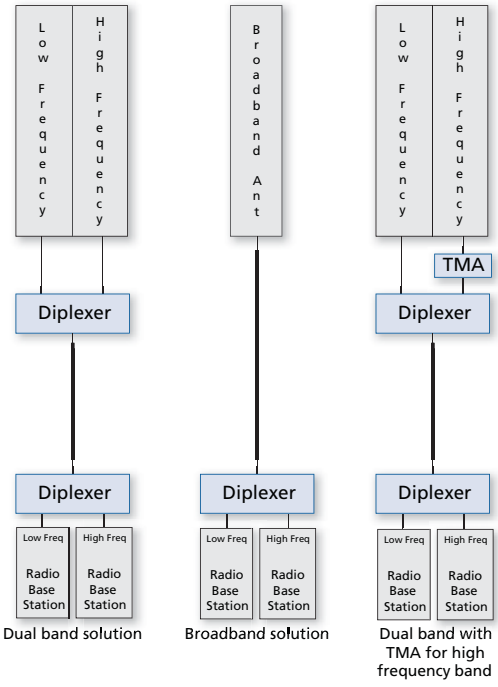
The RFS family of diplexers and triplexers is designed to enable feeder sharing of several systems on the same site. Focusing at the highest technical performance standard and at easy installation, RFS have developed a broad range of innovative products for cellular band, GSM 900, GSM 1800, PCS 1900 and UMTS 2100, covering frequency bands from 806 to 2170 MHz.

The following schemes indicate some typical configurations for the dual band diplexers and the triplexer. In order to keep the schemes simple the shown sites have single-polarized antennas and single diplexers are used. Sites with dual-polarized antennas will require double diplexers, which are available in one enclosure or with flexible dual mounting bracket. Variants including DC pass for TMAs are also available.

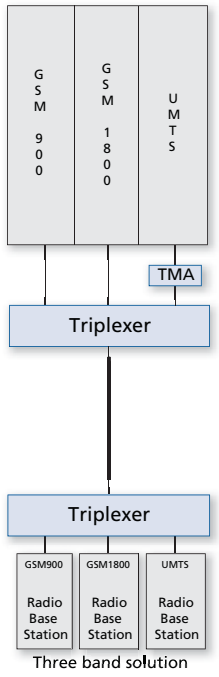
Features & Benefits

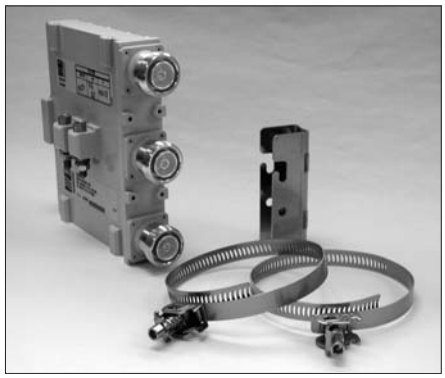
- Frequency ranges from 806-2170 MHz
- Low level of insertion loss
- High isolation between bands
- DC pass versions are available
- Compact and low weight
- Reduction in numbers of feeders
- Hardly no impact on the uplink and downlink signals
- Re-use of site installations without visible add on
- Less installation time and fast roll out

2 Systems with Diplexers - one feeder solution



3 Systems with Triplexers - one feeder solution





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Diplexer/Triplexer

Selection Guides

Diplexer SMR 800/900

	MOUNTING OPTION
FD809060	Indoor with ground strap
FD809060-1	Indoor with mounting
FD809060-2	Outdoor

Diplexer GSM 900/1800

	MOUNTING OPTION
DBC-1	Outdoor
DBC-2	Indoor

Diplexer 1710-1880 / 1920-2170

	NO DC PASS	DC PASS IN 3G/UMTS PATH	DC PASS GSM1800 PATH	FULL DC PASS
Outdoor Usage				
FDDW6505/1D-3	•			
FDDW6505/2D-3		•		
FDDW6505/3D-3			•	
FDDW6505/4D-3				•
Rack Usage				
FDDW6505/1R-0	•			
FDDW6505/2R-0		•		
FDDW6505/3R-0			•	
FDDW6505/4R-0				•

Diplexer 806-960 / 1710-2170

	FULL DC PATH	DC PASS IN HIGH FREQUENCY BAND	DC PASS IN LOW FREQUENCY BAND
Bottom Short Neck Connector			
FDGW5504/1C-3	•		
FDGW5504/2C-3		•	
FDGW5504/3C-3			•
Bottom Long Neck Connector			
FDGW5504/1C-3L	•		
FDGW5504/2C-3L		•	
FDGW5504/3C-3L			•
In-line Connector			
FDGW6004/1C-3L	•		
FDGW6004/2C-3L		•	
FDGW6004/3C-3L			•

Triplexer 870-960 / 1710-1880 / 1920-2170

	DC PASS IN UMTS BAND
FGDW5005S-3	•

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Diplexer/Triplexer

Diplexer for SMR 800 and 900

	FD809060	FD809060-1	FD809060-2
Low band Frequency band, MHz	806-869	806-869	806-869
High band Frequency band, MHz	896-940	896-940	896-940
Insertion Loss, dB (max)	0.35	0.35	0.35
Low band/high band isolation, dB (min)	60	60	60
Peak Power Common Port, W	13500	13500	13500
Indoor/outdoor	Indoor with ground strap	Indoor with mounting	Outdoor with mounting

Diplexer for GSM900 and DCS1800

	DBC-1	DBC-2
Low band Frequency band, MHz	870-960	870-960
High band Frequency band, MHz	1710-1880	1710-1880
Low band Insertion loss, dB	0.3	0.3
High band Insertion loss, dB	0.3	0.3
Low band/high band isolation, dB	55	55
DC pass	Full DC pass	Full DC pass
PIM, COM port @ 2 x 43 dBm, dB	-107	-107
Peak Power Common Port, W	250	250
Indoor/outdoor	Outdoor	Indoor

Diplexer for DCS1800 and UMTS

	FDDW6505/1D-3	FDDW6505/2D-3	FDDW6505/3D-3	FDDW6505/4D-3
Low band Frequency band, MHz	1710-1880	1710-1880	1710-1880	1710-1880
High band Frequency band, MHz	1920-2170	1920-2170	1920-2170	1920-2170
Insertion Loss, dB (max)	0.5	0.5	0.5	0.5
Low band/high band isolation, dB (min)	65	65	65	65
DC pass	No	High pass band	Low pass band	Full DC pass
PIM, reflected @ 2 x 43 dBm, dB	-115	-115	-115	-115
Peak Power Common Port, W	1000	1000	1000	1000
Indoor/outdoor	Outdoor	Outdoor	Outdoor	Outdoor

Diplexer for DCS1800 and UMTS, rack mount

	FDDW6505/1R-3	FDDW6505/2R-3	FDDW6505/3R-3	FDDW6505/4R-3
Low band Frequency band, MHz	1710-1880	1710-1880	1710-1880	1710-1880
High band Frequency band, MHz	1920-2170	1920-2170	1920-2170	1920-2170
Insertion Loss, dB (max)	0.5	0.5	0.5	0.5
Low band/high band isolation, dB (min)	65	65	65	65
DC pass	No	High pass band	Low pass band	Full DC pass
PIM, reflected @ 2 x 43 dBm [dBm]	-115	-115	-115	-115
Peak Power Common Port, W	1000	1000	1000	1000
Indoor/outdoor	Indoor	Indoor	Indoor	Indoor

Diplexer for Cellular Band, CDMA 850, GSM900 and DCS1800, PCS1900, UMTS

	FDGW5504/1C-3	FDGW5504/2C-3	FDGW5504/3C-3
Low band Frequency band, MHz	806-960	806-960	806-960
High band Frequency band, MHz	1710-2170	1710-2170	1710-2170
Insertion Loss, 806-960 MHz, typ, dB	0.2	0.2	0.2
Insertion Loss, 1710-2170 MHz, DC Pass, typ, dB	0.3	0.3	
Insertion Loss, 1710-2170 MHz, DC Block, typ, dB			0.4
Low band/high band isolation, dB	65	65	65
DC pass	High and low pass bands	High pass band	Low pass band
PIM, max @ 2 x 43 dBm, dB	-112	-112	-112
Low band port Peak Power, W	15000	15000	15000
High band port Peak Power, W	8000	8000	8000
Indoor/outdoor	Outdoor	Outdoor	Outdoor

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Diplexer/Triplexer

Long Neck Diplexer for Cellular Band, CDMA 850, GSM900 and DCS1800, PCS1900, UMTS

	FDGW5504/1C-3L	FDGW5504/2C-3L	FDGW5504/3C-3L
Low band Frequency band, MHz	806-960	806-960	806-960
High band Frequency band, MHz	1710-2170	1710-2170	1710-2170
Insertion Loss, 806-960 MHz, typ, dB	0.2	0.2	0.2
Insertion Loss, 1710-2170 MHz, DC Pass, typ, dB		0.3	0.3
Insertion Loss, 1710-2170 MHz, DC Block, typ, dB			0.4
Low band/high band isolation, dB	65	65	65
DC pass	High and low pass bands	High pass band	Low pass band
PIM, max @ 2 x 43 dBm, dB	-112	-112	-112
Low band port Peak Power, W	15000	15000	15000
High band port Peak Power, W	8000	8000	8000
Indoor/outdoor	Outdoor	Outdoor	Outdoor

Triplexer for GSM 900, GSM 1800 and UMTS

	FGDW5005S-3
Low band Frequency band, MHz	870-960
Mid Frequency Band, MHz	1710-1880
High band Frequency band, MHz	1920-2170
Insertion Loss Low Frequency Band, dB (max)	0.2
Insertion Loss Mid and High Frequency Bands, dB (max)	0.5
Isolation between bands, dB (min)	50
PIM, COM port @ 2 x 43 dBm, dBm	-110
DC pass	UMTS band
Peak Power GSM900, W (max)	150
Peak Power GSM1800, W (max)	150
Peak Power UMTS, W (max)	300
Indoor/outdoor	Outdoor

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Tower Mounted Boosters

Application

For ongoing rollout with high emphasis on coverage objectives, the RFS Tower Mounted Booster (TMB) provides a low-cost solution for efficient coverage of low-density population areas. Allowing a reduction of the number of sites needed, the TMB minimizes capital expenditure linked to a project.

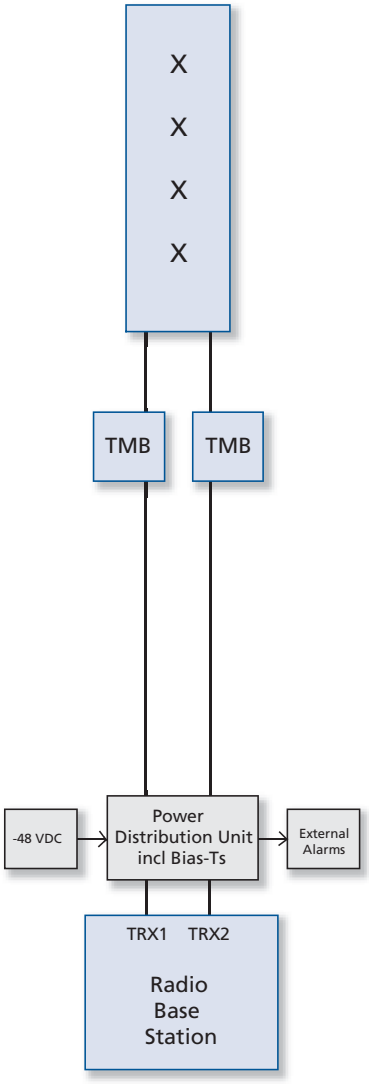
The RFS boosters are designed to be used, both for the EGSM 900 and DCS 1800 application. The booster system is designed to be located in the tower close to the antenna, ensuring the best possible BTS up-link sensitivity and providing the highest down-link power available on the market. The system requires one Power Distribution Unit and two TMBs for a dual-carrier solution. The Power Distribution Unit is placed in the base station cabinet, supplying power, controlling TMB and reporting alarm status.

The TMB is an optimal solution for the following application:

- For compensation of large feeder loss.
- For coverage of low-density populated areas
- For highway coverage where the traffic does not justify a large number of sites.
- For boosting cell coverage e.g. along coastlines.
- For boosting up low power signals from micro BTS.

Features & Benefits

- High down-link power, EDGE and GSM compliant
- Built-in bias-tee: No need for additional cabling in the tower
- Gain setting of uplink and downlink for correct cell balancing
- Simple and user-friendly mounting method
- Enlargement of the cell size
- Less BTS sites
- Improvement of downlink coverage
- Increases the overall system uplink receiver sensitivity
- Reduction of the dropped call rate and improved call quality
- More revenue per BTS



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GSM 900 and 1800 boosters

	BTM904515S-2	BTM904515S-2-Low	BTM184515S-1
Frequency Band, UL, MHz	885-915	880-910	1710-1785
Frequency Band, DL, MHz	930-960	925-955	1805-1880
Bandwidth, MHz	30	30	75
Output Power, GSM, dBm	46.0 ± 1.5	46.0 ± 1.5	46.0 ± 1.5
Output Power, EDGE, dBm	44.5 ± 1.5	44.5 ± 1.5	44.5 ± 1.5
Tx Gain, dB	14.0 ± 1.5	14.0 ± 1.5	14.0 ± 1.5
Tx Gain adjustment range, step size 0.5 dB, dB	0-14	0-14	0-14
Rx Gain, dB	16.0 ± 1.0	16.0 ± 1.0	16.0 ± 1.0
Rx Gain adjustment range, step size 1.0 dB, dB	6 to 16	6 to 16	6 to 16
Rx Noise Figure, typ @ 25°C, dB	1.8	1.8	1.8
IIP3, dBm	-2	-2	-2
Indoor/outdoor	Outdoor IP66	Outdoor IP66	Outdoor IP66
Weight, kg (lb)	16 (35.2)	16 (35.2)	16 (35.2)

Power supply and battery backup unit for booster

	PDU48400D-1
IInput Supply Voltage, VDC	-48
Input Supply Current, A	10
Output Supply Voltage, VDC	31.5
Bias Tee Insertion Loss, dB	0.25
Alarm Reporting	Yes
Indoor/outdoor	Indoor

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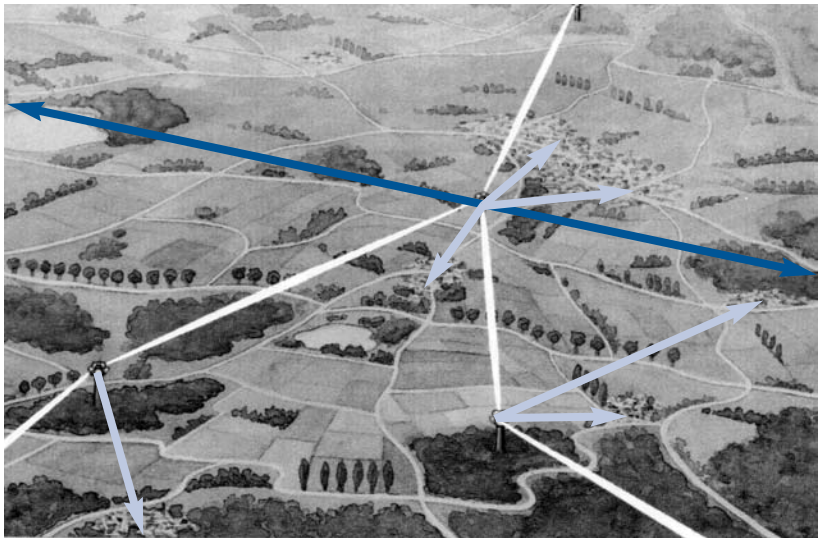
Systems and Applications

Introduction

Over the past decade microwave links have proven a popular solution for the telecommunication industry. The relative ease and economy of installation has been them deployed in an increasing number of point-to-point applications – from communications backbones (blue), to branch links (white) and distribution networks (light blue), not to mention applications in the broadcast industry and private enterprises.



With the rise of new cellular operators and technologies, overall microwave network density is undeniably escalating.

Backbone systems are built country wide in a majority of case using a ring structure. In the very seldom case that a link is down the service will remain full operational. The frequencies in use are below 10 GHz allowing link distances up to 50 km with antennas up to 4.5m diameter.

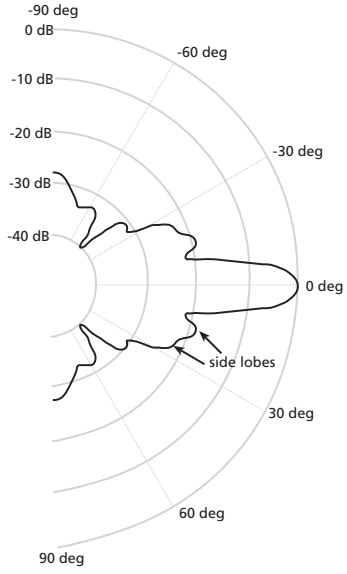
Branch links are connected to the backbone towers providing the signal to main areas and towns. The frequencies in use are up to 20 GHz providing links up to 20 km with medium size antennas.

Distribution links using frequencies above 22 GHz with small antennas are completing the network.

Yet this intensification of microwave communications brings added challenge. The greater the number of point-to-point links in a given area, the greater the potential for these to interact with one another and cause interference. Since any distortion of the signal reduces the quality of service, controlling interferences is now the mandate of any radio network operator and national authority. The key issue for consideration is the design and location of the source of the signal – the antenna.

Minimizing Interference by antenna design

The radiated power of a microwave antenna apart the main beam at 0 deg is significant up to 90 deg from the main beam. It is these side lobes that can cause interference with adjacent point-to-point links, and it is theses side lobes that must be minimized through careful antenna design and installation.



RFS is taking care on this fact using advanced antenna designs and extensive quality control during production.

In addition the antenna mounts as well as fine adjustments means provide an easy and quick antenna installation.

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Systems and Applications

Radio Link Applications

In the field of telecommunications, recent years have been marked by the rapid construction of radio link networks for different applications.

Radio Link Backbone Systems

Backbone or back haul systems have been built for mobile operators who want to be independent from Telcos and fixed wire operators. It saves cost for leasing a fixed line and allows a simple upgrade of the network if higher capacity is required.

In addition traditional and new telcom's, utilities as well as broadcast organizations are upgrading their networks to offer higher capacities to clients or to upgrade their system from analogue to digital service.

Backbone systems usually use large size antennas in frequency bands below 10 GHz.

Due to the distance from the antenna to the radio a flexible elliptical waveguide is used for connection. RFS antennas plus FLEXWELL® Elliptical waveguides match perfectly the needs.

Radio link systems for base station connectivity

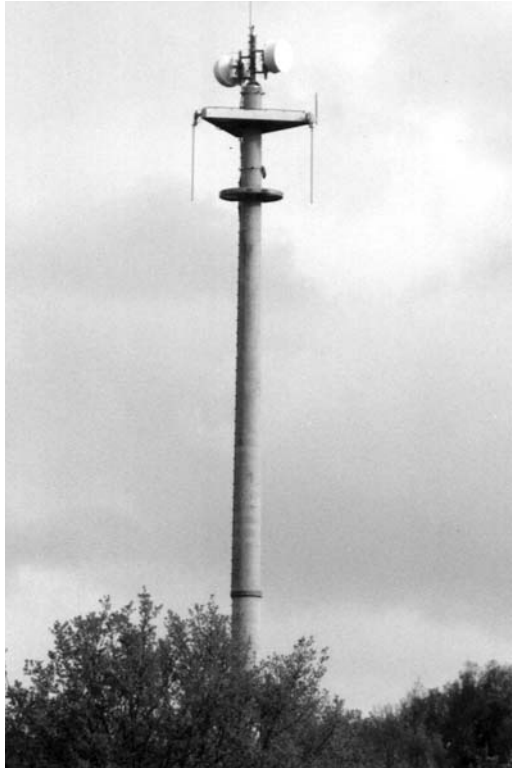
Mobile operators use microwave in about 70% of cases for the connection of base station to base station and base station to switching centers. A very quick and cost effective deployment is mandatory to be successful in a rapidly growing market.

This construction process is still a long way from completion. The central issues are higher and more secure network coverage as well as expansion of capacity.

Radio link stations can be erected in a large variety of locations, and these all have specific structural and electrical requirements which must be fulfilled by the antenna/waveguide system.

It is now common practice to install new base stations on existing radio link towers for backhaul applications to share the cost of a site. Maximum use is made of existing infrastructure. The disadvantage in such cases is the high level of radiated interference caused by existing telecommunication equipment.

These problems can however be overcome by careful frequency planning together with the use of antennas with high side lobe suppression and high cross-polarization discrimination.



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Systems and Applications

The number of available radio link towers is no way near enough to achieve satisfactory network coverage for mobile applications, as the distance between adjacent towers can be 20 to 50 km depending on the frequency range in use. For this reason network operators are forced to use other sites in unusual locations.

On account of their height industrial chimneys can be ideal. However large concentration of emitted gases, which are caused by turbulence and are potentially highly corrosive, are encountered in such locations. This means that the antenna system must be manufactured from corrosion-resistant materials. Furthermore, any combination of different materials must also be able to resist corrosion.

In urban environments radio links can be installed on multi-story buildings. This however does not always have a positive effect on the overall visual impression created by the building. The number of installation options is restricted, especially if preservation orders have to be taken into account as well. In such cases the planner's work can be made easier by incorporating antennas which either blend with the background or are at least to a large degree inconspicuous.

RFS CompactLine® and Lens antennas meet perfectly these requirements offering a very small shape.

A way of reducing the cost for erecting new towers is the use of high-voltage masts. Large numbers of these masts and pylons already exist and providing the necessary height. The disadvantage here is that it is not possible to switch-off the high-voltage supply in order to undertake repairs and maintenance or to replace the transmission equipment. It follows therefore that the radio equipment can only be mounted on the mast at a point below the high-voltage cables. RFS low attenuation FLEXWELL® Elliptical waveguide can be used for transferring the RF signal to and from the antenna. In frequency bands above 10 GHz RFS overmoded FLEXWELL® Elliptical waveguide provides an extremely low attenuation. This could lead to the use of a smaller antenna size on top of the mast or to a reduced power of the radio which is enlarging the lifetime of the electronic equipment.

In locations where there is no possibility of installing the antenna on an existing structure, it will be necessary to erect a new tower. In order to keep the size and associated costs of the new tower within manageable proportions, the antennas should offer minimum wind loading while at the same time assuring high mechanical stability. Simple and fast installation is also a standard requirement.

Especially RFS small and medium size antennas with their advanced casting mounts meet these requirements perfectly.

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Systems and Applications

Antennas with waveguide installation

Small antennas (1 and 2 ft) operating in the frequency range above 10 GHz are, as a rule, connected directly to the transmission equipment. Special mechanical and electrical matching ensures that the RF signal passes directly into the radio equipment with the minimum loss.

It is not always possible to integrate the antenna and radio equipment due to structural restrictions at the installation site. In this case, as with larger antennas, use is made of flexible waveguide. Long connections lead to increased losses. These losses can only be offset in the overall link calculations by using larger antennas or additional amplifier stages in the transmission equipment.

An alternative solution is the use of overmoded waveguide. The attenuation with this type of waveguide is particularly low, as it no longer operates in the single-moded frequency range.

High order modes are suppressed by means of appropriate filter units in the waveguide connectors.

There are significant advantages to be gained by using overmoded waveguide whenever a frequency range above 18 GHz is used in a mobile communication network.

RFS end-to-end philosophy

RFS offers for all installation scenarios the right products:

Radio integrated with antenna

The radio unit is directly mounted onto the back of the antenna. This is a very common type of installation providing a quick and cost effective solution.

RFS is providing a variety of integrated antennas in different sizes. All interfaces meet highest electrical as well as mechanical specification to secure a stable operation in the field.

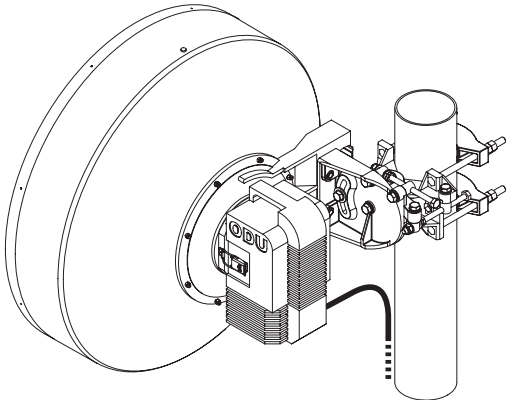
Please contact RFS for more detail.

Radio near to the antenna

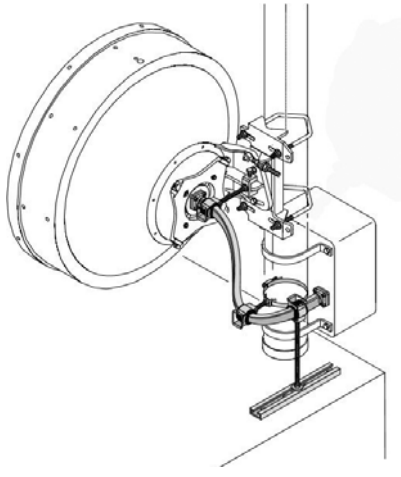
In cases where the radio can not be attached directly to the antenna, an additional section of a Twistflex waveguide provides the connection to the radio. The radio is installed on the pipe or tower near to the antenna.

Twistflex waveguides are also used to connect antennas to waveguide runs providing the necessary flexibility during installation.

RFS provides Twistflex waveguides in all frequency bands with different lengths. Necessary fixing hardware can be ordered separately.



Antenna integrated with ODU



Antenna with Twistflex installation

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Systems and Applications

Radio in a shelter

In traditional backbone systems as well as in configurations where quick and easy maintenance is required, the radio is installed in a shelter at ground level. In such cases FLEXWELL® Elliptical Waveguide provides a low-loss connection to the antenna.

RFS is providing all necessary tools and accessories to install the antenna/waveguide system with best electrical and mechanical performance. This includes hoisting stockings, flanging tools, bending tools and fast earthing components.

As waveguide runs have to be filled with dry air, suitable equipment for manual as well as automatic dehydration is part of the RFS product portfolio.

The bottom line

RFS antenna/waveguide systems provide a high mechanical stability and corrosion resistance and are easy to install. Antennas and waveguides are matched offering highest system performance and stability.

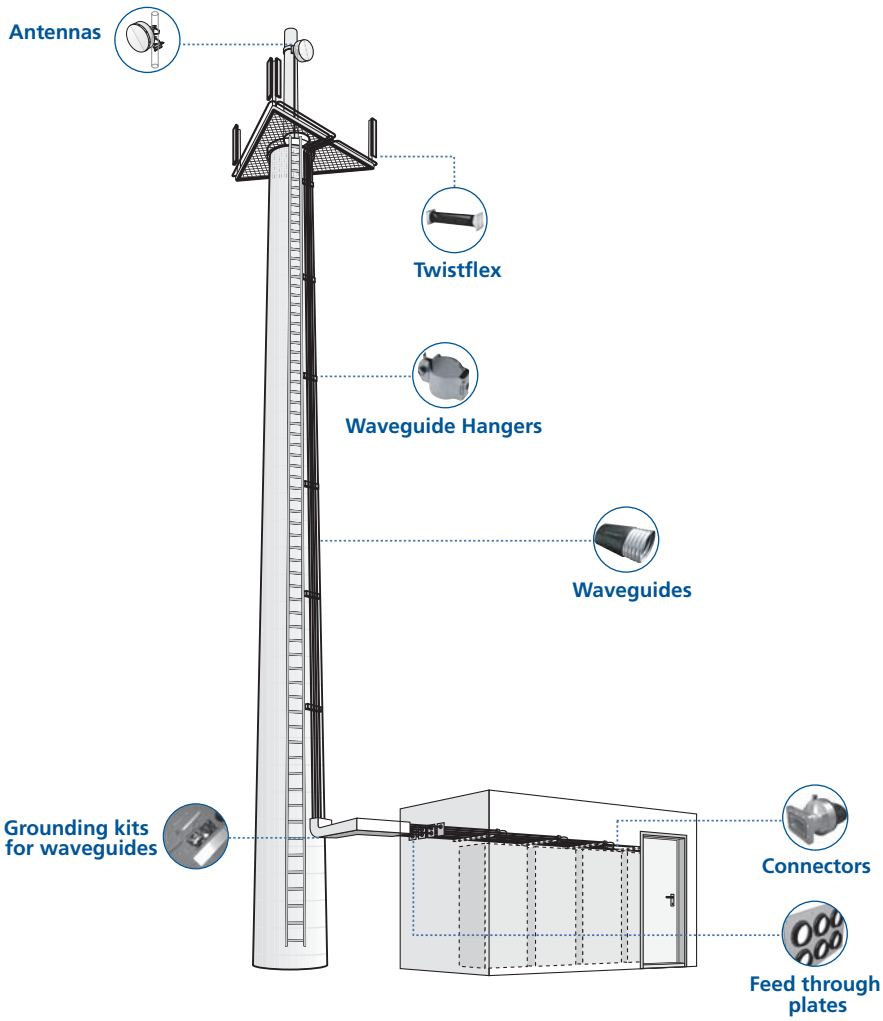
Mechanical features are outstanding to secure the radio link even under severe environmental conditions.

Small size antennas are offered with a very small shape to minimize the environmental impact. This is required in rural areas to get the permission for a radio link much easier.

Electrical characteristics comply and even exceed with national and international standards to minimize interference and to simplify network planning.

Low-Loss waveguides and simple means of dehydrating short waveguide runs make planning and maintenance easier.

Optimized logistic and state-of-the-art manufacturing respond to the request for short delivery times.



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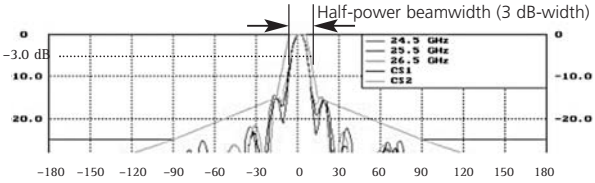
Properties and Definitions

Half Power Beam Width (HPBW)

The angle, relative to the main beam axis, between the two directions at which the co-polar pattern is 3 dB below the value on the main beam axis. The values are nominal and stated as the minimum for the frequency band.



Gain

The ratio of the radiation intensity, in the main beam axis to the radiation intensity that would be obtained if the power accepted by the antenna were radiated isotropically. Value measured in dBi. The values are stated for the three frequencies at mid-band as well as at bottom and top of the frequency band.

The tolerance for antenna gain is ± 0.2 dB for single polarized antennas. In the case of dual polarized antennas, tolerance is also ± 0.2 dB for the average value of both ports and ± 0.3 dB for each port alone.

Front-to-back-ratio (F/B)

Denotes the highest level of radiation relative to the main beam in an angular zone of 180° ± 40° for all antennas. Tolerance on stated values is 2 dB.

Cross-polar discrimination (XPD)

The difference in dB between the co-polarized main beam gain and the cross-polarized signal measured within an angular zone in azimuth of twice the maximum half power beam width of the frequency band.

The value is 30 dB minimum for all antennas except where noted.

Antenna inter-port isolation (IPI)

Denotes the ratio in dB of the power level applied to one port of a dual polarized antenna to the power level received in the other input port of the same antenna.

The value is 35 dB minimum for all antennas (40 dB respectively 45 dB for UXA antennas).

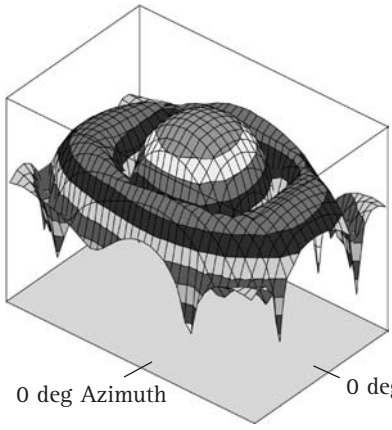
Return loss / voltage-standing-wave-ratio (VSWR)

The stated values are guaranteed across the frequency band of operation.

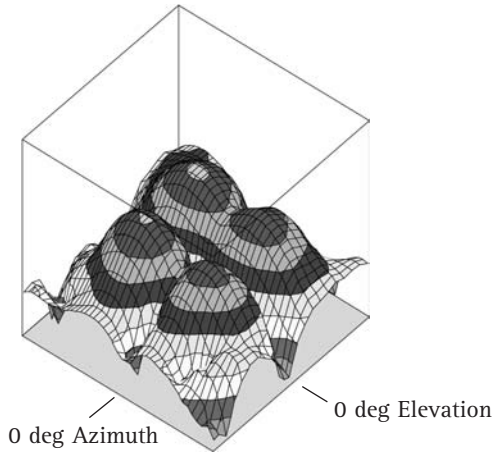
Radiation pattern

A diagram relating power flux density at a constant distance from an antenna to direction relative to the antenna main beam axis.

a.) Copolar Pattern and RPE



b.) Cross polar Pattern and RPE



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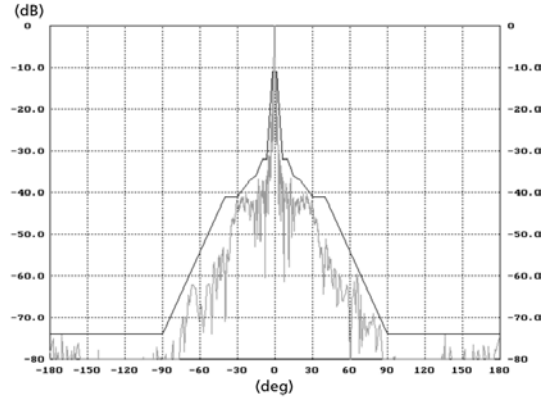
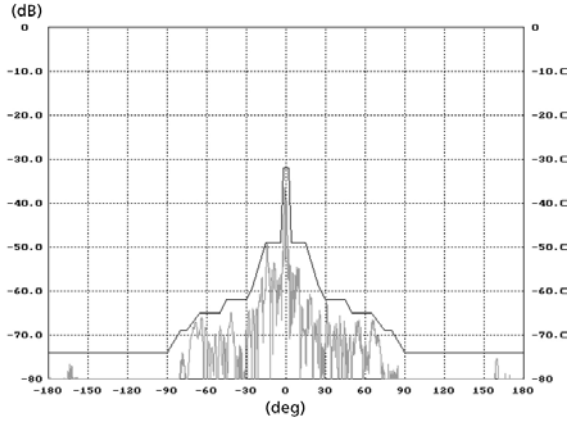
Properties and Definitions

Radiation pattern envelopes (RPE's)

The envelope represent the worst values of measurements taken on the pattern test range at the three frequencies mid-band, bottom and top of the band, in both copolar and cross polar condition, horizontal and vertical polarized, over the full 360° of azimuth.

Since the envelope is drawn over the highest peaks out of all measurements actual interference radiation in an operation system will be generally smaller than calculated from the RPE. Tolerance on given values is 3 dB in an angular region of ±100° and 2 dB from 100° to 180°.





Mechanical Properties and Definitions

In addition to the electrical performance RFS designs antennas with outstanding mechanical features. This assures a high link stability as well as a long lifetime.

Key mechanical features are Survival and Operational windspeed.

Survival windspeed

The antenna sub-system will survive the specified survival windspeed without any permanent deformation or changes of shape. The value is 250 km/h (70 m/sec) for the 1 ft and 2 ft antennas and 200 km/h (56 m/sec) for all other antennas.

An additional load of an ice layer of 30 mm radial ice is taken into account. Special 'Windload kits' are available to improve the survival windspeed of all antennas up to 250 km/h.

Operational windspeed

The antenna axis deflection is less than one third of the half power beam width at the highest frequency which occurs. The drop in signal is only approximately 1 dB; the radio link will therefore continue to operate. The value is 190 km/h (53 m/sec) for all antennas.

Antennas with windload kit offer an operational windspeed of 200 km/h all types.

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Mechanical Design

All RFS designs are based on advanced methods of calculation (Finite Element Method) providing state of the art results. In addition there are numerous possibilities for simulation based on recognized standards and regulations. Results have been approved by independent stress analysts.

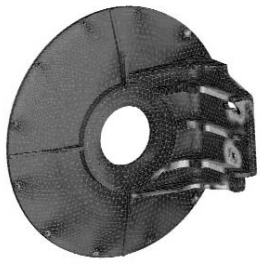
The proof of mechanical stability is determined on the basis of EIA Standards RS-195-* and RS-222-* which are recognized world-wide.

* Current Version

These standards prescribe the wind resistance coefficients (Cw values) to be used for calculating the equivalent forces caused by wind loading. The values are the result of numerous trials in a wind tunnel and calculations of aerodynamic properties. Amongst other things they also take into account the physical shape of the antenna, e.g. reflector only (standard antenna) or reflector with shroud and radome (high performance antenna).

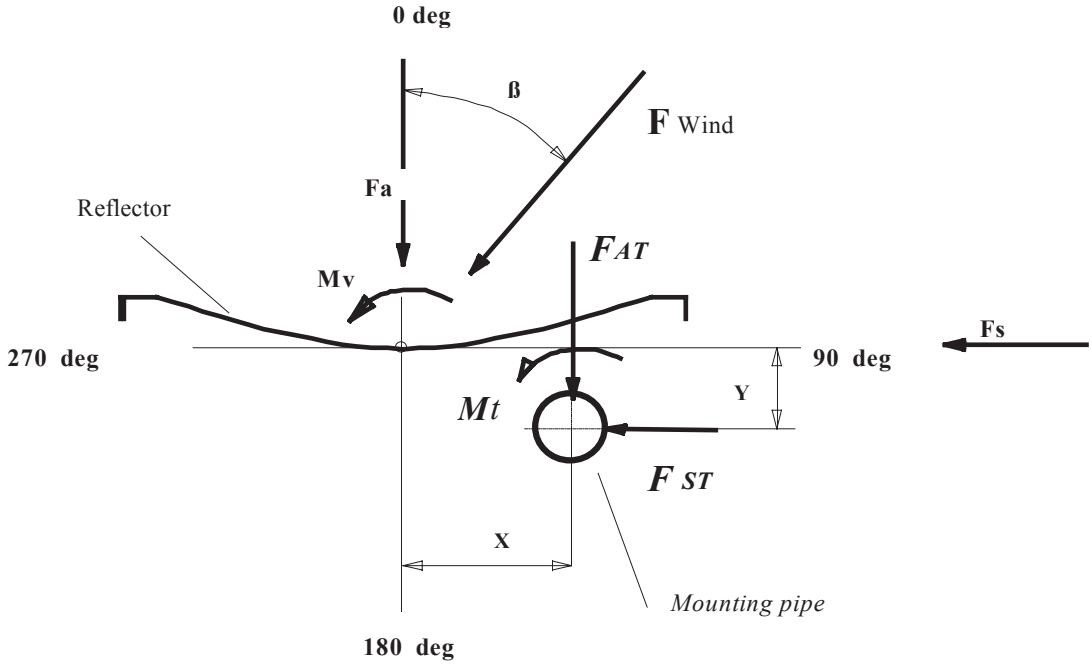
A wind force Fwind acting on the antenna leads to a load on the mounting pipe. This load can be divided into an axial force FAT, a lateral force FST and a torque (turning moment) Mt.

2ft M-Mount Complete



4ft Ring

4ft Reflector with Sway Bar



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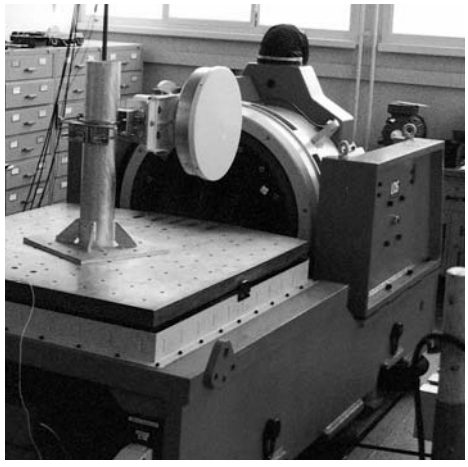
Mechanical Tests

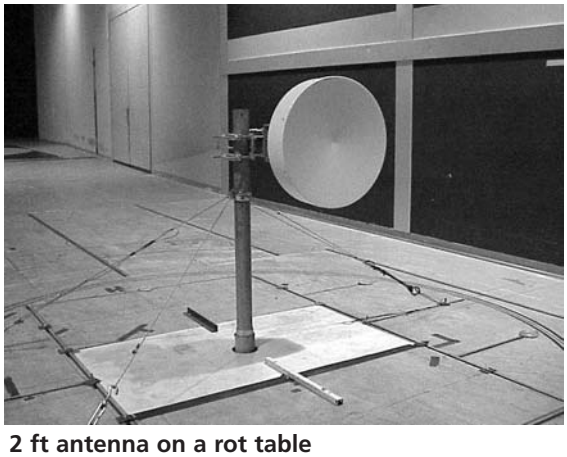
In addition to calculation RFS has proven the design with extensive physical testing. Small size antennas have been put on a shock and vibration test facility. The applied test conditions exceed the requirement of the European standard EN 300 019, class 4M5.

Shock Test

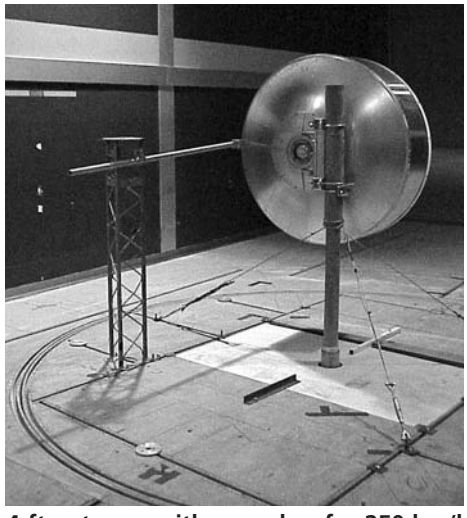


Vibration Test

Wind tunnel tests including 4 ft (1.2m) antennas and equivalent windload tests complete the mechanical testing. Windspeeds have been applied exceeding the mechanical design wind speeds to prove the design even under extreme conditions.



2 ft antenna on a rot table



4 ft antenna with sway bar for 250 km/h survival wind speed

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Mechanical Tests

Large size antennas are difficult to be tested in a standard wind tunnel due to a missing rigid mounting structure. Therefore RFS has designed an equivalent windload test rig.

The job of the test rig is to apply different forces to the antenna in such a way that it simulates the wind force, split into an axial component F_a, a lateral component Fs and the torque M_V that develops in the vertex of the antenna.

For this purpose the test rig has different independent hydraulic systems, which employ hydraulic cylinders and a band to apply forces to the antenna.

The contour of the antenna is checked with a template before and after the load is applied. According to the definition of survival windspeed no permanent deformation or changes of shape has to occur on the antenna sub-system.

Dial gauges register the flexible change of shape of the antenna and the mast mounting during the test.

This system enables antennas with a diameter of up to 4.5 m to be measured at a wind load of up to 250 km/h. Forces acting on the mounting pipe can be up to 150 kN axially and 40 kN laterally, together with a torque of 90 kNm. The hydraulic pressure required to create these measurement conditions is approx. 65 bar.

Equivalent Windload Test

Bottom Line: RFS antennas provide secure operations under all standard environmental conditions. This is assured by the use of corrosion resistant materials as well as selected material combinations. Continuous proving in environmental chambers and salt fog spray test facilities guarantee an outstanding long lifetime.

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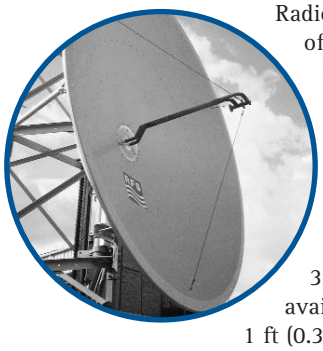
Solid Parabolic Microwave Antennas

Introduction and Antenna Descriptions



Radio Frequency Systems offers the most comprehensive line of highest quality microwave antennas in the industry. Antennas are available in all the common frequency bands ranging from 3GHz to 60GHz. They are available in diameters from 1 ft (0.3 m) to 15 ft (4.60 m). System design becomes easy and efficient with such a comprehensive antenna offering.

The antennas are available in four performance classes offering complete flexibility when designing a network.

The antennas meet the pattern requirements according to EN 300 631, EN 300 833 and FCC depending on the frequency range.

In addition to the different electrical classes of antennas Radio Frequency Systems offers the system design engineers different options of survival wind speeds. This allows the use of antennas in areas where extreme wind conditions are normal.

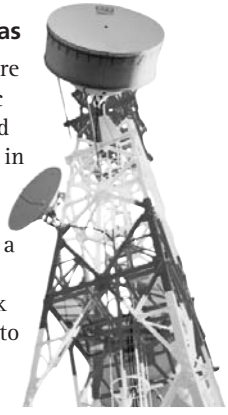
Standard Performance Antennas

Standard Performance Antennas are economical solutions for systems where side lobe suppression is of less importance. The antennas consist of a reflector, feed and tower mount. Low VSWR versions are available for low echo distortion.

STANDARD PERFORMANCE ANTENNAS	
Single polarized	PA & PAL series
Single polarized, spread spectrum	PSF series
Dual polarized	PAX series

Improved Performance Antennas

Improved Performance Antennas are unshrouded and offer an economic solution for systems requiring good radiation performance particularly in the back region. The improved F/B ratio is achieved by use of an efficient feed design together with a deep dish reflector. These features result in an improved front to back ratio, and were specially designed to meet FCC category A standards.



IMPROVED PERFORMANCE ANTENNAS	
Single polarized	PAD series
Dual polarized	PADX series

High Performance Antennas

High Performance Antennas are similar to Ultra High Performance Antennas in construction. They are ideally suited for systems where a good level of side lobe suppression is required.

HIGH PERFORMANCE ANTENNAS	
Single polarized	DA series
Dual polarized	DAX series

Ultra High Performance Antennas

Ultra High Performance Antennas are the optimum choice for systems where a high level of pattern performance is required because of high local radio congestion. The antennas are supplied with low VSWR feed, planar radome, tower mount and shroud with RF absorber.

ULTRA HIGH PERFORMANCE ANTENNAS	
Single polarized	UA series
Dual polarized	UDA series

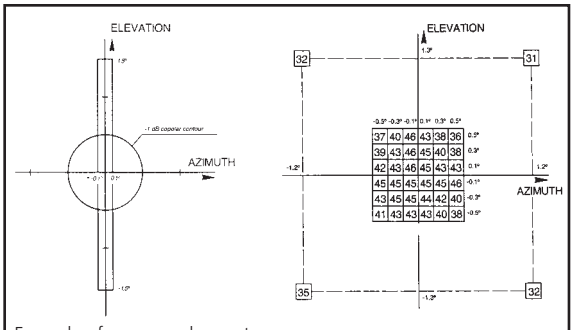
High Cross Polar Discrimination Antennas

UXA series of antennas are based on Ultra High Performance Antennas. These antennas offer high side lobe suppression. In addition UXA antennas offer extremely high cross-polar discrimination. They are therefore ideally suited for very high capacity systems utilizing extensive frequency reuse in highly congested environments. This outstanding performance is achieved by use of a special corrugated illuminator, a rigid torsion box back structure which ensures the reflector maintains its shape in the field and strict quality control during manufacture.

The cross-polar characteristics for radiation angles close to bore sight meet the highest XPD requirements according to EN 300 833 and FCC.

High cross-polar discrimination antennas are available for frequencies from 4 GHz to 23 GHz.

ULTRA HIGH PERFORMANCE ANTENNAS	
Dual Polarized	UXA series



Example of a cross polar contour

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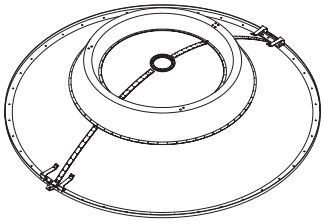
Solid Parabolic Microwave Antennas

Introduction and Antenna Descriptions

Reflectors



Antennas with diameters up to 10ft (3.0m) are supplied with reflectors in one piece. Antennas with diameters 12ft (3.7m) are supplied with a two piece reflector (except UXA-types). Antennas with diameters of 15ft (4.6m) are supplied with a 3 piece reflector.

8ft and 10ft antennas are available in 2 pieces optional for easy transportation.

Colors

Standard color for RFS Microwave Antennas is white. Custom colors are available upon request.

Molded fiberglass radomes are white. High Performance, Ultra High Performance and High Cross Polarization Discrimination antenna are supplied with planar white radomes. Custom colors are available upon request.

SlimLine and CompactLine Antennas

Radio Frequency Systems recognizes that mobile operators and private microwave users have requirements for cost effective solutions for their microwave antenna systems. These needs include products, which are easy and quick to install while maintaining good electrical performance. In response to these needs Radio Frequency Systems developed the SlimLine and CompactLine series of antennas.

The SlimLine series of antennas utilize a conventional feed system and are available in Standard, High and Ultra High performance versions. The SlimLine series of antennas are available in diameters from 1ft (0.3 m) to 6 ft (1.8 m).

RFS SLIMLINE® ANTENNAS		
Single polarized	Standard	SP
	Standard, non-pressurized	SPF
	High performance	SD
	Ultra High Performance	SU
Dual Polarized	Standard	SPX
	High performance	SDX
	Ultra High Performance	SUX

The CompactLine series of antennas use a special feed system which results in a reduced shroud length and consequently a lower profile antenna. These antennas are lighter in weight than standard antennas for reduced tower loading and shipping costs. Furthermore CompactLine antennas up to 2ft (0.6m) diameter are very rugged, with a wind loading rating of 250 km/h (155mph). Their type designation is SB for single polarization and SBX for dual polarization. CompactLine antennas are available in 1ft (0.3 m), 2 ft (0.6 m), 3ft (0.9 m) and 4ft (1.2 m) diameters.

RFS COMPACTLINE® ANTENNAS		
Single polarized	Ultra High Performance	SB
Dual Polarized	Ultra High Performance	SBX

1ft and 2 ft antennas consist of an integrated reflector/shroud system avoiding any RF-leakage. This is a further contribution offering excellent radiation performance especially in the back direction.

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Solid Parabolic Microwave Antennas

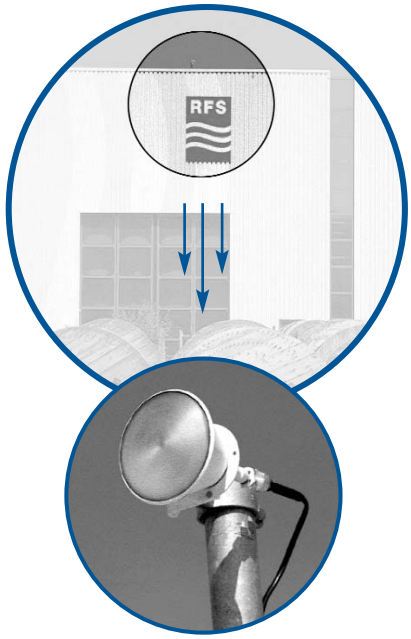
Lens Antennas

RFS lens antennas are an economical solution for short haul radio links. The antennas are based on conventional horn antenna design. A dielectric lens is used to correct the phase difference at the aperture, which occurs due to the large ratio of wavelength to aperture diameter. Lens antennas have no metallic parts blocking the radiating aperture. This results in a very high antenna efficiency of nearly 70%.

An additional advantage is the visual impression. To a certain extent a lens antenna looks like a lamp. This solution is highly suited to installations where environmental restrictions limit the choice of antenna type, such as in the proximity of listed buildings or monuments.

Lens antennas are available with a diameter of 0.5ft (0.15m) offering an ultra high radiation performance.

RFS LENS ANTENNAS		
Single polarized	Ultra High Performance	LA



Customized Antennas

RFS SlimLine® and especially RFS CompactLine® antennas can be provided with a custom designed adaption for the outdoor unit of the radio equipment. This allows the outdoor unit of the radio to be mounted directly the antenna, removing the need for an additional twistflex or elliptical waveguide connection between the radio and the antenna. The antenna is normally mounted to a vertical pole. The equipment box can be replaced without the need for a realignment the antenna system. RFS is taken special care to meet highest electrical as well as mechanical requirements of the interface. In addition to wind tunnel tests, shock and vibration tests with radios as well as water spray tests are performed demonstrating a leakage free interface.

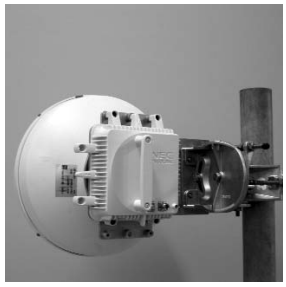
RFS is continuously increasing the product portfolio of customized antennas. For more details please contact RFS.

Rain Test

Integrated Antennas with Multi purpose mount

2ft Ceragon

2ft Alcatel



1ft NEC

2ft Siemens

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Solid Parabolic Microwave Antennas

Antenna Types, Overview

STANDARD PERFORMANCE

PAD
Single polarized, standard, (FCC part 101, category “A” compliant)

PADX
Dual polarized, standard, (FCC part 101, category “A” compliant)

PA, SP
Single polarized
PAL
Single polarized, low VSWR

PAX, SPX
Dual polarized

PSF, SPF
Single polarized, non-pressurized, Spread Spectrum

HIGH PERFORMANCE

DA, SD, SDF
Single polarized

DAX, SDX
Dual polarized

ULTRA HIGH PERFORMANCE

UA, SU
Single polarized

UDA, SUX
Dual polarized

UXA
Dual polarized, high XPD

SB
CompactLine, single polarized

SBX
CompactLine, dual polarized

LA
Lens, single polarized

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Solid Parabolic Microwave Antennas

Antenna Selection Guide

PERFORMANCE		STANDARD				IMPROVED		HIGH			ULTRA HIGH, HIGH XPD			ULTRA HIGH		
Frequency, GHz	RFS Code	single PA/SP	single PAL	single PSF/SPF	dual PAX/SPX	single PAD	dual PADX	single DA/SD	single SDF	dual DAX/SDX	single UA/SU	dual UDA/SUX	dual UXA	single SB	dual SBX	single LA
2.3-2.5	23			2-6ft												
3.4-3.6	35		4-8ft								1-2ft					
3.6-4.2	36		6-15ft		6-15ft			6-15ft		8-15ft	6-12ft	6ft	8-15ft			
4.4-5.0	44		6-15ft		6-15ft			6-15ft		6-15ft	6-12ft	6ft	8-15ft	2ft		
5.25-5.85	52			2-6ft					4-6ft							
5.725-5.85	57	4-12ft		8-12ft				4-12ft								
5.725-6.875	W57	4-12ft				6-8ft		4-12ft								
5.925-6.425	59	4-6ft	8-15ft		6-15ft	6-10ft	6-10ft	4-15ft		4-15ft	4-12ft	6ft	6-15ft			
5.925-6.875	W59				8-12ft	6-10ft	10ft			8-12ft			10-12ft			
6.425-7.125	65	4-6ft	8-15ft		4-15ft	6-10ft	6-10ft	4-15ft		4-15ft	4-12ft	4-6ft	6-15ft			
7.125-7.75	71	2-6ft	8-15ft		4-15ft			4-15ft		4-15ft	2-12ft	4-6ft	4-15ft			
7.125-8.5	W71	2-6ft	8-15ft		4-15ft			2-15ft		4-15ft	2-12ft	4-15ft		4ft		
7.725-8.275	77									4-15ft			6-15ft			
7.75-8.5	78	2-6ft	8-15ft		4-15ft			4-15ft		4-15ft	2-12ft	4-6ft	6-15ft			
10.3-10.7	103	2-6ft	8-12ft		4-12ft			2-12ft		4-12ft	2-12ft	4-6ft	4-12ft	2ft		
10.5-10.7	105					6-8ft	6-8ft	4-12ft		4-8ft			4-8ft	2-3ft		
10.7-11.7	107	2-6ft	8-12ft		4-12ft	6-10ft	6-10ft	2-12ft		4-12ft	2-12ft	4-6ft	4-12ft	2-4ft		
12.2-13.25	122		2-10ft		6-10ft			2-10ft		2-10ft						
12.7-13.25	127	2-6ft	8-10ft		2-10ft			2-10ft		2-10ft	2-10ft	2-6ft	4-10ft	1-4ft	2ft	
14.2-15.35	142	2-6ft	8ft		2-8ft			8ft			2-8ft	2-6ft	2-8ft	1-4ft	1-2ft	
17.7-19.7	190	2-6ft			2-6ft						3-6ft	1-6ft	2-6ft	1-4ft	1-2ft	
21.2-23.6	220	2-6ft			2-6ft						3-6ft	1-6ft	2-6ft	1-4ft	1-2ft	0.5ft
24.25-26.5	250										3-4ft	1-4ft		1-4ft	1-2ft	
27.3-28.5	270													1-2ft		
27.5-29.5	280													1-2ft	1-2ft	
29.5-31.5	300													1-2ft		
31.0-33.4	320													1-2ft	1-2ft	
37.0-39.5	380											1-2ft		1-2ft	1-2ft	0.5ft
51.4-52.6	520													1ft		
54.25-59.0	550													1ft		

Flange Selection Guide

DESIGNATOR	FLANGE TYPE
B	PBR-flange
C	CPR-flange
D	PDR-flange
E	EIA-flange
G	Cover gasket
J	N-male connector with Jumper
K	WR75 contact flange
M	CMR flange
N	N-female connector
O	UAR-flange
P	PAR-flange
U	UG Cover-flange
V	UDR-flange
W	UBR-flange
Y	CBR flange
Z	UG Choke-flange

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Solid Parabolic Microwave Antennas

Ordering Information & Antenna Options

In order to easily identify an antenna model RFS utilizes a model numbering system which clearly identifies the antenna type, diameter, frequency, revision and antenna input.

In addition to the standard products Radio Frequency Systems offers, products with increased wind rating, improved environmental ratings, planar radome colors and radome types. For these options please contact your local RFS sales office.

As an example	DA 12 - 59 A C	
Antenna Type	DA	see page 280
Antenna Diameter	12	12ft (3.7m) diameter
Frequency Band	59	5.925 - 6.425GHz.
Design Revision	A	
Input Flange	C	CPR

Flanges

Different flange types are available for the whole antenna range. The flange sizes, -profiles and dimensions are in accordance with specifications 154 IEC and EIA (Electronic Industry Association) which classifies the flange types in the following coding systems:

IEC-flanges

1st digit	pressurizable unpressurizable etc.
2nd digit	flange type-A, B, D etc.
3rd digit	waveguide profile, rectangular, etc.
secondary numbers	Waveguide size according to 154-IEC

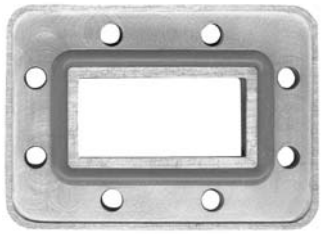
DESCRIPTION OF FLANGE TYPES:

Type	Flange Profile
A	Round
B	Square
D	Rectangular

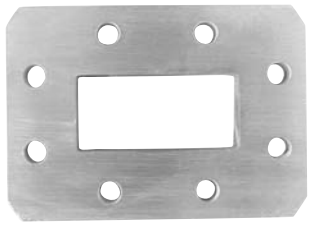
Typical coding examples

P D R 70
- 70 — waveguide size 70
- R — rectangular
- D — type D, flange profile rectangular
- P — pressurizable

U B R 140
- 140 — waveguide size 140
- R — rectangular
- B — type B, flange profile square
- U — unpressurizable



PDR



UDR

PBR

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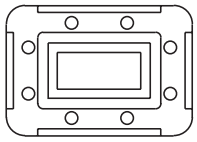
EIA Flange Identification

CPRG Flanges

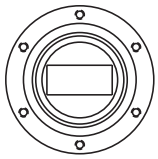
CPRG, pressurizable contact flanges, are flat faced with a gasket groove and secured with nuts and bolts. One full thickness gasket is used when mating two CPRG flanges.



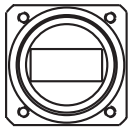
CPR G Flange

Choke Flanges

Choke flanges include a choke groove, gasket groove and threaded bolt holes for mating to a cover flange. One O-ring is used when mating a choke flange to a cover flange without gasket groove. Use an O-ring and half gasket when mating a choke flange to a cover/gasket flange. Two choke flanges cannot be mated.

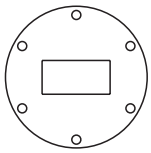


Choke Flanges

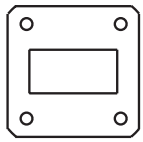


Cover Flanges

Cover flanges are flat faced without any choke or gasket grooves, and have clear bolt holes for mating to a choke or cover flange. A conductive gasket is required when mating two cover flanges. One O-ring is used when mating a cover flange to a cover/gasket flange.

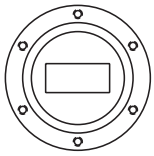


Cover Flanges

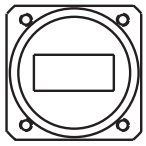


Cover/Gasket

Cover/gasket flanges are flat faced with a gasket groove only, and have clear bolt holes for mating with a choke, cover, or cover/gasket flange. One O-ring and a half gasket are used when mating two cover/gasket flanges or when mating a cover/gasket flange to a choke flange. One O-ring is used when mating a cover/gasket flange to a cover flange without gasket groove.



Cover/Gasket



CONTACT FLANGES	CPR()G	CPR()F
Flange Size/type		
CPR90G	Comes with CPR G Connector (Use Full gasket)	Comes with CPR F Connector (Use 1/2 gasket)
CPR112G	Comes with CPR G Connector (Use Full gasket)	Comes with CPR F Connector (Use 1/2 gasket)
CPR137G	Comes with CPR G Connector (Use Full gasket)	Comes with CPR F Connector (Use 1/2 gasket)
CPR159G	Comes with CPR G Connector (Use Full gasket)	Comes with CPR F Connector (Use 1/2 gasket)
CPR187G	Comes with CPR G Connector (Use Full gasket)	Comes with CPR F Connector (Use 1/2 gasket)
CPR229G	Comes with CPR G Connector (Use Full gasket)	Comes with CPR F Connector (Use 1/2 gasket)
CPR90F	Comes with CPR G Connector (Use 1/2 gasket)	Mates (Not Pressurizable)
CPR112F	Comes with CPR G Connector (Use 1/2 gasket)	Mates (Not Pressurizable)
CPR137F	Comes with CPR G Connector (Use 1/2 gasket)	Mates (Not Pressurizable)
CPR159F	Comes with CPR G Connector (Use 1/2 gasket)	Mates (Not Pressurizable)
CPR187F	Comes with CPR G Connector (Use 1/2 gasket)	Mates (Not Pressurizable)
CPR229F	Comes with CPR G Connector (Use 1/2 gasket)	Mates (Not Pressurizable)

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Mounting Information

Multi-purpose mount (M-mount) for 1 and 2 ft antennas

The mounting hardware – called the M-mount – has been especially designed for the installation of small antennas (1 and 2 ft).

The M-mount provides ± 30 deg fine adjustment of both azimuth and elevation.

This is especially important for small antennas used in short radio links.

The mount is made primarily from cast aluminum parts, which provide outstanding stability together with a very low weight.

The basic material of the mount is seawater-resistant aluminum alloy.

The M-mount enables small antennas (1 and 2 ft) to be mounted on pipe diameters of 48-114 mm (2-4.5 in).

The mount is standard for all 2 ft antennas. It can be ordered optional for 1 ft antennas.

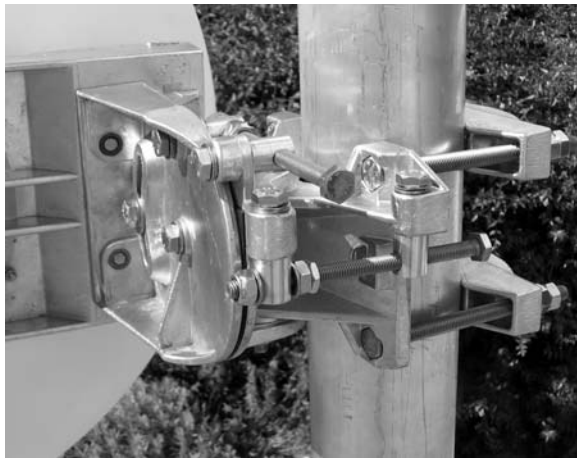
Oversized Mounting Hardware

The Oversized Mounting Hardware has been specially designed for the installation of small antennas on larger diameter pipes which are already in place on radio link towers. These pipes are often larger than the standard 114 mm. Therefore RFS has designed an alternative mounting bracket which makes it unnecessary for the installation team to provide a special mechanical interface.

The Oversized Mounting Hardware enables small antennas to be mounted on pipe diameters of 120-219 mm (4.8-9 in).

The easy and fast installation saves time and cost because no additional steel work has to be prepared. In addition the Oversized Mounting Hardware provides more flexibility and higher stability to secure the link. For more details contact RFS.

1ft M-Mount, optional



2ft M-Mount

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Antenna Options

Increased Wind Load Kit

Large RFS antennas, 6 to 12 ft (1.8 to 3.7m) diameter, already incorporate a strong back ring structure to support the reflector. The hot dip galvanized steel mount is fixed to the back ring.

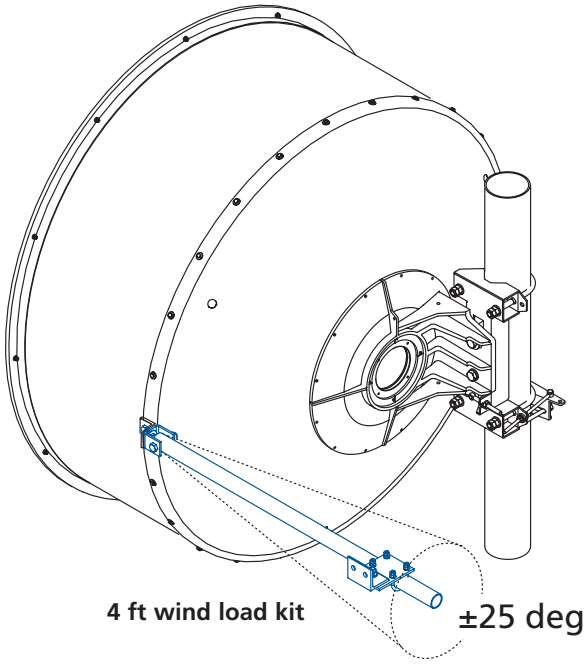
This configuration allows a simple upgrade of one of the antenna's most important mechanical features.

The Increased Wind Load Kit consists of additional struts for mounting between the back ring and the reflector rim. Thus enables the wind forces to be directed to the most rigid part of the antenna mount.

The 3 and 4 ft antennas can simply be upgraded by an additional side strut due to basic strong casting mount.

The kit can be installed on site before lifting the antenna onto the tower.

Antennas with a wind load kit provide a survival wind speed of 250 km/h (155mph), 200 km/h (125mph) without kit, and an operational wind speed of 200 km/h (125mph), 190 km/h (118mph) without kit.



Sway Bars

For protection against antenna shifting and deflection, 6, 8, 10 and 12 ft (1.8, 2.4, 3.0 and 3.7m) antennas contain one sway bar and 15 ft (4.6m) antennas have four (4) sway bars. Additional sway bars are available as an option for all 6ft (1.8 m) to 12ft (3.7m) antennas.

Harsh Environment Antennas

For increased protection within extreme corrosive and humid environments, harsh environment antennas are offered as an option. These antennas come with special corrosion resistant components and finishes, and are designed to withstand corrosive weathering environments typical of industrial, shoreline and offshore environments.

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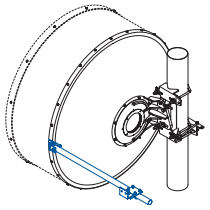
Solid Parabolic Microwave Antennas

Wind and Installation Kits Overview

250 Km/h Windkit

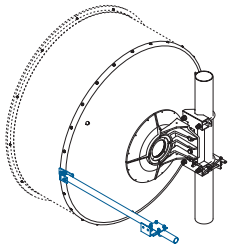
3 ft



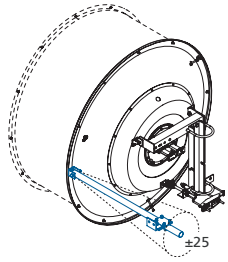
SMA-WK-3

4 ft

Std. Mount

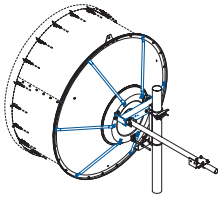


T-Mount



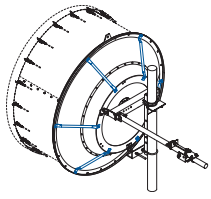
SMA-WK-4

6 ft



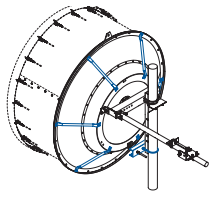
SMA-WK-6A

8 ft



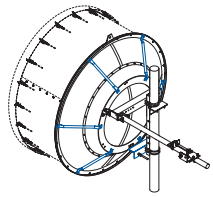
SMA-WK-8

10 ft



SMA-WK-10

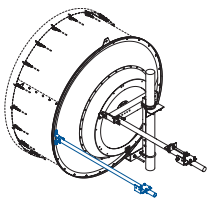
12 ft



SMA-WK-12

Additional Swaybar Kits

6 to 12 ft



SMA-SK-60-2000A
SMA-SK-60-3000A

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Radomes

Molded Radomes

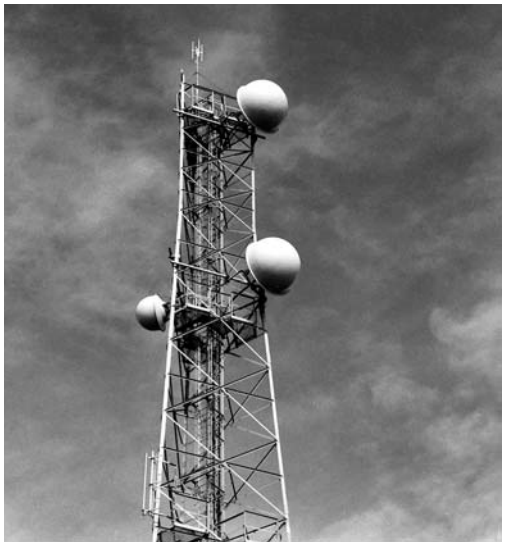
Optional molded radomes are available for Standard Performance antennas 2 to 12 ft. The radomes are made of fiberglass reinforced polyester resin covered with a gel coat. The 2 ft radome is manufactured from ABS material.

The shape minimizes the influence of the radome upon antenna gain, return loss and radiation characteristic.

Radomes with a special flat shape are available for all 4 and 6 ft antennas above 5.6 GHz. These radomes provide reduced packing volume and therefore are ideal for transportation. The radomes are identified by 'SH' in the model name.

Moulded radomes protect against the accumulation of snow, ice and dirt, and reduce windload. The surface is protected against ultraviolet degradation.

The standard colour is white.



	DIAMETER	ATTENUATION, dB							ADD TO ANTENNA VSWR		
MODEL NUMBER	ft (m)	6 GHz	8 GHz	11 GHz	13 GHz	15 GHz	18 GHz	22 GHz	6 to 9 GHz	10 to 16 GHz	>17 GHz
Radome_2	2 (0.6)	NA	0.5	0.9	1.1	1.3	2	2.4	0.03	0.04	0.05
Radome_4	4 (1.2)	0.3	0.5	1	1.3	1.5	2	2.4	0.03	0.04	0.05
Radome_4SH	4 (1.2)	0.3	0.5	1	1.3	1.5	2	2.4	0.03	0.04	0.05
Radome_6	6 (1.8)	0.4	0.6	1	1.4	1.5	2	2.5	0.03	0.04	0.05
Radome_6SH	6 (1.8)	0.4	0.6	1	1.4	1.5	2.1	2.5	0.03	0.04	0.05
Radome_8	8 (2.4)	0.5	0.6	1.1	1.6	1.8	NA	NA	0.03	0.04	NA
Radome_10	10 (3.0)	0.8	1	1.5	1.9	NA	NA	NA	0.03	0.04	NA
Radome_12	12 (3.7)	0.9	1.1	1.6	NA	NA	NA	NA	0.03	0.04	NA

Flexible Planar Radomes

Flexible Planar radomes manufactured from Complan are supplied with all shrouded antennas > 2ft with the exception of 3 and 4 ft CompactLine antennas. For Teflon coated fiberglass radomes please contact RFS.

Replacement Planar Radomes

Replacement radomes are available. Please contact RFS.

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Antenna Input[1] – N Male

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
SlimLine Standard Performance, Non-Pressurized, Single Polarized															
SPF2-23A	2 (0.6)	13.8	20.1	20.5	20.9	30	25		1.50/13.98	± 5	± 15	200 (125)	10 (22)	–	
SPF3-23A	3 (0.9)	9.2	23.8	24.2	24.5	33	25		1.50/13.98	± 5	± 15	200 (125)	16 (35.2)	–	
SPF4-23A	4 (1.2)	6.9	26.7	27.1	27.4	36	25		1.50/13.98	± 5	± 10	200 (125)	24 (52.8)	–	
SPF6-23A	6 (1.8)	4.6	30.2	30.6	31.0	39	25		1.50/13.98	± 5	± 5	200 (125)	70 (154)	–	

Antenna Input[1] – 154 IEC-PDR 40

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
Standard Performance, Low VSWR, Single Polarized															
PAL6-36B	6 (1.8)	3	34.3	34.8	35.5	42	30		1.08 / 28.3	± 5	± 5	200 (125)	50 (110)		Range 1, class 1
PAL8-36A	8 (2.4)	2.3	36.6	37.3	37.9	44	30		1.06 / 30.7	± 5	± 5	200 (125)	120 (264)		Range 1, class 1
PAL10-36A	10 (3.0)	1.8	38.5	39.2	39.8	47	30		1.06 / 30.7	± 5	± 5	200 (125)	215 (473)	B	Range 1, class 1
PAL12-36A	12 (3.7)	1.5	40.1	40.8	41.4	50	30		1.06 / 30.7	± 5	± 5	200 (125)	310 (682)	B	Range 1, class 1
PAL15-36A	15 (4.6)	1.1	42	42.7	43.3	52	30		1.06 / 30.7	± 5	± 5	200 (125)	570 (1254)	B	Range 1, class 1
Standard Performance, Dual Polarized															
PAX6-36B	6 (1.8)	3	34.2	34.7	35.4	42	30	35	1.08 / 28.3	± 5	± 5	200 (125)	50 (110)		Range 1, class 1
PAX8-36A	8 (2.4)	2.3	36.5	37.2	37.8	44	30	35	1.06 / 30.7	± 5	± 5	200 (125)	120 (264)		Range 1, class 1
PAX10-36A	10 (3.0)	1.8	38.4	39.1	39.7	46	30	35	1.06 / 30.7	± 5	± 5	200 (125)	215 (473)		Range 1, class 1
PAX12-36A	12 (3.7)	1.5	40	40.7	41.3	49	30	35	1.06 / 30.7	± 5	± 5	200 (125)	310 (682)	B	Range 1, class 1
PAX15-36A	15 (4.6)	1.1	42	42.7	43.3	52	30	35	1.06 / 30.7	± 5	± 5	200 (125)	570 (1254)	B	Range 1, class 1
High Performance, Single Polarized															
DA6-36B	6 (1.8)	3	33.7	34.4	35	56	30		1.08 / 28.3	± 5	± 5	200 (125)	95 (209)		Range 1, class 2
DA8-36A	8 (2.4)	2.3	36.5	37.2	37.8	60	30		1.06 / 30.7	± 5	± 5	200 (125)	180 (396)		Range 1, class 2
DA10-36A	10 (3.0)	1.8	38.4	39.1	39.7	62	30		1.06 / 30.7	± 5	± 5	200 (125)	290 (638)		Range 1, class 2
DA12-36A	12 (3.7)	1.5	40	40.7	41.3	63	30		1.06 / 30.7	± 5	± 5	200 (125)	420 (924)	B	Range 1, class 2
DA15-36A	15 (4.6)	1.1	42	42.7	43.3	65	30		1.06 / 30.7	± 5	± 5	200 (125)	750 (1650)	B	Range 1, class 2
High Performance, Dual Polarized															
DAX8-36A	8 (2.4)	2.3	36.5	37.2	37.8	60	30	35	1.08 / 28.3	± 5	± 5	200 (125)	180 (396)		Range 1, class 2
DAX10-36A	10 (3.0)	1.8	38.4	39.1	39.7	62	30	35	1.06 / 30.7	± 5	± 5	200 (125)	290 (638)		Range 1, class 2
DAX12-36A	12 (3.7)	1.5	40	40.7	41.3	63	30	35	1.06 / 30.7	± 5	± 5	200 (125)	420 (924)	B	Range 1, class 2
DAX15-36A	15 (4.6)	1.1	42	42.7	43.3	65	30	35	1.06 / 30.7	± 5	± 5	200 (125)	750 (1650)	B	Range 1, class 2
Ultra High Performance, Single Polarized															
UA6-36B	6 (1.8)	3	33.7	34.4	35	60	30		1.08 / 28.3	± 5	± 5	200 (125)	95 (209)		Range 1, class 3
UA8-36A	8 (2.4)	2.3	36.5	37.2	37.8	64	30		1.06 / 30.7	± 5	± 5	200 (125)	180 (396)		Range 1, class 3
UA10-36A	10 (3.0)	1.8	38.4	39.1	39.7	66	30		1.06 / 30.7	± 5	± 5	200 (125)	290 (638)	B	Range 1, class 3
UA12-36A	12 (3.7)	1.5	40	40.7	41.3	68	30		1.06 / 30.7	± 5	± 5	200 (125)	420 (924)	B	Range 1, class 3
Ultra High Performance, Dual Polarized															
UDA6-36B	6 (1.8)	3	33.5	34.2	34.8	60	30	35	1.08 / 28.3	± 5	± 5	200 (125)	95 (209)		Range 1, class 3
Ultra High Performance, High Crosspolar Discrimination, Dual Polarized															
UXA8-36A	8 (2.4)	2.3	36.5	37.2	37.8	66	40	45	1.08 / 28.3	± 5	± 5	200 (125)	180 (396)		Range 1, class 3, XPD
UXA10-36A	10 (3.0)	1.8	38.4	39.1	39.7	67	40	45	1.06 / 30.7	± 5	± 5	200 (125)	290 (638)	B	Range 1, class 3, XPD
UXA12-36A	12 (3.7)	1.5	40	40.7	41.3	70	40	45	1.06 / 30.7	± 5	± 5	200 (125)	420 (924)	A	Range 1, class 3, XPD
UXA15-36A	15 (4.6)	1.1	42	42.7	43.3	72	38	45	1.06 / 30.7	± 5	± 5	200 (125)	750 (1650)	B	Range 1, class 3, XPD

[1]To specify antenna input at the time of order, insert the appropriate antenna input code, from page 281, after the revision letter in the model number.

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Parabolic Point to Point Antennas 4.4 - 5.0 GHz

Antenna Input[1] – 154 IEC-PDR 48, UG-148/U

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
Standard Performance, Low VSWR, Single Polarized															
PAL6-44B	6 (1.8)	2.4	35.9	36.5	37	45	30		1.06 / 30.7	± 5	± 5	200 (125)	50 (110)		Range 1, class 1
PAL8-44A	8 (2.4)	1.8	38.5	39.1	39.6	46	30		1.06 / 30.7	± 5	± 5	200 (125)	120 (264)		Range 1, class 1
PAL10-44A	10 (3.0)	1.5	40.4	41	41.5	50	30		1.06 / 30.7	± 5	± 5	200 (125)	215 (473)		Range 1, class 1
PAL12-44A	12 (3.7)	1.2	42	42.6	43.1	51	30		1.06 / 30.7	± 5	± 5	200 (125)	310 (682)		Range 1, class 1
PAL15-44A	15 (4.6)	0.9	43.7	44.3	44.8	52	30		1.06 / 30.7	± 5	± 5	200 (125)	570 (1254)		Range 1, class 1
Standard Performance, Dual Polarized															
PAX6-44B	6 (1.8)	2.4	35.6	36.2	36.7	45	30	35	1.06 / 30.7	± 5	± 5	200 (125)	50 (110)		Range 1, class 1
PAX8-44A	8 (2.4)	1.8	38.2	38.8	39.3	46	30	35	1.06 / 30.7	± 5	± 5	200 (125)	120 (264)		Range 1, class 1
PAX10-44A	10 (3.0)	1.5	40.1	40.7	41.2	50	30	35	1.06 / 30.7	± 5	± 5	200 (125)	215 (473)		Range 1, class 1
PAX12-44A	12 (3.7)	1.2	41.7	42.3	42.8	51	30	35	1.06 / 30.7	± 5	± 5	200 (125)	310 (682)		Range 1, class 1
PAX15-44A	15 (4.6)	0.9	43.7	44.3	44.8	52	30	35	1.06 / 30.7	± 5	± 5	200 (125)	570 (1254)		Range 1, class 1
High Performance, Single Polarized															
DA6-44B	6 (1.8)	2.4	35.9	36.5	37	62	30		1.06 / 30.7	± 5	± 5	200 (125)	95 (209)		Range 1, class 2
DA8-44A	8 (2.4)	1.8	38.5	39.1	39.6	65	30		1.06 / 30.7	± 5	± 5	200 (125)	180 (396)		Range 1, class 2
DA10-44A	10 (3.0)	1.5	40.4	41	41.5	67	30		1.06 / 30.7	± 5	± 5	200 (125)	290 (638)		Range 1, class 2
DA12-44A	12 (3.7)	1.2	42	42.6	43.1	68	30		1.06 / 30.7	± 5	± 5	200 (125)	420 (924)		Range 1, class 2
DA15-44A	15 (4.6)	0.9	43.7	44.3	44.8	68	30		1.06 / 30.7	± 5	± 5	200 (125)	750 (1650)		Range 1, class 2
High Performance, Dual Polarized															
DAX6-44B	6 (1.8)	2.4	35.6	36.2	36.7	60	30	35	1.06 / 30.7	± 5	± 5	200 (125)	95 (209)		Range 1, class 2
DAX8-44A	8 (2.4)	1.8	38.2	38.8	39.6	64	30	35	1.06 / 30.7	± 5	± 5	200 (125)	180 (396)		Range 1, class 2
DAX10-44A	10 (3.0)	1.5	40.1	40.7	41.2	66	30	35	1.06 / 30.7	± 5	± 5	200 (125)	290 (638)		Range 1, class 2
DAX12-44A	12 (3.7)	1.2	41.7	42.3	42.8	67	30	35	1.06 / 30.7	± 5	± 5	200 (125)	420 (924)		Range 1, class 2
DAX15-44A	15 (4.6)	0.9	43.7	44.3	44.8	67	30	35	1.06 / 30.7	± 5	± 5	200 (125)	750 (1650)		Range 1, class 2
Ultra High Performance, Single Polarized															
UA6-44B	6 (1.8)	2.4	35.9	36.5	37	64	30		1.06 / 30.7	± 5	± 5	200 (125)	95 (209)		Range 1, class 3
UA8-44A	8 (2.4)	1.8	38.5	39.1	39.6	66	30		1.06 / 30.7	± 5	± 5	200 (125)	180 (396)		Range 1, class 3
UA10-44A	10 (3.0)	1.5	40.4	41	41.5	68	30		1.06 / 30.7	± 5	± 5	200 (125)	290 (638)		Range 1, class 3
UA12-44A	12 (3.7)	1.2	42	42.6	43.1	71	30		1.06 / 30.7	± 5	± 5	200 (125)	420 (924)		Range 1, class 3
Ultra High Performance, Dual Polarized															
UDA6-44B	6 (1.8)	2.4	35.6	36.2	36.7	62	30	35	1.06 / 30.7	± 5	± 5	200 (125)	95 (209)		Range 1, class 3
Ultra High Performance, High Crosspolar Discrimination, Dual Polarized															
UXA8-44A	8 (2.4)	1.8	38.2	38.8	39.6	66	40	45	1.06 / 30.7	± 5	± 5	200 (125)	180 (396)		Range 1, class 3, XPD
UXA10-44A	10 (3.0)	1.5	40.1	40.7	41.2	68	40	45	1.06 / 30.7	± 5	± 5	200 (125)	290 (638)		Range 1, class 3, XPD
UXA12-44A	12 (3.7)	1.2	41.7	42.3	42.8	69	40	45	1.06 / 30.7	± 5	± 5	200 (125)	420 (924)		Range 1, class 3, XPD
UXA15-44A	15 (4.6)	0.9	43.7	44.3	44.8	71	38	45	1.06 / 30.7	± 5	± 5	200 (125)	750 (1650)		Range 1, class 3, XPD
CompactLine, Single Polarized															
SB2-44B	2 (0.6)	5.9	25.6	26.6	27.6	42	30		1.30/17.7	± 30	± 30	250 (156)	12 (26.5)		Range 1, class 1

5.25 - 5.85 GHz

Antenna Input[1] – N Female

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
SlimLine Standard Performance, Non-Pressurized, Single Polarized															
SPF2-52B	2 (0.6)	5.8	27.8	28.5	29.1	43	30		1.50 / 13.98			200 (125)	10 (22)		
SPF3-52B	3 (0.9)	3.9	31.3	32.0	32.6	45	30		1.50 / 13.98			200 (125)	16 (35.2)		
SPF4-52B	4 (1.2)	3.0	33.9	34.4	34.9	48	30		1.50 / 13.98			200 (125)	24 (52.8)		
SPF6-52B	6 (1.8)	2.0	37.6	38.1	38.6	50	30		1.50 / 13.98			200 (125)	70 (154)		
SlimLine High Performance, Non-Pressurized, Single Polarized															
SDF3-52B	3 (0.9)	3.9	31.3	32.0	32.6	55	30		1.50 / 13.98			200 (125)	16 (35.2)		
SDF4-52B	4 (1.2)	3.0	33.9	34.4	34.9	58	30		1.50 / 14.0			200 (125)	24 (52.8)		
SDF6-52B	6 (1.8)	2.0	37.6	38.1	38.6	61	30		1.50 / 14.0			200 (125)	70 (154)		

[1]To specify antenna input at the time of order, insert the appropriate antenna input code, from page 281, after the revision letter in the model number.

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Parabolic Point to Point Antennas 5.725 - 5.85 GHz

Antenna Input[1] – N Female, 154 IEC-PDR70, CPR137G

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
Standard Performance, Single Polarized															
PA4-57A	4 (1.2)	3.1	34.7	34.8	34.9	42	30		1.15 / 23.1	± 5	± 10	200 (125)	48 (105)	-	Range 1, class 1
PA6-57B	6 (1.8)	2.1	38.2	38.3	38.4	46	30		1.15 / 23.1	± 5	± 5	200 (125)	50 (110)	-	Range 1, class 1
PA8-57A	8 (2.4)	1.5	40.7	40.8	40.9	48	30		1.15 / 23.1	± 5	± 5	200 (125)	120 (264)	-	Range 1, class 1
PA10-57A	10 (3.0)	1.2	42.6	42.7	42.8	51	30		1.15 / 23.1	± 5	± 5	200 (125)	215 (473)	-	Range 1, class 1
PA12-57A	12 (3.7)	1	44.2	44.3	44.4	52	30		1.15 / 23.1	± 5	± 5	200 (125)	310 (682)	-	Range 1, class 1
Standard Performance, Non-Pressurized, Single Polarized															
PSF8-57A	8 (2.4)	1.7	40.3	40.4	40.5	46	25		1.30 / 17.7	± 5	± 5	200 (125)	130 (285)	-	
PSF10-57A	10 (3.0)	1.4	42.2	42.7	42.4	49	25		1.30 / 17.7	± 5	± 5	200 (125)	264 (580)	-	
PSF12-57A	12 (3.7)	1.2	43.8	43.9	44.0	50	25		1.30 / 17.7	± 5	± 5	200 (125)	364 (800)	-	
High Performance, Single Polarized															
DA4-57A	4 (1.2)	3.1	34.7	34.8	34.9	55	30		1.15 / 23.1	± 5	± 10	200 (125)	63 (140)	-	Range 1, class 2
DA6-57B	6 (1.8)	2.1	38.2	38.3	38.4	64	30		1.15 / 23.1	± 5	± 5	200 (125)	95 (209)	-	Range 1, class 2
DA8-57A	8 (2.4)	1.5	40.7	40.8	40.9	68	30		1.15 / 23.1	± 5	± 5	200 (125)	180 (396)	-	Range 1, class 2
DA10-57A	10 (3.0)	1.2	42.6	42.7	42.8	70	30		1.15 / 23.1	± 5	± 5	200 (125)	290 (638)	-	Range 1, class 2
DA12-57A	12 (3.7)	1	44.2	44.3	44.4	71	30		1.15 / 23.1	± 5	± 5	200 (125)	420 (924)	-	Range 1, class 2

5.725 - 6.875 GHz

Antenna Input[1] – 154 IEC-PDR70, CPR137G

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
Standard Performance, Single Polarized															
PA4-W57A	4 (1.2)	2.8	34.7	35.5	36.3	42	28		1.20 / 20.8	± 5	± 10	200 (125)	48 (105)	-	Range 1, class 1
PA6-W57B	6 (1.8)	1.9	38.2	39.0	39.8	46	30		1.15 / 23.1	± 5	± 5	200 (125)	50 (110)	-	Range 1, class 1
PA8-W57A	8 (2.4)	1.4	40.7	41.5	42.3	48	30		1.15 / 23.1	± 5	± 5	200 (125)	120 (264)	-	Range 1, class 1
PA10-W57A	10 (3.0)	1.1	42.6	43.5	44.2	51	30		1.15 / 23.1	± 5	± 5	200 (125)	215 (473)	-	Range 1, class 1
PA12-W57A	12 (3.7)	0.9	44.2	45.1	45.8	52	30		1.15 / 23.1	± 5	± 5	200 (125)	310 (682)	-	Range 1, class 1
Improved Performance, Single Polarized (FCC Part 101, category A compliant)															
PAD6-W57A	6 (1.8)	1.9	38.1	38.9	39.7	55	30		1.15 / 23.1	± 5	± 5	200 (125)	84 (185)	A	
PAD8-W57A	8 (2.4)	1.4	40.6	41.4	42.2	57	30		1.15 / 23.1	± 5	± 5	200 (125)	130 (285)	A	
High Performance, Single Polarized															
DA4-W57A	4 (1.2)	2.8	34.7	35.5	36.3	55	28		1.20 / 20.8	± 5	± 10	200 (125)	63 (140)	-	Range 1, class 2
DA6-W57B	6 (1.8)	1.9	38.2	39.0	39.8	64	30		1.15 / 23.1	± 5	± 5	200 (125)	95 (209)	-	Range 1, class 2
DA8-W57A	8 (2.4)	1.4	40.7	41.5	42.3	68	30		1.15 / 23.1	± 5	± 5	200 (125)	180 (396)	-	Range 1, class 2
DA10-W57A	10 (3.0)	1.1	42.6	43.5	44.2	70	30		1.15 / 23.1	± 5	± 5	200 (125)	290 (638)	-	Range 1, class 2
DA12-W57A	12 (3.7)	0.9	44.2	45.1	45.8	71	30		1.15 / 23.1	± 5	± 5	200 (125)	420 (924)	-	Range 1, class 2

[1]To specify antenna input at the time of order, insert the appropriate antenna input code, from page 281, after the revision letter in the model number.

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Antenna Input[1] – 154 IEC-PDR 70, CPR137G

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
Standard Performance, Low VSWR, Single Polarized															
PAL8-59A	8 (2.4)	1.5	41.2	41.6	42	48	30		1.06 / 30.7	± 5	± 5	200 (125)	120 (264)	B	Range 1, class 1
PAL10-59A	10 (3.0)	1.2	43	43.4	43.7	51	30		1.06 / 30.7	± 5	± 5	200 (125)	215 (473)	B	Range 1, class 1
PAL12-59A	12 (3.7)	0.9	44.8	45.1	45.4	52	30		1.06 / 30.7	± 5	± 5	200 (125)	310 (682)	B	Range 1, class 1
PAL15-59A	15 (4.6)	0.8	46.3	46.6	47	54	30		1.06 / 30.7	± 5	± 5	200 (125)	570 (1254)		Range 1, class 1
Standard Performance, Dual Polarized															
PAX8-59A	8 (2.4)	1.5	40.9	41.3	41.7	48	30	35	1.06 / 30.7	± 5	± 5	200 (125)	120 (264)	B	Range 1, class 1
PAX10-59A	10 (3.0)	1.2	42.9	43.2	43.5	51	30	35	1.06 / 30.7	± 5	± 5	200 (125)	215 (473)	B	Range 1, class 1
PAX12-59A	12 (3.7)	0.9	44.6	44.8	45.2	52	30	35	1.06 / 30.7	± 5	± 5	200 (125)	310 (682)	B	Range 1, class 1
PAX15-59A	15 (4.6)	0.8	46.3	46.6	47	54	30	35	1.06 / 30.7	± 5	± 5	200 (125)	570 (1254)	B	Range 1, class 1
Improved Performance, Single Polarized (FCC Part 101, category A compliant)															
PAD6-59A	6 (1.8)	1.8	38.4	38.7	39.1	55	30		1.06 / 30.7	± 5	± 5	200 (125)	84 (185)	A	
PAD8-59A	8 (2.4)	1.4	40.9	41.3	41.6	57	30		1.06 / 30.7	± 5	± 5	200 (125)	130 (285)	A	
PAD10-59A	10 (3.0)	1.2	42.8	43.2	43.5	61	30		1.06 / 30.7	± 5	± 5	200 (125)	264 (580)	A	
Improved Performance, Dual Polarized (FCC Part 101, category A compliant)															
PADX6-59A	6 (1.8)	1.8	38.2	38.5	38.9	55	30		1.06 / 30.7	± 5	± 5	200 (125)	84 (185)	A	
PADX8-59A	8 (2.4)	1.4	40.7	41.1	41.4	57	30		1.06 / 30.7	± 5	± 5	200 (125)	130 (285)	A	
PADX10-59A	10 (3.0)	1.2	42.7	43.1	43.4	61	30		1.06 / 30.7	± 5	± 5	200 (125)	264 (580)	A	
High Performance, Single Polarized															
DA4-59A	4 (1.2)	2.8	34.9	35.3	35.6	58	30		1.10 / 26.4	± 5	± 10	200 (125)	45 (99)		Range 1, class 2
DA6-59B	6 (1.8)	1.9	38.5	39	39.3	62	30		1.06 / 30.7	± 5	± 5	200 (125)	95 (209)	A	Range 1, class 2
DA8-59A	8 (2.4)	1.5	41.2	41.6	42	66	30		1.06 / 30.7	± 5	± 5	200 (125)	180 (396)	A	Range 1, class 2
DA10-59A	10 (3.0)	1.2	43	43.4	43.7	69	30		1.06 / 30.7	± 5	± 5	200 (125)	290 (638)	A	Range 1, class 2
DA12-59A	12 (3.7)	0.9	44.8	45.1	45.4	70	30		1.06 / 30.7	± 5	± 5	200 (125)	420 (924)	A	Range 1, class 2
DA15-59A	15 (4.6)	0.8	46.3	46.6	47	71	30		1.06 / 30.7	± 5	± 5	200 (125)	750 (1650)	B	Range 1, class 2
High Performance, Dual Polarized															
DAX4-59A	4 (1.2)	2.8	34.1	34.5	34.8	56	30	35	1.10 / 26.4	± 5	± 5	200 (125)	45 (99)		Range 1, class 2
DAX6-59B	6 (1.8)	1.9	38.3	38.7	39	64	30	35	1.06 / 30.7	± 5	± 5	200 (125)	95 (209)	A	Range 1, class 2
DAX8-59A	8 (2.4)	1.5	40.9	41.3	41.7	67	30	35	1.06 / 30.7	± 5	± 5	200 (125)	180 (396)	A	Range 1, class 2
DAX10-59A	10 (3.0)	1.2	42.9	43.2	43.5	69	30	35	1.06 / 30.7	± 5	± 5	200 (125)	290 (638)	A	Range 1, class 2
DAX12-59A	12 (3.7)	0.9	44.6	44.8	45.2	71	30	35	1.06 / 30.7	± 5	± 5	200 (125)	420 (924)	A	Range 1, class 2
DAX15-59A	15 (4.6)	0.8	46.3	46.6	47	71	30	35	1.06 / 30.7	± 5	± 5	200 (125)	750 (1650)	A	Range 1, class 2
Ultra High Performance, Single Polarized															
UA6-59B	6 (1.8)	1.9	38.5	39	39.3	67	30		1.06 / 30.7	± 5	± 5	200 (125)	95 (209)	A	Range 1, class 3
UA8-59A	8 (2.4)	1.5	41.2	41.6	42	70	30		1.06 / 30.7	± 5	± 5	200 (125)	180 (396)	A	Range 1, class 3
UA10-59A	10 (3.0)	1.2	43	43.4	43.7	72	30		1.06 / 30.7	± 5	± 5	200 (125)	290 (638)	A	Range 1, class 3
UA12-59A	12 (3.7)	0.9	44.8	45.1	45.4	74	30		1.06 / 30.7	± 5	± 5	200 (125)	420 (924)	A	Range 1, class 3
Ultra High Performance, High Crosspolar Discrimination, Dual Polarized															
UXA6-59B	6 (1.8)	1.9	38.3	38.7	39	69	40	45	1.06 / 30.7	± 5	± 5	200 (125)	95 (209)	A	Range 1, class 3, XPD
UXA8-59A	8 (2.4)	1.5	40.9	41.3	41.7	71	40	45	1.06 / 30.7	± 5	± 5	200 (125)	180 (396)	A	Range 1, class 3, XPD
UXA10-59A	10 (3.0)	1.2	42.9	43.2	43.5	74	40	45	1.06 / 30.7	± 5	± 5	200 (125)	290 (638)	A	Range 1, class 3, XPD
UXA12-59A	12 (3.7)	0.9	44.6	44.8	45.2	76	40	45	1.06 / 30.7	± 5	± 5	200 (125)	420 (924)	A	Range 1, class 3, XPD
UXA15-59A	15 (4.6)	0.8	46.3	46.6	47	77	38	45	1.06 / 30.7	± 5	± 5	200 (125)	750 (1650)	A	Range 1, class 3, XPD
SlimLine Standard Performance, Single Polarized															
SP4-59A	4 (1.2)	2.8	34.9	35.3	35.6	42	30		1.15 / 23.1	± 5	± 10	200 (125)	30 (66)		Range 1, class 1
SP6-59B	6 (1.8)	1.9	38.5	39	39.6	46	30		1.15 / 23.1	± 5	± 5	200 (125)	50 (110)		Range 1, class 1
SlimLine Standard Performance, Dual Polarized															
SPX6-59B	6 (1.8)	1.9	38.3	38.8	39.1	46	30	35	1.15 / 23.1	± 5	± 5	200 (125)	50 (110)		Range 1, class 1
SlimLine Ultra High Performance, Single Polarized															
SU6-59B	6 (1.8)	1.9	38.3	38.8	39.1	64	30		1.15 / 23.1	± 5	± 5	200 (125)	95 (209)		Range 1, class 3
SlimLine Ultra High Performance, Dual Polarized															
SUX6-59B	6 (1.8)	1.9	38.1	38.6	38.9	64	30	35	1.15 / 23.1	± 5	± 5	200 (125)	95 (209)		Range 1, class 3

[1]To specify antenna input at the time of order, insert the appropriate antenna input code, from page 281, after the revision letter in the model number.

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Antenna Input[1] – 154 IEC-PDR 70, CPR137G

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
Standard Performance, Dual Polarized															
PAX8-W59A	8 (2.4)	1.3	40.9	41.7	42.5	49	30	35	1.08 / 28.3	± 5	± 5	200 (125)	120 (264)		Range 1, class 1
PAX10-W59A	10 (3.0)	1	42.9	43.6	44.4	51	30	35	1.08 / 28.3	± 5	± 5	200 (125)	215 (473)		Range 1, class 1
PAX12-W59A	12 (3.7)	0.8	44.6	45.2	46	52	30	35	1.08 / 28.3	± 5	± 5	200 (125)	310 (682)		Range 1, class 1
Improved Performance, Single Polarized (FCC Part 101, category A compliant)															
PAD6-W59B	6 (1.8)	1.7	38.4	39.1	39.7	55	30		1.08 / 28.3	± 5	± 5	200 (125)	50 (110)	A	
PAD8-W59A	8 (2.4)	1.3	40.9	41.6	42.2	57	30		1.08 / 28.3	± 5	± 5	200 (125)	130 (285)	A	
PAD10-W59A	10 (3.0)	1.1	42.7	43.4	44.0	61	30		1.08 / 28.3	± 5	± 5	200 (125)	264 (580)	A	
Improved Performance, Dual Polarized (FCC Part 101, category A compliant)															
PADX10-W59A	10 (3.0)	1.1	42.7	43.4	44.0	59	30		1.10 / 26.4	± 5	± 5	200 (125)	264 (580)	A	
High Performance, Dual Polarized															
DAX8-W59A	8 (2.4)	1.3	40.9	41.5	42.1	63	30	35	1.08 / 28.3	± 5	± 5	200 (125)	180 (396)		Range 1, class 2
DAX10-W59A	10 (3.0)	1	42.9	43.5	44.1	66	30	35	1.08 / 28.3	± 5	± 5	200 (125)	290 (638)		Range 1, class 2
DAX12-W59A	12 (3.7)	0.8	44.6	45.1	45.7	68	30	35	1.08 / 28.3	± 5	± 5	200 (125)	420 (924)		Range 1, class 2
DAX15-W59A	15 (4.6)	0.7	46.3	46.9	47.6	70	30	35	1.08 / 28.3	± 5	± 5	200 (125)	750 (1650)		Range 1, class 2
Ultra High Performance, High Crosspolar Discrimination, Dual Polarized															
UXA10-W59A	10 (3.0)	1	42.9	43.5	44.1	73	40	45	1.08 / 28.3	± 5	± 5	200 (125)	290 (638)		Range 1, class 3, XPD
UXA12-W59A	12 (3.7)	0.8	44.6	45.1	45.7	75	40	45	1.08 / 28.3	± 5	± 5	200 (125)	420 (924)		Range 1, class 3, XPD

[1]To specify antenna input at the time of order, insert the appropriate antenna input code, from page 281, after the revision letter in the model number.

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Antenna Input[1] – 154 IEC-PDR 70, CPR137G

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
Standard Performance, Low VSWR, Single Polarized															
PAL8-65A	8 (2.4)	1.3	42	42.4	42.9	49	30		1.06 / 30.7	± 5	± 5	200 (125)	120 (264)	B	Range 1, class 1
PAL10-65A	10 (3.0)	1	43.7	44.1	44.6	52	30		1.06 / 30.7	± 5	± 5	200 (125)	215 (473)	B	Range 1, class 1
PAL12-65A	12 (3.7)	0.8	45.3	45.8	46.2	53	30		1.06 / 30.7	± 5	± 5	200 (125)	310 (682)	B	Range 1, class 1
PAL15-65A	15 (4.6)	0.7	47	47.5	47.9	55	30		1.06 / 30.7	± 5	± 5	200 (125)	570 (1254)	B	Range 1, class 1
Standard Performance, Dual Polarized															
PAX8-65A	8 (2.4)	1.3	41.8	42.2	42.7	51	30	35	1.06 / 30.7	± 5	± 5	200 (125)	120 (264)	B	Range 1, class 1
PAX10-65A	10 (3.0)	1	43.5	43.9	44.4	52	30	35	1.06 / 30.7	± 5	± 5	200 (125)	215 (473)	B	Range 1, class 1
PAX12-65A	12 (3.7)	0.8	45.1	45.6	46	53	30	35	1.06 / 30.7	± 5	± 5	200 (125)	310 (682)	B	Range 1, class 1
PAX15-65A	15 (4.6)	0.7	47	47.5	47.9	55	30	35	1.06 / 30.7	± 5	± 5	200 (125)	570 (1254)	B	Range 1, class 1
Improved Performance, Single Polarized (FCC Part 101, category A compliant)															
PAD6-65A	6 (1.8)	1.6	39.1	39.6	40.0	57	30		1.06 / 30.7	± 5	± 5	200 (125)	84 (185)	A	
PAD8-65A	8 (2.4)	1.2	41.6	42.1	42.5	59	30		1.06 / 30.7	± 5	± 5	200 (125)	130 (285)	A	
PAD10-65A	10 (3.0)	1.1	43.5	43.9	44.3	63	30		1.06 / 30.7	± 5	± 5	200 (125)	264 (580)	A	
Improved Performance, Dual Polarized (FCC Part 101, category A compliant)															
PADX6-65A	6 (1.8)	1.6	38.9	39.4	39.8	57	30		1.06 / 30.7	± 5	± 5	200 (125)	84 (185)	A	
PADX8-65A	8 (2.4)	1.2	41.4	41.9	42.3	59	30		1.06 / 30.7	± 5	± 5	200 (125)	130 (285)	A	
PADX10-65A	10 (3.0)	1	43.6	43.9	44.4	63	30		1.06 / 30.7	± 5	± 5	200 (125)	264 (580)	A	
High Performance, Single Polarized															
DA4-65A	4 (1.2)	2.5	35.6	36	36.5	58	30		1.08 / 28.3	± 5	± 10	200 (125)	45 (99)		Range 1, class 2
DA6-65B	6 (1.8)	1.7	39.4	39.8	40.2	64	30		1.06 / 30.7	± 5	± 5	200 (125)	95 (209)	A	Range 1, class 2
DA8-65A	8 (2.4)	1.3	41.9	42.3	42.8	66	30		1.06 / 30.7	± 5	± 5	200 (125)	180 (396)	A	Range 1, class 2
DA10-65A	10 (3.0)	1	43.7	44.1	44.6	69	30		1.06 / 30.7	± 5	± 5	200 (125)	290 (638)	A	Range 1, class 2
DA12-65A	12 (3.7)	0.8	45.3	45.8	46.2	70	30		1.06 / 30.7	± 5	± 5	200 (125)	420 (924)	A	Range 1, class 2
DA15-65A	15 (4.6)	0.7	47	47.5	47.9	71	30		1.06 / 30.7	± 5	± 5	200 (125)	750 (1650)	A	Range 1, class 2
High Performance, Dual Polarized															
DAX4-65A	4 (1.2)	2.5	34.8	35.3	35.7	58	30	35	1.10 / 26.4	± 5	± 5	200 (125)	45 (99)		Range 1, class 2
DAX6-65B	6 (1.8)	1.7	39.2	39.7	40.1	64	30	35	1.06 / 30.7	± 5	± 5	200 (125)	95 (209)	A	Range 1, class 2
DAX8-65A	8 (2.4)	1.3	41.8	42.2	42.7	68	30	35	1.06 / 30.7	± 5	± 5	200 (125)	180 (396)	A	Range 1, class 2
DAX10-65A	10 (3.0)	1	43.5	43.9	44.4	70	30	35	1.06 / 30.7	± 5	± 5	200 (125)	290 (638)	A	Range 1, class 2
DAX12-65A	12 (3.7)	0.8	45.1	45.6	46	71	30	35	1.06 / 30.7	± 5	± 5	200 (125)	420 (924)	A	Range 1, class 2
DAX15-65A	15 (4.6)	0.7	47	47.5	47.9	71	30	35	1.06 / 30.7	± 5	± 5	200 (125)	750 (1650)	A	Range 1, class 2
Ultra High Performance, Single Polarized															
UA4-65A	4 (1.2)	2.5	35.6	36	36.5	63	30		1.06 / 30.7	± 5	± 10	200 (125)	45 (99)		Range 1, class 3
UA6-65B	6 (1.8)	1.7	39.4	39.8	40.2	67	30		1.06 / 30.7	± 5	± 5	200 (125)	95 (209)	A	Range 1, class 3
UA8-65A	8 (2.4)	1.3	41.9	42.3	42.8	70	30		1.06 / 30.7	± 5	± 5	200 (125)	180 (396)	A	Range 1, class 3
UA10-65A	10 (3.0)	1	43.7	44.1	44.6	72	30		1.06 / 30.7	± 5	± 5	200 (125)	290 (638)	A	Range 1, class 3
UA12-65A	12 (3.7)	0.8	45.3	45.8	46.2	74	30		1.06 / 30.7	± 5	± 5	200 (125)	420 (924)	A	Range 1, class 3
Ultra High Performance, Dual Polarized															
UDA10-65A	10 (3.0)	1	43.5	43.9	44.4	73	30	35	1.06 / 30.7	± 5	± 5	200 (125)	290 (638)		Range 1, class 3
UDA12-65A	12 (3.7)	0.8	45.1	45.6	46	75	30	35	1.06 / 30.7	± 5	± 5	200 (125)	420 (924)		Range 1, class 3
Ultra High Performance, High Crosspolar Discrimination, Dual Polarized															
UXA6-65B	6 (1.8)	1.7	39.2	39.7	40.1	69	40	45	1.06 / 30.7	± 5	± 5	200 (125)	95 (209)	A	Range 1, class 3, XPD
UXA8-65A	8 (2.4)	1.3	41.8	42.2	42.7	71	40	45	1.06 / 30.7	± 5	± 5	200 (125)	180 (396)	A	Range 1, class 3, XPD
UXA10-65A	10 (3.0)	1	43.5	43.9	44.4	74	40	45	1.06 / 30.7	± 5	± 5	200 (125)	290 (638)	A	Range 1, class 3, XPD
UXA12-65A	12 (3.7)	0.8	45.1	45.6	46	76	40	45	1.06 / 30.7	± 5	± 5	200 (125)	420 (924)	A	Range 1, class 3, XPD
UXA15-65A	15 (4.6)	0.7	47	47.5	47.9	77	38	45	1.06 / 30.7	± 5	± 5	200 (125)	750 (1650)	A	Range 1, class 3, XPD
SlimLine Standard Performance, Single Polarized															
SP4-65A	4 (1.2)	2.5	35.9	36.4	36.8	43	30		1.15 / 23.1	± 5	± 10	200 (125)	30 (66)		Range 1, class 1
SP6-65B	6 (1.8)	1.7	39.4	39.9	40.3	47	30		1.15 / 23.1	± 5	± 5	200 (125)	50 (110)		Range 1, class 1
SlimLine Standard Performance, Dual Polarized															
SPX4-65A	4 (1.2)	2.5	35.3	35.8	36.2	43	30	35	1.15 / 23.1	± 5	± 5	200 (125)	30 (66)		Range 1, class 1
SPX6-65B	6 (1.8)	1.7	39.2	39.7	40.1	47	30	35	1.15 / 23.1	± 5	± 5	200 (125)	50 (110)		Range 1, class 1
SlimLine Ultra High Performance, Single Polarized															
SU4-65A	4 (1.2)	2.5	35.6	36	36.5	61	30		1.15 / 23.1	± 5	± 10	200 (125)	45 (99)		Range 1, class 3
SU6-65B	6 (1.8)	1.7	39.2	39.7	40.1	65	30		1.15 / 23.1	± 5	± 5	200 (125)	95 (209)		Range 1, class 3
SlimLine Ultra High Performance, Dual Polarized															
SUX4-65A	4 (1.2)	2.5	34.8	35.3	35.7	61	30	35	1.15 / 23.1	± 5	± 5	200 (125)	45 (99)		Range 1, class 3
SUX6-65B	6 (1.8)	1.7	39	39.5	39.9	65	30	35	1.15 / 23.1	± 5	± 5	200 (125)	95 (209)		Range 1, class 3

[1]To specify antenna input at the time of order, insert the appropriate antenna input code, from page 281, after the revision letter in the model number.

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Antenna Input[1] – 154 IEC-PDR 70, CPR137G

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
Standard Performance, Low VSWR, Single Polarized															
PAL8-71A	8 (2.4)	1.1	42.6	43	43.3	50	30		1.06 / 30.7	± 5	± 5	200 (125)	120 (264)		Range 1, class 1
PAL10-71A	10 (3.0)	0.9	44.6	44.9	45.3	52	30		1.06 / 30.7	± 5	± 5	200 (125)	215 (473)		Range 1, class 1
PAL12-71A	12 (3.7)	0.7	46.2	46.6	47	54	30		1.06 / 30.7	± 5	± 5	200 (125)	310 (682)		Range 1, class 1
PAL15-71A	15 (4.6)	0.6	47.9	48.3	48.6	56	30		1.06 / 30.7	± 5	± 5	200 (125)	570 (1254)		Range 1, class 1
Standard Performance, Dual Polarized															
PAX8-71A	8 (2.4)	1.1	42.4	42.8	43.1	50	30	35	1.06 / 30.7	± 5	± 5	200 (125)	120 (264)		Range 1, class 1
PAX10-71A	10 (3.0)	0.9	44.4	44.7	45.1	52	30	35	1.06 / 30.7	± 5	± 5	200 (125)	215 (473)		Range 1, class 1
PAX12-71A	12 (3.7)	0.7	46	46.4	46.8	54	30	35	1.06 / 30.7	± 5	± 5	200 (125)	310 (682)		Range 1, class 1
PAX15-71A	15 (4.6)	0.6	47.9	48.3	48.6	56	30	35	1.06 / 30.7	± 5	± 5	200 (125)	570 (1254)		Range 1, class 1
High Performance, Single Polarized															
DA4-71A	4 (1.2)	2.2	36.6	37	37.3	62	30		1.08 / 28.3	± 5	± 10	200 (125)	45 (99)		Range 1, class 2
DA6-71B	6 (1.8)	1.5	40.1	40.5	40.8	66	30		1.06 / 30.7	± 5	± 5	200 (125)	95 (209)		Range 1, class 2
DA8-71A	8 (2.4)	1.1	42.6	43	43.3	68	30		1.06 / 30.7	± 5	± 5	200 (125)	180 (396)		Range 1, class 2
DA10-71A	10 (3.0)	0.9	44.6	44.9	45.3	70	30		1.06 / 30.7	± 5	± 5	200 (125)	290 (638)		Range 1, class 2
DA12-71A	12 (3.7)	0.7	46.2	46.6	47	71	30		1.06 / 30.7	± 5	± 5	200 (125)	420 (924)		Range 1, class 2
DA15-71A	15 (4.6)	0.6	47.9	48.3	48.6	72	30		1.06 / 30.7	± 5	± 5	200 (125)	750 (1650)		Range 1, class 2
High Performance, Dual Polarized															
DAX4-71A	4 (1.2)	2.2	36.2	36.6	36.9	61	30	35	1.10 / 26.4	± 5	± 5	200 (125)	45 (99)		Range 1, class 2
DAX6-71B	6 (1.8)	1.5	39.9	40.3	40.6	65	30	35	1.06 / 30.7	± 5	± 5	200 (125)	95 (209)		Range 1, class 2
DAX8-71A	8 (2.4)	1.1	42.4	42.8	43.1	68	30	35	1.06 / 30.7	± 5	± 5	200 (125)	180 (396)		Range 1, class 2
DAX10-71A	10 (3.0)	0.9	44.4	44.7	45.1	70	30	35	1.06 / 30.7	± 5	± 5	200 (125)	290 (638)		Range 1, class 2
DAX12-71A	12 (3.7)	0.7	46	46.4	46.8	71	30	35	1.06 / 30.7	± 5	± 5	200 (125)	420 (924)		Range 1, class 2
DAX15-71A	15 (4.6)	0.6	47.9	48.3	48.6	72	30	35	1.06 / 30.7	± 5	± 5	200 (125)	750 (1650)		Range 1, class 2
Ultra High Performance, Single Polarized															
UA8-71A	8 (2.4)	1.1	42.6	43	43.3	71	30		1.06 / 30.7	± 5	± 5	200 (125)	180 (396)		Range 1, class 3
UA10-71A	10 (3.0)	0.9	44.6	44.9	45.3	73	30		1.06 / 30.7	± 5	± 5	200 (125)	290 (638)		Range 1, class 3
UA12-71A	12 (3.7)	0.7	46.2	46.6	47	74	30		1.06 / 30.7	± 5	± 5	200 (125)	420 (924)		Range 1, class 3
Ultra High Performance, High Crosspolar Discrimination, Dual Polarized															
UXA4-71A	4 (1.2)	1.5	35.7	36.1	36.4	62	40	40	1.10 / 26.4	± 5	± 5	200 (125)	45 (99)		Range 1, class 3, XPD
UXA6-71B	6 (1.8)	1.5	39.9	40.3	40.6	68	40	45	1.06 / 30.7	± 5	± 5	200 (125)	95 (209)		Range 1, class 3, XPD
UXA8-71A	8 (2.4)	1.1	42.4	42.8	43.1	72	40	45	1.06 / 30.7	± 5	± 5	200 (125)	180 (396)		Range 1, class 3, XPD
UXA10-71A	10 (3.0)	0.9	44.4	44.7	45.1	74	40	45	1.06 / 30.7	± 5	± 5	200 (125)	290 (638)		Range 1, class 3, XPD
UXA12-71A	12 (3.7)	0.7	46	46.4	46.8	76	40	45	1.06 / 30.7	± 5	± 5	200 (125)	420 (924)		Range 1, class 3, XPD
UXA15-71A	15 (4.6)	0.6	47.9	48.3	48.6	77	38	45	1.06 / 30.7	± 5	± 5	200 (125)	750 (1650)		Range 1, class 3, XPD
SlimLine Standard Performance, Single Polarized															
SP2-71B	2 (0.6)	4.6	30.6	31	31.3	40	30		1.15 / 23.1	± 30	± 30	250 (156)	10 (22)		Range 1, class 1
SP4-71A	4 (1.2)	2.3	36.6	37	37.3	46	30		1.15 / 23.1	± 5	± 10	200 (125)	30 (66)		Range 1, class 1
SP6-71B	6 (1.8)	1.5	40.2	40.6	40.9	48	30		1.15 / 23.1	± 5	± 5	200 (125)	50 (110)		Range 1, class 1
SlimLine Standard Performance, Dual Polarized															
SPX4-71A	4 (1.2)	2.3	36.3	36.7	37.0	46	30	35	1.15 / 23.1	± 5	± 5	200 (125)	30 (66)		Range 1, class 1
SPX6-71B	6 (1.8)	1.5	40	40.4	40.7	48	30	35	1.15 / 23.1	± 5	± 5	200 (125)	50 (110)		Range 1, class 1
SlimLine Ultra High Performance, Single Polarized															
SU2-71B	2 (0.6)	4.6	30.2	30.6	30.9	55	30		1.15 / 23.1	± 30	± 30	250 (156)	15 (33)		Range 1, class 2
SU4-71A	4 (1.2)	2.3	36.2	36.6	36.9	62	30		1.15 / 23.1	± 5	± 10	200 (125)	45 (99)		Range 1, class 3
SU6-71B	6 (1.8)	1.5	39.9	40.3	40.6	66	30		1.15 / 23.1	± 5	± 5	200 (125)	95 (209)		Range 1, class 3
SlimLine Ultra High Performance, Dual Polarized															
SUX4-71A	4 (1.2)	2.3	35.7	36.1	36.4	62	30	35	1.15 / 23.1	± 5	± 5	200 (125)	45 (99)		Range 1, class 3
SUX6-71B	6 (1.8)	1.5	39.9	40.3	40.6	66	30	35	1.15 / 23.1	± 5	± 5	200 (125)	95 (209)		Range 1, class 3

[1]To specify antenna input at the time of order, insert the appropriate antenna input code, from page 281, after the revision letter in the model number.

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Antenna Input[1] – 154 IEC-PDR 84, CPR112G

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
Standard Performance, Low VSWR, Single Polarized															
PAL8-W71A	8 (2.4)	1.1	42.6	43.3	44.0	50	30		1.10 / 26.4	± 5	± 5	200 (125)	120 (264)		Range 1, class 1
PAL10-W71A	10 (3.0)	0.9	44.6	45.3	46.0	52	30		1.10 / 26.4	± 5	± 5	200 (125)	215 (473)		Range 1, class 1
PAL12-W71A	12 (3.7)	0.7	46.2	47.0	47.7	54	30		1.10 / 26.4	± 5	± 5	200 (125)	310 (682)		Range 1, class 1
PAL15-W71A	15 (4.6)	0.6	47.9	48.7	49.4	56	30		1.10 / 26.4	± 5	± 5	200 (125)	570 (1254)		Range 1, class 1
Standard Performance, Dual Polarized															
PAX8-W71A	8 (2.4)	1.1	42.4	43.1	43.9	50	30	35	1.10 / 26.4	± 5	± 5	200 (125)	120 (264)		Range 1, class 1
PAX10-W71A	10 (3.0)	0.9	44.4	45.1	45.9	52	30	35	1.10 / 26.4	± 5	± 5	200 (125)	215 (473)		Range 1, class 1
PAX12-W71A	12 (3.7)	0.7	46	46.7	47.5	54	30	35	1.10 / 26.4	± 5	± 5	200 (125)	310 (682)		Range 1, class 1
PAX15-W71A	15 (4.6)	0.6	47.7	48.6	49.4	56	30	35	1.10 / 26.4	± 5	± 5	200 (125)	570 (1254)		Range 1, class 1
High Performance, Single Polarized															
DA2-W71B	2 (0.6)	4.3	30.8	31.3	31.7	52	30		1.19 / 21.2	± 30	± 30	250 (156)	15 (33)		Range 1, class 2
DA4-W71A	4 (1.2)	2.2	36.6	37.3	38.1	62	30		1.10 / 26.4	± 5	± 10	200 (125)	45 (99)		Range 1, class 2
DA6-W71B	6 (1.8)	1.5	40.1	40.8	41.6	66	30		1.10 / 26.4	± 5	± 5	200 (125)	95 (209)		Range 1, class 2
DA8-W71A	8 (2.4)	1.1	42.6	43.3	44.1	68	30		1.10 / 26.4	± 5	± 5	200 (125)	180 (396)		Range 1, class 2
DA10-W71A	10 (3.0)	0.9	44.6	45.3	46.1	70	30		1.10 / 26.4	± 5	± 5	200 (125)	290 (638)		Range 1, class 2
DA12-W71A	12 (3.7)	0.7	46.2	47.0	47.7	71	30		1.10 / 26.4	± 5	± 5	200 (125)	420 (924)		Range 1, class 2
DA15-W71A	15 (4.6)	0.6	47.9	48.7	49.4	72	30		1.10 / 26.4	± 5	± 5	200 (125)	750 (1650)		Range 1, class 2
High Performance, Dual Polarized															
DAX4-W71A	4 (1.2)	2.2	36.2	36.9	37.7	61	30	35	1.10 / 26.4	± 5	± 5	200 (125)	45 (99)		Range 1, class 2
DAX6-W71B	6 (1.8)	1.5	39.9	40.6	41.4	65	30	35	1.10 / 26.4	± 5	± 5	200 (125)	95 (209)		Range 1, class 2
DAX8-W71A	8 (2.4)	1.1	42.4	43.1	43.9	68	30	35	1.10 / 26.4	± 5	± 5	200 (125)	180 (396)		Range 1, class 2
DAX10-W71A	10 (3.0)	0.9	44.4	45.1	45.9	70	30	35	1.10 / 26.4	± 5	± 5	200 (125)	290 (638)		Range 1, class 2
DAX12-W71A	12 (3.7)	0.7	46	46.7	47.5	71	30	35	1.10 / 26.4	± 5	± 5	200 (125)	420 (924)		Range 1, class 2
DAX15-W71A	15 (4.6)	0.6	47.7	48.6	49.4	72	30	35	1.10 / 26.4	± 5	± 5	200 (125)	750 (1650)		Range 1, class 2
Ultra High Performance, Single Polarized															
UA8-W71A	8 (2.4)	1.1	42.6	43.3	44.1	71	30		1.10 / 26.4	± 5	± 5	200 (125)	180 (396)		Range 1, class 3
UA10-W71A	10 (3.0)	0.9	44.6	45.3	46.1	73	30		1.10 / 26.4	± 5	± 5	200 (125)	290 (638)		Range 1, class 3
UA12-W71A	12 (3.7)	0.7	46.2	47.0	47.7	74	30		1.10 / 26.4	± 5	± 5	200 (125)	420 (924)		Range 1, class 3
Ultra High Performance, Dual Polarized															
UDA8-W71A	8 (2.4)	1.1	42.4	43.1	43.9	71	30	35	1.10 / 26.4	± 5	± 5	200 (125)	180 (396)		Range 1, class 3
UDA10-W71A	10 (3.0)	0.9	44.4	45.1	45.9	73	30	35	1.10 / 26.4	± 5	± 5	200 (125)	290 (638)		Range 1, class 3
UDA12-W71A	12 (3.7)	0.7	46	46.7	47.5	74	30	35	1.10 / 26.4	± 5	± 5	200 (125)	420 (924)		Range 1, class 3
UDA15-W71A	15 (4.6)	0.6	47.7	48.6	49.4	76	30	35	1.10 / 26.4	± 5	± 5	200 (125)	750 (1650)		Range 1, class 3
SlimLine Standard Performance, Single Polarized															
SP2-W71B	2 (0.6)	4.3	30.8	31.3	31.9	40	30		1.20 / 20.8	± 30	± 30	250 (156)	10 (22)		Range 1, class 1
SP4-W71A	4 (1.2)	2.2	36.6	37.3	38	45	30		1.15 / 23.1	± 5	± 10	200 (125)	30 (66)		Range 1, class 1
SP6-W71B	6 (1.8)	1.5	40.1	40.8	41.6	48	30		1.15 / 23.1	± 5	± 5	200 (125)	50 (110)		Range 1, class 1
SlimLine Standard Performance, Dual Polarized															
SPX4-W71A	4 (1.2)	2.2	36.2	36.9	37.6	45	30	35	1.19 / 21.2	± 5	± 5	200 (125)	30 (66)		Range 1, class 1
SPX6-W71B	6 (1.8)	1.5	39.9	40.6	41.4	48	30	35	1.19 / 21.2	± 5	± 5	200 (125)	50 (110)		Range 1, class 1
SlimLine Ultra High Performance, Single Polarized															
SU2-W71B	2 (0.6)	4.3	30.8	31.3	31.9	55	30		1.20 / 20.8	± 30	± 30	250 (156)	15 (33)		Range 1, class 2
SU3-W71A	3 (0.9)	2.6	33.7	34.4	35.3	58	30		1.20 / 20.8	± 5	± 15	200 (125)	23 (50.5)		Range 1, class 3
SU4-W71A	4 (1.2)	2.2	36.2	36.9	37.6	63	30		1.15 / 23.1	± 5	± 10	200 (125)	45 (99)		Range 1, class 3
SU6-W71B	6 (1.8)	1.5	40	40.8	41.6	67	30		1.15 / 23.1	± 5	± 5	200 (125)	95 (209)		Range 1, class 3
SlimLine Ultra High Performance, Dual Polarized															
SUX4-W71A	4 (1.2)	2.2	36.1	36.8	37.5	63	30	35	1.19 / 21.2	± 5	± 5	200 (125)	45 (99)		Range 1, class 3
SUX6-W71B	6 (1.8)	1.5	39.8	40.6	41.4	67	30	35	1.19 / 21.2	± 5	± 5	200 (125)	95 (209)		Range 1, class 3
CompactLine, Single Polarized															
SB4-W71A	4 (1.2)	2.3	36.2	36.9	37.6	63	30		1.30 / 17.7	± 5	± 10	200 (125)	39 (86)		Range 1, class 3

[1]To specify antenna input at the time of order, insert the appropriate antenna input code, from page 281, after the revision letter in the model number.

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Antenna Input[1] – 154 IEC-PDR 84

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
High Performance, Dual Polarized															
DAX4-77A	4 (1.2)	2.1	37.1	37.4	37.7	58	30	35	1.10 / 26.4	± 5	± 5	200 (125)	45 (99)		Range 1, class 2
DAX6-77B	6 (1.8)	1.5	40.5	40.8	41.1	63	30	35	1.06 / 30.7	± 5	± 5	200 (125)	95 (209)		Range 1, class 2
DAX8-77A	8 (2.4)	1.1	43.1	43.4	43.7	65	30	35	1.06 / 30.7	± 5	± 5	200 (125)	180 (396)		Range 1, class 2
DAX10-77A	10 (3.0)	0.9	45	45.3	45.6	67	30	35	1.06 / 30.7	± 5	± 5	200 (125)	290 (638)		Range 1, class 2
DAX12-77A	12 (3.7)	0.7	46.6	46.9	47.2	69	30	35	1.06 / 30.7	± 5	± 5	200 (125)	420 (924)		Range 1, class 2
DAX15-77A	15 (4.6)	0.6	48.3	48.6	48.9	71	30	35	1.06 / 30.7	± 5	± 5	200 (125)	750 (1650)		Range 1, class 2
Ultra High Performance, High Crosspolar Discrimination, Dual Polarized															
UXA6-77B	6 (1.8)	1.5	40.5	40.8	41.1	70	40	45	1.06 / 30.7	± 5	± 5	200 (125)	95 (209)		Range 1, class 3, XPD
UXA8-77A	8 (2.4)	1.1	43	43.3	43.6	73	40	45	1.06 / 30.7	± 5	± 5	200 (125)	180 (396)		Range 1, class 3, XPD
UXA10-77A	10 (3.0)	0.9	45	45.3	45.6	76	40	45	1.06 / 30.7	± 5	± 5	200 (125)	290 (638)		Range 1, class 3, XPD
UXA12-77A	12 (3.7)	0.7	46.6	46.9	47.2	77	40	45	1.06 / 30.7	± 5	± 5	200 (125)	420 (924)		Range 1, class 3, XPD
UXA15-77A	15 (4.6)	0.6	48.3	48.6	48.9	78	38	45	1.06 / 30.7	± 5	± 5	200 (125)	750 (1650)		Range 1, class 3, XPD

[1]To specify antenna input at the time of order, insert the appropriate antenna input code, from page 281, after the revision letter in the model number.

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Antenna Input[1] – 154 IEC-PDR 84, CPR112G

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
Standard Performance, Low VSWR, Single Polarized															
PAL8-78A	8 (2.4)	1.1	43.3	43.8	44.1	51	30		1.06 / 30.7	± 5	± 5	200 (125)	120 (264)		Range 1, class 1
PAL10-78A	10 (3.0)	0.9	45.3	45.7	46.1	53	30		1.06 / 30.7	± 5	± 5	200 (125)	215 (473)		Range 1, class 1
PAL12-78A	12 (3.7)	0.7	46.9	47.3	47.7	54	30		1.06 / 30.7	± 5	± 5	200 (125)	310 (682)		Range 1, class 1
PAL15-78A	15 (4.6)	0.6	48.6	49	49.4	57	30		1.06 / 30.7	± 5	± 5	200 (125)	570 (1254)		Range 1, class 1
Standard Performance, Dual Polarized															
PAX8-78A	8 (2.4)	1.1	43.1	43.6	43.9	51	30	35	1.06 / 30.7	± 5	± 5	200 (125)	120 (264)		Range 1, class 1
PAX10-78A	10 (3.0)	0.9	45.1	45.5	45.9	52	30	35	1.06 / 30.7	± 5	± 5	200 (125)	215 (473)		Range 1, class 1
PAX12-78A	12 (3.7)	0.7	46.7	47.1	47.5	54	30	35	1.06 / 30.7	± 5	± 5	200 (125)	310 (682)		Range 1, class 1
PAX15-78A	15 (4.6)	0.6	48.6	49	49.4	56	30	35	1.06 / 30.7	± 5	± 5	200 (125)	570 (1254)		Range 1, class 1
High Performance, Single Polarized															
DA4-78A	4 (1.2)	2.1	37.3	37.7	38.1	63	30		1.08 / 28.3	± 5	± 10	200 (125)	45 (99)		Range 1, class 2
DA6-78B	6 (1.8)	1.5	40.8	41.3	41.6	67	30		1.06 / 30.7	± 5	± 5	200 (125)	95 (209)		Range 1, class 2
DA8-78A	8 (2.4)	1.1	43.3	43.8	44.1	68	30		1.06 / 30.7	± 5	± 5	200 (125)	180 (396)		Range 1, class 2
DA10-78A	10 (3.0)	0.9	45.3	45.7	46.1	70	30		1.06 / 30.7	± 5	± 5	200 (125)	290 (638)		Range 1, class 2
DA12-78A	12 (3.7)	0.7	46.9	47.3	47.7	71	30		1.06 / 30.7	± 5	± 5	200 (125)	420 (924)		Range 1, class 2
DA15-78A	15 (4.6)	0.6	48.6	49	49.4	71	30		1.06 / 30.7	± 5	± 5	200 (125)	750 (1650)		Range 1, class 2
High Performance, Dual Polarized															
DAX4-78A	4 (1.2)	2.1	37.1	37.5	37.9	58	30	35	1.10 / 26.4	± 5	± 5	200 (125)	45 (99)		Range 1, class 2
DAX6-78B	6 (1.8)	1.5	40.6	41.1	41.4	63	30	35	1.06 / 30.7	± 5	± 5	200 (125)	95 (209)		Range 1, class 2
DAX8-78A	8 (2.4)	1.1	43.1	43.6	43.9	65	30	35	1.06 / 30.7	± 5	± 5	200 (125)	180 (396)		Range 1, class 2
DAX10-78A	10 (3.0)	0.9	45.1	45.5	45.9	67	30	35	1.06 / 30.7	± 5	± 5	200 (125)	290 (638)		Range 1, class 2
DAX12-78A	12 (3.7)	0.7	46.7	47.1	47.5	69	30	35	1.06 / 30.7	± 5	± 5	200 (125)	420 (924)		Range 1, class 2
DAX15-78A	15 (4.6)	0.6	48.6	49	49.4	71	30	35	1.06 / 30.7	± 5	± 5	200 (125)	750 (1650)		Range 1, class 2
Ultra High Performance, Single Polarized															
UA8-78A	8 (2.4)	1.1	43.3	43.8	44.1	71	30		1.06 / 30.7	± 5	± 5	200 (125)	180 (396)		Range 1, class 3
UA10-78A	10 (3.0)	0.9	45.3	45.7	46.1	73	30		1.06 / 30.7	± 5	± 5	200 (125)	290 (638)		Range 1, class 3
UA12-78A	12 (3.7)	0.7	46.9	47.3	47.7	75	30		1.06 / 30.7	± 5	± 5	200 (125)	420 (924)		Range 1, class 3
Ultra High Performance, High Crosspolar Discrimination, Dual Polarized															
UXA6-78B	6 (1.8)	1.5	40.6	41.1	41.4	70	40	45	1.06 / 30.7	± 5	± 5	200 (125)	95 (209)		Range 1, class 3
UXA8-78A	8 (2.4)	1.1	43.1	43.6	43.9	73	40	45	1.06 / 30.7	± 5	± 5	200 (125)	180 (396)		Range 1, class 3
UXA10-78A	10 (3.0)	0.9	45.1	45.5	45.9	76	40	45	1.06 / 30.7	± 5	± 5	200 (125)	290 (638)		Range 1, class 3
UXA12-78A	12 (3.7)	0.7	46.7	47.1	47.5	77	40	45	1.06 / 30.7	± 5	± 5	200 (125)	420 (924)		Range 1, class 3
UXA15-78A	15 (4.6)	0.6	48.6	49	49.4	78	38	45	1.06 / 30.7	± 5	± 5	200 (125)	750 (1650)		Range 1, class 3
SlimLine Standard Performance, Single Polarized															
SP2-78B	2 (0.6)	4.3	31.4	31.7	32.1	41	30		1.15 / 23.1	± 30	± 30	250 (156)	10 (22)		Range 1, class 1
SP4-78A	4 (1.2)	2.1	37.3	37.7	38.1	45	30		1.15 / 23.1	± 5	± 10	200 (125)	30 (66)		Range 1, class 1
SP6-78B	6 (1.8)	1.5	41	41.4	41.8	49	30		1.15 / 23.1	± 5	± 5	200 (125)	50 (110)		Range 1, class 1
SlimLine Standard Performance, Dual Polarized															
SPX4-78A	4 (1.2)	2.1	37.2	37.6	38	45	30	35	1.15 / 23.1	± 5	± 5	200 (125)	30 (66)		Range 1, class 1
SPX6-78B	6 (1.8)	1.5	40.6	41.1	41.4	49	30	35	1.15 / 23.1	± 5	± 5	200 (125)	50 (110)		Range 1, class 1
SlimLine Ultra High Performance, Single Polarized															
SU2-78B	2 (0.6)	4.3	31.1	31.4	31.8	55	30		1.15 / 23.1	± 30	± 30	250 (156)	15 (33)		Range 1, class 2
SU4-78A	4 (1.2)	2.1	37	37.4	37.8	63	30		1.15 / 23.1	± 5	± 10	200 (125)	45 (99)		Range 1, class 3
SU6-78B	6 (1.8)	1.5	40.8	41.3	41.6	68	30		1.15 / 23.1	± 5	± 5	200 (125)	95 (209)		Range 1, class 3
SlimLine Ultra High Performance, Dual Polarized															
SUX4-78A	4 (1.2)	2.1	36.8	37.2	37.6	63	30	35	1.15 / 23.1	± 5	± 5	200 (125)	45 (99)		Range 1, class 3
SUX6-78B	6 (1.8)	1.5	40.6	41.1	41.4	68	30	35	1.15 / 23.1	± 5	± 5	200 (125)	95 (209)		Range 1, class 3

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Antenna Input[1] – 154 IEC-PDR 100, 154 IEC-PBR 100

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
Standard Performance, Low VSWR, Single Polarized															
PAL8-103A	8 (2.4)	0.8	45.7	45.9	46	52	30		1.08 / 28.3	± 5	± 5	200 (125)	120 (264)	B	Range 1, class 1
PAL10-103A	10 (3.0)	0.7	47.6	47.8	47.9	54	30		1.08 / 28.3	± 5	± 5	200 (125)	215 (473)	B	Range 1, class 1
PAL12-103A	12 (3.7)	0.5	49	49.2	49.3	56	30		1.08 / 28.3	± 5	± 5	200 (125)	310 (682)	B	Range 1, class 1
Standard Performance, Dual Polarized															
PAX8-103A	8 (2.4)	0.8	45.6	45.8	45.9	52	30	35	1.10 / 26.4	± 5	± 5	200 (125)	120 (264)	B	Range 1, class 1
PAX10-103A	10 (3.0)	0.7	47.5	47.7	47.8	54	30	35	1.10 / 26.4	± 5	± 5	200 (125)	215 (473)	B	Range 1, class 1
PAX12-103A	12 (3.7)	0.5	48.9	49.1	49.2	56	30	35	1.10 / 26.4	± 5	± 5	200 (125)	310 (682)	B	Range 1, class 1
High Performance, Single Polarized															
DA8-103A	8 (2.4)	0.8	45.7	45.9	46	68	30		1.08 / 28.3	± 5	± 5	200 (125)	180 (396)	A	Range 1, class 2
DA10-103A	10 (3.0)	0.7	47.6	47.8	47.9	70	30		1.08 / 28.3	± 5	± 5	200 (125)	290 (638)	A	Range 1, class 2
DA12-103A	12 (3.7)	0.5	49	49.2	49.3	71	30		1.08 / 28.3	± 5	± 5	200 (125)	420 (924)	A	Range 1, class 2
High Performance, Dual Polarized															
DAX8-103A	8 (2.4)	0.8	45.6	45.8	45.9	68	30	35	1.10 / 26.4	± 5	± 5	200 (125)	180 (396)	A	Range 1, class 2
DAX10-103A	10 (3.0)	0.7	47.5	47.7	47.8	70	30	35	1.10 / 26.4	± 5	± 5	200 (125)	290 (638)	A	Range 1, class 2
DAX12-103A	12 (3.7)	0.5	48.9	49.1	49.2	71	30	35	1.10 / 26.4	± 5	± 5	200 (125)	420 (924)	A	Range 1, class 2
Ultra High Performance, Single Polarized															
UA8-103A	8 (2.4)	0.8	45.7	45.9	46	72	30		1.08 / 28.3	± 5	± 5	200 (125)	180 (396)	A	Range 1, class 3
UA10-103A	10 (3.0)	0.7	47.6	47.8	47.9	74	30		1.08 / 28.3	± 5	± 5	200 (125)	290 (638)	A	Range 1, class 3
UA12-103A	12 (3.7)	0.5	49	49.2	49.3	76	30		1.08 / 28.3	± 5	± 5	200 (125)	420 (924)	A	Range 1, class 3
Ultra High Performance, High Crosspolar Discrimination, Dual Polarized															
UXA4-103A	4 (1.2)	1.7	39.5	39.7	39.8	69	40	45	1.10 / 26.4	± 5	± 10	200 (125)	40 (88)	A	Range 1, class 3, XPD
UXA6-103B	6 (1.8)	1	43.1	43.3	43.4	73	40	45	1.08 / 28.3	± 5	± 5	200 (125)	95 (209)	A	Range 1, class 3, XPD
UXA8-103A	8 (2.4)	0.8	45.6	45.8	45.9	76	40	45	1.08 / 28.3	± 5	± 5	200 (125)	180 (396)	A	Range 1, class 3, XPD
UXA10-103A	10 (3.0)	0.7	47.5	47.7	47.8	78	40	45	1.08 / 28.3	± 5	± 5	200 (125)	290 (638)	A	Range 1, class 3, XPD
UXA12-103A	12 (3.7)	0.5	48.9	49.1	49.2	78	40	45	1.08 / 28.3	± 5	± 5	200 (125)	420 (924)	A	Range 1, class 3, XPD
SlimLine Standard Performance, Single Polarized															
SP2-103B	2 (0.6)	3.2	33.4	33.6	33.8	40	28		1.20 / 20.8	± 30	± 30	250 (156)	10 (22)		Range 1, class 1
SP3-103A	3 (0.9)	2.2	36.9	37.1	37.2	44	30		1.20 / 20.8	± 5	± 15	200 (125)	16 (35.2)		Range 1, class 1
SP4-103A	4 (1.2)	1.6	39.6	39.8	39.9	46	30		1.15 / 23.1	± 5	± 10	200 (125)	24 (53)		Range 1, class 1
SP6-103B	6 (1.8)	1	43.2	43.4	43.5	50	30		1.15 / 23.1	± 5	± 5	200 (125)	50 (110)	B	Range 1, class 1
SlimLine Standard Performance, Dual Polarized															
SPX4-103A	4 (1.2)	1.6	39.5	39.7	39.8	46	30	35	1.20 / 20.8	± 5	± 10	200 (125)	24 (53)		Range 1, class 1
SPX6-103B	6 (1.8)	1	43.1	43.3	43.4	50	30	35	1.20 / 20.8	± 5	± 5	200 (125)	50 (110)	B	Range 1, class 1
SlimLine High Performance, Single Polarized															
SD2-103B	2 (0.6)	3.2	33.4	33.6	33.8	54	28		1.20 / 20.8	± 30	± 30	250 (156)	15 (33)		Range 1, class 2
SD3-103A	3 (0.9)	2.2	36.9	37.1	37.2	58	30		1.20 / 20.8	± 5	± 15	200 (125)	23 (50.5)	A	Range 1, class 2
SD4-103A	4 (1.2)	1.6	39.6	39.8	39.9	60	30		1.15 / 23.1	± 5	± 10	200 (125)	35 (77)	A	Range 1, class 2
SD6-103B	6 (1.8)	1	43.2	43.4	43.5	64	30		1.15 / 23.1	± 5	± 5	200 (125)	95 (209)	A	Range 1, class 2
SlimLine High Performance, Dual Polarized															
SDX4-103A	4 (1.2)	1.6	39.5	39.7	39.8	60	30	35	1.20 / 20.8	± 5	± 10	200 (125)	35 (77)		Range 1, class 2
SDX6-103B	6 (1.8)	1	43.1	43.3	43.4	64	30	35	1.20 / 20.8	± 5	± 5	200 (125)	95 (209)	A	Range 1, class 2
SlimLine Ultra High Performance, Single Polarized															
SU2-103B	2 (0.6)	3.2	33.4	33.6	33.8	59	30		1.20 / 20.8	± 30	± 30	250 (156)	15 (33)		Range 1, class 3
SU3-103A	3 (0.9)	2.2	36.9	37.1	37.2	63	30		1.20 / 20.8	± 5	± 15	200 (125)	23 (50.5)	A	Range 1, class 3
SU4-103A	4 (1.2)	1.6	39.6	39.8	39.9	65	32		1.15 / 23.1	± 5	± 10	200 (125)	35 (77)	A	Range 1, class 3
SU6-103B	6 (1.8)	1	43.2	43.4	43.5	70	32		1.15 / 23.1	± 5	± 5	200 (125)	95 (209)	A	Range 1, class 3
SlimLine Ultra High Performance, Dual Polarized															
SUX4-103A	4 (1.2)	1.6	39.5	39.7	39.8	65	32	35	1.20 / 20.8	± 5	± 10	200 (125)	35 (77)		Range 1, class 3
SUX6-103B	6 (1.8)	1	43.1	43.3	43.4	70	32	35	1.20 / 20.8	± 5	± 5	200 (125)	95 (209)	A	Range 1, class 3
CompactLine, Single Polarized															
SB2-103B	2 (0.6)	3.1	34.3	34.5	34.7	60	30		1.25 / 19.1	± 30	± 30	250 (156)	12 (26.5)		Range 1, class 3
SB3-103A	3 (0.9)	2.1	37.3	37,5	37,7	63	30		1.30 / 17.7	± 5	± 15	200 (125)	23 (50.5)		Range 1, class 3

[1]To specify antenna input at the time of order, insert the appropriate antenna input code, from page 281, after the revision letter in the model number.

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Antenna Input[1] – 154 IEC-PDR100 (except CompactLine), CPR90G

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
Improved Performance, Single Polarized (FCC Part 101, category A compliant)															
PAD6-105A	6 (1.8)	1	43.4	43.5	43.5	60	30		1.06 / 30.7	± 5	± 5	200 (125)	70 (154)	A	
PAD8-105A	8 (2.4)	0.8	45.8	45.9	46.0	62	30		1.06 / 30.7	± 5	± 5	200 (125)	127 (280)	A	
Improved Performance, Dual Polarized (FCC Part 101, category A compliant)															
PADX6-105A	6 (1.8)	1	43.3	43.4	43.4	60	30		1.08 / 28.3	± 5	± 5	200 (125)	70 (154)	A	
PADX8-105A	8 (2.4)	0.8	45.7	45.8	45.9	62	30		1.08 / 28.3	± 5	± 5	200 (125)	127 (280)	A	
High Performance, Single Polarized															
DA4-105A	4 (1.2)	1.7	39.7	39.8	39.9	61	30		1.10 / 26.4	± 5	± 10	200 (125)	35 (77)	A	Range 1, class 2
DA6-105B	6 (1.8)	1.1	43.5	43.6	43.7	68	30		1.08 / 28.3	± 5	± 5	200 (125)	95 (209)	A	Range 1, class 2
DA8-105A	8 (2.4)	0.85	45.9	46.0	46.1	69	30		1.06 / 30.7	± 5	± 5	200 (125)	200 (440)	A	Range 1, class 2
DA10-105A	10 (3.0)	0.7	47.8	47.9	48.0	70	30		1.06 / 30.7	± 5	± 5	200 (125)	360 (792)	A	Range 1, class 2
DA12-105A	12 (3.7)	0.5	49.2	49.2	49.3	71	30		1.08 / 28.3	± 5	± 5	200 (125)	420 (924)	A	Range 1, class 2
High Performance, Dual Polarized															
DAX4-105A	4 (1.2)	1.7	39.7	39.8	39.9	64	30		1.10 / 26.4	± 5	± 10	200 (125)	35 (77)	A	Range 1, class 2
DAX6-105B	6 (1.8)	1.1	43.2	43.3	43.4	65	30		1.08 / 28.3	± 5	± 5	200 (125)	95 (209)	A	Range 1, class 2
DAX8-105A	8 (2.4)	0.85	45.7	45.8	45.9	69	30		1.06 / 30.7	± 5	± 5	200 (125)	200 (440)	A	Range 1, class 2
Ultra High Performance, High Crosspolar Discrimination, Dual Polarized															
UXA4-105A	4 (1.2)	1.7	39.7	39.8	39.9	69	40		1.08 / 28.3	± 5	± 10	200 (125)	40 (88)	A	Range 1, class 3, XPD
UXA6-105B	6 (1.8)	1.1	43.2	43.3	43.4	75	40		1.06 / 30.7	± 5	± 5	200 (125)	95 (209) *	A	Range 1, class 3, XPD
UXA8-105A	8 (2.4)	0.85	45.7	45.8	45.9	79	40		1.06 / 30.7	± 5	± 5	200 (125)	200 (440)	A	Range 1, class 3, XPD
CompactLine, Single Polarized															
SB2-105B	2 (0.6)	3.1	34.5	34.6	34.7	60	30		1.20 / 20.8	± 30	± 30	250 (156)	12 (26.5)	A	Range 1, class 3
SB3-105A	3 (0.9)	2.1	37.5	37.6	37.7	63	30		1.30 / 17.7	± 5	± 15	200 (125)	23 (50.5)	A	Range 1, class 3

[1]To specify antenna input at the time of order, insert the appropriate antenna input code, from page 281, after the revision letter in the model number.

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Antenna Input[1] – 154 IEC-PDR 100, 154 IEC-PBR 100, CPR90G, UG40B/U

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
Standard Performance, Low VSWR, Single Polarized															
PAL8-107A	8 (2.4)	0.8	46.1	46.4	46.9	53	30		1.06 / 30.7	± 5	± 5	200 (125)	120 (264)	B	Range 1, class 1
PAL10-107A	10 (3.0)	0.7	48	48.4	48.6	55	30		1.06 / 30.7	± 5	± 5	200 (125)	215 (473)	B	Range 1, class 1
PAL12-107A	12 (3.7)	0.5	49.4	49.8	50	56	30		1.06 / 30.7	± 5	± 5	200 (125)	310 (682)	B	Range 1, class 1
Standard Performance, Dual Polarized															
PAX8-107A	8 (2.4)	0.8	45.9	46.2	46.7	53	30	35	1.06 / 30.7	± 5	± 5	200 (125)	120 (264)	B	Range 1, class 1
PAX10-107A	10 (3.0)	0.7	47.8	48.2	48.4	55	30	35	1.06 / 30.7	± 5	± 5	200 (125)	215 (473)	B	Range 1, class 1
PAX12-107A	12 (3.7)	0.5	49.2	49.6	49.9	56	30	35	1.06 / 30.7	± 5	± 5	200 (125)	310 (682)	B	Range 1, class 1
Improved Performance, Single Polarized (FCC Part 101, category A compliant)															
PAD6-107A	6 (1.8)	1.0	43.5	43.9	44.3	60	30		1.06 / 30.7	± 5	± 5	200 (125)	84 (185)	A	
PAD8-107A	8 (2.4)	0.7	46.0	46.4	46.8	62	30		1.06 / 30.7	± 5	± 5	200 (125)	130 (285)	A	
PAD10-107A	10 (3.0)	0.7	47.9	48.3	48.5	64	30		1.06 / 30.7	± 5	± 5	200 (125)	264 (580)	A	
Improved Performance, Dual Polarized (FCC Part 101, category A compliant)															
PADX6-107A	6 (1.8)	1.0	43.4	43.8	44.2	60	30		1.08 / 28.3	± 5	± 5	200 (125)	84 (185)	A	
PADX8-107A	8 (2.4)	0.7	45.9	46.3	46.7	62	30		1.08 / 28.3	± 5	± 5	200 (125)	130 (285)	A	
PADX10-107A	10 (3.0)	0.7	47.9	48.3	48.5	64	30		1.08 / 28.3	± 5	± 5	200 (125)	264 (580)	A	
High Performance, Single Polarized															
DA8-107A	8 (2.4)	0.8	46.1	46.4	46.9	71	30		1.06 / 30.7	± 5	± 5	200 (125)	180 (396)	A	Range 1, class 2
DA10-107A	10 (3.0)	0.7	48	48.4	48.6	71	30		1.06 / 30.7	± 5	± 5	200 (125)	290 (638)	A	Range 1, class 2
DA12-107A	12 (3.7)	0.5	49.4	49.8	50	71	30		1.06 / 30.7	± 5	± 5	200 (125)	420 (924)	A	Range 1, class 2
High Performance, Dual Polarized															
DAX8-107A	8 (2.4)	0.8	45.9	46.2	46.7	69	30	35	1.06 / 30.7	± 5	± 5	200 (125)	180 (396)	A	Range 1, class 2
DAX10-107A	10 (3.0)	0.7	47.8	48.2	48.4	70	30	35	1.06 / 30.7	± 5	± 5	200 (125)	290 (638)	A	Range 1, class 2
DAX12-107A	12 (3.7)	0.5	49.2	49.6	49.9	72	30	35	1.06 / 30.7	± 5	± 5	200 (125)	420 (924)	A	Range 1, class 2
Ultra High Performance, Single Polarized															
UA8-107A	8 (2.4)	0.8	46.1	46.4	46.9	74	30		1.06 / 30.7	± 5	± 5	200 (125)	180 (396)	A	Range 1, class 3
UA10-107A	10 (3.0)	0.7	48	48.4	48.6	75	30		1.06 / 30.7	± 5	± 5	200 (125)	290 (638)	A	Range 1, class 3
UA12-107A	12 (3.7)	0.5	49.4	49.8	50	76	30		1.06 / 30.7	± 5	± 5	200 (125)	420 (924)	B	Range 1, class 3
Ultra High Performance, High Crosspolar Discrimination, Dual Polarized															
UXA4-107A	4 (1.2)	1.5	40	40.4	40.8	70	40	45	1.08 / 28.3	± 5	± 10	200 (125)	40 (88)	A	Range 1, class 3, XPD
UXA6-107B	6 (1.8)	1	43.5	43.8	44.3	73	40	45	1.06 / 30.7	± 5	± 5	200 (125)	95 (209)	A	Range 1, class 3, XPD
UXA8-107A	8 (2.4)	0.8	45.9	46.2	46.7	75	40	45	1.06 / 30.7	± 5	± 5	200 (125)	180 (396)	A	Range 1, class 3, XPD
UXA10-107A	10 (3.0)	0.7	47.8	48.2	48.4	77	40	45	1.06 / 30.7	± 5	± 5	200 (125)	290 (638)	A	Range 1, class 3, XPD
UXA12-107A	12 (3.7)	0.5	49.2	49.6	49.9	78	40	45	1.06 / 30.7	± 5	± 5	200 (125)	420 (924)	A	Range 1, class 3, XPD
SlimLine Standard Performance, Single Polarized															
SP2-107B	2 (0.6)	3.1	33.8	34.2	34.6	41	28		1.20 / 20.8	± 30	± 30	250 (156)	10 (22)		Range 1, class 1
SP3-107A	3 (0.9)	2	37.2	37.6	38	44	30		1.20 / 20.8	± 5	± 15	200 (125)	16 (35.2)	B	Range 1, class 1
SP4-107A	4 (1.2)	1.5	40.1	40.5	40.9	47	30		1.15 / 23.1	± 5	± 10	200 (125)	24 (53)	B	Range 1, class 1
SP6-107B	6 (1.8)	1	43.7	44	44.5	51	30		1.15 / 23.1	± 5	± 5	200 (125)	50 (110)	B	Range 1, class 1
SlimLine Standard Performance, Dual Polarized															
SPX4-107A	4 (1.2)	1.5	40	40.4	40.8	47	30	35	1.20 / 20.8	± 5	± 10	200 (125)	24 (53)		Range 1, class 1
SPX6-107B	6 (1.8)	1	43.6	43.9	44.4	51	30	35	1.20 / 20.8	± 5	± 5	200 (125)	50 (110)		Range 1, class 1
SlimLine High Performance, Single Polarized															
SD2-107B	2 (0.6)	3.1	33.8	34.2	34.6	55	28		1.20 / 20.8	± 30	± 30	250 (156)	15 (33)		Range 1, class 2
SD3-107A	3 (0.9)	2	37.2	37.6	38	58	30		1.20 / 20.8	± 5	± 15	200 (125)	23 (50.5)	B	Range 1, class 2
SD4-107A	4 (1.2)	1.5	40.1	40.5	40.9	61	30		1.15 / 23.1	± 5	± 10	200 (125)	35 (77)	A	Range 1, class 2
SD6-107B	6 (1.8)	1	43.7	44	44.5	65	30		1.15 / 23.1	± 5	± 5	200 (125)	95 (209)	A	Range 1, class 2
SlimLine High Performance, Dual Polarized															
SDX4-107A	4 (1.2)	1.5	40	40.4	40.8	61	30	35	1.20 / 20.8	± 5	± 10	200 (125)	35 (77)	A	Range 1, class 2
SDX6-107B	6 (1.8)	1	43.6	43.9	44.4	65	30	35	1.20 / 20.8	± 5	± 5	200 (125)	95 (209)	A	Range 1, class 2
SlimLine Ultra High Performance, Single Polarized															
SU2-107B	2 (0.6)	3.1	33.8	34.2	34.6	60	30		1.20 / 20.8	± 30	± 30	250 (156)	15 (33)		Range 1, class 2
SU3-107A	3 (0.9)	2	37.2	37.6	38	63	30		1.20 / 20.8	± 5	± 15	200 (125)	23 (50.5)	B	Range 1, class 2
SU3-107F	3 (0.9)	2.2	36.6	37.5	38.1	63	30		1.20 / 20.8	± 5	± 15	200 (125)	23 (50.5)	A	
SU4-107A	4 (1.2)	1.5	40.1	40.5	40.9	66	32		1.15 / 23.1	± 5	± 10	200 (125)	35 (77)	A	Range 1, class 3
SU6-107B	6 (1.8)	1	43.7	44	44.5	70	32		1.15 / 23.1	± 5	± 5	200 (125)	95 (209)	A	Range 1, class 3

continued on next page

[1]To specify antenna input at the time of order, insert the appropriate antenna input code, from page 281, after the revision letter in the model number.

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Antenna Input[1] – 154 IEC-PDR 100, 154 IEC-PBR 100, CPR90G, UG40B/U

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
SlimLine Ultra High Performance, Dual Polarized															
SUX4-107A	4 (1.2)	1.5	40	40.4	40.8	66	32	35	1.20 / 20.8	± 5	± 10	200 (125)	35 (77)	A	Range 1, class 3
SUX6-107B	6 (1.8)	1	43.6	43.9	44.4	70	32	35	1.20 / 20.8	± 5	± 5	200 (125)	95 (209)	A	Range 1, class 3
CompactLine, Single Polarized															
SB2-107C	2 (0.6)	3.0	34.8	35.1	35.4	60	30		1.30 / 17.7	± 30	± 30	250 (156)	12 (26.5)	B	Range 1, class 3
SB4-107B	4 (1.2)	1.5	40.0	40.4	40.8	67	30		1.30 / 17.7	± 5	± 10	200 (125)	35 (77)	A	Range 1, class 3
SB3-107A	3 (0.9)	2	37.9	38.4	38.8	64	30		1.30 / 17.7	± 5	± 15	200 (125)	23 (50.5)	B	Range 1, class 3

12.2 - 13.25 GHz

Antenna Input[1] – 154 IEC-PDR 120, WR75 CHOKE

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
Standard Performance, Low VSWR, Single Polarized															
PAL2-122B	2 (0.6)	2.7	35.2	35.5	35.8	42	30		1.13 / 24.3	± 30	± 30	250 (156)	10 (22)		Range 1, class 1
PAL4-122A	4 (1.2)	1.4	41.3	41.6	41.9	48	30		1.10 / 26.4	± 5	± 10	200 (125)	30 (66)	B	Range 1, class 1
PAL6-122B	6 (1.8)	0.9	44.8	45.2	45.5	52	30		1.08 / 28.3	± 5	± 5	200 (125)	50 (110)	A	Range 1, class 1
PAL8-122A	8 (2.4)	0.7	47.3	47.6	47.9	54	30		1.08 / 28.3	± 5	± 5	200 (125)	120 (264)	A	Range 1, class 1
PAL10-122A	10 (3.0)	0.6	49	49.4	49.7	57	30		1.08 / 28.3	± 5	± 5	200 (125)	215 (473)	A	Range 1, class 1
Standard Performance, Dual Polarized															
PAX6-122B	6 (1.8)	0.9	44.6	45	45.3	52	30	35	1.10 / 26.4	± 5	± 5	200 (125)	50 (110)	A	Range 1, class 1
PAX8-122A	8 (2.4)	0.7	47.1	47.4	47.7	54	30	35	1.10 / 26.4	± 5	± 5	200 (125)	120 (264)	A	Range 1, class 1
PAX10-122A	10 (3.0)	0.6	48.8	49.2	49.5	57	30	35	1.10 / 26.4	± 5	± 5	200 (125)	215 (473)	A	Range 1, class 1
High Performance, Single Polarized															
DA2-122B	2 (0.6)	2.7	35.2	35.5	35.8	56	30		1.13 / 24.3	± 30	± 30	250 (156)	15 (33)		Range 1, class 2
DA4-122A	4 (1.2)	1.4	41.3	41.6	41.9	62	30		1.10 / 26.4	± 5	± 10	200 (125)	35 (77)	B	Range 1, class 2
DA6-122B	6 (1.8)	0.9	44.8	45.2	45.5	67	30		1.08 / 28.3	± 5	± 5	200 (125)	95 (209)	A	Range 1, class 2
DA8-122A	8 (2.4)	0.7	47.3	47.6	47.9	70	30		1.08 / 28.3	± 5	± 5	200 (125)	180 (396)	A	Range 1, class 2
DA10-122A	10 (3.0)	0.6	49	49.4	49.7	71	30		1.08 / 28.3	± 5	± 5	200 (125)	290 (638)	A	Range 1, class 2
High Performance, Dual Polarized															
DAX2-122B	2 (0.6)	2.7	34.9	35.2	35.5	56	30	35	1.15 / 23.1	± 30	± 30	250 (156)	15 (33)		Range 1, class 2
DAX4-122A	4 (1.2)	1.4	41	41.3	41.6	62	30	35	1.10 / 26.4	± 5	± 10	200 (125)	35 (77)	B	Range 1, class 2
DAX6-122B	6 (1.8)	0.9	44.6	45	45.3	67	30	35	1.10 / 26.4	± 5	± 5	200 (125)	95 (209)	A	Range 1, class 2
DAX8-122A	8 (2.4)	0.7	47.1	47.4	47.7	70	30	35	1.10 / 26.4	± 5	± 5	200 (125)	180 (396)	A	Range 1, class 2
DAX10-122A	10 (3.0)	0.6	48.8	49.2	49.5	71	30	35	1.10 / 26.4	± 5	± 5	200 (125)	290 (638)	A	Range 1, class 2

[1]To specify antenna input at the time of order, insert the appropriate antenna input code, from page 281, after the revision letter in the model number.

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Antenna Input[1] – 154 IEC-PDR 120 (except CompactLine), 154 IEC-PBR 120

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
Standard Performance, Low VSWR, Single Polarized															
PAL8-127A	8 (2.4)	0.7	47.6	47.7	47.9	54	30		1.08 / 28.3	± 5	± 5	200 (125)	120 (264)	A	Range 1, class 1
PAL10-127A	10 (3.0)	0.6	49.4	49.5	49.7	57	30		1.08 / 28.3	± 5	± 5	200 (125)	215 (473)	A	Range 1, class 1
Standard Performance, Dual Polarized															
PAX8-127A	8 (2.4)	0.7	47.4	47.5	47.7	54	30	35	1.10 / 26.4	± 5	± 5	200 (125)	120 (264)	A	Range 1, class 1
PAX10-127A	10 (3.0)	0.6	49.2	49.3	49.5	57	30	35	1.10 / 26.4	± 5	± 5	200 (125)	215 (473)	A	Range 1, class 1
High Performance, Single Polarized															
DA8-127A	8 (2.4)	0.7	47.6	47.7	47.9	71	30		1.08 / 28.3	± 5	± 5	200 (125)	180 (396)	A	Range 1, class 2
DA10-127A	10 (3.0)	0.6	49.4	49.5	49.7	71	30		1.08 / 28.3	± 5	± 5	200 (125)	290 (638)	A	Range 1, class 2
High Performance, Dual Polarized															
DAX8-127A	8 (2.4)	0.7	47.4	47.5	47.7	70	30	35	1.10 / 26.4	± 5	± 5	200 (125)	180 (396)	A	Range 1, class 2
DAX10-127A	10 (3.0)	0.6	49.2	49.3	49.5	71	30	35	1.10 / 26.4	± 5	± 5	200 (125)	290 (638)	A	Range 1, class 2
Ultra High Performance, Single Polarized															
UA8-127A	8 (2.4)	0.7	47.6	47.7	47.9	74	30		1.08 / 28.3	± 5	± 5	200 (125)	180 (396)	A	Range 1, class 3
UA10-127A	10 (3.0)	0.6	49.4	49.5	49.7	76	30		1.08 / 28.3	± 5	± 5	200 (125)	290 (638)	A	Range 1, class 3
Ultra High Performance, High Crosspolar Discrimination, Dual Polarized															
UXA4-127A	4 (1.2)	1.4	41.3	41.4	41.6	67	40	45	1.10 / 26.4	± 5	± 10	200 (125)	40 (88)	B	Range 1, class 3
UXA6-127B	6 (1.8)	0.9	45	45.1	45.3	73	40	45	1.10 / 26.4	± 5	± 5	200 (125)	95 (209)	A	Range 1, class 3
UXA8-127A	8 (2.4)	0.7	47.4	47.5	47.7	75	40	45	1.10 / 26.4	± 5	± 5	200 (125)	180 (396)	A	Range 1, class 3
UXA10-127A	10 (3.0)	0.6	49.2	49.3	49.5	76	40	45	1.10 / 26.4	± 5	± 5	200 (125)	290 (638)	A	Range 1, class 3
SlimLine Standard Performance, Single Polarized															
SP2-127B	2 (0.6)	2.7	35.3	35.5	35.7	44	32		1.20 / 20.8	± 30	± 30	250 (156)	10 (22)		Range 1, class 1
SP3-127A	3 (0.9)	1.8	38.7	38.9	39.1	46	32		1.20 / 20.8	± 5	± 15	200 (125)	16 (35.2)		Range 1, class 1
SP4-127A	4 (1.2)	1.4	41.5	41.7	41.9	48	32		1.20 / 20.8	± 5	± 10	200 (125)	24 (53)	B	Range 1, class 1
SP6-127B	6 (1.8)	0.9	45.1	45.3	45.5	54	32		1.20 / 20.8	± 5	± 5	200 (125)	50 (110)	B	Range 1, class 1
SlimLine Standard Performance, Dual Polarized															
SPX2-127B	2 (0.6)	2.7	35.1	35.3	35.5	44	32	35	1.25 / 19.1	± 30	± 30	250 (156)	10 (22)		Range 1, class 1
SPX3-127A	3 (0.9)	1.8	38.6	38.8	39	46	32	35	1.25 / 19.1	± 5	± 15	200 (125)	16 (35.2)		Range 1, class 1
SPX4-127A	4 (1.2)	1.4	41.3	41.5	41.7	48	32	35	1.25 / 19.1	± 5	± 10	200 (125)	24 (53)	B	Range 1, class 1
SPX6-127B	6 (1.8)	0.9	44.8	45	45.2	54	32	35	1.25 / 19.1	± 5	± 5	200 (125)	50 (110)	B	Range 1, class 1
SlimLine High Performance, Single Polarized															
SD2-127B	2 (0.6)	2.7	35.3	35.5	35.7	56	30		1.20 / 20.8	± 30	± 30	250 (156)	15 (33)		Range 1, class 2
SD3-127A	3 (0.9)	1.8	38.7	38.9	39.1	60	30		1.20 / 20.8	± 5	± 15	200 (125)	23 (50.5)		Range 1, class 2
SD4-127A	4 (1.2)	1.4	41.5	41.7	41.9	62	30		1.20 / 20.8	± 5	± 10	200 (125)	35 (77)		Range 1, class 2
SD6-127B	6 (1.8)	0.9	45.1	45.3	45.5	66	30		1.20 / 20.8	± 5	± 5	200 (125)	95 (209)		Range 1, class 2
SlimLine High Performance, Dual Polarized															
SDX2-127B	2 (0.6)	2.7	35.1	35.3	35.5	56	30	35	1.25 / 19.1	± 30	± 30	250 (156)	15 (33)		Range 1, class 2
SDX3-127A	3 (0.9)	1.8	38.6	38.8	39	60	30	35	1.25 / 19.1	± 5	± 15	200 (125)	23 (50.5)		Range 1, class 2
SDX4-127A	4 (1.2)	1.4	41.3	41.5	41.7	62	30	35	1.25 / 19.1	± 5	± 10	200 (125)	35 (77)		Range 1, class 2
SDX6-127B	6 (1.8)	0.9	44.8	45	45.2	66	30	35	1.25 / 19.1	± 5	± 5	200 (125)	95 (209)		Range 1, class 2
SlimLine Ultra High Performance, Single Polarized															
SU2-127B	2 (0.6)	2.7	35.2	35.4	35.6	62	32		1.20 / 20.8	± 30	± 30	250 (156)	15 (33)		Range 1, class 3
SU3-127A	3 (0.9)	1.8	38.6	38.8	39	64	32		1.20 / 20.8	± 5	± 15	200 (125)	23 (50.5)		Range 1, class 3
SU4-127A	4 (1.2)	1.4	41.3	41.5	41.7	67	32		1.20 / 20.8	± 5	± 10	200 (125)	35 (77)	B	Range 1, class 3
SU6-127B	6 (1.8)	0.9	44.9	45.1	45.3	72	32		1.20 / 20.8	± 5	± 5	200 (125)	95 (209)	A	Range 1, class 3
SlimLine Ultra High Performance, Dual Polarized															
SUX2-127B	2 (0.6)	2.7	35.1	35.3	35.5	65	32	35	1.25 / 19.1	± 30	± 30	250 (156)	15 (33)		Range 1, class 3
SUX3-127A	3 (0.9)	1.8	38.6	38.8	39	64	32	35	1.25 / 19.1	± 5	± 15	200 (125)	23 (50.5)		Range 1, class 3
SUX4-127A	4 (1.2)	1.4	41.3	41.5	41.7	67	32	35	1.25 / 19.1	± 5	± 10	200 (125)	35 (77)	B	Range 1, class 3
SUX6-127B	6 (1.8)	0.9	44.8	45	45.2	72	32	35	1.25 / 19.1	± 5	± 5	200 (125)	95 (209)	A	Range 1, class 3
CompactLine, Single Polarized															
SB1-127B	1 (0.3)	4.5	30.6	31.0	31.4	56	30		1.30 / 17.7	± 5	± 25	250 (156)	4 (8.8)		Range 1, class 3
SB2-127C	2 (0.6)	2.7	36.4	36.7	37	62	30		1.30 / 17.7	± 30	± 30	250 (156)	12 (26.5)		Range 1, class 3
SB3-127A	3 (0.9)	1.8	39.2	39.5	39.8	65	30		1.30 / 17.7	± 5	± 15	200 (125)	23 (50.5)	A	Range 1, class 3
SB4-127A	4 (1.2)	1.4	41.2	41.5	41.8	67	30		1.30 / 17.7	± 5	± 10	200 (125)	35 (77)	A	Range 1, class 3
CompactLine, Dual Polarized															
SBX2-127C	2 (0.6)	2.7	36.2	36.5	36.8	62	30	35	1.28 / 18.2	± 30	± 30	250 (156)	12 (26.5)		Range 1, class 3

[1]To specify antenna input at the time of order, insert the appropriate antenna input code, from page 281, after the revision letter in the model number.

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Antenna Input[1] – 154 IEC-PBR 140, UG-541/U

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
Standard Performance, Single Polarized															
PA8-142A	8 (2.4)	0.6	48.3	48.5	48.8	56	30		1.10 / 26.4	± 5	± 5	200 (125)	120 (264)		Range 2, class 1
Standard Performance, Dual Polarized															
PAX8-142A	8 (2.4)	0.6	48.3	48.5	48.8	56	30	35	1.10 / 26.4	± 5	± 5	200 (125)	120 (264)		Range 2, class 1
High Performance, Single Polarized															
DA8-142A	8 (2.4)	0.6	48.3	48.5	48.8	70	30		1.10 / 26.4	± 5	± 5	200 (125)	180 (396)		Range 2, class 1
Ultra High Performance, Single Polarized															
UA8-142A	8 (2.4)	0.6	48.3	48.5	48.8	73	30		1.10 / 26.4	± 5	± 5	200 (125)	180 (396)		Range 2, class 3
Ultra High Performance, High Crosspolar Discrimination, Dual Polarized															
UXA2-142C	2 (0.6)	2.3	36.3	36.5	36.8	64	40	45	1.13 / 24.3	± 30	± 30	250 (156)	15 (33)		Range 2, class 2
UXA4-142B	4 (1.2)	1.2	42.3	42.5	42.8	70	40	45	1.10 / 26.4	± 5	± 10	200 (125)	40 (88)		Range 2, class 2
UXA6-142C	6 (1.8)	0.8	45.8	46	46.3	75	40	45	1.10 / 26.4	± 5	± 5	200 (125)	95 (209)		Range 2, class 2
UXA8-142A	8 (2.4)	0.6	48.3	48.5	48.8	76	38	40	1.10 / 26.4	± 5	± 5	200 (125)	180 (396)		Range 2, class 2
SlimLine Standard Performance, Single Polarized															
SP2-142B	2 (0.6)	2.3	36.2	36.5	36.8	43	32		1.20 / 20.8	± 30	± 30	250 (156)	10 (22)		Range 2, class 1
SP3-142A	3 (0.9)	1.6	39.6	40	40.3	47	32		1.20 / 20.8	± 5	± 15	200 (125)	16 (35.2)		Range 2, class 1
SP4-142A	4 (1.2)	1.2	42.2	42.5	42.8	49	32		1.20 / 20.8	± 5	± 10	200 (125)	24 (53)		Range 2, class 1
SP6-142B	6 (1.8)	0.8	45.7	46	46.3	53	32		1.20 / 20.8	± 5	± 5	200 (125)	50 (110)		Range 2, class 1
SlimLine Standard Performance, Dual Polarized															
SPX2-142B	2 (0.6)	2.3	36.1	36.4	36.7	43	32	35	1.25 / 19.1	± 30	± 30	250 (156)	10 (22)		Range 2, class 1
SPX3-142A	3 (0.9)	1.6	39.5	39.9	40.2	47	32	35	1.25 / 19.1	± 5	± 15	200 (125)	16 (35.2)		Range 2, class 1
SPX4-142A	4 (1.2)	1.2	42.1	42.4	42.7	49	32	35	1.25 / 19.1	± 5	± 10	200 (125)	24 (53)		Range 2, class 1
SPX6-142B	6 (1.8)	0.8	45.7	45.9	46.2	53	32	35	1.25 / 19.1	± 5	± 5	200 (125)	50 (110)		Range 2, class 1
SlimLine Ultra High Performance, Single Polarized															
SU2-142B	2 (0.6)	2.3	36.2	36.5	36.8	62	32		1.20 / 20.8	± 30	± 30	250 (156)	15 (33)		Range 2, class 2
SU3-142A	3 (0.9)	1.6	39.6	40	40.3	67	32		1.20 / 20.8	± 5	± 15	200 (125)	23 (50.5)		Range 2, class 2
SU4-142A	4 (1.2)	1.2	42.2	42.5	42.8	70	32		1.20 / 20.8	± 5	± 10	200 (125)	35 (77)		Range 2, class 2
SU6-142B	6 (1.8)	0.8	45.7	46	46.3	73	32		1.20 / 20.8	± 5	± 5	200 (125)	95 (209)		Range 2, class 2
SlimLine Ultra High Performance, Dual Polarized															
SUX2-142B	2 (0.6)	2.3	36.1	36.4	36.7	65	32	35	1.25 / 19.1	± 30	± 30	250 (156)	15 (33)		Range 2, class 3
SUX3-142A	3 (0.9)	1.6	39.5	39.9	40.2	64	32	35	1.25 / 19.1	± 5	± 15	200 (125)	23 (50.5)		Range 2, class 2
SUX4-142A	4 (1.2)	1.2	42.1	42.4	42.7	70	32	35	1.25 / 19.1	± 5	± 10	200 (125)	35 (77)		Range 2, class 2
SUX6-142B	6 (1.8)	0.8	45.6	45.9	46.2	74	32	35	1.25 / 19.1	± 5	± 5	200 (125)	95 (209)		Range 2, class 3
CompactLine, Single Polarized															
SB1-142B	1 (0.3)	4.2	31.9	32.0	32.1	53	30		1.30 / 17.7	± 5	± 25	250 (156)	4 (8.8)		Range 2, class 2
SB2-142C	2 (0.6)	2.1	37.1	37.3	37.5	66	30		1.30 / 17.7	± 30	± 30	250 (156)	12 (26.5)		Range 2, class 3
SB3-142A	3 (0.9)	1.5	40.2	40.4	40.6	68	30		1.30 / 17.7	± 5	± 15	200 (125)	23 (50.5)		Range 2, class 3
SB4-142A	4 (1.2)	1.2	42.2	42.5	42.8	72	30		1.30 / 17.7	± 5	± 10	200 (125)	35 (77)		Range 2, class 3
CompactLine, Dual Polarized															
SBX1-142B	1 (0.3)	4.3	31.7	31.8	31.9	53	30	35	1.30 / 17.7	± 5	± 25	250 (156)	4 (8.8)		Range 2, class 2
SBX2-142C	2 (0.6)	2.1	36.9	37.1	37.3	66	30	35	1.28 / 18.2	± 30	± 30	250 (156)	12 (26.5)		Range 2, class 3

[1]To specify antenna input at the time of order, insert the appropriate antenna input code, from page 281, after the revision letter in the model number.

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Antenna Input[1] – 154 IEC-PBR 220, UG-596/U

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
Ultra High Performance, High Crosspolar Discrimination, Dual Polarized															
UXA2-190C	2 (0.6)	1.9	37.8	38.3	38.7	66	40	45	1.13 / 24.3	± 30	± 30	250 (156)	15 (33)	A	Range 2, class 3
UXA4-190B	4 (1.2)	0.9	44	44.5	44.9	72	40	45	1.13 / 24.3	± 5	± 10	200 (125)	40 (88)	A	Range 2, class 3
UXA6-190B	6 (1.8)	0.7	47.5	48	48.4	76	36	40	1.13 / 24.3	± 5	± 5	200 (125)	95 (209)	A	Range 2, class 3
SlimLine Standard Performance, Single Polarized															
SP2-190B	2 (0.6)	1.9	38.2	38.7	39.2	48	32		1.20 / 20.8	± 30	± 30	250 (156)	10 (22)		Range 2, class 1
SP3-190A	3 (0.9)	1.3	41.6	42.1	42.6	50	32		1.20 / 20.8	± 5	± 15	200 (125)	16 (35.2)	B	Range 2, class 1
SP4-190A	4 (1.2)	0.9	44.2	44.7	45.2	54	32		1.20 / 20.8	± 5	± 10	200 (125)	24 (53)	B	Range 2, class 1
SP6-190B	6 (1.8)	0.7	47.7	48.2	48.7	57	32		1.20 / 20.8	± 5	± 5	200 (125)	50 (110)	B	Range 2, class 1
SlimLine Standard Performance, Dual Polarized															
SPX2-190B	2 (0.6)	1.9	38	38.5	39	48	32	35	1.25 / 19.1	± 30	± 30	250 (156)	10 (22)		Range 2, class 1
SPX3-190A	3 (0.9)	1.3	41.5	42	42.5	50	32	35	1.25 / 19.1	± 5	± 15	200 (125)	16 (35.2)	B	Range 2, class 1
SPX4-190A	4 (1.2)	0.9	44	44.5	45	54	32	35	1.25 / 19.1	± 5	± 10	200 (125)	24 (53)	B	Range 2, class 1
SPX6-190B	6 (1.8)	0.7	47.4	47.9	48.4	57	32	35	1.25 / 19.1	± 5	± 5	200 (125)	50 (110)	B	Range 2, class 1
SlimLine Ultra High Performance, Single Polarized															
SU3-190A	3 (0.9)	1.3	41.6	42.1	42.6	63	32		1.20 / 20.8	± 5	± 15	200 (125)	23 (50.5)	A	Range 2, class 2
SU4-190A	4 (1.2)	0.9	44.1	44.6	45.1	71	32		1.20 / 20.8	± 5	± 10	200 (125)	35 (77)	A	Range 2, class 2
SU6-190B	6 (1.8)	0.7	47.5	48	48.5	75	32		1.20 / 20.8	± 5	± 5	200 (125)	95 (209)	A	Range 2, class 3
SlimLine Ultra High Performance, Dual Polarized															
SUX1-190A	1 (0.3)	3.4	32.5	33	33.5	58	30	35	1.25 / 19.1	± 5	± 25	250 (156)	5 (11)		Range 2, class 2
SUX2-190B	2 (0.6)	1.9	38	38.5	39	62	32	35	1.25 / 19.1	± 30	± 30	250 (156)	15 (33)		Range 2, class 2
SUX3-190A	3 (0.9)	1.3	41.5	42	42.5	63	32	35	1.25 / 19.1	± 5	± 15	200 (125)	23 (50.5)	A	Range 2, class 2
SUX4-190A	4 (1.2)	0.9	44	44.5	45	67	32	35	1.25 / 19.1	± 5	± 10	200 (125)	35 (77)	A	Range 2, class 2
SUX6-190B	6 (1.8)	0.7	47.4	47.9	48.4	76	32	35	1.25 / 19.1	± 5	± 5	200 (125)	95 (209)	A	Range 2, class 3
CompactLine, Single Polarized															
SB1-190B	1 (0.3)	3.4	33.5	34	34.4	55	30		1.30 / 17.7	± 5	± 25	250 (156)	4 (8.8)		Range 2, class 2
SB2-190C	2 (0.6)	1.8	38.5	39.0	39.5	70	30		1.30 / 17.7	± 30	± 30	250 (156)	12 (26.5)	A	Range 2, class 3
SB3-190A	3 (0.9)	1.3	41.6	42.1	42.6	70	30		1.30 / 17.7	± 5	± 15	200 (125)	23 (50.5)	A	Range 2, class 3
SB4-190A	4 (1.2)	0.9	43.7	44.5	45.2	72	30		1.30 / 17.7	± 5	± 10	200 (125)	35 (77)	A	Range 2, class 3
CompactLine, Dual Polarized															
SBX1-190B	1 (0.3)	3.4	33.3	33.8	34.2	55	30	35	1.30 / 17.7	± 5	±25	250 (156)	4 (8.8)		Range 2, class 2
SBX2-190C	2 (0.6)	1.8	38.3	38.8	39.3	70	30	35	1.28 / 18.2	± 30	± 30	250 (156)	12 (26.5)	A	Range 2, class 3

[1]To specify antenna input at the time of order, insert the appropriate antenna input code, from page 281, after the revision letter in the model number.

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Antenna Input[1] – 154 IEC-PBR 220, 154 IEC-UBR220 (only Lens Antenna), UG-596/U

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
Ultra High Performance, High Crosspolar Discrimination, Dual Polarized															
UXA2-220C	2 (0.6)	1.6	39.5	40	40.5	66	40	45	1.15 / 23.1	± 30	± 30	250 (156)	15 (33)		Range 3, class 2, XPD
UXA4-220A	4 (1.2)	0.8	45.5	46	46.4	72	36	40	1.13 / 24.3	± 5	± 10	200 (125)	40 (88)		Range 3, class 3, XPD
UXA6-220B	6 (1.8)	0.5	49	49.5	49.9	76	36	40	1.13 / 24.3	± 5	± 5	200 (125)	95 (209)		Range 3, class 2, XPD
SlimLine Standard Performance, Single Polarized															
SP2-220B	2 (0.6)	1.6	39.7	40.2	40.7	52	32		1.20 / 20.8	± 30	± 30	250 (156)	10 (22)		Range 3, class 1
SP3-220A	3 (0.9)	1.1	43.1	43.6	44.1	53	32		1.20 / 20.8	± 5	± 15	200 (125)	16 (35.2)	B	
SP4-220A	4 (1.2)	0.8	45.8	46.3	46.8	58	32		1.20 / 20.8	± 5	± 10	200 (125)	24 (53)	B	
SP6-220B	6 (1.8)	0.5	49.2	49.7	50.2	61	32		1.20 / 20.8	± 5	± 5	200 (125)	50 (110)	B	Range 3, class 1
SlimLine Standard Performance, Dual Polarized															
SPX2-220B	2 (0.6)	1.6	39.5	40	40.5	52	32	35	1.25 / 19.1	± 30	± 30	250 (156)	10 (22)	B	Range 3, class 1
SPX3-220A	3 (0.9)	1.1	43	43.5	44	53	32	35	1.25 / 19.1	± 5	± 15	200 (125)	16 (35.2)	B	
SPX4-220A	4 (1.2)	0.8	45.5	46	46.5	58	32	35	1.25 / 19.1	± 5	± 10	200 (125)	24 (53)	B	Range 3, class 1
SPX6-220B	6 (1.8)	0.5	48.9	49.4	49.9	61	32	35	1.25 / 19.1	± 5	± 5	200 (125)	50 (110)	A	Range 3, class 1
SlimLine Ultra High Performance, Single Polarized															
SU3-220A	3 (0.9)	1.1	43.1	43.6	44.1	70	32		1.20 / 20.8	± 5	± 15	200 (125)	23 (50.5)	A	Range 3, class 2
SU4-220A	4 (1.2)	0.8	45.6	46.1	46.6	72	32		1.20 / 20.8	± 5	± 10	200 (125)	35 (77)	A	Range 3, class 3
SU6-220B	6 (1.8)	0.5	49	49.5	50	75	32		1.20 / 20.8	± 5	± 5	200 (125)	95 (209)	A	Range 3, class 2
SlimLine Ultra High Performance, Dual Polarized															
SUX1-220A	1 (0.3)	2.8	34.1	34.6	35.1	61	30	35	1.25 / 19.1	± 5	± 25	250 (156)	5 (11)		Range 3, class 2
SUX2-220B	2 (0.6)	1.6	39.5	40	40.5	66	32	35	1.25 / 19.1	± 30	± 30	250 (156)	15 (33)	B	Range 3, class 2
SUX3-220A	3 (0.9)	1.1	43	43.5	44	68	32	35	1.25 / 19.1	± 5	± 15	200 (125)	23 (50.5)	A	Range 3, class 3
SUX4-220A	4 (1.2)	0.8	45.5	46	46.5	72	32	35	1.25 / 19.1	± 5	± 10	200 (125)	35 (77)	A	Range 3, class 3
SUX6-220B	6 (1.8)	0.5	48.9	49.4	49.9	75	32	35	1.25 / 19.1	± 5	± 5	200 (125)	95 (209)	A	Range 3, class 2
CompactLine, Single Polarized															
SB1-220B	1 (0.3)	2.7	35.3	35.6	35.9	61	30		1.30 / 17.7	± 5	± 25	250 (156)	4 (8.8)	B	Range 3, class 3
SB2-220C	2 (0.6)	1.5	40.5	41	41.5	66	30		1.30 / 17.7	± 30	± 30	250 (156)	12 (26.5)	A	Range 3, class 3
SB3-220A	3 (0.9)	1.1	43.1	43.6	44.1	70	30		1.30 / 17.7	± 5	± 15	200 (125)	23 (50.5)	A	Range 3, class 3
SB4-220A	4 (1.2)	0.8	45.5	46.1	46.6	74	30		1.30 / 17.7	± 5	± 10	200 (125)	33 (73)	A	Range 3, class 3
CompactLine, Dual Polarized															
SBX1-220B	1 (0.3)	2.7	35.1	35.4	35.7	61	30	35	1.28 / 18.2	± 5	± 25	250 (156)	4 (8.8)		Range 3, class 3
SBX2-220C	2 (0.6)	1.6	40.3	40.8	41.3	66	30	35	1.28 / 18.2	± 30	± 30	250 (156)	12 (26.5)	A	Range 3, class 3
Lens Antenna															
LA05-220B	0.5 (0.15)	6	28.3	28.8	29.3	45	30		1.15 / 23.1			250 (156)	2 (4.4)		Range 3, class 1

[1]To specify antenna input at the time of order, insert the appropriate antenna input code, from page 281, after the revision letter in the model number.

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Parabolic Point to Point Antennas 24.25 - 26.5 GHz

Antenna Input[1] – 154 IEC-PBR 220

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
SlimLine Ultra High Performance, Single Polarized															
SU3-250A	3 (0.9)	0.9	44.2	44.6	45	70	30		1.20 / 20.8	± 5	± 15	200 (125)	23 (50.5)	A	Range 4, class 2
SU4-250A	4 (1.2)	0.7	46.8	47.2	47.6	73	32		1.20 / 20.8	± 5	± 10	200 (125)	35 (77)	A	Range 4, class 2
SlimLine Ultra High Performance, Dual Polarized															
SUX1-250A	1 (0.3)	2.5	35.3	35.7	36.1	62	30	35	1.25 / 19.1	± 5	± 25	250 (156)	5 (11)		Range 4, class 2
SUX2-250B	2 (0.6)	1.4	40.5	40.8	41.3	67	30	35	1.25 / 19.1	± 30	± 30	250 (156)	15 (33)	B	Range 4, class 2
SUX3-250A	3 (0.9)	0.9	44	44.4	44.8	70	30	35	1.25 / 19.1	± 5	± 15	200 (125)	23 (50.5)		Range 4, class 2
SUX4-250A	4 (1.2)	0.7	46.7	47.1	47.5	73	32	35	1.25 / 19.1	± 5	± 10	200 (125)	35 (77)	A	Range 4, class 2
CompactLine, Single Polarized															
SB1-250B	1 (0.3)	2.4	36	36.4	36.8	62	30		1.30 / 17.7	± 5	± 25	250 (156)	4 (8.8)		Range 4, class 2
SB2-250C	2 (0.6)	1.3	41.3	41.8	42.3	70	30		1.30 / 17.7	± 30	± 30	250 (156)	12 (26.5)	A	Range 4, class 2
SB4-250A	4 (1.2)	0.7	46.8	47.2	47.6	73	30		1.30 / 17.7	± 5	± 10	200 (125)	33 (73)	A	Range 4, class 2
CompactLine, Dual Polarized															
SBX1-250B	1 (0.3)	2.4	35.8	36.2	36.6	62	30	35	1.28 / 18.2	± 5	± 25	250 (156)	4 (8.8)		Range 4, class 2
SBX2-250C	2 (0.6)	1.3	41.1	41.6	42.1	70	30	35	1.28 / 18.2	± 30	± 30	250 (156)	12 (26.5)	A	Range 4, class 2

27.3 - 28.5 GHz

Antenna Input[1] – 154 IEC-PBR 320

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
CompactLine, Single Polarized															
SB1-270A	1 (0.3)	2.2	36.6	36.9	37.2	63	30		1.30 / 17.7	± 5	± 25	250 (156)	4 (8.8)		Range 4, class 2
SB2-270B	2 (0.6)	1.3	41.6	41.9	42.2	68	30		1.30 / 17.7	± 30	± 30	250 (156)	12 (26.5)		Range 4, class 2

27.5 - 29.5 GHz

Antenna Input[1] – 154 IEC-PBR 320

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
CompactLine, Single Polarized															
SB1-280B	1 (0.3)	2.2	37.0	37.2	37.4	63	30		1.30 / 17.7	± 5	± 25	250 (156)	4 (8.8)		Range 4, class 2
SB2-280C	2 (0.6)	1.3	42.0	42.4	42.8	69	30		1.30 / 17.7	± 30	± 30	250 (156)	12 (26.5)		Range 4, class 2
CompactLine, Dual Polarized															
SBX1-280B	1 (0.3)	2.2	36.8	37.0	37.2	63	30	35	1.28 / 18.2	± 5	± 25	250 (156)	4 (8.8)		Range 4, class 2
SBX2-280C	2 (0.6)	1.3	41.8	42.2	42.6	69	30	35	1.28 / 18.2	± 30	± 30	250 (156)	12 (26.5)		Range 4, class 2

29.5 - 31.5 GHz

Antenna Input[1] – 154 IEC-PBR 320

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
CompactLine, Single Polarized															
SB1-300A	1 (0.3)	2.2	37.3	37.6	37.8	63	30		1.30 / 17.7	± 5	± 25	250 (156)	4 (8.8)		Range 4 and 5, class 2
SB2-300B	2 (0.6)	1.3	42.5	42.8	43.1	68	30		1.30 / 17.7	± 30	± 30	250 (156)	12 (26.5)		Range 4 and 5, class 2

[1]To specify antenna input at the time of order, insert the appropriate antenna input code, from page 281, after the revision letter in the model number.

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Antenna Input[1] – 154 IEC-PBR 320

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
CompactLine, Single Polarized															
SB1-320B	1 (0.3)	2.1	37.7	38	38.3	63	30		1.30 / 17.7	± 5	± 25	250 (156)	4 (8.8)		Range 5, class 3a
SB2-320C	2 (0.6)	1.2	42.9	43.2	43.5	68	30		1.30 / 17.7	± 30	± 30	250 (156)	12 (26.5)		Range 5, class 3a
CompactLine, Dual Polarized															
SBX1-320B	1 (0.3)	2.1	37.5	37.8	38.1	63	30	35	1.28 / 18.2	± 5	± 25	250 (156)	4 (8.8)		Range 5, class 3a
SBX2-320C	2 (0.6)	1.2	42.7	43.1	43.3	68	30	35	1.28 / 18.2	± 30	± 30	250 (156)	12 (26.5)		Range 5, class 3a

37.0 - 39.5 GHz

Antenna Input[1] – 154 IEC-PBR 320, 154 IEC-UBR 320 (only lens antenna)

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
SlimLine Ultra High Performance, Dual Polarized															
SUX1-380A	1 (0.3)	1.7	39	39.3	39.6	58	28	35	1.25 / 19.1	± 5	± 25	250 (156)	5 (11)	B	Range 5, class 2
SUX2-380B	2 (0.6)	1	44.1	44.4	44.7	63	28	35	1.25 / 19.1	± 30	± 30	250 (156)	15 (33)	A	Range 5, class 2
Lens Antenna															
LA05-380B	0.5 (0.15)	3.6	33.4	33.7	34.0	44	28		1.15 / 23.1			250 (156)	2 (4.4)		Range 5, class 2

37.0 - 40.0 GHz

Antenna Input[1] – 154 IEC-PBR 320

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
CompactLine, Single Polarized															
SB1-380B	1 (0.3)	1.6	39.7	40	40.3	60	30		1.30 / 17.7	± 5	± 25	250 (156)	4 (8.8)	A	Range 5, class 3b
SB2-380C	2 (0.6)	0.9	44.7	45	45.3	67	30		1.30 / 17.7	± 30	± 30	250 (156)	12 (26.5)	A	Range 5, class 3b
CompactLine, Dual Polarized															
SBX1-380B	1 (0.3)	1.7	39.5	39.8	40.1	60	28	35	1.28 / 18.2	± 5	± 25	250 (156)	4 (8.8)	A	Range 5, class 3b
SBX2-380C	2 (0.6)	0.9	44.5	44.8	45.1	65	30	35	1.28 / 18.2	± 30	± 30	250 (156)	12 (26.5)	A	Range 5, class 3b

51.4 - 52.6 GHz

Antenna Input[1] – UG 383

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
CompactLine, Single Polarized															
SB1-520A	1 (0.3)	1.2	41.7	41.8	41.9	63	30		1.30 / 17.7	± 5	± 25	250 (156)	4 (8.8)		Range 6, class 2 and 3

54.25 - 59.0 GHz

Antenna Input[1] – UG 383

Model Number	Diameter ft (m)	3 dB-BW (deg)	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	XPD (dB)	IPI (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)	Elev (deg)	Windspeed km/h (mph)	Weight kg (lb)	FCC Standard	ETSI Standard
CompactLine, Single Polarized															
SB1-550A	1 (0.3)	1.1	42.1	42.5	42.9	63	30		1.30 / 17.7	± 5	± 25	250 (156)	4 (8.8)		Range 6, class 2 and 3

[1]To specify antenna input at the time of order, insert the appropriate antenna input code, from page 281, after the revision letter in the model number.

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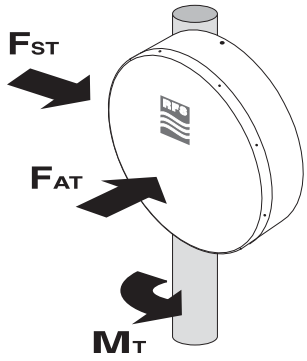
Solid Parabolic Microwave Antennas

Forces and Twisting Moments Due to Wind



Antenna Diameter	Antenna Type	Forces Moments	Pipe Diameter 51 mm Wind Speed 110 km/h (68mph)	200 km/h (125mph)	Pipe Diameter 114 mm Wind Speed 110 km/h (68mph)	200 km/h (125mph)	Pipe Diameter 219 mm Wind Speed 110 km/h (68mph)	200 km/h (125mph)
.5ft (0.15m)	LA	FAT max N (lb)	8 (1.8)	27 (6)				
		FST max N (lb)	11 (2.5)	39 (8.7)				
		MT max Nm (ft lb)	2 (1.5)	7 5.2)				
1ft (0.3m)	SB, SBX	FAT max N (lb)	90 (20)	280 (62)	90 (20)	280 (62)		
		FST max N (lb)	30 (6.7)	90 (20)	30 (6.7)	90 (20)		
		MT max Nm (ft lb)	25 (18.6)	80 (60)	25 (18.6)	80 (60)		
1ft (0.3m)	SUX	FAT max N (lb)	90 (20)	280 (63)	90 (20)	280 (62)		
		FST max N (lb)	40 (9)	140 (31)	40 (9)	140 (31)		
		MT max Nm (ft lb)	25 (18.6)	80 (60)	25 (18.6)	80 (60)		
2ft (0.6m)	SB, SBX	FAT max N (lb)	275 (61)	905 (200)	275 (61)	905 (200)		
		FST max N (lb)	105 (24)	330 (73)	105 (24)	330 (73)		
		MT max Nm (ft lb)	95 (69)	305 (221)	105 (76)	340 (247)		
2ft (0.6m)	SD, SDX, SU, SUX DA, UXA	FAT max N (lb)	275 (61)	905 (200)	275 (61)	905 (200)		
		FST max N (lb)	135 (30)	450 (100)	135 (30)	450 (100)		
		MT max Nm (ft lb)	95 (69)	305 (221)	105 (76)	340 (247)		
2ft (0.6m)	SP, SPX PAL, PAX	FAT max N (lb)	360 (80)	1195 (264)	360 (80)	1195 (264)		
		FST max N (lb)	105 (24)	350 (78)	105 (24)	350 (78)		
		MT max Nm (ft lb)	130 (95)	430 (312)	145 (105)	475 (344)		
3ft (0.9m)	SB	FAT max N (lb)			540 (120)	1800(403)		
		FST max N(lb)			210 (47)	685 (155)		
		Mtmax NM (ft lb)			160 (119)	530 (344)		
3ft (0.9m)	SD, SDX, SU, SUX	FAT max N (lb)			540 (120)	1800 (403)		
		FST max N (lb)			270 (60)	890 (200)		
		MT max Nm (ft lb)			160 (119)	530 (344)		
3ft (0.9m)	SP, SPX	FAT max N (lb)			720 (161)	2380 (533)		
		FST max N (lb)			210 (47)	700 (157)		
		MT max Nm (ft lb)			230 (171)	530 (392)		
4ft (1.2m)	SB	FAT max N (lb)			1000 (225)	3290 (740)		
		FST max N (lb)			415 (93)	1360 (306)		
		MT max Nm (ft lb)			320 (238)	1055 (784)		
4ft (1.2m)	SD, SDX, SU, SUX DA, DAX, UA, UXA	FAT max N (lb)			1000 (224)	3290 (737)		
		FST max N (lb)			500 (112)	1630 (365)		
		MT max Nm (ft lb)			320 (238)	1055 (784)		
4ft (1.2m)	PAL, PAX, SP, SPX	FAT max N (lb)			1310 (293)	4345 (973)		
		FST max N (lb)			390 (87)	1280 (286)		
		MT max Nm (ft lb)			460 (342)	1500 (1120)		

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Forces and Twisting Moments Due to Wind

Antenna Diameter	Antenna Type	Forces Moments	Pipe Diameter 51 mm Wind Speed 110 km/h (68mph)	200 km/h (125mph)	Pipe Diameter 114 mm Wind Speed 110 km/h (68mph)	200 km/h (125mph)	Pipe Diameter 219 mm Wind Speed 110 km/h (68mph)	200 km/h (125mph)
6ft (1.8m)	SD, SDX, SU, SUX	FAT max N (lb)			2270 (508)	7500 (1680)		
	DA, DAX,	FST max N (lb)			1125 (252)	3715 (832)		
	UA, UDA, UXA	MT max Nm (ft lb)			860 (640)	2835 (2100)		
6ft (1.8m)	PAL, PAX, SP, SPX	FAT max N (lb)			2995 (670)	9900 (2217)		
		FST max N (lb)			880(197)	2910 (651)		
		MT max Nm (ft lb)			925 (690)	3055 (2270)		
8ft (2.4m)	PAL, PAX	FAT max N (lb)			5120 (1147)	16940 (3795)		
		FST max N (lb)			1500 (336)	4980 (1115)		
		MT max Nm (ft lb)			1960 (1450)	6470 (4800)		
8ft (2.4m)	DA, DAX, UA,	FAT max N (lb)			3880 (870)	12380 (2773)		
	UDA, UXA	FST max N (lb)			1920 (430)	6350 (1422)		
		MT max Nm (ft lb)			1800 (1340)	5960 (4400)		
10ft (3.0m)	PAL, PAX	FAT max N (lb)			7730 (1730)	25570 (5728)		
	UDA, UXA	FST max N (lb)			2270 (508)	7520 (1684)		
		MT max Nm (ft lb)			3410 (2523)	11260 (8400)		
10ft (3.0m)	DA, DAX, UA,	FAT max N (lb)			5860 (1312)	19370 (4340)		
	UDA, UXA	FST max N (lb)			2900 (650)	9590 (2148)		
		MT max Nm (ft lb)			3100 (2300)	10240 (7600)		
12ft (3.7m)	PAL , PAX	FAT max N (lb)			11050 (2475)	36530 (8182)		
		FST max N (lb)			3250 (728)	10740 (2405)		
		MT max Nm (ft lb)			5580 (4129)	18450 (13700)		
12ft (3.7m)	DA, DAX, UA,	FAT max N (lb)			8370 (1875)	27670 (6200)		
	UDA, UXA	FST max N (lb)			4150 (930)	13710 (3071)		
		MT max Nm (ft lb)			5040 (3750)	16650 (12400)		
15ft (4.6m)	PAL, PAX	FAT max N (lb)					5600 (1255)	16940 (3795)
		FST max N (lb)					4980(1115)	16460 (3690)
		MT max Nm (ft lb)					10940 (8095)	36160 (26758)
15ft (4.6m)	DA, DAX	FAT max N (lb)					12830 (2874)	42430 (9504)
	UDA, UXA	FST max N (lb)					6360 (1425)	21000 (4704)
		MT max Nm (ft lb)					9910 (7333)	32750 (24235)

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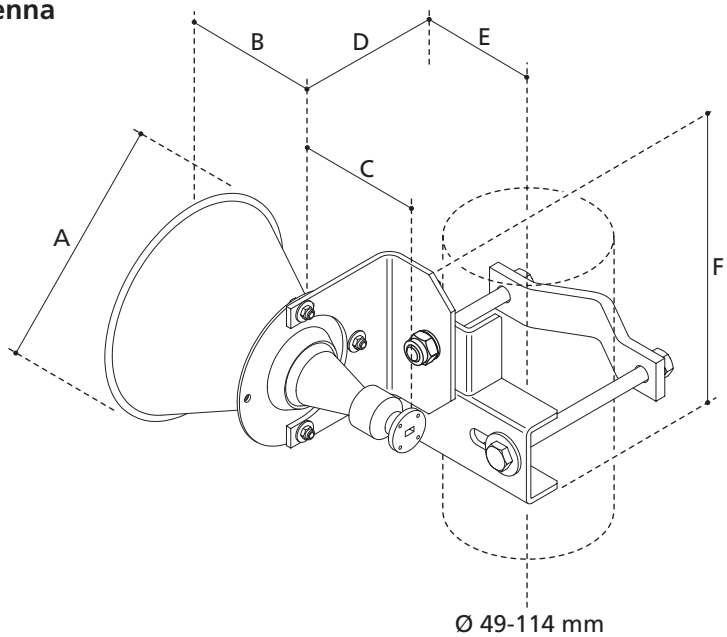
0.5 ft Lens Antenna



All dimensions in mm (inch)

A	B	C	DØ49	DØ89	DØ114	E	F
160(6.3)	126(5.0)	100(3.9)	134(5.3)	154(6.1)	167(6.6)	40(1.6)	110(4.3)

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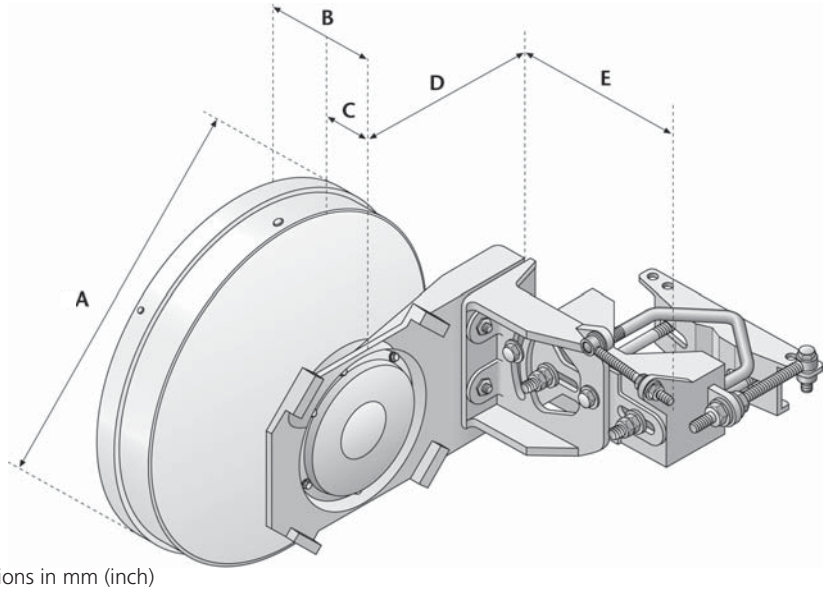
Antenna Mount Outlines

1 ft Antenna with Standard Mount

SB, SBX,
SUX

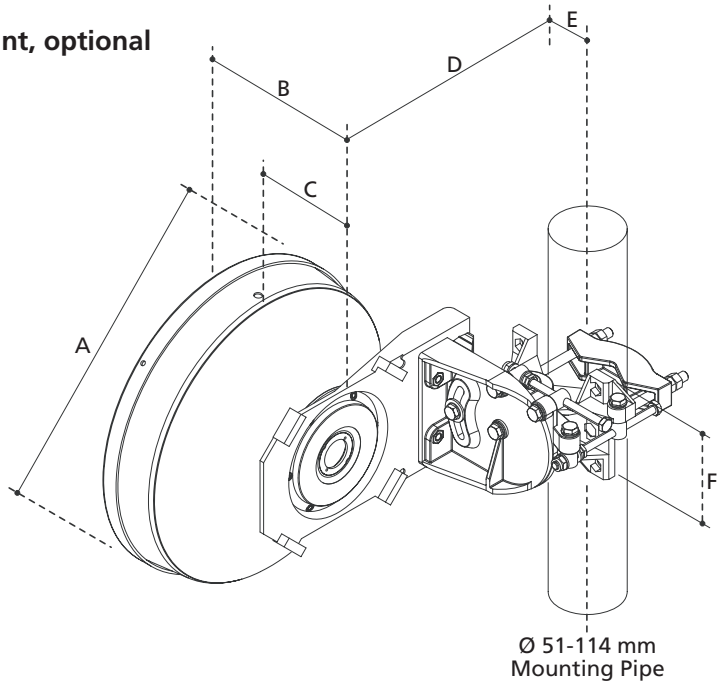


All dimensions in mm (inch)

ANT TYPE	A	B	C	D PIPE Ø 114	D PIPE Ø 51	E
SB, SBX	380(15)	170(6.7)	85(3.3)	287(11.3)	242(9.5)	133(5.2)
SUX	380(15)	250 (9.8)	85(3.3)	287(11.3)	242(9.5)	133(5.2)

1 ft Antenna with M-mount, optional

SB, SBX,
SUX



All dimensions in mm (inch)

ANT TYPE	A	B	C	D PIPE Ø114	D PIPE Ø89	D PIPE Ø 51	E	F
SB, SBX	380(15)	170(6.7)	85(3.3)	321(12.6)	306(12.0)	282(11.1)	96(3.8)	140(5.5)
SUX	380(15)	250(9.8)	85(3.3)	321(12.6)	306(12.0)	282(11.1)	96(3.8)	140(5.5)

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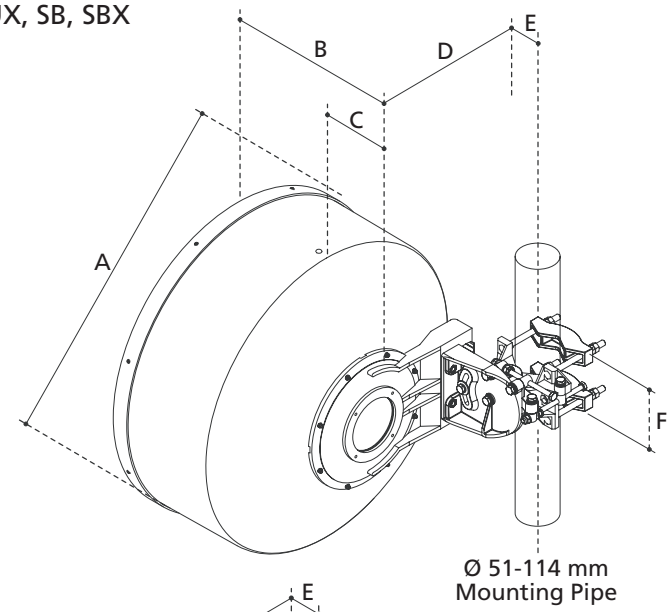
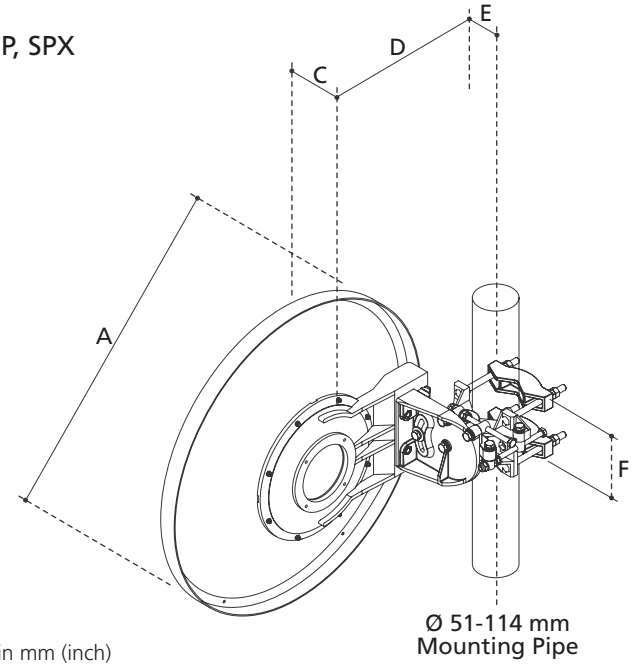
Antenna Mount Outlines

2 ft Antenna

DA, UXA, SD, SDX, SU, SUX, SB, SBX



PAL, PAX, SP, SPX



All dimensions in mm (inch)

ANT TYPE	A	B	C	D PIPE Ø114	D PIPE Ø89	D PIPE Ø 51	E	F
DA, UXA, SD, SDX, SU, SUX	700(28)	389(15.4)	114(4.5)	371(14.6)	357(14.1)	333(13.1)	99(3.9)	146(5.7)
PAL, PAX, SP, SPX	700(28)		114(4.5)	371(14.6)	357(14.1)	333(13.1)	99(3.9)	146(5.7)
SB, SBX	700(28)	289(11.5)	114(4.5)	371(14.6)	357(14.1)	333(13.1)	99(3.9)	146(5.7)

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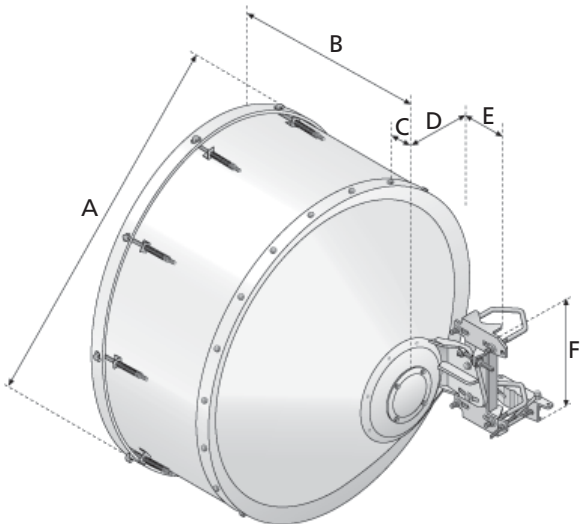
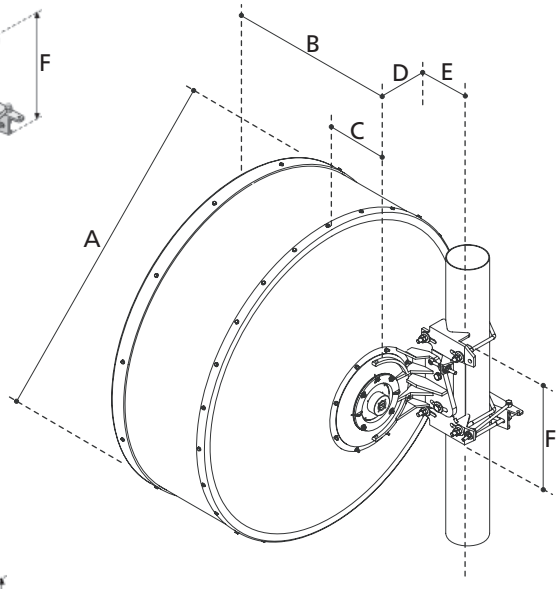
Antenna Mount Outlines

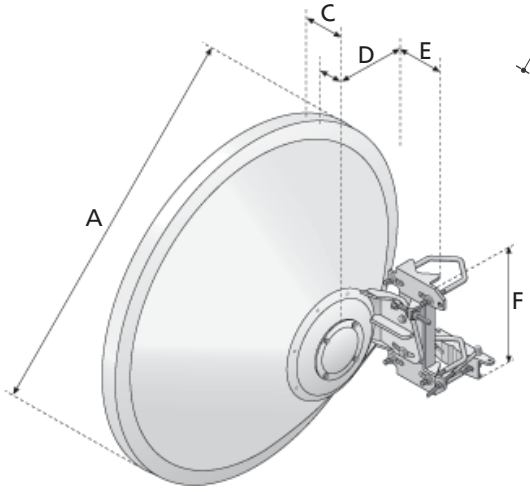
3 ft Antenna
SD, SDX, SU, SUX



SB



SP, SPX



All dimensions in mm (inch)

ANT TYPE	A	B	C	D	E	F
SD, SDX, SU, SUX	970(38.3)	620(24.5)	165(6.5)	273(10.8)	67(2.6)	350(13.8)
SP, SPX	970(38.3)		165(6.5)	273(10.8)	67(2.6)	350(13.8)
SB	970(38.3)	500(19.8)	170(6.8)	273(10.8)	65(2.5)	350(13.8)

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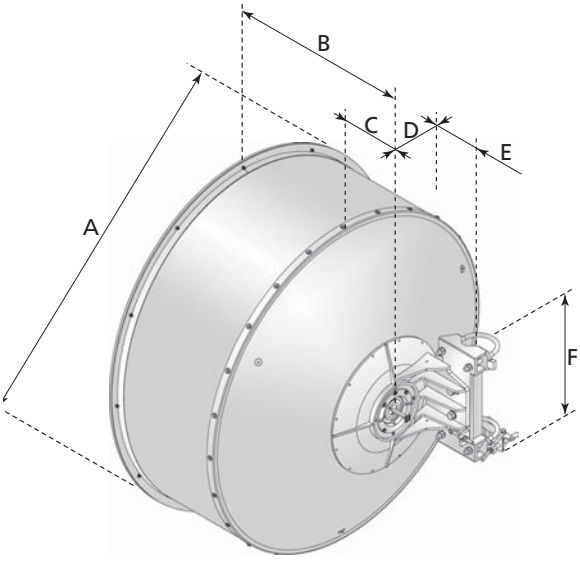
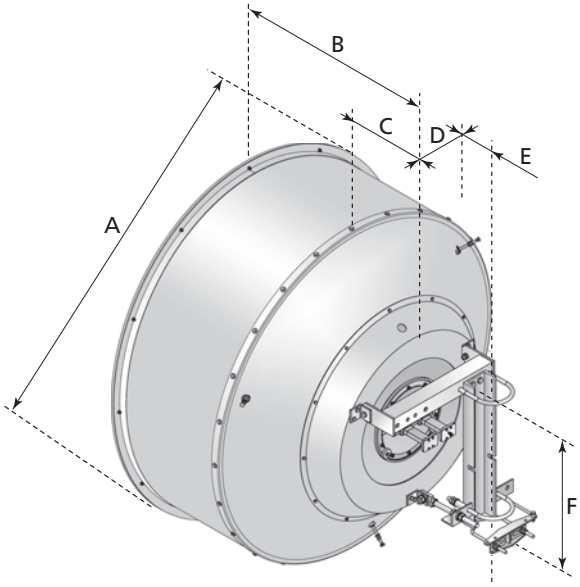
Antenna Mount Outlines

4 ft Antenna

DA, DAX, UA, UXA,
SD, SDX, SDF, SU, SUX



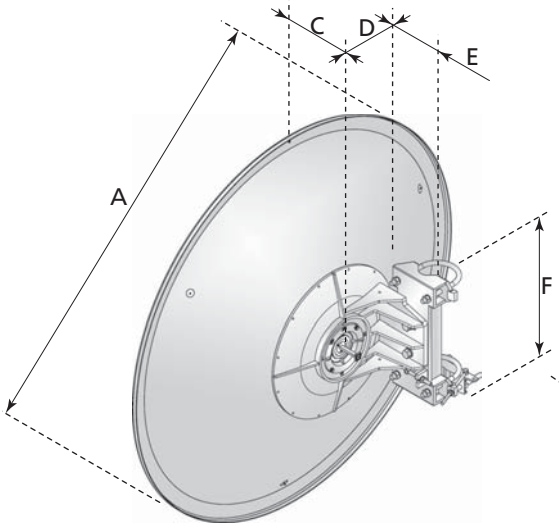
DAX, UXA, SDX, SUX (<10GHz)



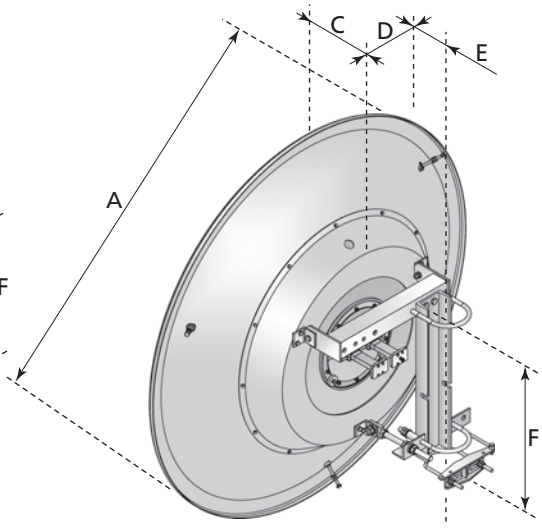
All dimensions in mm (inch)

ANT TYPE	A	B	C	DØ114	E	F
Single Pol. (All frequencies)	1313(51.7)	746(29.4)	248(9.8)	291(11.5)	95(3.8)	451(17.8)
Dual Pol. (>10GHz)	1313(51.7)	746(29.4)	248(9.8)	291(11.5)	95(3.8)	451(17.8)
Dual Pol. (<10GHz)	1313(51.7)	810(31.8)	230(9.1)	144(5.7)	229(9.0)	590(23.2)

PA, PAL, PAX, SP, SPF, SPX



PAX, SPX (<10GHz)



All dimensions in mm (inch)

ANT TYPE	A	B	C	DØ114	E	F
Single Pol. (All frequencies)	1262(49.9)	–	211(8.3)	291(11.5)	95(3.8)	451(17.8)
Dual Pol. (>10GHz)	1262(49.9)	–	211(8.3)	291(11.5)	95(3.8)	451(17.8)
Dual Pol. (<10GHz)	1262(49.9)	–	230(9.1)	144(5.7)	229(9.0)	590(23.2)

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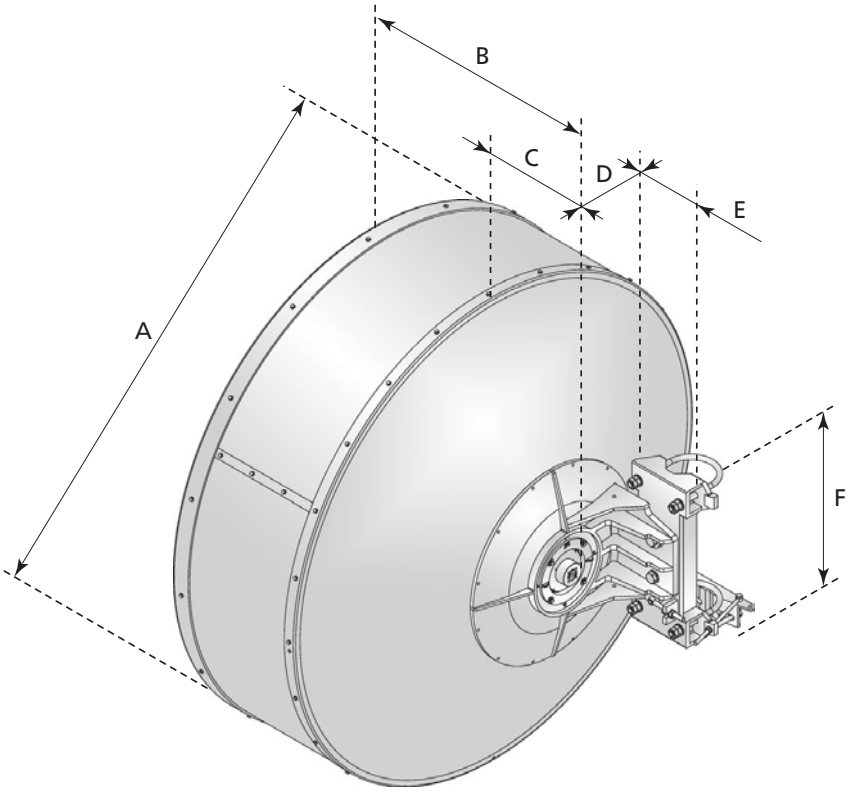
CompactLine® 4 ft Antenna
SB



All dimensions in mm (inch)

A	B	C	DØ114	E	F
1262(49.7)	631(24.9)	248(9.8)	291(11.5)	82(3.2)	451(17.8)

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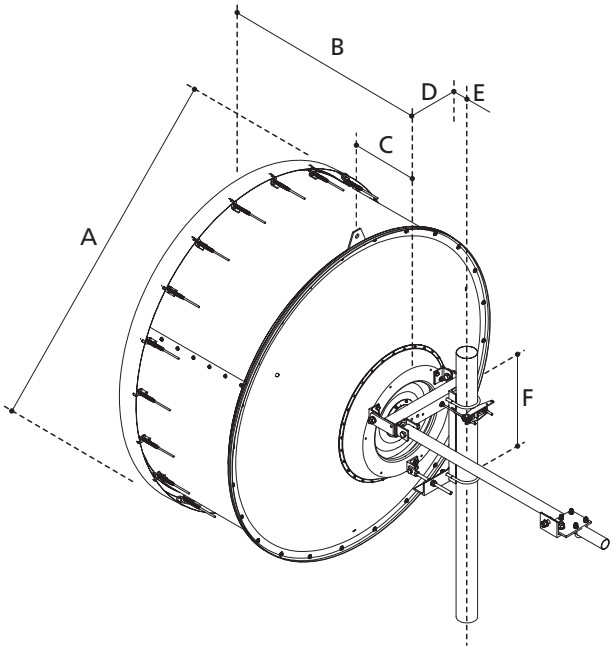
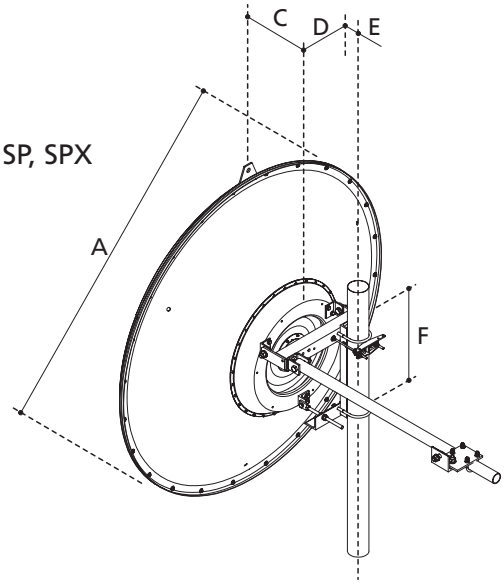
Antenna Mount Outlines

6 ft Antenna

UA, UDA, UXA, DA, DAX, SD, SDX, SU, SUX



PA, PAL, PAX, SP, SPX



All dimensions in mm (inch)

A	B	C	D Ø114	E	F
2000(79)	1242(48.9)*	364(14.3)	175(6.9)	283(11.1)	590(23.2)

*3.6-4.2 GHz = 1342(52.8)

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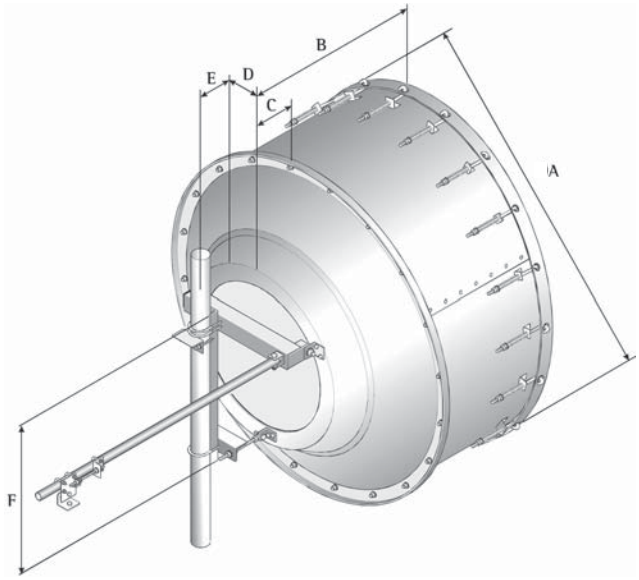
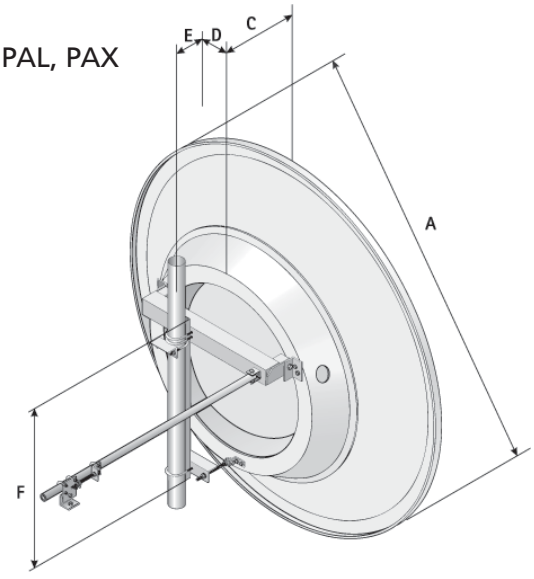
8 ft Antenna
UA, UDA, UXA, DA, DAX



PA, PAL, PAX



All dimensions in mm (inch)

A	B	C	D Ø114	E	F
2616(103.4)	1455(57.5)*	465(18.4)	190(7.5)	310(12.3)	1125(44.5)

*3.6-4.2 GHz = 1645(65)

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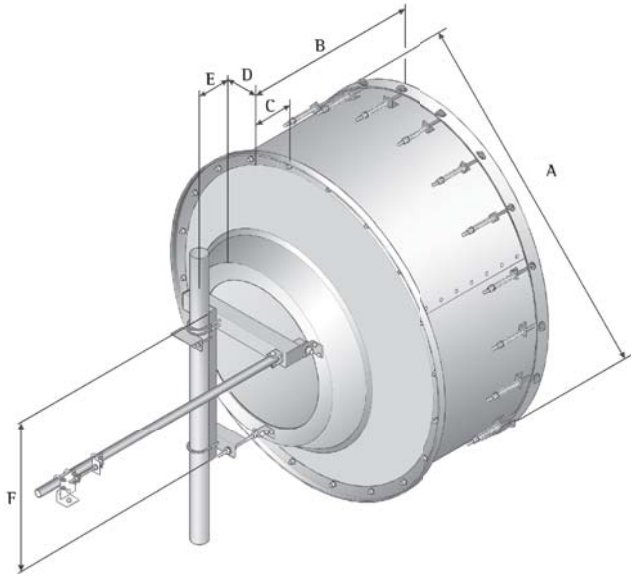
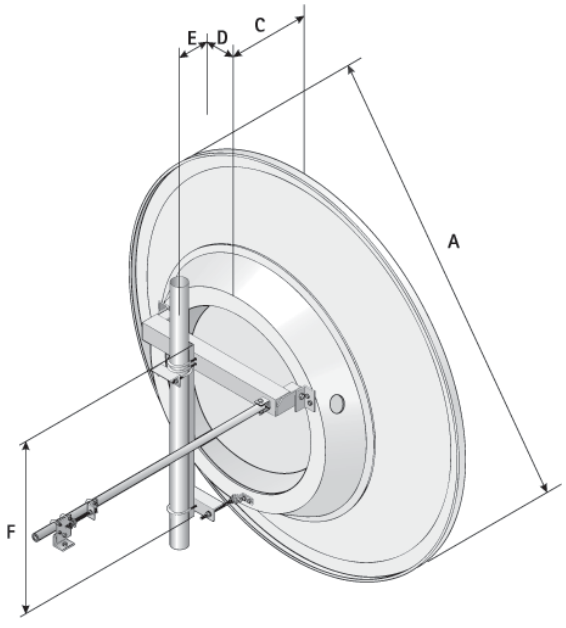
Antenna Mount Outlines

10 ft Antenna
UA, UDA, UXA, DA, DAX



PA, PAL, PAX



All dimensions in mm (inch)

A	B	C	D Ø114	E	F
3170(125.3)	1645(65)*	550(21.7)	190(7.5)	370(14.6)	1440(56.9)

*3.6-4.2 GHz = 1845(72.9)

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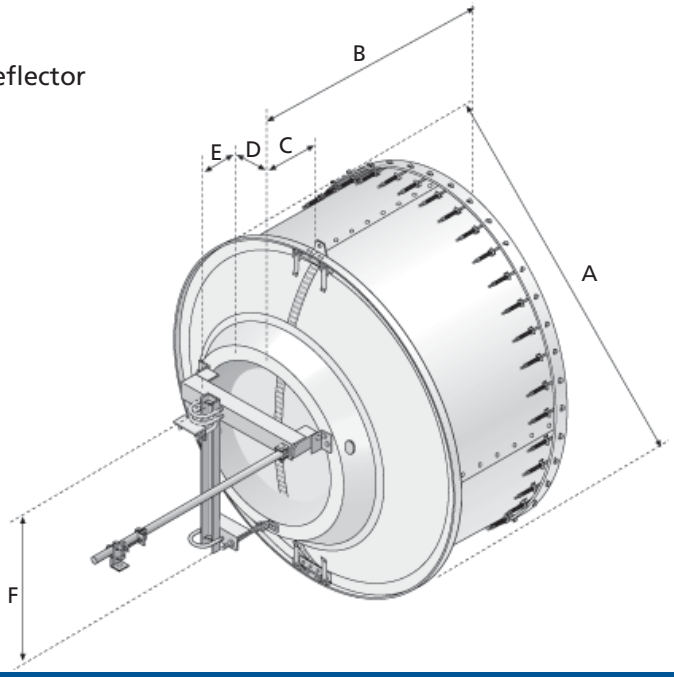
Antenna Mount Outlines

12 ft Antenna
UXA with non split reflector
UA, UDA, DA, DAX

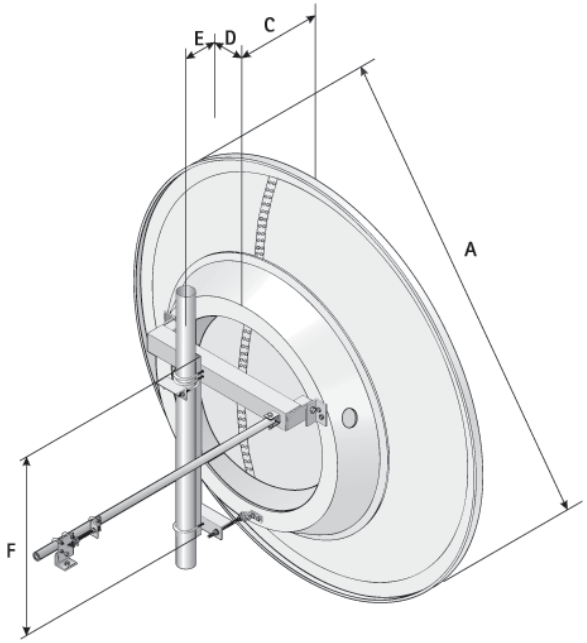


All dimensions in mm (inch)

A	B	C	D Ø114	E	F
3800(150)	1880(74.3)*	670(26.5)	190(7.5)	410(16.2)	1580(62.5)

*3.6-4.2 GHz = 2070(81.8)

12 ft Antenna
PAL, PAX



All dimensions in mm (inch)

A	B	C	D Ø114	E	F
3840(151.8) P-type	-	670(26.5)	190(7.5)	410(16.2)	1580(62.5)

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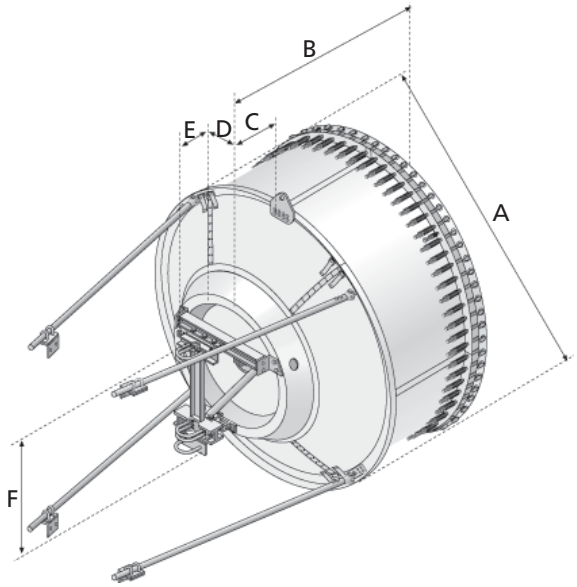
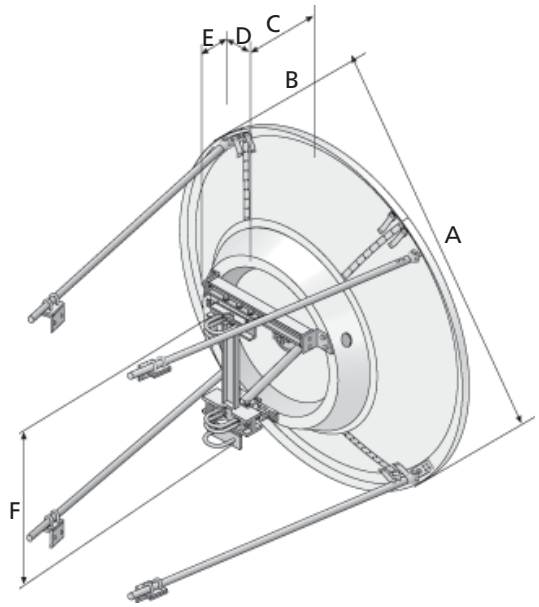
Antenna Mount Outlines

15 ft Antenna
UDA, UXA, DA, DAX



PAL, PAX



All dimensions in mm (inch)

A	B	C	D	E	F
4757(188)	2360(93.3)*	855(33.8)	294(11.6)	455(17.9)	1690(66.8)

*3.6-4.2 GHz = 2600(103)

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Packing Information

ANTENNA SIZE	ANTENNA TYPE	NUMBER OF ANTENNAS	SIZE CRATE LXWXH [cm]	VOLUME [m³]	WEIGHT NET/GROSS [kg]	PACKING TYPE
1 ft	SU-SUX	1	43x39x40	0.07	5/5	Cardboard
		18	132x82x134	1.45	100/134	Cardboard + pallet
		1	45x41x41	0.07	5/7	Laidflat
1 ft	SB-SBX	1	43x39x30	0.05	4/5	Cardboard
		24	132x82x126	1.36	96/138	Cardboard + pallet
		1	45x41x41	0.07	4/6	Laidflat
2 ft	PAL-PAX-SP-SPX	1	72x72x33	0.17	10/12	Cardboard
		16	147x147x147	3.18	160/220	Cardboard + pallet
		1	72x72x33	0.17	10/15	Laidflat
2 ft	DA-UXA-SD-SDX-SU-SUX	1	72x72x53	0.27	15/17	Cardboard
		12	147x147x173	3.74	180/230	Cardboard + pallet
2 ft	SB-SBX	1	72x72x44	0.23	12/15	Cardboard
		12	147x147x58	3.22	150/200	Cardboard + pallet
		1	75x75x58	0.33	12/20	Laidflat
3 ft	SP-SPX	1	100x100x44	0.44	16/20	Cardboard
		6	200x100x134	2.68	96/150	Cardboard + pallet
		1	100x100x50	0.50	16/30	Laidflat
3 ft	SD-SDX-SU-SUX	1	100x100x54	0.54	23/30	Cardboard
		4	200x100x122	2.44	92/150	Cardboard + pallet
		6	200x100x176	3.52	138/210	Cardboard + pallet
		1	100x100x65	0.65	23/35	Laidflat
3 ft	SB-SBX	1	100x100x44	0.44	16/20	Cardboard
4 ft	PAL-PAX-SP-SPX	1	135x135x52	0.95	24/70	Laidflat
	PAX (f<10 GHz)	1	135x135x81	1.47	24/90	Laidflat
4 ft	All types	2	145x145x100	2.10	70/315	Open-work
		3	145x145x130	2.73	105/360	Open-work
		4	145x145x160	3.36	140/410	Open-work
4 ft	DA-DAX-UA-UXA-SU-SUX	1	135x135x64	1.17	35/80	Laidflat
	DAX-UXA (f<10 GHz)	1	135x135x81	1.47	45/105	Laidflat
4 ft	All types	2	145x145x145	3.05	90/360	Open-work
		3	145x145x205	4.31	135/470	Open-work
		4	280x145x145	5.89	180/530	Open-work
4 ft	SB	1	135x115x87	1.35	35/68	Laidflat
6 ft	PAL-PAX-SP-SPX	1	198x198x80	3.14	70/210	Laidflat
		2	270x212x90	5.15	140/396	Open-work
6 ft	PAX (f<10 GHz)	1	198x198x102	4.00	70/220	Laidflat
		2	270x212x120	6.87	140/360	Open-work
6 ft	DA-DAX-UA-UXA-SU-SUX	1	198x198x80	3.14	110/255	Laidflat
		2	300x212x120	7.63	220/460	Open-work
6 ft	DAX-UXA (f<10 GHz)	1	198x198x102	4.00	190/300	Laidflat
		2	300x212x135	8.59	220/580	Open-work
6 ft	Windkit SMA-WK-6	1	20x100x30	0.06	30	Cardboard

IMPORTANT PLEASE NOTE: The standard packing can vary slightly depending on the manufacturing location and antenna configuration. Please confirm final packing with RFS.

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Solid Parabolic Microwave Antennas

Packing Information

ANTENNA SIZE	ANTENNA TYPE	NUMBER OF ANTENNAS	SIZE CRATE LXWXH [cm]	VOLUME [m³]	WEIGHT NET/GROSS [kg]	PACKING TYPE
8 ft	PAL-PAX	1	274x225x190	11.71	120/380	Open-work
		2	274x225x200	12.33	240/510	Open-work
		1, split refl.	275x217x103	6.14	120/420	Open-work
		2, split refl.	300x175x160	8.40	240/610	Open-work
8 ft	DA-DAX-UA-UXA	1	274x225x190	11.71	180/555	Open-work
		2	335x225x200	15.07	360/735	Open-work
		1, split refl.	335x180x150	9.04	180/540	Open-work
		2, split refl.	300x225x190	12.82	180/550	Open-work
8 ft	Windkit SMA-WK-8	1	18x90x40	0.06	10	Cardboard
10 ft	PAL-PAX	1	334x240x260	20.84	215/665	Open-work
		2	334x240x265	21.24	430/1170	Open-work
		1, split refl.	330x225x113	8.39	215/500	Open-work
		2, split refl.	334x225x145	10.90	430/750	Open-work
10 ft	DA-DAX-UA-UXA	1	334x240x260	20.84	290/835	Open-work
		2	400x240x265	25.44	580/1320	Open-work
		1, split refl.	357x225x137	11.00	290/575	Open-work
		2, split refl.	445x225x185	18.52	580/1100	Open-work
10 ft	Windkit SMA-WK-10	1	20x125x40	0.10	20	Cardboard
12 ft	PAL-PAX	1, split refl.	394x225x133	11.79	310/630	Open-work
		2, split refl.	400x225x180	16.20	620/900	Open-work
		1	400x240x340	32.64	310/950	Open-work
		2	450x240x345	37.26	620/1478	Open-work
12 ft	DA-DAX-UA-UXA	1, split refl.	447x225x167	16.80	420/830	Open-work
		2, split refl.	500x225x200	22.50	840/1200	Open-work
		1	400x240x340	32.64	420/1050	Open-work
		2	480x240x345	39.74	740/1700	Open-work
12 ft	Windkit SMA-WK-12	1	20x125x40	0.10	35	Cardboard
15 ft	PAL-PAX	1, split refl.	500x224x282	33.84	570/1650	Open-work
		2, split refl.	500x240x318	38.16	1140/2500	Open-work
15 ft	DA-DAX-UXA	1, split refl.	500x240x282	33.84	750/1750	Open-work
		2, split refl.	520x240x318	39.69	900/2120	Open-work

IMPORTANT PLEASE NOTE: The standard packing can vary slightly depending on the manufacturing location and antenna configuration. Please confirm final packing with RFS.

1 ft

Cardboard

Laid flat

Cardboard & Pallet Bottom

2 ft

Cardboard

Laid flat

Cardboard & Pallet Bottom

3 ft

Cardboard

Laid flat

Cardboard & Pallet Bottom

4 ft

Laid flat

6 ft

Laid flat

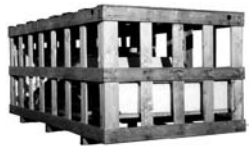
8 ft

Open-work

10/12/15 ft

Open-work
• Crossbars

Open-work



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Microwave Grid Antennas

Introduction and Antenna Descriptions

RFS offers grid antennas in the frequency bands mainly used in point-to point microwave networks as well as for far access terminal stations in point- to multipoint systems.

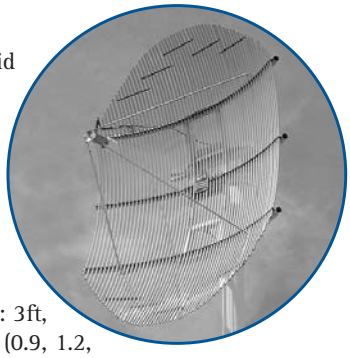
Grid antennas are available in two different performance classes providing excellent radiation performance and easy installation.

A low weight and a very small package volume are the outstanding features of RFS Grid antennas.

The antennas have been designed according to the high electrical and mechanical specifications applied to RFS solid parabolic antennas.

All antennas include a pipe mount.

APL Series



The APL Series of grid antennas offers high gain and good performance with a design specially developed for small package.

The antennas are supplied in five sizes: 3ft, 4ft, 6ft, 8ft, and 10ft (0.9, 1.2, 1.8, 2.4, 3.0m) covering the frequency ranges of 1.5 and 2.5 GHz.

The use of broadband feeds allows a maximum flexibility in system planning.

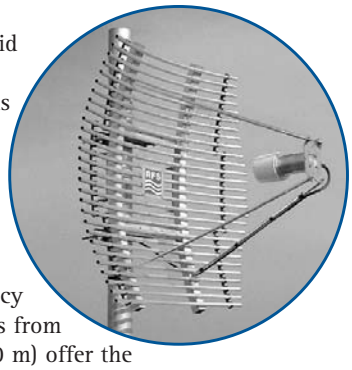
The small package and light weight in consumption with high gain and high front-to-back ratio makes the APL series interesting in rural areas where transportation cost is a key cost factor.

Features

- Small design for high survival wind speeds of 200 km/h (125 mph)
- Broad band feeds for 1.5 GHz and 2.5 GHz
- Horizontal and vertical polarization
- Low volume packing for low cost transportation
- Reflector and mount made of aluminum alloy
- Low tower wind loading
- High front-to-back ratio
- Lightweight
- Simple and quick assembly

MODEL NUMBERS	
APL3	3ft (0.9m) diameter
APL4	4ft (1.2m) diameter
APL6	6ft (1.8m) diameter
APL8	8ft (2.4m) diameter
APL10	10ft (3.0m) diameter

HPL Series



The HPL series of Grid antennas is designed for radio link systems where a higher front to back ratio is required.

Antennas are available in 2.5 GHz and 3.6 GHz frequency bands. Different sizes from 3ft to 10ft (0.9 to 3.0 m) offer the necessary flexibility in radio link planning.

These antennas are the optimum choice for WLL and WiMax applications where the terminal station is far away from the next base station.

The high density aluminum grid reflector are entirely dismountable from 4 to 10 ft. The 3 ft reflector is fixed to provide the necessary stability for high wind applications.

All antennas combine low windload with advanced electrical performance.

Features

- Small design for high survival wind speeds of 200 km/h (125 mph)
- Broad band feeds at 2.5 GHz and 3.6 GHz
- Horizontal and vertical polarization
- Low cost packing and transportation
- Reflector and mount made of aluminum alloy
- Low tower wind loading
- Extended front-to-back ratio
- Lightweight
- Simple and quick assembly

MODEL NUMBERS	
HPL3	3ft (0.9m) diameter
HPL4	4ft (1.2m) diameter
HPL6	6ft (1.8m) diameter
HPL8	8ft (2.4m) diameter
HPL10	10ft (3.0m) diameter

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Microwave Grid Antennas

Introduction and Antenna Descriptions

MINIGRID Antennas, MGA and MGAR Series

The MINIGRID Antennas developed and produced by RFS offers high gain and extreme rugged reliability in a relative small page.

The antennas are supplied in four sizes: 2 ft, 3 ft, 4 ft and 6 ft (0.6, 0.9, 1.2 and 1.8m).

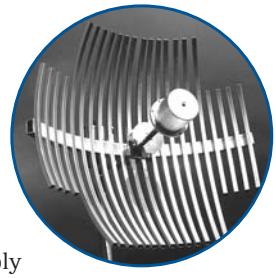
Broadband feeds for maximum flexibility are covering the standard bands from 0.82 GHz to 2.7 GHz (MGA-types).

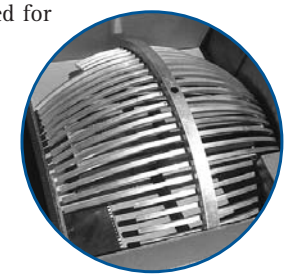
In addition RFS offers a range of narrow band antennas (MGAR-types) for low capacity rural telephony and spread spectrum applications in the 1.35-1.535 GHz, 2.3-2.5 GHz and 3.4-3.6 GHz bands.

The small size, lightweight and low wind loading in addition to the high gain and high front-to-back ratio make the MINIGRID antennas the perfect replacement for stacked Yagis.

Features

- Small rugged design for high wind speeds 350 km/h (220 mph). 200 km/h (125 mph) for 6 ft (1.8m)
- Horizontal or vertical polarization
- Low-cost packing and transportation
- Corrosion-resistant aluminum tube reflector, hot-dipped galvanized mounting, stainless steel hardware
- Welded construction
- Low tower wind loading
- High front-to-back ratio
- Lightweight
- Simple and quick assembly
- Reflectors can be stacked for reduced shipping volumes





MODEL NUMBERS	
MGA(R) 2 series	2 ft (0.6 m) diameter
MGA(R) 3 series	3 ft. (0.9 m) diameter
MGA(R) 4 series	4 ft. (1.2 m) diameter
MGA(R) 6 series	6 ft. (1.8 m) diameter

Overview Grid Antennas

FREQUENCY, GHz	RFS CODE	MGA	MGAR	APL	HPL
0.82-0.96	082	3-6ft			
1.35-1.535	14		2-6ft		
1.35-1.55	15			3-10ft	
1.35-1.85	16	2-6ft			
1.7-2.1	18	2-6ft			
1.9-2.3	19	2-6ft			
2.3-2.5	23		2-6ft		
2.3-2.7	24	2-6ft		3-10ft	3-10ft
3.4-3.6	35		2-6ft		
3.4-3.8	34				3-10ft

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Antenna Input – N Female

Model Number	Diameter ft (m)	Beamwidth, degrees H Plane	E Plane	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)
MINIGRID									
MGA3-082AN	3 (0.9)	21	25	16.0	16.3	16.5	20	1.40 / 15.6	Infinite
MGA4-082AN	4 (1.2)	17.4	21.2	18.3	18.6	19.1	21	1.40 / 15.6	Infinite
MGA6-082AN	6 (1.8)	12.6	14.7	21.2	21.3	21.6	30	1.40 / 15.6	Infinite

1.350 - 1.535 GHz

Antenna Input – N Female

Model Number	Diameter ft (m)	Beamwidth, degrees H Plane	E Plane	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)
Narrow Band MINIGRID for Spread Spectrum/ISMBand									
MGAR2-14AN	2 (0.6)	21.4	21.4	15.9	16.6	17.3	21	1.35 / 16.5	Infinite
MGAR3-14AN	3 (0.9)	13.5	13.5	19.0	20.0	20.9	30	1.35 / 16.5	Infinite
MGAR4-14AN	4 (1.2)	10.0	11.0	22.0	22.5	23.0	30	1.35 / 16.5	Infinite
MGAR6-14AN	6 (1.8)	7.1	7.1	25.1	25.7	26.2	32	1.35 / 16.5	Infinite

1.350 - 1.555 GHz

Antenna Input – N Female

Model Number	Diameter ft (m)	Beamwidth, degrees H Plane	E Plane	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)
Grid, Standard Performance, Single Polarized (horizontal or vertical)									
APL3-15AN	3 (0.9)	10.5	10.5	19.8	20.0	20.5	25	1.5 / 14.0	
APL4-15AN	4 (1.2)	9	9	22.8	23.1	23.4	28	1.5 / 14.0	
APL6-15AN	6 (1.8)	7	7	25.9	26.4	26.9	30	1.5 / 14.0	
APL8-15AN	8 (2.4)	5.4	5.4	27.8	28.1	28.4	34	1.5 / 14.0	
APL10-15AN	10 (3.0)	4.8	4.8	29.5	30.0	30.5	35	1.5 / 14.0	

1.35 - 1.85 GHz

Antenna Input – N Female

Model Number	Diameter ft (m)	Beamwidth, degrees H Plane	E Plane	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)
MINIGRID									
MGA2-16AN	2 (0.6)	21.4	21.4	16.2	18.0	18.7	21	1.30 / 17.7	Infinite
MGA3-16AN	3 (0.9)	13.5	13.5	19.3	21.7	21.9	30	1.40 / 15.6	Infinite
MGA4-16AN	4 (1.2)	10	11	22.3	23.7	25.3	30	1.40 / 15.6	Infinite
MGA6-16AN	6 (1.8)	7.1	7.1	25.5	27.0	28.2	30	1.25 / 19.0	Infinite

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Microwave Grid Antennas

1.7 - 2.1 GHz

Antenna Input – N Female

Model Number	Diameter ft (m)	Beamwidth, degrees H Plane	E Plane	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)
MINIGRID									
MGA2-18AN	2 (0.6)	18	16.2	18.5	18.9	19.3	25	1.30 / 17.7	Infinite
MGA3-18AN	3 (0.9)	11.4	11.4	21.2	22.5	23.5	33	1.30 / 17.7	Infinite
MGA4-18AN	4 (1.2)	9.2	9.2	24.8	25.3	26.2	32	1.30 / 17.7	Infinite
MGA6-18AN	6 (1.8)	6	6	27.5	28.5	29.3	34	1.20 / 20.8	Infinite

1.9 - 2.3 GHz

Antenna Input – N Female

Model Number	Diameter ft (m)	Beamwidth, degrees H Plane	E Plane	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)
MINIGRID									
MGA2-19AN	2 (0.6)	16.3	16.3	19.1	19.4	21.6	27	1.30 / 17.7	Infinite
MGA3-19AN	3 (0.9)	10.3	10.3	22.5	23.4	23.9	35	1.30 / 17.7	Infinite
MGA4-19AN	4 (1.2)	8	8	25.6	26.8	27.2	34	1.30 / 17.7	Infinite
MGA6-19AN	6 (1.8)	5.4	5.4	28.5	29.3	30.1	35	1.20 / 20.8	Infinite

2.3 - 2.5 GHz

Antenna Input – N Female

Model Number	Diameter ft (m)	Beamwidth, degrees H Plane	E Plane	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)
Narrow Band MINIGRID for Spread Spectrum/ISMBand									
MGAR2-23AN	2 (0.6)	13.7	13.7	20.4	20.8	21.1	29	1.35 / 16.5	Infinite
MGAR3-23AN	3 (0.9)	8.6	8.6	23.7	24.2	24.7	32	1.35 / 16.5	Infinite
MGAR4-23AN	4 (1.2)	7	7	26.8	27.0	27.2	32	1.35 / 16.5	Infinite
MGAR6-23AN	6 (1.8)	4.5	4.5	29.6	30.1	30.4	38	1.35 / 16.5	Infinite

2.3 - 2.7 GHz

Antenna Input – N Female

Model Number	Diameter ft (m)	Beamwidth, degrees H Plane	E Plane	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)
Grid, Standard Performance, Single Polarized (horizontal or vertical)									
APL3-24AN	3 (0.9)	8	8	23.5	24	24.8	20	1.4 / 15.6	
APL4-24AN	4 (1.2)	5.5	5.5	26.8	27	27.2	30	1.3 / 17.7	±10
APL6-24AN	6 (1.8)	4	4	29.9	30	30.1	30	1.3 / 17.7	±10
APL8-24AN	8 (2.4)	3.8	3.8	32.1	32.5	32.9	32	1.3 / 17.7	±10
APL10-24AN	10 (3.0)	2.8	2.8	35	35.5	36	35	1.3 / 17.7	±10
Grid, High Performance, Single Polarized ((horizontal or vertical)									
HPL3-24AN	3 (0.9)	6.9	7	24.8	25.5	25.9	30	1.33 / 17.0	
HPL4-24AN	4 (1.2)	6	6.2	27.2	28	28.8	33	1.3 / 17.7	±10
HPL6-24AN	6 (1.8)	4.2	4.1	30.9	31.6	32.1	41	1.3 / 17.7	±10
HPL8-24AN	8 (2.4)	3.6	3.2	32.7	33.4	34	43	1.3 / 17.7	±10
HPL10-24AN	10 (3.0)	2.8	2.7	34.2	35	35.8	45	1.3 / 17.7	±10
MINIGRID									
MGA2-24AN	2 (0.6)	13.7	13.7	21.4	21.6	21.8	29	1.30 / 17.7	Infinite
MGA3-24AN	3 (0.9)	8.6	8.6	24.0	25.0	25.5	32	1.30 / 17.7	Infinite
MGA4-24AN	4 (1.2)	7	7	27.2	27.6	28.3	32	1.30 / 17.7	Infinite
MGA6-24AN	6 (1.8)	4.3	4.7	30.1	30.9	31.5	36	1.20 / 20.8	Infinite

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Antenna Input – N Female

Model Number	Diameter ft (m)	Beamwidth, degrees H Plane	E Plane	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)
MINIGRID, Narrow Band									
MGAR2-35AN	2 (0.6)	9.5	10.0	23.0	23.4	23.7	30	1.40 / 15.6 @ (3.4 - 3.6GHz), 1.5 /15.0 @ (3.4 - 3.7 GHz)	Infinite
MGAR3-35AN	3 (0.9)	7	7	26.6	27.0	27.3	32	1.40 / 15.6 @ (3.4 - 3.6GHz), 1.5 /15.0 @ (3.4 - 3.7 GHz)	Infinite
MGAR4-35AN	4 (1.2)	5.3	5.3	29.0	29.4	29.7	32	1.40 / 15.6 @ (3.4 - 3.6GHz), 1.5 /15.0 @ (3.4 - 3.7 GHz)	Infinite
MGAR6-35AN	6 (1.8)	3.5	3.5	32.6	33.0	33.3	34	1.40 / 15.6 @ (3.4 - 3.6GHz), 1.5 /15.0 @ (3.4 - 3.7 GHz)	Infinite

3.4 - 3.8 GHz

Antenna Input – N Female

Model Number	Diameter ft (m)	Beamwidth, degrees H Plane	E Plane	Gain (dBi) Low	Mid	High	F/B Ratio (dB)	VSWR/ R L (dB)	Fine Adjustment Az (deg)
Grid, High Performance, Single Polarized ((horizontal or vertical)									
HPL3-34AN	3 (0.9)	5.4	5.4	28	28.2	28.4	30	1.3 / 17.7	
HPL4-34AN	4 (1.2)	4.9	4.9	30.1	30.3	30.5	32	1.3 / 17.7	±10
HPL6-34AN	6 (1.8)	3	3	34	34.3	34.6	37	1.3 / 17.7	±10
HPL8-34AN	8 (2.4)	2.4	2.4	36.1	36.2	36.3	42	1.3 / 17.7	±10
HPL10-34AN	10 (3.0)	2	2	38	38.2	38.4	45	1.3 / 17.7	±10

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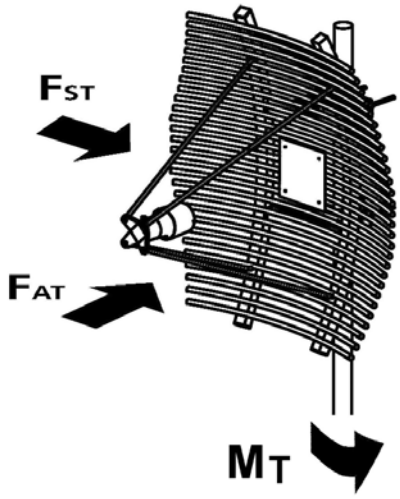
Forces Due to Wind

The influence of wind and ice on parabolic antennas is important in planning support structures. Wind forces usually are multiples of the antenna weight. The maximum values do not occur simultaneously.



DIAMETER FT (M)	ANTENNA TYPE	FORCES MOMENTS	WIND SPEED 110 KM/H (68 MPH)	WIND SPEED 200 KM/H (125 MPH)
2ft (0.6)	MGA, MGAR	FAT max N (lb)	75 (39)	600 (135)
		FST max N (lb)	50 (11)	200 (45)
		MT max Nm (lbft)	50 (37)	160 (118)
3ft (0.9)	APL	FAT max N (lb)	194 (44)	641 (144)
		FST max N (lb)	118 (27)	391 (88)
		MT max Nm (lbft)	51(38)	168 (124)
3ft (0.9)	HPL	FAT max N (lb)	260 (58)	860 (193)
		FST max N (lb)	113 (25)	375 (84)
		MT max Nm (lbft)	49 (36)	161 (119)
3ft (0.9)	MGA, MGAR	FAT max N (lb)	387 (87)	1300 (292)
		FST max N (lb)	140 (31)	500 (112)
		MT max Nm (lbft)	90 (66)	310 (229)
4ft (1.2)	APL	FAT max N (lb)	331 (74)	1094 (246)
		FST max N (lb)	189 (42)	625 (141)
		MT max Nm (lbft)	81 (60)	269 (198)
4ft (1.2)	HPL	FAT max N (lb)	454 (102)	1500 (337)
		FST max N (lb)	198 (45)	656 (147)
		MT max Nm (lbft)	85 (63)	282 (208)
4ft (1.2)	MGA, MGAR	FAT max N (lb)	671 (151)	2200 (493)
		FST max N (lb)	240 (54)	800 (179)
		MT max Nm (lbft)	240 (177)	800 (590)
6ft (1.8)	APL	FAT max N (lb)	671 (151)	2189 (492)
		FST max N (lb)	364 (82)	1203 (270)
		MT max Nm (lbft)	157 (116)	517 (381)
6ft (1.8)	HPL	FAT max N (lb)	1020 (229)	3375 (759)
		FST max N (lb)	445 (100)	1476 (332)
		MT max Nm (lbft)	191 (141)	635 (468)
6ft (1.8)	MGA, MGAR	FAT max N (lb)	1371 (308)	4500 (1009)
		FST max N (lb)	610 (137)	2000 (449)
		MT max Nm (lbft)	330 (243)	1090 (804)
8ft (2.4)	APL	FAT max N (lb)	1418 (319)	4688 (1054)
		FST max N (lb)	638 (143)	2109 (474)
		MT max Nm (lbft)	274 (202)	907 (669)
8ft (2.4)	HPL	FAT max N (lb)	1805 (406)	5959 (1340)
		FST max N (lb)	799 (180)	2640 (594)
		MT max Nm (lbft)	344 (254)	1135 (837)
10ft (3.0)	APL	FAT max N (lb)	2221 (499)	7344 (1651)
		FST max N (lb)	1016 (228)	3394 (763)
		MT max Nm (lbft)	437 (322)	1459 (1076)
10ft (3.0)	HPL	FAT max N (lb)	2826 (635)	9344 (2101)
		FST max N (lb)	1248 (281)	4125 (927)
		MT max Nm (lbft)	537 (396)	1774 (1308)

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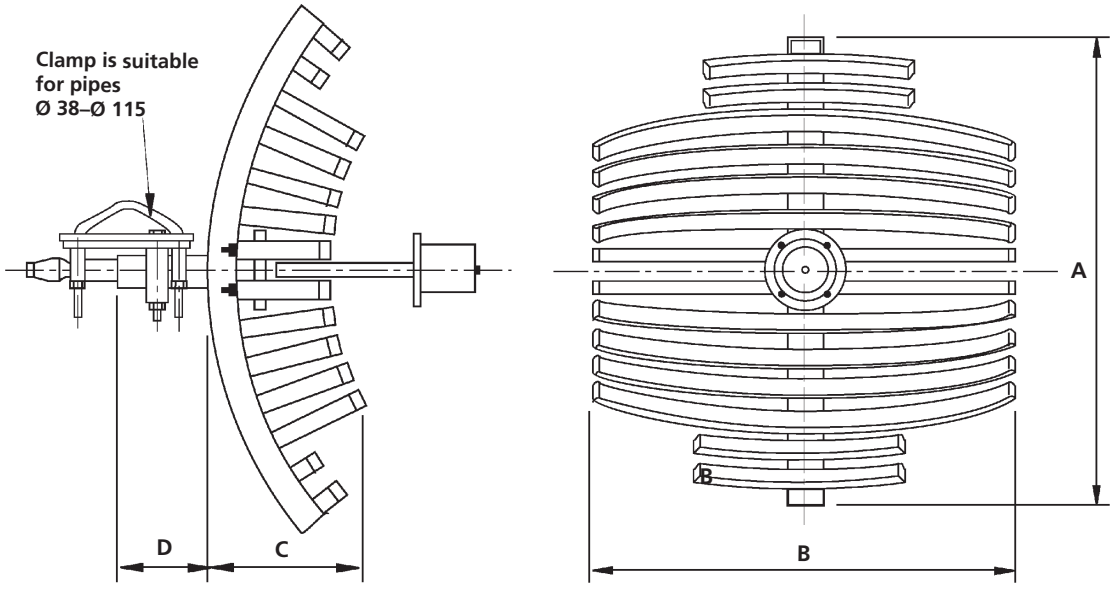
Grid Antenna Mount Outlines

MINIGRID Antennas MGA2/MGAR2 Series - 2 ft (0.6 m)



All dimensions in mm (inch)

A	B	C	D
640(25.2)	690(27.17)	200(7.87)	120(4.72)

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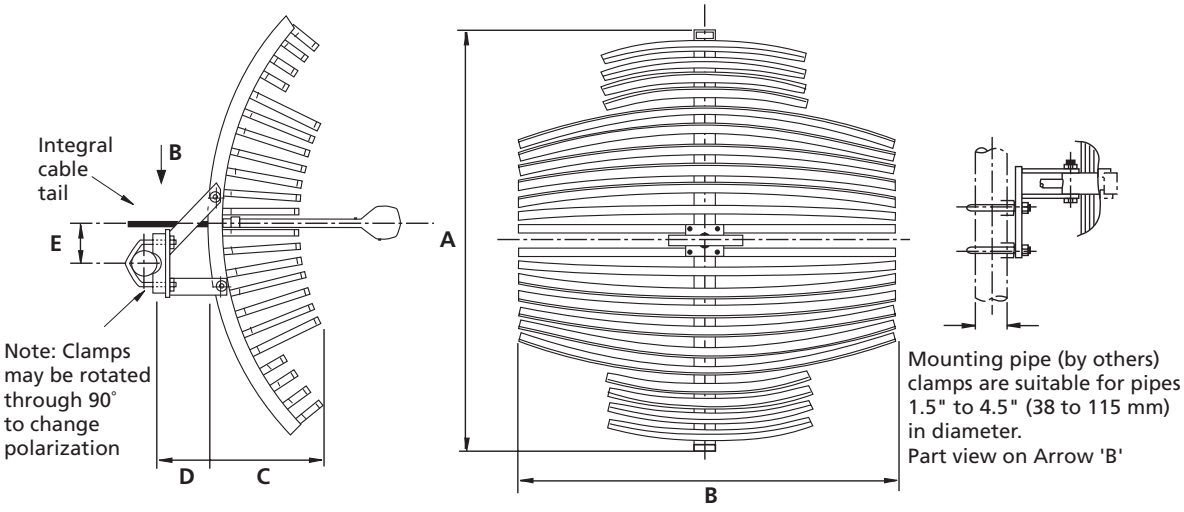
Grid Antenna Mount Outlines

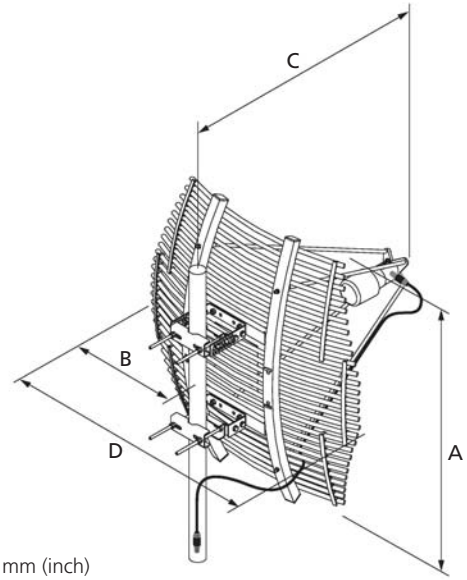
MINIGRID Antennas MGA3/MGAR3 Series - 3 ft (0.9 m)



All dimensions in mm (inch)

A	B	C	D	E
1030(40.55)	950(37.4)	290(11.41)	130(5.11)	100(3.94)

GRID Antennas APL3/HPL3 Series - 3 ft (0.9 m)



All dimensions in mm (inch)

A	B	CØ30	CØ124	D
1125(44.3)	510(20.1)	980(38.6)	1030(40.6)	1020(40.2)

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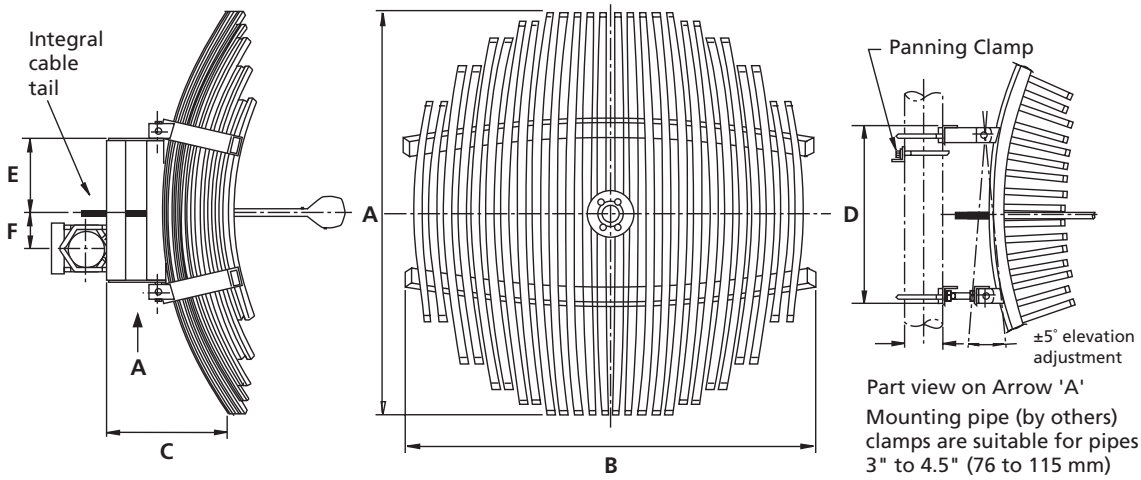
Grid Antenna Mount Outlines

MINIGRID Antennas MGA4/MGAR4 Series - 4 ft (1.2 m)



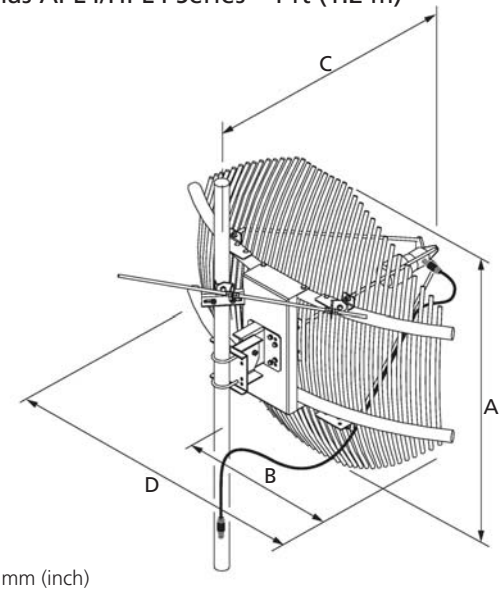
Part view on Arrow 'A'

Mounting pipe (by others) clamps are suitable for pipes 3" to 4.5" (76 to 115 mm) in diameter.

All dimensions in mm (inch)

A	B	C	D	E	F
1220(48)	1265(50)	350(13.78)	530(20.87)	220(8.66)	110(4.33)

GRID Antennas APL4/HPL4 Series - 4 ft (1.2 m)



All dimensions in mm (inch)

A	B	CØ65	CØ114	D
1370(53.9)	703(27.7)	1145(45.1)	1165(45.9)	1406(55.4)

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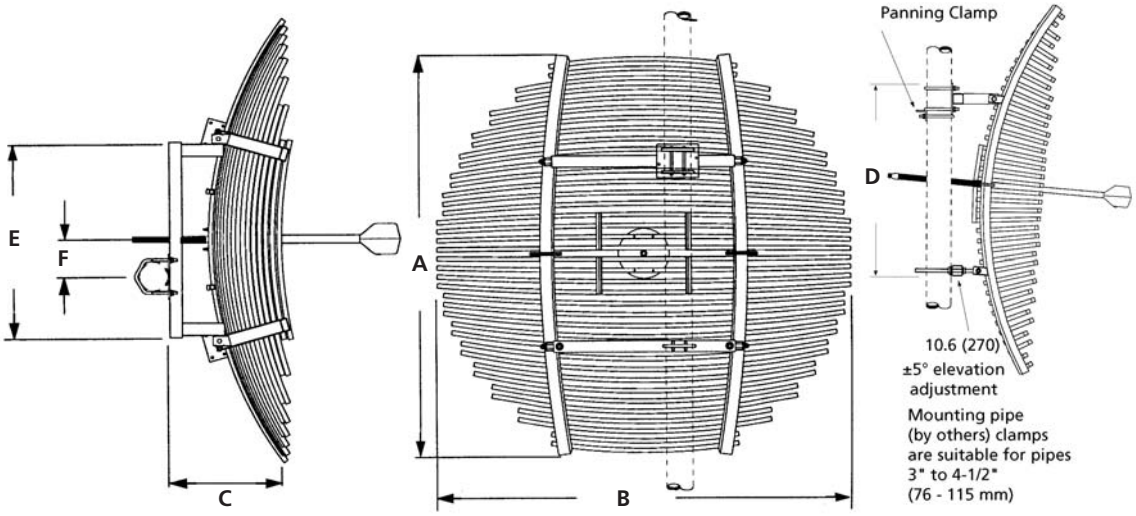
Grid Antenna Mount Outlines

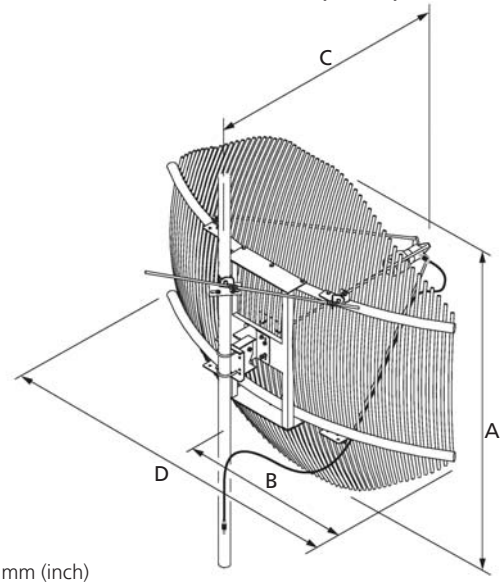
MINIGRID Antennas MGA6/MGAR6 Series - 6 ft (1.8 m)



All dimensions in mm (inch)

A	B	C	D	E	F
1746(68.7)	1800(70.87)	485(19.09)	920(36.22)	766(30.16)	150(5.90)

GRID Antennas APL6/HPL6 Series - 6 ft (1.8 m)



All dimensions in mm (inch)

A	B	CØ65	CØ114	D
1980(78.0)	1015(40.0)	1430(56.3)	1450(57.1)	2030(80.0)

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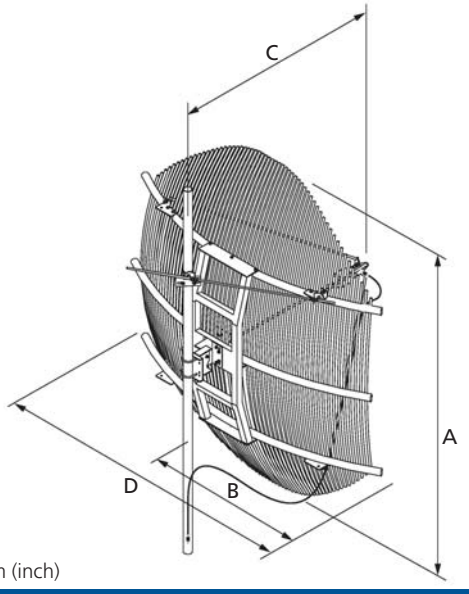
Grid Antenna Mount Outlines

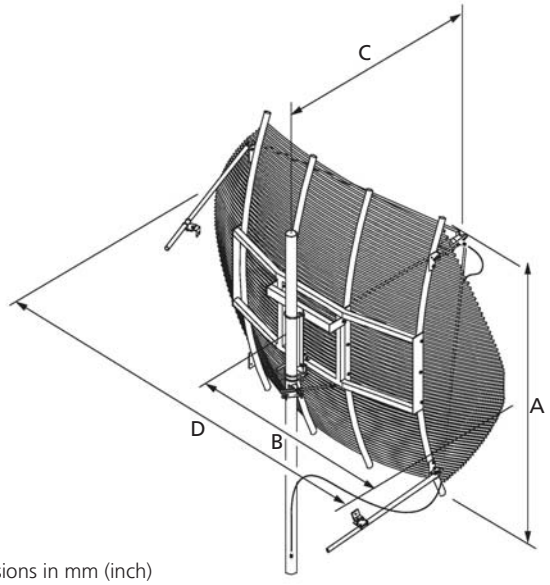
GRID Antennas APL8/HPL8 Series - 8 ft (2.4 m)



All dimensions in mm (inch)

A	B	CØ65	CØ114	D
2690(105.9)	1110(43.7)	1625(64.0)	1550(61.0)	2220(87.4)

GRID Antennas APL10/HPL10 Series - 10 ft (3.0 m)



All dimensions in mm (inch)

A	B	CØ89	CØ114	D
2560(100.8)	1610(63.4)	1908(75.1)	1920(75.6)	3220(126.8)

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Broadband Wireless Antennas

Introduction

In recent times new operators worldwide have launched various systems for Broadband Wireless Applications in competition to fix wire operators and mobile network operators. Well known are Wireless Local Loop (WLL) systems, Local Multipoint Distribution Systems (LMDS) and Multichannel Multipoint Distribution Service (MMDS). In addition to these services WiMAX systems will be deployed.

Radio Frequency Systems offers a growing line of antennas for these applications. Several frequency bands have already been allocated for Point-to-Multipoint applications. The main frequency ranges are 2.5, 3.5, 5.8, 26 and 28 GHz. No matter what your frequency and broadband antenna application, RFS has the most technically advanced line of products to meet the needs. For decades RFS has earned the reputation for bringing the most innovative and advanced solutions to the market in a range of antenna products.

RFS has taken full account of the frequency bands already allocated. The RFS antenna program will be extended continuously to give new operators more flexibility to optimize and improve their networks. All antennas comply with specifications of European Telecommunication Standard Institute, better known under its acronym of ETSI, and to the US-standard of Federal Communication Commissions (FCC).

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Optimization of the network

Operators are permanently under pressure to optimize their networks in terms of cost and increase of capacity. Application of a Wireless Local Loop system does not require total coverage of a given area. The terminal station at the subscribers' end is in a fixed location, which is entirely different than in mobile applications. There is therefore no point in covering an area where there are no subscribers (houses) (Figure 1).

Figure 1

Instead of two antennas each with a 180-deg. sector, the network is optimized with a 90-deg. sector antenna (town above base station) and a 30-deg. antenna (village below base station). In these cases it is possible to use antennas that have a higher gain compared to a 180-deg antenna. This both extends the range and saves costs because less power is needed from the active equipment in order to obtain good signal strength within the sector.

A successful operator will very soon have to improve the capacity in a sector. This could be done, for example, by employing new frequencies. In general this is not an option due to the lack of availability of frequency spectrum. Therefore the operator has to divide the main sector into several sub-sectors (Figure 2).

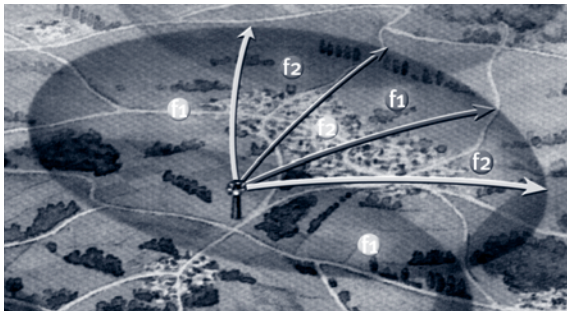

Figure 2

The original 90-deg. sector with the frequency f2 is decoupled from the adjacent sectors using frequency f1. Replacing the 90-deg. antenna with 3 x 30-deg. antennas allows use of the same frequency decoupling method.

The main advantage is that the existing terminal antennas can continue to be used without the need for adjustment or re-alignment. The increase of capacity can be achieved solely by software means.

Decoupling by polarization is more difficult because all terminal station antennas in one of the sectors will have to be readjusted as a result of the change in polarization (rotate by 90-deg).

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WiMAX Application

The term WiMAX (Worldwide Interoperability for Microwave Access) has become synonymous with the IEEE 802.16 Wireless Metropolitan Area Network (MAN) air interface standard.

Filling the gap between Wireless LANs and wide area networks, WiMAX-compliant systems will provide a cost-effective fixed wireless alternative to conventional wire-line DSL and cable in areas where those technologies are readily available. And more importantly the WiMAX technology can provide a cost-effective broadband access solution in areas beyond the reach of DSL and cable.

The ongoing evolution of IEEE 802.16 will expand the standard to address mobile applications thus enabling broadband access directly to WiMAX-enabled portable devices ranging from smart phones and PDAs to notebook and laptop computers.

RFS is considering the increased antenna demands and provides antennas in the three frequency bands that are of primary interest for WiMAX applications with today's prevailing regulations:

The licensed 2.5 GHz bands:

The bands between 2.5 and 2.69 GHz have been allocated in the U.S., Mexico, Brazil and some Southeast Asian countries. Also prevalent in Southeast Asia (including Australia, South Korea & New Zealand), is the 2.3 GHz band.

The licensed 3.5 GHz bands:

The primary licensed spectrum allocated for BWA applications in this general vicinity lies between 3.4 and 3.6 GHz although there are some new allocations between 3.3-3.4 and 3.6-3.8 GHz.

Bands between 3.4 and 3.6 GHz have been allocated for BWA in the majority of countries, with the exception of the U.S.

The license-exempt 5.8 GHz Band

Because in the majority of countries license-exempt spectrum is "free" to use, this band is strategic for enabling grass roots deployments in underserved, low population density rural and remote markets. Different from Wi-Fi which is primarily targeted for Local Area Network (indoor) applications, WiMAX is targeted for longer range Metropolitan Area (indoor & outdoor) applications and thus benefits from higher allowable power output levels. In the upper 5 GHz band (5.725-5.850 GHz), many countries allow higher power output (4 Watts vs 1 Watt EIRP) which makes this band more attractive to WiMAX applications.

The band 5.725-5.850 GHz is mainly used in US.

In addition to single antennas RFS is also developing MIMO (Multiple Inputs Multiple Outputs) antennas in the 2.5 and 3.5 GHz bands.

Adaptive antenna systems (AAS) are an optional part of the 802.16 standard providing beam forming properties that can steer their focus to a particular direction or directions. This means that while transmitting, the signal can be limited to the required direction of the receiver; like a spotlight. Conversely when receiving, the AAS can be made to focus only in the direction from where the desired signal is coming from. They also have the property of suppressing co-channel interference from other locations. AASs are considered to be future developments that could improve the spectrum re-use and capacity of a WiMAX network.

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Antennas for 2.5 GHz ISM and WiMAX systems

RFS offers antennas in the 2.4 - 2.69 GHz band 65, 90 and 120 deg sector sizes.

All antennas have five degree vertical beam width, which minimizes the effect of tower sway and wide enough for the optimum amount of gain versus aperture size. The vertical patterns of this product family have been tailored to a cosecant-squared power taper, which produces the optimum amount of null fill and upper sidelobe suppression. This type of vertical pattern yields optimum fixed wireless coverage from close-in to fringe regions in the coverage area. Null fill insures that the fixed wireless subscribers has maximum signal to noise ratio (S/N), which translates to maximum achievable data bandwidth. Conversely deep lower nulls create low S/N for the close-in users, which reduces data bandwidth.

The high Cross-Polarization Isolations of 30dB ensures conformance to FCC rules and provides low interference from orthogonal polarized sources. This ensures protection from signals originating from other MMDS systems which share orthogonally polarized transmission in the same service area.

Antennas are supplied with either a fixed pipe mount or an optional mechanical down tilt bracket for optimizing your coverage needs from 0 to 10 degrees. Connectors are located at the bottom and are available with N- female connector.

For more details contact RFS.

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Antennas for 3.5 GHz WLL and WiMAX systems

RFS has designed several antenna solutions to cover the needs of an optimized network in the frequency band 3.4 – 3.6 GHz for Wireless Local Loop applications.

The easiest way to cover a large service area is to use antennas with an omnidirectional radiation characteristic (VOA-Series).

RFS currently offers antennas with two different gain values. The difference in gain is 3 dB. This enables a larger range to be covered but it has to be considered that the half-power beamwidth becomes narrower.

Antennas with a sector characteristic concentrate power within a specific azimuth area (SEC-Series).

RFS has designed different sectors for network optimization. Apart from the most common 90 deg. sector, 60, 120 and 180 deg sector antennas are available.

Two different gain values are available for each sector size. The adjacent half-power beamwidths are comparable to antennas for omnidirectional power distribution.

These antennas are designed for a survival windspeed of 250 km/h.

The connector for all antennas is an N-female type.

SEC-Series

VOA-Series

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Antennas for 26/28 GHz LMDS systems

The frequency ranges 24.5 - 26.5 and 27.35 - 29.5 GHz are used for Local Multipoint Distribution Systems (LMDS). These bands require slightly different antenna solutions. Only short radio links from base station to subscribers are viable due to disadvantageous atmospherical influences. But nevertheless more capacity becomes available with these frequencies.

At frequency ranges above 20 GHz it is possible to employ very small antennas on account of the short wavelengths involved. This is a feature that is popular with operators who are always looking for so-called 'invisible antennas'.

RFS has designed 90 deg sector antennas with very sharply defined slopes in the radiation pattern at the sector edge for central station applications. This was achieved by using modified horn antennas with additional shielding (SEC-series).

Antennas can be easily prepared for customized applications.

For terminal applications small RFS CompactLine Antennas can be used.

SEC-Series

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Antenna Selection Guide

FREQUENCY	MODEL NUMBER	ANTENNA TYPE	MIDBAND GAIN
3.4 – 3.6GHz	SEC35-60ANVH	60° Sector	17.4dBi
3.4 – 3.6GHz	SEC35-60ANVL	60° Sector	15.2dBi
3.4 – 3.6GHz	SEC35-60ANHH2	60° Sector	18dBi
3.4 – 3.6GHz	SEC35-90ANVH	90° Sector	15.6dBi
3.4 – 3.6GHz	SEC35-90ANVH2	90° Sector	16.7dBi
3.4 – 3.6GHz	SEC35-90ANHH2	90° Sector	16.7dBi
3.4 – 3.6GHz	SEC35-90ANVL	90° Sector	13.7dBi
3.4 – 3.6GHz	SEC35-120ANVH	120° Sector	15.3dBi
3.4 – 3.6GHz	SEC35-120ANVL	120° Sector	12.2dBi
3.4 – 3.6GHz	SEC35-180ANVH	180° Sector	13.4dBi
3.4 – 3.6GHz	SEC35-180ANVL	180° Sector	10.7dBi
3.4 – 3.6GHz	VOA35-360ANVH	Omni directional	11.1dBi
3.4 – 3.6GHz	VOA35-360ANVL	Omni directional	8.2dBi
3.4 – 3.6GHz	SU1-35AN	Parabolic	20.5dBi
3.4 – 3.6GHz	SU2-35AN	Parabolic	24.5dBi
3.4 – 3.6GHz	PAL4-35AN	Parabolic	30.8dBi
3.4 – 3.6GHz	PAL6-35AN	Parabolic	34.0dBi
3.4 – 3.6GHz	PAL8-35AN	Parabolic	36.0dBi
24.25 - 26.75GHz	SEC260-90ABH	90° Sector	16.1 dBi
24.25 - 26.75GHz	SEC260-90ABV	90° Sector	14.9dBi
27.35 - 29.5GHz	SEC280-90ABH	90° Sector	15.9dBi
27.35 - 29.5GHz	SEC280-90BBV	90° Sector	15.5dBi

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3.4 - 3.6 GHz, Antenna Input – N Female

MODEL NUMBER	HEIGHT mm (in)	3dB BEAMWIDTH Az (deg)	3dB BEAMWIDTH Elev (deg)	GAIN (dBi) Low	GAIN (dBi) Mid	GAIN (dBi) High	F/B RATIO (dB)	XPD (dB)	VSWR/ R L (dB)	WINDSPEED km/h (mph)
OMNIDIRECTIONAL ANTENNAS										
VOA35-360ANVH	880 (34.5)	360	6.5	11.1	11.2	10.7	–	20	1.50 / 14.0	250 (156)
VOA35-360ANVL	520 (20.5)	360	11.5	8.2	8.7	7.2	–	20	1.50 / 14.0	250 (156)
SECTOR ANTENNAS										
SEC35-120ANVH	815 (32.2)	120	6.3	15.1	15.3	15.6	25	20	1.50 / 14.0	250 (156)
SEC35-120ANVL	495 (19.6)	120	11.5	12.1	12.2	12.3	25	20	1.50 / 14.0	250 (156)
SEC35-180ANVH	815 (32.2)	180	6.5	13.3	13.4	13.8	25	20	1.50 / 14.0	250 (156)
SEC35-180ANVL	495 (19.6)	180	11.5	10.6	10.7	10.8	20	20	1.50 / 14.0	250 (156)
SEC35-60ANVH	815 (32.2)	60	6	17	17.4	17.6	30	20	1.50 / 14.0	250 (156)
SEC35-60ANVL	495 (19.6)	60	11	15.1	15.2	15.3	30	20	1.50 / 14.0	250 (156)
SEC35-60ANHH2	815 (32.2)	60	6.7	17.5	18	18	30	20	1.50 / 14.0	250 (156)
SEC35-90ANVH	815 (32.2)	90	6.5	15.1	15.6	15.8	30	20	1.50 / 14.0	250 (156)
SEC35-90ANVH2	815 (32.2)	90	6.2	16.2	16.7	16.7	35	20	1.50 / 14.0	250 (156)
SEC35-90ANVL	495 (19.6)	90	11.5	13.6	13.7	13.8	25	20	1.50 / 14.0	250 (156)
SEC35-90ANHH2	815 (32.2)	90	6.9	16	16.7	16.7	30	20	1.50 / 14.0	250 (156)

MODEL NUMBER	DIAMETER ft (m)	3dB BEAMWIDTH Az (deg)	3dB BEAMWIDTH Elev (deg)	GAIN (dBi) Low	GAIN (dBi) Mid	GAIN (dBi) High	F/B RATIO (dB)	XPD (dB)	VSWR/ R L (dB)	FINE ADJUSTMENT Az (deg)	FINE ADJUSTMENT Elev (deg)	WINDSPEED km/h (mph)
PARABOLIC ANTENNAS												
SU1-35AN	1 (0.3)	15.5	14	20.2	20.5	20.7	30	30	1.40 / 16.0	± 5	± 25	250 (156)
SU2-35AN	2 (0.6)	9.5	8.7	24	24.5	25	30	30	1.50 / 14.0	± 5	± 15	250 (156)
PAL4-35AN	4 (1.2)	4.9	4.9	30.4	30.8	31.2	40	28	1.20 / 21.0	± 5	± 10	200 (125)
PAL6-35BN	6 (1.8)	3.2	3.2	33.5	34	34.5	45	30	1.20 / 21.0	± 5	± 5	200 (125)
PAL8-35AN	8 (2.4)	2.4	2.4	35.5	36	36.5	47	30	1.20 / 21.0	± 5	± 5	200 (125)

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24.25 - 26.75 GHz, Antenna Input – PBR 220

MODEL NUMBER	HEIGHT mm (in)	3dB BEAMWIDTH Az (deg)	3dB BEAMWIDTH Elev (deg)	GAIN (dBI) Low	GAIN (dBI) Mid	GAIN (dBI) High	F/B RATIO (dB)	XPD (dB)	VSWR/ R L (dB)	WINDSPEED km/h (mph)
SECTOR ANTENNAS										
SEC260-90ABH	190 (7.5)	90	9	16	16.1	16.2	40	35	1.50 / 14.0	250 (156)
SEC260-90ABV	190 (7.5)	90	9	14.4	14.9	15.3	40	30	1.50 / 14.0	250 (156)

27.5 - 29.5 GHz, Antenna Input – PBR 320

MODEL NUMBER	HEIGHT mm (in)	3dB BEAMWIDTH Az (deg)	3dB BEAMWIDTH Elev (deg)	GAIN (dBI) Mid	F/B RATIO (dB)	XPD (dB)	VSWR/ R L (dB)	WINDSPEED km/h (mph)	ANTENNA INPUT
SECTOR ANTENNAS									
SEC280-90ABH	190 (7.5)	90	8.5	15.9	40	30	1.50 / 14.0	250 (156)	PBR 320
SEC280-90BBV	190 (7.5)	90	8.5	15.5	40	30	1.50 / 14.0	250 (156)	PBR 320

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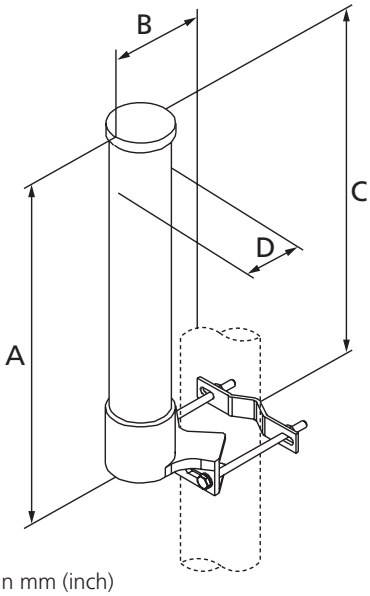
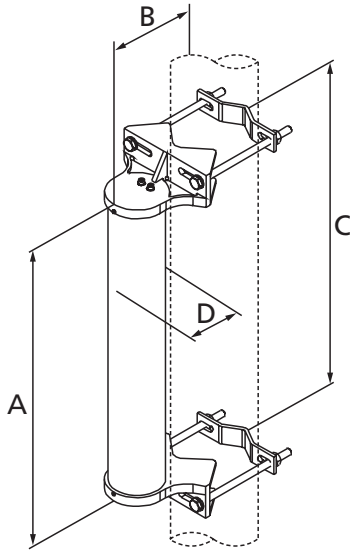
Omnidirectional Antennas
VOA35-360ANVL
VOA35-360ANVH



All dimensions in mm (inch)

ANT TYPE	A	B Ø114	C	D
VOA35-360ANVL	520 (20.5)	112(4.4)	910(36)	80(3.2)
VOA35-360ANVH	880(34.5)	112(4.4)	550(21.8)	80(3.2)

Sector Antennas
SEC-35L Series
SEC-35H Series



All dimensions in mm (inch)

ANT TYPE	A	B Ø114	C	D
SEC-35L Series	495(19.6)	134(5.3)	570(23)	80(3.2)
SEC-35H Series	815(32.2)	134(5.3)	900(35.6)	80(3.2)

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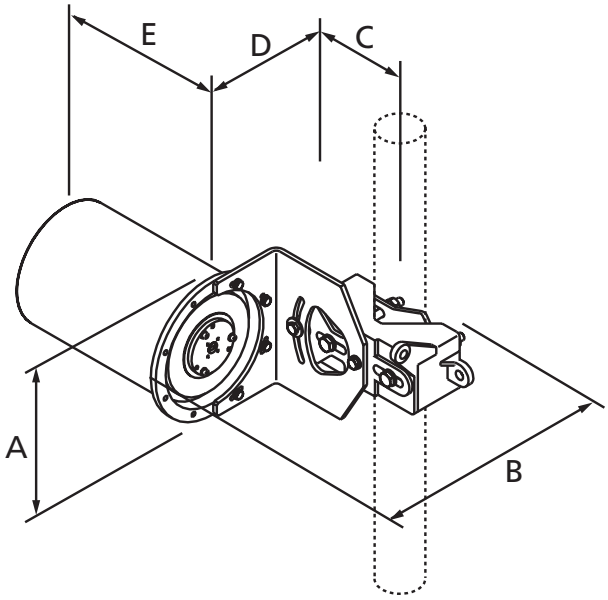
Antenna Mount Outlines

Sector Antennas
SEC260 Series
SEC280 Series



All dimensions in mm (inch)

ANT TYPE	ØA	B	C	DØ114	E
SEC260 Series	190(7.5)	370(14.6)	125(5)	204(8)	245(9.7)
SEC280 Series	190(7.5)	370(14.6)	125(5)	204(8)	245(9.7)

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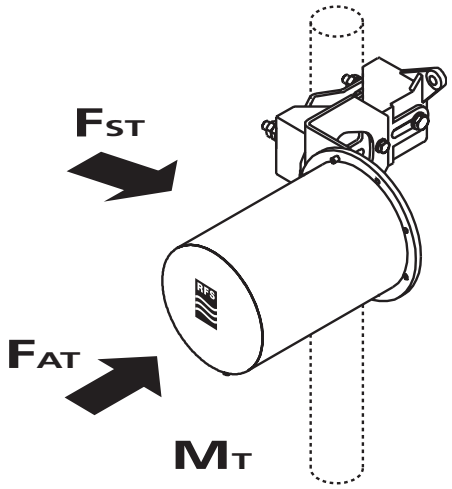
Forces and Twisting Moments Due to Wind

ANTENNA TYPE						
Forces Moments	Pipe Diameter 51mm Wind Speed		Pipe Diameter 90mm Wind Speed		Pipe Diameter 114mm Wind Speed	
	110 km/h (68mph)	200 km/h (125mph)	110 km/h (68mph)	200 km/h (125mph)	110 km/h (68mph)	200 km/h (125mph)
SEC35-60ANVL, SEC35-90ANVL, SEC35-120ANVL, SEC35-180ANVL						
FAT max N (lb)	17 (3.8)	57 (12.8)			17 (3.8)	57 (12.8)
FST max N (lb)	17 (3.8)	57 (12.8)			17 (3.8)	57 (12.8
MT max Nm (ft lb)	1.8 (1.3)	6 (4.5)			2.5 (1.9)	8.3 (6.1)
SEC35-60ANVH, SEC35-90ANVH, SEC35-120ANVH, SEC35-180ANVH, SEC35-90ANVH2, SEC35-60ANHH2, SEC35-90ANHH2						
FAT max N (lb)	28 (6.3)	93 (20.8)			28 (6.3)	93 (20.8)
FST max N (lb)	28 (6.3)	93 (20.8)			28 (6.3)	93 (20.8)
MT max Nm (ft lb)	3 (2.2)	10 (7.4)			4 (3)	14 (10.4)
SEC260-90 ABH, SEC260-90 ABV, SEC 280-90ABH, SEC280-90 BBV						
FAT max N (lb)	25 (5.6)	85(19)			25(5.6)	85 (19)
FST max N (lb)	26 (5.8)	87 (20)			26 (5.8)	87 (20)
MT max Nm (ft lb)	5 (3.7)	17 (12.7)			5 (3.7)	17 (12.7)
VOA35-360ANVL						
FAT max N (lb)	22 (4.9)	73 (16.4)			22 (4.9)	73 (16.4)
FST max N (lb)	22 (4.9)	73 (16.4)			22 (4.9)	73 (16.4)
MT max Nm (ft lb)	1.9 (1.4)	6.2 (4.6)			2.4 (1.8)	8.1 (6)
VOA35-360ANVH						
FAT max N (lb)	31 (6.9)	102 (22.8)	31 (6.9)	102 (22.8)		
FST max N (lb)	31 (6.9)	102 (22.8)	31 (6.9)	102 (22.8)		
MT max Nm (ft lb)	2.6 (1.9)	8.7 (6.4)	3.4 (2.5)	11.3 (8.4)		



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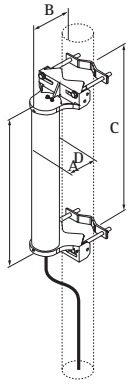
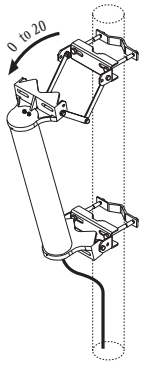
Tilt Mounts/Dividers/Couplers

Tilt Mount for 3.5 GHz sector antennas

The optional tilt mount enables the network planer to optimize the coverage within a cell by adjusting the down tilt from 0 up to -20 deg in elevation.



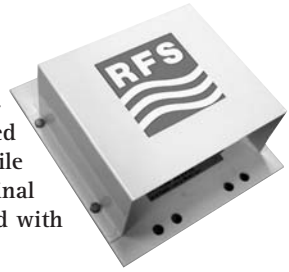
Standard Mount



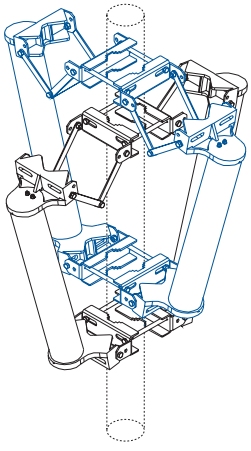
Tilt Mount (Optional)

It can be applied to all sector antennas in different array configurations. An example is shown with 4 x 90 deg sector antennas.

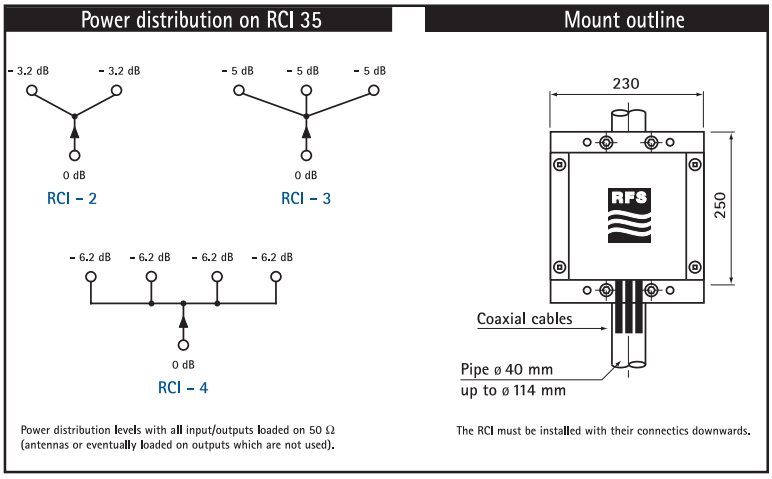
Divider/Coupler



- The RCI 35, couplers-dividers enable to feed or add up energy while complying with nominal impedance (50W) and with low insertion losses.
- Their main applications are the coupling of 2, 3, or 4 antennas with the same phase and the same amplitude. These antennas can be either different or identical.
- Main advantages:
  - Low SWR
  - Wide band
  - Low insertion losses
  - Small bulk
  - Good protection against running water
- The N-type connects enables to use coaxial cables RG 213 U or RG 214 U.
- The coaxial input/ouputs receptacles are made in N-Female connects and located on a 7.5 cm plate set back from the lower part of cover. The connections are completely protected against weather aggression.



Configuration with 4 x SEC 35-90-13 V on tilt mounts, for a 360° coverage.



3.4 – 3.7 GHz
Input/Output Flange: N Female

Frequency Range 3.4 - 3.7 GHz	Number of outputs	VSWR / R.L. [dB]	Input/Output Impedence [W]	Insertion loss [dB]	Max. Input Power [W]	Net Weight [kg]
RCI-2NN3500	2	1.2/20.8	50	< 0.3	100	2.1
RCI-3NN3500	3	1.2/20.8	50	< 0.3	100	2.1
RCI-4NN3500	4	1.2/20.8	50	< 0.3	100	2.1

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FLEXWELL® Elliptical Waveguide

Introduction

Waveguides are used for the transmission of RF energy at microwave frequencies. The traditional rigid rectangular and circular waveguide configurations have been supplemented for the last 40 years by elliptical corrugated FLEXWELL® transmission lines.

Today, rectangular waveguides are mainly used for short connecting pieces, bends and twists, and sometimes in the form of UHF rectangular waveguides as very low loss TV antenna feeders

Elliptical waveguides have helical corrugations and thus are suited for bending and winding on drums. These waveguides are recommended, due to their low attenuation and ease of handling, for microwave antenna feeders in the 2-40 GHz frequency range.

For some frequency bands elliptical waveguides have been developed with extra low attenuation, achieved by overmoding.

RADIO FREQUENCY SYSTEMS is the originator and designer of continuous seam welded corrugated transmission lines. FLEXWELL® is RFS's brand name for the highest quality, best performing, and most reliable elliptical waveguide in the industry. FLEXWELL® designs are constantly proven successful in thousands of installations throughout the world. FLEXWELL® elliptical waveguide is the ideal choice for microwave antenna systems and offers quality and reliability that you can depend on.

Wide Selection

FLEXWELL® waveguides are available in a wide selection of frequency bands throughout the 3 GHz to 40 GHz microwave bands. The waveguides are equivalent in sizes to rectangular waveguide R32 (WR284) through R320 (WR28).

Three versions of FLEXWELL® elliptical waveguide are offered: FLEXWELL® "Standard" waveguide, low VSWR "Premium" waveguide and "Overmoded waveguide". Standard and premium waveguide differ only in testing and guaranteed attainable VSWR. FLEXWELL® "standard" waveguide is recommended for low and medium capacity radio relay systems, while FLEXWELL® "premium" elliptical waveguide assemblies are recommended for high capacity radio systems. Overmoded waveguides offer exceptionally low attenuation characteristics compared with conventional waveguides. The waveguide operates above the cut-off frequency of higher order modes utilizing the lowest attenuation characteristics of the waveguide. Connectors for overmoded waveguide include filters which eliminate distortion due to mode conversion.

FLEXWELL® elliptical waveguide is constructed of pure electrolytic copper strip which uses a special RFS process to butt weld, corrugate and form into an approximate elliptical shape. The copper waveguide is covered with a black polyethylene jacket for protection during transport and installation.

Special fire retardant jacketing is available for FLEXWELL® waveguide on request. The manufacturing process of FLEXWELL® elliptical waveguide is continuous and so the waveguide can be supplied in long lengths.

Maximum Strength and Flexibility

The corrugation design achieves high transverse stability, flexibility and crush strength for superior handling and forming at an installation. The inherent strength and flexibility of FLEXWELL® waveguide allows a continuous length of waveguide to be run directly from a tower-mounted antenna to the equipment building, eliminating flange joint discontinuities and the use of bends and twists associated with a rigid rectangular waveguide system.

Less Planning and Reduced Installation Cost

FLEXWELL® elliptical waveguide feeder systems requires less planning and reduces installation costs when compared to a feeder system using a rigid rectangular waveguide. FLEXWELL® waveguide is available cut to length with factory attached connectors or in continuous lengths for termination in the field.

Excellent Electrical Performance

FLEXWELL® elliptical waveguide has set an industry standard for excellent electrical performance. Each waveguide has been carefully designed for low loss and low VSWR in specific frequency bands. For optimum system performance, there is no substitute for FLEXWELL® waveguide.

Complete Feeder System from One Reliable Source

In addition to waveguides, RFS offers a complete range of waveguide connectors, installation accessories, and high quality pressurization systems. This means no hassles, no multiple shipments and no out of sequence deliveries. With RFS, you get a total feeder system from one reliable source.

Waveguide Theory

Waveguides are used for the transmission of RF energy at microwave frequencies. The traditional rigid rectangular and circular waveguide configurations have been supplemented for the last 40 years by elliptical corrugated Flexwell® transmission lines.

Today, **rectangular waveguides** are mainly used for short connecting pieces, bends and twists, and sometimes in the form of UHF rectangular waveguides as very low loss TV antenna feeders.

Flexwell® waveguides

have helical corrugations and thus are suited for bending and winding on drums. These waveguides are recommended, due to their low attenuation and ease of handling, for microwave antenna feeders in the 2 to 40 GHz frequency range.

For some frequency bands Flexwell® transmission lines have been developed with extra low attenuation, achieved by the use of overmoding.

Radio Frequency Systems is the originator and designer of FLEXWELL® Elliptical Waveguides. It is a continuous seam welded corrugated transmission line.

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Propagation Mechanism

Whereas the propagation mechanism of coaxial cables can be explained in terms of current, voltage and characteristic impedance, we must in the case of waveguides use such terms like electromagnetic wave propagation, field configuration and wavemode.

Maxwell's equations are the basis for all considerations. If we assume a good conductivity of the waveguide walls (e.g. copper) and all fields being in a steady state condition, then the complex rms-values of the electromagnetic field are in accordance with Maxwell's equations.

$$\nabla \times \underline{\bar{E}} = -\mu \frac{\partial \bar{H}}{\partial t}$$

$$\nabla \times \bar{H} = \varepsilon \frac{\partial \bar{E}}{\partial t}$$

if $\bar{E} = \mathrm{Re}(\bar{E} \cdot e^{j\omega t})$

and $\bar{H} = \mathrm{Re}(\bar{H} \cdot e^{j\omega t})$

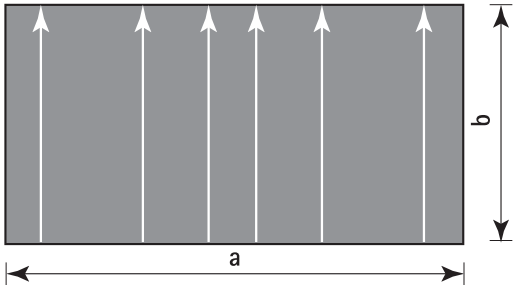
then $\nabla \times \bar{E} = -j\omega\mu\bar{H}$

$\nabla \times \bar{H} = j\omega\varepsilon\underline{\bar{E}}$

In order to obtain suitable solutions to the Maxwell equations it is useful to describe the electrical and magnetical field strength in a system of coordinates which includes the metallical boundary of the waveguide. Following, the practical application of the Maxwell equations is explained:

Cut-off frequency and cut-off wavelength

Rectangular Waveguide



Cartesian coordinates are best suited to describe the field in a rectangular waveguide. If we consider transverse electrical fields (TE_{mn} waves or H_{mn} waves), then the cut-off wavelength is as follows:

$$\lambda_c = \frac{2}{\sqrt{\left(\frac{m}{a}\right)^2 + \left(\frac{n}{b}\right)^2}}$$

The cut-off wavelength of the fundamental H_{10} wave is then:

$$\lambda_c = \frac{2}{\sqrt{\left(\frac{1}{a}\right)^2 + \left(\frac{0}{b}\right)^2}} = 2 \bullet a$$

The cut-off frequency f_c above which energy transmission is possible follows to be:

$$f_c = \frac{c}{\lambda_c} = \frac{c}{2a} \quad \text{with c = velocity of light} = 299.792 \cdot 10^6 \text{ m/sec}$$

$$f_c\,(\text{GHz}) = \frac{299.792}{2a\,(\text{mm})}$$

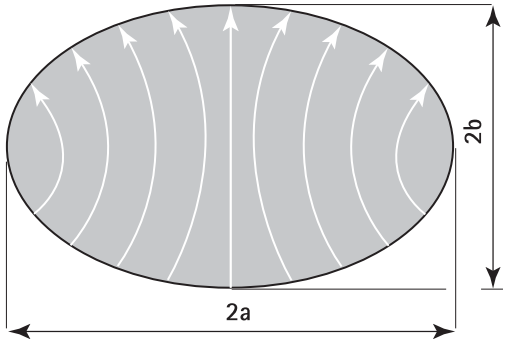
Example: rectangular waveguide size R 70 with:

a = 34.849 mm:

$$f_c = \frac{299.792}{2 \times 34{,}849}(\text{GHz}) = 4.301 \text{ GHz}$$

Elliptical Waveguide

E field lines of H_{c11} mode



The cut-off wavelengths of the various modes that can propagate in an elliptical waveguide are derived from the parametric nulls of the modified Mathieu's functions (first type) for the E waves and their differential quotient for the H waves.

In an elliptical waveguide the H waves can be either cosines elliptical $H_{cm,n}$ waves, or sine elliptical $H_{sm,n}$ waves.

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Propagation Mechanism

The fundamental wavemode is the H_{c11} wave and its cut-off wavelength is as follows:

$$\lambda_{c_{H_{c11}}} = \frac{\pi a \sqrt{1 - \frac{b^2}{a^2}}}{\sqrt{q_{c11}}}$$

In this equation, the expression $\sqrt{1 - \frac{b^2}{a^2}}$ is the eccentricity e and q_{c11} is the first parametric null of the modified cosine elliptical Mathieu function of first type and first order.

Once cut-off frequency is known, then for any waveguide the important terms: group velocity, phase velocity and wavelength can be calculated as follows:

$$V_{gr} = c\sqrt{1 - \left(\frac{\lambda}{\lambda_c}\right)^2}$$

$$V_{ph} = \frac{c}{\sqrt{1 - \left(\frac{\lambda}{\lambda_c}\right)^2}}$$

$$\lambda_H = \frac{\lambda}{\sqrt{1 - \left(\frac{\lambda}{\lambda_c}\right)^2}}$$

With v_{gr} - group velocity
V_{ph} - phase velocity
λ_H - wavelength in waveguide
λ - wavelength in free space
f - frequency

Frequency Range of Operation

a) Rectangular waveguide

Rectangular waveguides are used in the following frequency range of operation:

$$1.25 \cdot f_c \leq f \leq 1.9 \cdot f_c$$

The upper frequency limit 1.9 fc is due to the fact that above that limit other wavemodes can exist. For the very common axis ratio of b over a = 0.5 the two wavemodes H_{01} and H_{20} can exist from $2.f_{cH_{10}}$ and onwards.

Taking a safety factor of 0.1 f_c gives the upper frequency limit of $1.9f_c$ for the fundamental wavemode.

b) Elliptical waveguide

Other than the H_{c11} fundamental wavemode, the next possible modes are the H_{s11} or H_{c21} mode, dependent upon the axis ratio b over a.

For Flexwell® transmission lines with an axis ratio b over a = 0.52 (Which is the case for most types) the operating frequency range is as follows:

$$1.48 \cdot f_c \leq f \leq 1.8 \cdot f_c$$

c) Overmoded elliptical waveguide

The energy is transmitted by the fundamental H_{c11} mode. For use of the physical minimum of attenuation, the operating frequency range has to be above the cutoff frequencies of some higher modes. For example Flexwell® waveguide E015;

$f_c = 5.21$ GHz:
12.7 GHz < f < 15.35 GHz
$2.43 \cdot f_c < f < 2.95 \cdot f_c$

In case of discontinuities the higher modes H_{s11}, H_{c21}, E_{c01} and E_{c11} are excited and a part of energy is converted from fundamental to higher modes. This effect results in attenuation ripple versus frequency. Group velocity of higher modes is low compared to fundamental mode, so mode reconversion to the dominant mode results in group delay distortion. The reconverted mode level is minimized by mode filters which are incorporated in the terminations. To minimize the effect of unwanted trapped modes, a minimum length is recommended.

Noise Contribution

In order to achieve the lowest possible noise contribution of the waveguide system it is necessary to fulfill the following requirements:

1 Low reflection factor (= good longitudinal uniformity)
2 Good mechanical and electrical contact

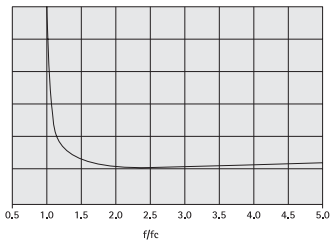
Requirement 1 is fulfilled by highly precise manufacturing and checking of waveguides and accessories, whereas requirement 2 is guaranteed by construction and handling measures, such as contact pressure, flanging with special tools, silver-plating of the contact surfaces, and avoidance of the use of tuning-screws.

Attenuation

The attenuation of waveguides is in principle like shown in the diagram. It is obvious, that a waveguide is a highpass. Starting at cutoff frequency with infinite attenuation the curve decreases rapidly with rising frequency. The increase at higher frequencies is caused by the skin effect.

For corrugated elliptical tubes the attenuation is described by numerical methods.

The attenuation is influenced by the dimensions, the shape, the material and the temperature. As the specific electrical resistance of copper increases with rising temperature, the attenuation values rise by 2 % for every 10° increased temperature.



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Theory of Overmoded Waveguide

Waveguides are preferred as feeders for microwave antennas due to their low attenuation. The laws of physics however set a limit to this performance depending on the material used and the mechanical structure of the waveguide. Typical attenuation values vary between 1–2 dB/100 m at 3 GHz and 60–110 dB/100 m at 40 GHz.

Flexwell® elliptical transmission lines are, electrically, comparable to rectangular waveguides. The mode of propagation is the TE_{C11} (H_{C11}) in the elliptical cross-section, which is very similar to the TE_{10} (H_{10}) in the rectangular cross-section. Flexwell® transmission lines have substantial mechanical advantages. The manufacturing process is continuous, so long lengths can be produced. As the waveguide is flexible due to its corrugations, installation is easy and straight forward almost as known from the as well corrugated 'usual' RF coaxial cables. Because of the long sections flanges are only at the ends, so the number of typical intermodulation sources is kept to a minimum.

For some RF link systems, however, even the low attenuation of elliptical waveguides may be too high, either due to low transmitter power being available, or because tower load precludes the use of large dishes with their concomitant high windloads. A third application is the satellite uplink, where very high power transmission is necessary. This power, provided by expensive amplifiers, is in case of single-mode waveguides mostly lost by the attenuation. Thereby e.g. the single-mode waveguide E150 would heat up to unacceptable 190°C at a power of 4 kW, whereas the overmoded waveguide EO 15 at the same condition remains 65°C cold.

In these situations, Overmoded Flexwell® Waveguides are recommended. Signal transmission is carried out by the fundamental TE_{C11} (H_{C11}) mode, but at frequencies well above the cutoff frequencies of higher modes. Consequently, additional unwanted higher order modes are excited. Although this leads to distortions of the transmitted signal, these effects are kept below the technically allowed limits.

Main Influencing Modes

The attenuation curve versus frequency is in principle the same for all possible modes. Near cutoff frequency the attenuation is infinite, with increasing frequency the curve has a minimum. From this consideration it is obvious, that modes with low cutoff frequency will provide the highest contribution to the signal distortions. Modes with cutoff frequency near the operating frequency band will be much more attenuated than the fundamental mode.

The unwanted modes are mainly excited at discontinuities. The biggest change of the cross-section is the transition from single-mode rectangular to overmoded elliptical waveguide.

The higher order modes are trapped in the elliptical waveguide between the connectors.So the waveguide performs as a resonator.

This results in ripples of the signal over frequency, both in terms of amplitude and group delay. We have observed that group delay distortion has much lower impact on a link system than amplitude ripples. Therefore only the latter has to be observed.

To get low signal distortion, the conversion and reconversion between higher order modes and fundamental mode has to be minimized.

This is achieved by special connectors made by electroforming. The applied NC technology allows the production of mendrals with prescribed mathematical functions. Mode filters additionally minimize the signal distortion.

Length of Waveguide and Modulation Techniques

The amplitude ripples are nonlinear distortions. They decrease with increasing waveguide length. The effects are the same as known from filters after tuning: they do not change after installation. That is why correction by an equalizer is possible.

OVERMODED WAVEGUIDE	FREQUENCY RANGE, GHz	MIN. RECOMMENDED LENGTH, M
EO11	10.7 - 11.7	35
EO15	12.7 - 15.35	20
EO19	17.3 - 19.7	15
EO22	21.2 - 23.6	10
EO38	37.0 - 39.5	5

For analogue modulation techniques a slight increase of harmonic distortion will be observed. Technically there is no limitation for the use of Overmoded Flexwell® transmission lines when considering the recommended minimum length.

For digital modulation techniques we have to respect certain limits for the ripples. In general, the simpler the technique is, the higher the allowed ripples can be.

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Modulation

The simplest form of digital modulation is the conversion of the binaries L and H to two states, either in amplitude or in phase. This is the most uneconomical use of existing frequency bandwidth.

In consequence more complex systems with 2m states are used. The necessary frequency bandwidth is divided by m at same bit rate.

Every discrete point in an IQ diagram is described by amplitude A(t) and phase f(t). A well defined combination of amplitude and phase represents one symbol. In case of distortions the received symbol may be wrong.

The permissible amplitude ripple can be estimated from Fig. 2.

However, the waveguide is not the only source of distortions in a link. We have calculated the possible application of digital modulation schemes: we assume that the waveguide contributes 1/3 (10 dB) of the totally allowed distortion. The minimum length can be read directly from Fig. 3 for the specific modulations.

The S/I level (signal to interference) is calculated from the amplitude ripple as:

$$S/I = -20 \cdot \log \frac{10^{\Delta\alpha/20} - 1}{10^{\Delta\alpha/20} + 1}$$

For 256-QAM we end up in a minimum length of 65 m for EO15 (f = 12.7...15.35 GHz) and for 64-QAM the length can be reduced to 20 m.

Up to now Overmoded Flexwell® transmission lines are installed in many terrestrial radio links and different satellite uplinks

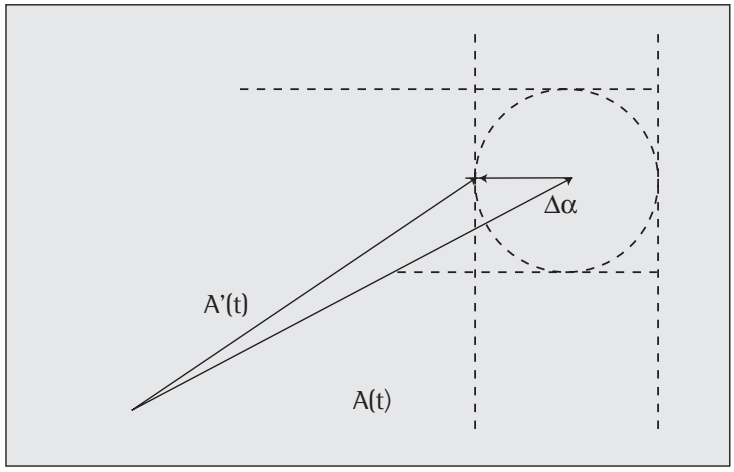
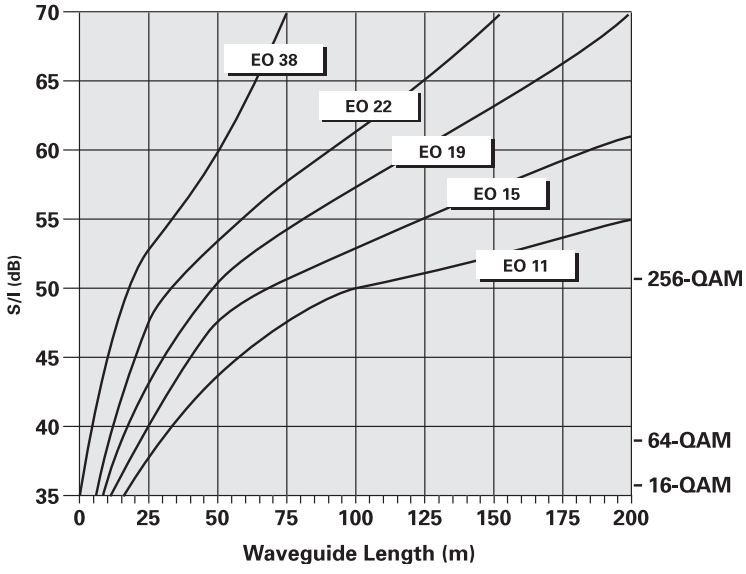


Fig. 2 Graph for the max. amplitude ripple Δα

Permissible Amplitude Ripple

	4-PSK	16-QAM	64-QAM	256-QAM
$\Delta\alpha_{max}$	3,0 dB	1,41 dB	0,62 dB	0,14 dB



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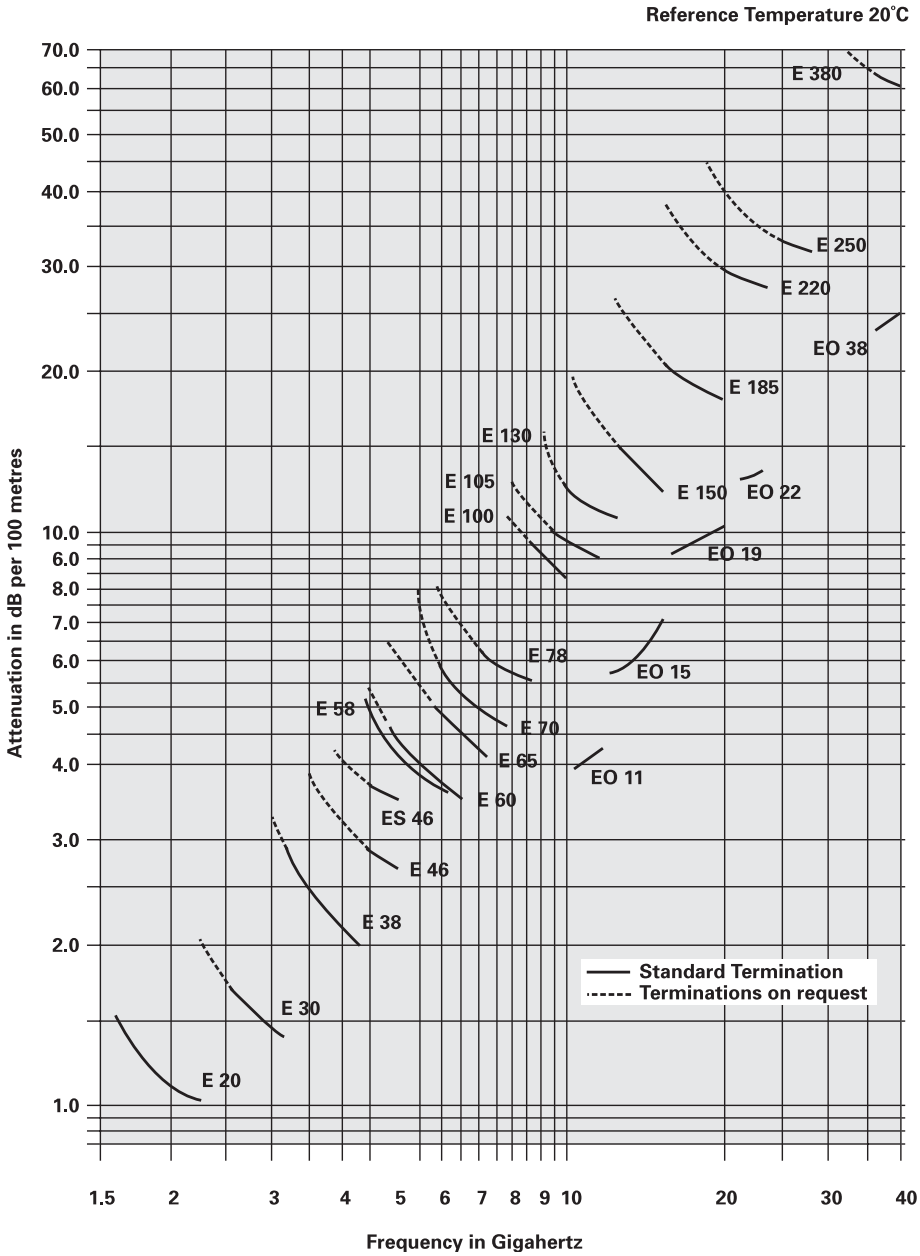
Waveguide Attenuation Chart



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FLEXWELL® Elliptical Waveguide

Product Overview, Mechanical

WAVEGUIDE TYPE	WEIGHT kg/m (lb/ft)	AIR VOLUME l/m (l/ft)	BENDING RADIUS W/O REBENDING mm (inch) E-PLANE	BENDING RADIUS W/O REBENDING mm (inch) H-PLANE	BENDING RADIUS WITH REBENDING mm (inch) E-PLANE	BENDING RADIUS WITH REBENDING mm (inch) H-PLANE	MAX. PULLING LENGTH PER HOISTING GRIP m (ft)	STANDARD HANGER SPACING m (ft)
E30	3.0 (2.01)	4.25 (1.3)	550 (21.8)	1500 (60)	700 (27.6)	2000 (79)	100 (305)	2 (6.6)
E38/EP38	2.1 (1.4)	2.34 (0.71)	300 (11.9)	800 (31.6)	400 (15.8)	1000 (39.5)	100 (305)	1.2 (4)
E46/EP46	1.5 (1.0)	1.68 (0.51)	280 (11.1)	700 (27.6)	380 (15)	850 (33.6)	100 (305)	1.2 (4)
ES46/ESP46	1.6 (1.1)	1.58 (0.48)	150 (5.9)	500 (19.8)	150 (5.9)	600 (23.7)	100 (305)	1.2 (4)
EP58	1.1 (0.73)	1.08 (0.33)	250 (9.9)	600 (23.7)	350 (13.8)	800 (31.6)	100 (305)	0.9 (3)
E60/EP60	1.1 (0.73)	1.02 (0.31)	200 (7.9)	550 (21.8)	300 (11.9)	800 (31.6)	100 (305)	0.9 (3)
E65/EP65	1.0 (0.67)	0.83 (0.25)	200 (7.9)	500 (19.8)	300 (11.9)	600 (23.7)	100 (305)	0.9 (3)
EP70	0.9 (0.60)	0.72 (0.22)	200 (7.9)	500 (19.8)	300 (11.9)	600 (23.7)	100 (305)	0.9 (3)
E78/EP78	0.7 (0.47)	0.60 (0.18)	200 (7.9)	500 (19.8)	250 (9.9)	600 (23.7)	100 (305)	0.9 (3)
EP100	0.6 (0.40)	0.38 (0.116)	150 (5.9)	350 (13.9)	200 (7.9)	400 (15.8)	100 (305)	0.6 (2)
E105/EP105	0.6 (0.40)	0.31 (0.094)	130 (5.1)	280 (11.0)	150 (5.9)	300 (11.9)	100 (305)	0.6 (2)
E130/EP130	0.4 (0.27)	0.24 (0.073)	130 (5.1)	280 (11.0)	150 (5.9)	300 (11.9)	100 (305)	0.9 (3)
E150/EP150	0.4 (0.27)	0.18 (0.055)	130 (5.1)	280 (11.0)	150 (5.9)	300 (11.9)	100 (305)	0.6 (2)
E185/EP185	0.3 (0.20)	0.11 (0.034)	130 (5.1)	280 (11.0)	150 (5.9)	300 (11.9)	100 (305)	0.6 (2)
E220	0.3 (0.20)	0.08 (0.024)	110 (4.3)	230 (9.1)	130 (5.1)	250 (9.9)	100 (305)	0.6 (2)
E250	0.2 (0.13)	0.06 (0.018)	90 (3.6)	150 (5.9)	100 (3.9)	180 (7.1)	50 (164)	0.5 (1.6)
E300	0.15 (0.1)	0.037 (0.011)	90 (3.6)	150 (5.9)	100 (3.9)	180 (7.1)	50 (164)	0.5 (1.6)
E380	0.1 (0.07)	0.03 (0.009)	80 (3.1)	140 (5.5)	90 (3.6)	150 (5.9)	50 (164)	0.3 (1.0)
EO11	1.1 (0.73)	0.89 (0.27)	400 (15.9)	900 (35.6)	NA	NA	100 (305)	0.9 (3)
EO15	0.9 (0.60)	0.58 (0.18)	300 (11.9)	600 (23.7)	NA	NA	100 (305)	0.9 (3)
EO19	0.6 (0.40)	0.31 (0.094)	200 (7.9)	400 (15.9)	NA	NA	100 (305)	0.6 (2)
EO22	0.4 (0.27)	0.24 (0.073)	200 (7.9)	400 (15.9)	NA	NA	100 (305)	0.6 (2)
EO38	0.2 (0.13)	0.07 (0.02)	150 (0.9)	300 (11.9)	NA	NA	100 (305)	0.6 (2)

GENERAL FEATURES:		
Waveguide structure:		Elliptical corrugated copper tube
Jacket,	standard:	J (Polyethylene black)
	optional:	JFN (fire retardant)

RECOMMENDED TEMPERATURE RANGE	
operation:	-50°C to +85°C
storage:	-70°C to +85°C
installation J-jacket:	-40°C to +60°C
installation JFN-jacket:	-25°C to +85°C

MAXIMUM PRESSURE	
operation:	0.3 bar
test:	0.5 bar

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FLEXWELL® Elliptical Waveguide

Product Overview, Electrical

WVG. TYPE	OPER. FREQ. GHz	CUT OFF FREQ. GHz	MAX. VSWR/ RETURN LOSS, dB	ATTENUATION dB/100m (ft) IN THE OPERATING FREQUENCY BAND			AVG. POWER kW	GROUP VELOCITY %c	GROUP DELAY ns/100m (ft)
				LOW BAND	MID BAND	HIGH BAND	MID BAND	MID BAND	MID BAND
E30	2.7 - 3.1	1.8	1.128/24.4	1.61 (0.49)	1.49 (0.45)	1.4 (0.43)	30.37	78.4	425.4 (129.7)
E38	3.6 - 4.2	2.4	1.15/23.1	2.37 (0.72)	2.20 (0.67)	2.08 (0.63)	16.27	78.8	423.2 (129.0)
EP38	3.6 - 4.2	2.4	1.083/28.0	2.37 (0.72)	2.20 (0.67)	2.08 (0.63)	16.27	78.8	423.2 (129.0)
E46	4.4 - 5.0	2.88	1.15/23.1	2.92 (0.89)	2.80 (0.85)	2.73 (0.83)	10.93	79.0	422.1 (128.7)
EP46	4.4 - 5.0	2.88	1.083/28.0	2.92 (0.89)	2.80 (0.85)	2.73 (0.83)	10.93	79.0	422.1 (128.7)
ES46	4.4 - 5.0	3.08	1.15/23.1	3.69 (1.12)	3.55 (1.08)	3.49 (1.06)	8.39	75.5	441.6 (134.6)
ESP46	4.4 - 5.0	3.08	1.073/29.1	3.69 (1.12)	3.55 (1.08)	3.49 (1.06)	8.39	75.5	441.6 (134.6)
EP58	4.4 - 6.2	3.56	1.083/28.0	5.10 (1.55)	3.96 (1.21)	3.60 (1.10)	6.54	74.1	450.3 (137.2)
E60	5.6 - 6.425	3.65	1.15/23.1	4.15 (1.27)	3.95 (1.20)	3.80 (1.16)	7.24	79.4	420.3 (128.1)
EP60	5.6 - 6.425	3.65	1.062/30.5	4.15 (1.27)	3.95 (1.20)	3.80 (1.16)	7.24	79.4	420.3 (128.1)
E65	5.9 - 7.125	4.01	1.15/23.1	4.9 (1.50)	4.5 (1.37)	4.25 (1.30)	5.26	78.7	423.8 (129.2)
EP65	5.9 - 7.125	4.01	1.062/30.5	4.9 (1.50)	4.5 (1.37)	4.25 (1.30)	5.26	78.7	423.8 (129.2)
EP70	6.4 - 7.75	4.34	1.062/30.5	5.5 (1.68)	5.0 (1.52)	4.8 (1.46)	4.65	79.1	421.5 (128.5)
E78	7.1 - 8.5	4.72	1.15/23.1	6.2 (1.89)	5.8 (1.77)	5.6 (1.71)	3.67	79.6	419.0 (127.7)
EP78	7.1 - 8.5	4.72	1.062/30.5	6.2 (1.89)	5.8 (1.77)	5.6 (1.71)	3.67	79.6	419.0 (127.7)
EP100	9.0 - 10.0	6.43	1.105/26.0	9.5 (2.90)	8.9 (2.71)	8.4 (2.56)	1.91	73.6	453.1 (138.1)
E105	10.0 - 11.7	6.49	1.15/23.1	9.6 (2.92)	9.2 (2.79)	8.9 (2.71)	1.77	79.9	417.3 (127.2)
EP105	10.0 - 11.7	6.49	1.062/30.5	9.6 (2.92)	9.2 (2.79)	8.9 (2.71)	1.77	79.9	417.3 (127.2)
E130	10.7 - 13.25	7.43	1.15/23.1	12.6 (3.84)	11.5 (3.52)	11.1 (3.39)	1.22	78.5	424.8 (129.5)
EP130	10.7 - 13.25	7.43	1.083/28.0	12.6 (3.84)	11.5 (3.52)	11.1 (3.39)	1.22	78.5	424.8 (129.5)
E150	13.4 - 15.35	8.64	1.15/23.1	14.6 (4.44)	14.0 (4.26)	13.7 (4.16)	0.88	79.7	418.6 (127.6)
EP150	13.4 - 15.35	8.64	1.083/28.0	14.6 (4.44)	14.0 (4.26)	13.7 (4.16)	0.88	79.7	418.6 (127.6)
E185	17.3 - 19.7	11.06	1.15/23.1	20.3 (6.17)	19.4 (5.92)	18.9 (5.75)	0.51	80.2	416.1 (126.8)
EP185	17.3 - 19.7	11.06	1.083/28.0	20.3 (6.17)	19.4 (5.92)	18.9 (5.75)	0.51	80.2	416.1 (126.8)
E220	21.2 - 23.6	13.36	1.105/26.0	28.8 (8.77)	28.3 (8.63)	28.1 (8.56)	0.31	80.3	415.6 (126.7)
E250	24.25 - 26.5	15.06	1.15/23.1	33.2 (10.1)	32.4 (9.88)	32.0 (9.75)	0.31	80.5	414.2 (126.3)
E300	27.5 - 33.4	19.05	1.15/23.1	50.0 (15.2)	46.0 (14.0)	44.4 (13.5)	0.14	78.1	427.1 (130.2)
E380	37.0 - 39.5	23.45	1.15/23.1	61.3 (18.7)	60.7 (18.5)	60.0 (18.3)	0.09	79.1	421.9 (128.6)

WVG. TYPE	OPER. FREQ. GHz	MAX. VSWR/ RETURN LOSS, dB	ATTENUATION dB/100m (ft) IN THE OPERATING FREQUENCY BAND			GROUP VELOCITY %c	GROUP DELAY ns/100m (ft)
			LOW BAND	MID BAND	HIGH BAND	MID BAND	MID BAND
EO11	10.7 - 11.7	1.073/29.1	3.95 (1.20)	4.10 (1.25)	4.25 (1.30)	93.2	358.0 (109.1)
EO15	12.7 - 15.35	1.083/28.0	5.80 (1.77)	6.09 (1.86)	6.93 (2.11)	92.6	360.4 (109.8)
EO19	17.7 - 19.7	1.083/28.0	9.24 (2.82)	9.52 (2.90)	9.97 (3.04)	92.5	360.5 (109.9)
EO22	21.2 - 23.6	1.105/26.0	12.5 (3.81)	13.0 (3.97)	13.7 (4.18)	93.4	357.2 (108.9)
EO38	37.0 - 39.5	1.15/23.1	24.5 (7.46)	24.7 (7.52)	25.0 (7.61)	93.1	358.4 (109.2)

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Packing information

FLEXWELL® transmission lines are shipped coiled in crates or cartons, or on non-returnable or returnable deposit type wooden reels. Although waveguide on reels is protected by wooden lagging it should be handled carefully. Reels must rest face down on their flanges, not layed on their side, and never dropped during handling. If fork lifts are used, the forks must be long enough to engage both flanges to avoid waveguide damage.

When waveguide is ordered with factory installed terminations the antenna end is wound on the outside of the coil. After carefully unlagging the reel, inspect the waveguide carefully for any signs of shipping damage.

Please ask RFS for final packing dimensions.

Drums packed on pallets with reduced protection

Short lengths can be shipped in crates or cartons. This package is available for E70 and smaller waveguide sizes.

Drums packed on pallets protected by wooden lagging

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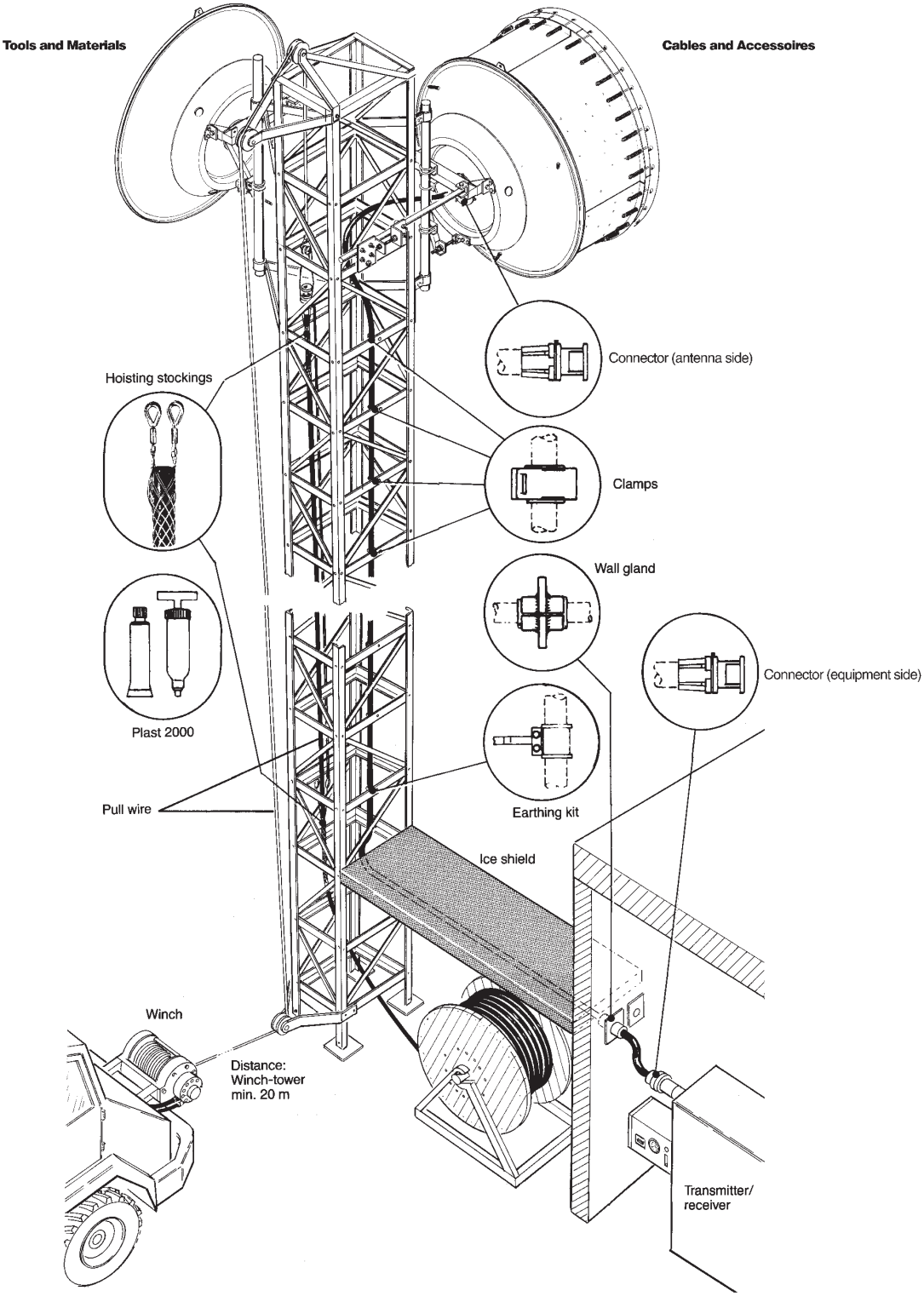
Typical Installation Approach

RFS offers all necessary tools, materials and accessories to provide a complete transmission line and antenna system.

A typical installation approach is shown below.



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FLEXWELL® Elliptical Waveguide Connectors

Introduction

RFS supplies a complete line of high quality, premium performance elliptical waveguide connectors. These connectors provide a low VSWR transition to a rectangular waveguide interface. RFS waveguide connectors are machined with a multi-step transition from elliptical to rectangular cross-section. This multi-step transition results in a compact design with superior electrical performance. Connectors are available with either EIA or IEC flange interfaces.

Sealing Method

RFS offers two types of connectors for sealing purposes.

Plast 2000 Sealing

Plast 2000 has a very good adhesion to the metallic parts of the connector and to the waveguide. The curing process depends on the humidity and temperature of the air. Under normal conditions, sealing against moisture is accomplished in a very short time. Plast 2000, to be purchased separately, is supplied in tubes of 20ccm and 70ccm. The 20ccm tube can be inserted directly into connector body. An injection gun is recommended when installation is carried on a large number of connectors. These connectors have been carefully designed for excellent VSWR performance without the use of any tuning screws. Model numbers on these connectors end with a letter “P” to designate the use of Plast 2000 sealing.

Exception all connectors with gasket and shrinking sleeves for E250, E300 and E380 series as well as all overmoded waveguides.

Gasket Sealing

In this design, the connector is sealed between the backnut and the waveguide with a conical shaped threaded gasket. The threaded gasket is held in place with an internal pressure plate to create a gas tight waveguide assembly that will not leak even if the waveguide is flexed near the connector. A seal between the connector backnut and the waveguide transition is achieved with a specially shaped flat gasket that encompasses the waveguide flare and connector bolt holes. Careful dimensional tolerances assure a safe contact between the flare and the waveguide transition, which includes a 1/8” NPT female pressure inlet and plug. A heat shrink boot is supplied for application over the elliptical waveguide and the connector backnut to provide strain relief and additional weatherproofing. Model number on these connectors end with a letter “G” for designation of gasket sealing.

Quick and Easy to Install

FLEXWELL® waveguide connectors are designed for quick and easy assembly in the field using either standard hand tools or flanging tools depending on connector type.

Connector Types

FLEXWELL® elliptical waveguide connectors are available in standard (non-tuneable), tuneable pre-tuned and fixed tuned versions. Fixed tuned connectors are available only with pressurized flanges (P-type). U-type flanges can be provided by the use of a shim.

FLEXWELL® connectors are offered with interface to EIA and IEC standard waveguide flanges.

Waveguide Splices

Electrically compensated elliptical waveguide splices, which do not degrade system performance, are available for field repairs of damaged waveguide runs. The construction and assembly of the waveguide splice is similar to the waveguide connector design.

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FLEXWELL® Elliptical Waveguide Connectors

Connector Overview

Standard

WAVEGUIDE TYPE	FREQUENCY BAND, GHz	FLANGE IEC-TYPE	FLANGE EIA-TYPE
E30	2.3 - 2.5		7/8 EIA
	2.5 - 2.7		7/8 EIA
	2.7 - 3.1	PDR 32	
E38	3.6 - 4.2	PDR 40	CPR229G
E46	4.4 - 5.0	PDR 48	
ES46	4.4 - 5.0	PDR 48	UG148/149/U
	4.4 - 5.0		CPR187G
E60	5.6 - 6.425	PDR 70	
	5.725 - 6.425		UG343/344/U
	5.925 - 6.425		UG343/344/U
	5.925 - 6.425		CPR137G
E65	5.9 - 7.15	PDR 70	
	6.4 - 7.15	PDR 70	
	5.725-6.875		CPR137G
	6.425 - 7.125		UG343/344/U
	6.425 - 7.125		CPR137G
E78	7.1 - 8.5	PDR 70	
	7.1 - 7.8	PDR 84	CPR137G
	7.75 - 8.5	PDR 84	
	7.1 - 8.5	PBR 84	
	7.125 - 8.5		CPR112G
	7.1 - 7.8	PBR 84	
	7.75 - 8.5	PBR 84	
E105	10.0 - 11.7	PDR 100	
	10.5 - 11.7		CPR90G
E130	10.7 - 12.75	PDR 120	
	11.7 - 13.25		WR75 Choke/Cover
	12.2 - 13.25	PDR 120	
	12.2 - 13.25	PBR 120	
E150	13.4 - 14.5	PBR 120	WR75 Contact
	13.4 - 14.5		WR75 Choke/Cover
	14.0 - 15.35	PDR 140	
	14.0 - 15.35	PBR 140	
E185	17.3 - 19.7	PDR 180	
	17.7 - 19.7	PBR 220	UG595/596/U
E220	21.2 - 23.6	PBR 220	
E250	24.25 - 26.5	PBR 220	
	24.25 - 26.5	PBR 260	
E300	27.5 - 33.4	PBR 320	
E380	37.0 - 39.5	PBR 320	

Overmoded

WAVEGUIDE TYPE	FREQUENCY BAND, GHz	FLANGE IEC-TYPE
EO11	10.7 - 11.7	PDR 100
EO15	12.75 - 14.5	PDR 120
	14.0 - 15.35	PDR 140
EO19	17.7 - 19.7	PBR 220
EO22	21.2 - 23.6	PBR 220
EO38	37.0 - 39.5	PBR 320

Premium

WAVEGUIDE TYPE	FREQUENCY BAND, GHz	FLANGE IEC-TYPE
EP38	3.6 - 4.2	PDR 40
EP46	4.4 - 5.0	PDR 48
ESP46	4.4 - 5.0	PDR 48
EP58	4.4 - 6.2	PDR 48
EP60	5.6 - 6.425	PDR 70
EP65	5.9 - 7.15	PDR 70
	6.4 - 7.15	PDR 70
EP70	6.4 - 7.8	PDR 70
EP78	7.1 - 8.5	PDR 70
	7.1 - 7.8	PDR 84
	7.75 - 8.5	PDR 84
	7.1 - 8.5	PBR 84
	7.1 - 7.8	PBR 84
	7.75 - 8.5	PBR 84
EP100	9.0 - 10.0	PBR 100
EP105	10.0 - 11.7	PDR 100
EP130	10.7 - 12.75	PDR 120
	12.2 - 13.25	PDR 120
	12.2 - 13.25	PBR 120
EP150	13.4 - 14.5	PBR 120
	14.0 - 15.35	PDR 140
	14.0 - 15.35	PBR 140
EP185	17.3 - 19.7	PDR 180
	17.7 - 19.7	PBR 220

PLAST 2000 CONSUMPTION	
FLEXWELL	Minimum Capacity in cm³
E30	120
E38	100
E46	70
ES46	70
EP58	60
E60	50
E65	50
EP70	50
E78	50
EP100	20
E105	20
E130	20
E150	20
E185	20
E220	20

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Grounding Kits

Radio Frequency Systems offers three types of Grounding kits.

- Pre-formed Grounding Kit
- Standard (non Pre-formed) Grounding Kit
- High Speed Grounding Kit

Pre-formed Grounding Kit, GKIT

The grounding kit with pre-formed copper strap facilitates installation with a pre-formed copper strap that eliminates the need for a coiling tool. This kit has been verified by independent labs to protect coax from the damaging effects of lightning current in excess of 200kA. One 3/8" two-hole ground lug and all bus bar attachment hardware are also included along with the required mastic and electrical tape for weatherproofing. 1/pkg

Standard (Non Pre-formed) Grounding Kit, GKIT-ST

Grounding Kits are used to ground the waveguide to the steel construction of the tower. The contact parts are made of solid copper to guarantee high current conduction. The grounding kits include a copper strip already for simple installation. A watertight installation is ensured. The kits are available for waveguides E30 to E380.

High Speed Grounding Kit, GKIT-HS

For different waveguides sizes high speed grounding kits are available too. The high speed grounding kit is pre-assembled. The grounding body consists of stainless steel, which is vulcanized with Ethylene-Propylene rubber. The contact surface is a tinned copper mesh. The standard grounding wire is pre-assembled with stainless steel screws. Safety washers prevent the screws from loosening. A simple but helpful detail, especially when mounting the grounding kit on the top of a tower.

Hangers

Radio Frequency Systems offers three types of hangers:

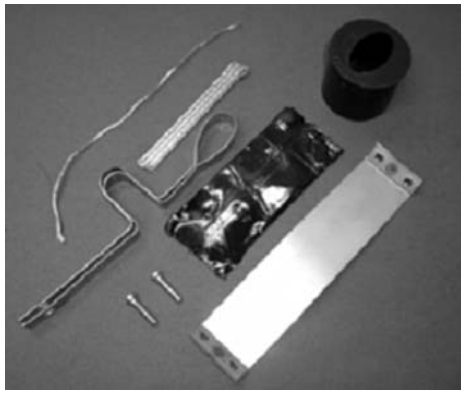
- Standard (non insulated) hanger
- Universal Clamps
- RSB clips

Standard Hanger Kit (Non-Insulated), CLAMP

Stainless steel hangers are available to fix elliptical waveguides to tower. Hanger spacing is depending on waveguide size. Hanger may be attached to angle adapters, tower standoffs, member mounting holes with up to 3/8"-16 hardware or to round member adapters through slot in the hanger. 10/pkg

Universal Clamps, CLAMP-R

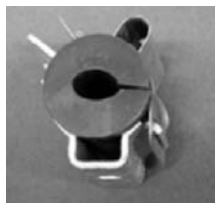
The universal clamp can be used for the installation of FLEXWELL elliptical waveguides for proper and secure

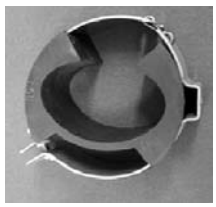


Standard Grounding Kit

High Speed Grounding Kit

Standard Hanger Kit (Non-Insulated)





Universal Clamps

tension. The clamps can be used as universal device for mounting of waveguide on any profile. Hot galvanized steel clamps are available for E30 to E220 waveguides.

All clamps are provided with a rubber clamp lining to secure a proper installation and to avoid any damage of the waveguide. The clamps can be fixed on different profiles. Suitable fixing hardware is available. 10/pkg

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RSB Clip

The RSB clip is designed for installation of FLEXWELL elliptical waveguide types E105 to E380 and overmoded waveguide types E022 and E038. The clip is a universal clamp device which can be used in many mounting configurations. The clip is manufactured from stainless steel and is resistant against most environmental conditions. 10/pkg.

All RSB clips are provided with a rubber clamp lining for proper installation. 10/pkg.

A 'Rucksack' option is available for small waveguide sizes E220 to E380 and E038. It provides an optimal use of existing space.

Angle Member Adapter Kit

Fastens hangers to tower angle members without drilling. Angle adapter includes a tower member set screw and a 3/8" hanger mounting screw. The hanger mounting screw may be located in either of two mounting holes. 10/pkg.

Installation tools

Hoisting Grips

Hoisting grips are used to distribute the force introduced into a waveguide when hoisted using a winch which is usually the case when waveguide size and/or length lead to an overall weight that cannot be operate manually. They consists of a wire mesh and hold the waveguide by means of friction over the complete length when pulled.

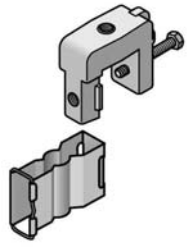
Two types are available for each waveguide size; the closed version -used when the top connector is installed after the waveguide is hoisted- and the open version – used in case where the top connector is installed prior to hoisting the waveguide. Also in the later case the closed version might be used if it shall be left on the waveguide replacing the top cable clamp. Waveguide with factory-installed connectors can be delivered with pre-installed hoisting grips on customer request. The maximum hoisting length per grip is 70 m (230 ft). 1/pkg

Bending Tool

Bending Tools provide perfect forming of FLEXWELL Elliptical waveguide bends during installation. The tool avoids undercutting of the minimum bending radii. Two forms included, one for E plane and one for H plane bends. 1/pkg.

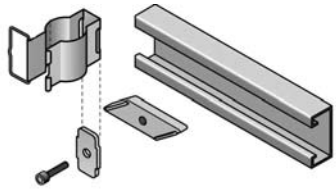
Bending Tool

RSB Clip



RSB-Cleat

Universal Clamping Plate (HUA-M8)



RSB Clamping Plate (RSB-315)

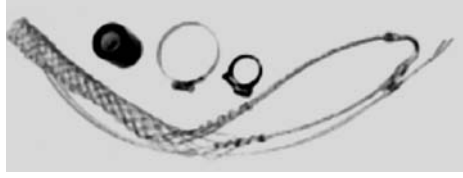
Tube mounting (TRB-8)

Rucksack option

Round Member Adapter

Angle Member Adapter Kit

Universal Installation Cleat (MKD-001-01)



Hoisting Grips

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FLEXWELL® Elliptical Waveguide Accessories

Flanging tools

Flanging tools* have been developed to simplify the installation and thus reducing costs. The flanging tools from RFS are designed to produce a perfect termination every time eliminating the need for any reworking of the termination.

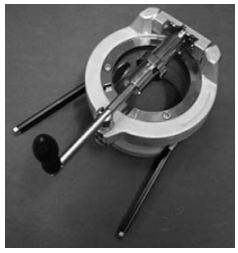
The tool consists of two parts. The tool and a die.

Different types of flanging tools are available depending on waveguide sizes:

- A Basic Tool for E30 to E150
- A Compact Tool for E105 to E380
- A Mini Tool for E185 to E380

A separate die is required for each waveguide size.

* Not applicable for gasket type connectors

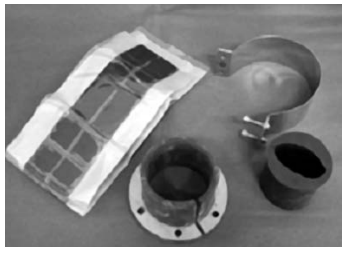


Basic Tool w/o die

Compact Tool with die

Mini Tools

WFS Series



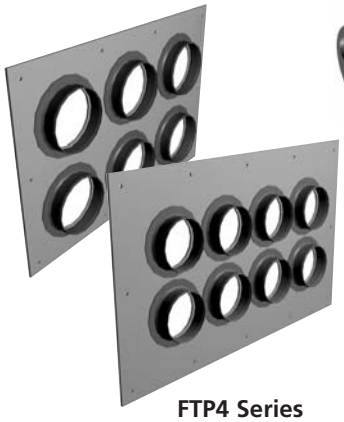
WF Series

WFT Series

Round Member Tower Stand-off Kit

Constructed of heavy stainless steel, the stand-offs provide 2-1/2" (63 mm) tower clearance to hangers when running waveguide over tower cross members, flanges and other tower obstacles. The kit consists of ten stainless steel tower stand-offs with stainless steel hardware. Use with threaded rod kit for additional tower clearance. 1/pkg.

BOOT 4" Series



FTP4 Series

ORDERING INFORMATION

FEED-THROUGH ENTRY PANELS

Model	Description
FTP4-1X1	Feed through entry panel, 102mm (4"), 1 hole, 1x1
FTP4-1X2	Feed through entry panel, 102mm (4"), 2 holes, 1x2
FTP4-1X3	Feed through entry panel, 102mm (4"), 3 holes, 1x3
FTP4-1X4	Feed through entry panel, 102mm (4"), 4 holes, 1x4
FTP4-2X2	Feed through entry panel, 102mm (4"), 4 holes, 2x2
FTP4-2X3	Feed through entry panel, 102mm (4"), 6 holes, 2x3
FTP4-2X4	Feed through entry panel, 102mm (4"), 8 holes, 2x4
FTP4-2X5	Feed through entry panel, 102mm (4"), 10 holes, 2x5
FTP4-2X6	Feed through entry panel, 102mm (4"), 12 holes, 2x6
FTP4-3X3	Feed through entry panel, 102mm (4"), 9 holes, 3x3
FTP4-3X4	Feed through entry panel, 102mm (4"), 12 holes, 3x4

PORT COVER FOR ENTRY PANELS

Model	Description
FTP4-PC	Port cover for 102mm (4") entry panel

Wall / Roof Feed Through

RFS offers two types of Wall/Roof feed through systems:

WFT Series Single Entry Feed Through

The single entry feed through system seals elliptical waveguide at building entrance. It consists of a rubber boot and aluminum split fastening ring.

WF Series Standard Feed Through

The standard feed through system consists of a rubber boot, stainless steel clamp, fixing and sealing material.

Waveguide Repair Kit

The repair kit is used to mend a small puncture hole in the outer conductor of copper elliptical waveguide. The kit is not intended to repair crushed waveguide. Supplied components include copper foil wrap (1-1/2" dia.), adhesive tape, sanding cloth and wrap-around heat shrink sleeve. Required tools are; sharp knife, alcohol cleaner, heat gun or wide flame torch. 1/pkg.

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Connector & Accessory Reference Guide (See installation hardware on separate table)

E30 (2.7 - 3.1 GHz)	
Connector, PDR32, 2.7 - 3.1 GHz, Plast 2000	D32-030FP-U
Connector, 7/8" EIA (GB), 2.5 - 2.7 GHz, Gasket	78EB-030FG
Connector, 7/8" EIA (GP), 2.5 - 2.7 GHz, Gasket	78E-030FG
Splice, 2.5 - 3.1 GHz, Gasket	SPLICE-030
Grounding Kit, Pre-formed Copper Strap-Factory attached Lug-24" Wire	GKIT-24-030
Grounding Kit, Pre-formed Copper Strap-Field attachable Lug-60" Wire	GKIT-60-030
Grounding Kit	GKIT-ST-030
Standard Hanger Kit, Non-insulated, stainless steel	CLAMP-030
Universal clamp with clamp lining for angle iron 50 mm (1.9 inch)	CLAMP-R-030-A5
Universal clamp with clamp lining for angle iron 80 mm (3.2 inch)	CLAMP-R-030-A8
Universal clamp with clamp lining for anchor bars with 18 to 22 mm (0.7 to 0.8 inch) slot	CLAMP-R-030-AC
Universal clamp with clamp lining for flat iron up to 15 mm (0.6 inch)	CLAMP-R-030-AF
Hoisting Grip, Lace-Up, single loop configuration	HOIST1-030L
Hoisting grip, Lace-Up, two loop configuration	HOIST2-L09
Wall/Roof Feed-Through, Aluminum plate	WFT-030
Flanging die, basic Tool	FDIE-B030*
Basic Tool	FTOOL-B020030*
E38 SERIES (3.6 - 4.2 GHz)	
Connector, PDR40, 3.6 - 4.2 GHz, Plast 2000	D40-038FP-U
Connector, CPR229G, 3.6 - 4.2 GHz, Gasket, only E38	C229-038TG
Splice, N/A, 3.4 - 4.2 GHz, Gasket	SPLICE-038
Grounding Kit, Pre-formed Copper Strap-Factory attached Lug-24" Wire	GKIT-24-038
Grounding Kit, Pre-formed Copper Strap-Field attachable Lug-60" Wire	GKIT-60-038
Grounding kit	GKIT-ST-038
Universal clamp with clamp lining	CLAMP-R-038
Hoisting grip, Lace-Up, two loop configuration	HOIST2-L08
Bending Tool Kit	BENDTOOL-038060
Wall/Roof Feed-Through, Aluminum plate	WFT-038
Wall/Roof Feed-Through, Stainless Steel plate	WF-038
Feed Through Boot Assembly w/1 hole - 4"	BOOT4-038
Flanging die, basic tool	FDIE-B038*
Basic Tool	FTOOL-B038150*
E46 SERIES (4.4 - 5.0 GHz)	
Connector, PDR48, 4.4 - 5.0 GHz, Plast 2000	D48-046FP
Splice, N/A, 4.4 - 5.0 GHz, Gasket	SPLICE-046
Grounding Kit	GKIT-ST-046
Universal clamp with clamp lining	CLAMP-R-046
Hoisting grip, Lace-Up, two loop configuration	HOIST2-L07
Bending Tool Kit	BENDTOOL-038060
Wall/Roof Feed-Through, Aluminum plate	WFT-046
Wall/Roof Feed-Through, Stainless Steel plate	WF-046
Flanging die, basic Tool	FDIE-B046*
Basic Tool	FTOOL-B038150*
ES46 SERIES (4.4-5.0 GHz)	
Connector, PDR48, 4.4 - 5.0 GHz, Plast 2000	D48-S46FP
Connector, CPR187G, 4.4 - 5.0 GHz, Gasket, only ES46	C187-S46FG
Connector, CPR187G, 4.4 - 5.0 GHz, Gasket, only ES46	C187-S46TG
Connector, UG-148/149/U, 4.4 - 5.0 GHz, Gasket	G148-S46TG
Splice, N/A, 4.4 - 5.0 GHz, Gasket	SPLICE-S46
Grounding Kit, Pre-formed Copper Strap-Factory attached Lug-24" Wire	GKIT-24-046
Grounding Kit, Pre-formed Copper Strap-Field attachable Lug-60" Wire	GKIT-60-046

ES46 SERIES (4.4-5.0 GHz) CONT'D	
Grounding Kit	GKIT-ST-S46
Standard Hanger Kit, Non-insulated, stainless steel	CLAMP-046
Universal clamp with clamp lining	CLAMP-R-S046
Hoisting Grip, Lace-Up, single loop configuration	HOIST1-046L
Hoisting grip, Lace-Up, two loop configuration	HOIST2-L07
Bending Tool Kit	BENDTOOL-038060
Wall/Roof Feed-Through, Aluminum plate	WFT-046
Wall/Roof Feed-Through, Stainless Steel plate	WF-046
Feed Through Boot Assembly w/1 hole - 4"	BOOT4-046
Flanging die, basic Tool	FDIE-BS46*
Basic Tool	FTOOL-B038150*
EP58 (4.4 - 6.2 GHz)	
Connector, PDR48, 4.4 - 6.2 GHz, Plast 2000	D48-058FP
Grounding Kit	GKIT-ST-058
Universal clamp with clamp lining	CLAMP-R-058
Hoisting grip, Lace-Up, two loop configuration	HOIST2-L06
Bending Tool Kit	BENDTOOL-038060
Wall/Roof Feed-Through, Stainless Steel plate	WF-058/060
Flanging die, basic Tool	FDIE-B058*
Basic Tool for E38 to E150	FTOOL-B038150*
E60 SERIES (5.6 - 6.425 GHz)	
Connector, CPR137G, 5.725 - 6.425 GHz, Gasket, only E60	C137-060FG
Connector, PDR70, 5.6 - 6.425 GHz, Plast 2000	D70-060FP-W
Connector, CPR137G, 5.925 - 6.425 GHz, Gasket, only E60	C137-060TG
Connector, UG-343/344/U, 5.925 - 6.425 GHz, Gasket	G343-060FG
Connector, UG-343/344/U, 5.925 - 6.425 GHz, Gasket	G343-060TG
Grounding Kit, Pre-formed Copper Strap-Factory attached Lug-24" Wire	GKIT-24-060
Grounding Kit, Pre-formed Copper Strap-Field attachable Lug-60" Wire	GKIT-60-060
Grounding Kit	GKIT-ST-060
Standard Hanger Kit, Non-insulated, stainless steel	CLAMP-060
Universal clamp with clamp lining	CLAMP-R-060
Hoisting Grip, Lace-Up, single loop configuration	HOIST1-060L
Hoisting grip, Lace-Up, two loop configuration	HOIST2-L06
Bending Tool Kit	BENDTOOL-038060
Bending Tool Kit	BENDTOOL-058078
Wall/Roof Feed-Through, Aluminum plate	WFT-060
Wall/Roof Feed-Through, Stainless Steel plate	WF-058/060
Feed Through Boot Assembly w/1 hole - 4"	BOOT4-060
Flanging die, basic Tool	FDIE-B060*
Basic Tool	FTOOL-B038150*
E65 SERIES (5.9 - 7.15 GHz)	
Connector, UG-343/344/U, 6.425 - 7.125 GHz, Gasket, only E65	G343-065FG
Connector, CPR137G, 6.425 - 7.125 GHz, Gasket, only E65	C137-065FG
Connector, PDR70, 6.4 - 7.125 GHz, Plast 2000	D70-065FP-U
Connector, PDR70, 5.9 - 7.125 GHz, Plast 2000	D70-065FP-W
Connector, UG-343/344/U, 5.725 - 7.125 GHz, Gasket	G343-065TG
Connector, CPR137G, 5.725 - 6.875 GHz, Gasket	C137-065TG
Connector, PDR70, 6.4 - 7.125 GHz, Plast 2000	D70-065FP-U
Splice, N/A, 6.425 - 7.125 GHz, Gasket	SPLICE-065
Grounding Kit, Pre-formed Copper Strap-Factory attached Lug-24" Wire	GKIT-24-065
Grounding Kit, Pre-formed Copper Strap-Field attachable Lug-60" Wire	GKIT-60-065
Grounding Kit	GKIT-ST-065
Standard Hanger Kit, Non-insulated, stainless steel	CLAMP-065

* Not applicable for gasket type connectors

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Connector & Accessory Reference Guide (See installation hardware on separate table)

E65 SERIES (5.9 - 7.15 GHz) CONT'D	
Universal clamp with clamp lining	CLAMP-R-065
Hoisting Grip, Lace-Up, single loop configuration	HOIST1-065L
Hoisting grip, Lace-Up, two loop configuration	HOIST2-L05
Bending Tool Kit	BENDTOOL-065078
Wall/Roof Feed-Through, Aluminum plate	WFT-065
Wall/Roof Feed-Through, Stainless Steel plate	WF-065
Feed Through Boot Assembly w/1 hole - 4"	BOOT4-065
Flanging die, basic Tool	FDIE-B065*
Basic Tool	FTOOL-B038150*
EP70 (6.4 - 7.8 GHz)	
Connector, PDR70, 6.4 - 7.75 GHz, Plast 2000	D70-070FP
Grounding Kit	GKIT-ST-070
Standard Hanger Kit, Non-insulated, stainless steel	CLAMP-070
Universal clamp with clamp lining	CLAMP-R-070
Hoisting grip, Lace-Up, two loop configuration	HOIST2-L05
Bending Tool Kit	BENDTOOL-058078
Wall/Roof Feed-Through, Stainless Steel plate	WF-070
Flanging die, basic Tool	FDIE-B070*
Basic Tool	FTOOL-B038150*
E78 SERIES (7.1 - 8.5 GHz)	
Connector, PDR70, 7.125 - 8.5 GHz, Plast 2000	D70-078FP-W
Connector, UG-51/52/U, 7.125 - 8.50 GHz, Gasket, only E78	G51-078FG
Connector, CPR137G, 7.125 - 7.75 GHz, Gasket, only E78	C137-078FG
Connector, UG-343/344/U, 7.125 - 7.75 GHz, Gasket, only E78	G343-078FG
Connector, CPR112G, 7.125 - 8.50 GHz, Gasket, only E78	C112-078FG
Connector, PDR84, 7.1 - 7.8 GHz, Plast 2000	D84-078FP-L
Connector, PDR84, 7.125 - 8.5 GHz, Plast 2000	D84-078FP-W
Connector, PBR84, 7.1 - 7.8 GHz, Plast 2000	B84-078FP-L
Connector, PDR84, 7.75 - 8.5 GHz, Plast 2000	D84-078FP-U
Connector, PBR84, 7.75 - 8.5 GHz, Plast 2000	B84-078FP-U
Connector, PBR84, 7.125 - 8.5 GHz, Plast 2000	B84-078FP-W
Connector, CPR112G, 7.125 - 8.50 GHz, Gasket	C112-078TG
Connector, UG-51/52/U, 7.125 - 8.50 GHz, Gasket	G51-078TG
Connector, CPR137G, 7.125 - 7.75 GHz, Gasket	C137-078TG
Connector, UG-343/344/U, 7.125 - 7.75 GHz, Gasket	G343-078TG
Splice, 7.125 - 8.5 GHz, Gasket	SPLICE-078
Grounding Kit, Pre-formed Copper Strap-Factory attached Lug-24" Wire	GKIT-24-078
Grounding Kit, Pre-formed Copper Strap-Field attachable Lug-60" Wire	GKIT-60-078
Grounding Kit	GKIT-ST-078
Standard Hanger Kit, Non-insulated, stainless steel	CLAMP-078
Universal clamp with clamp lining	CLAMP-R-078-E
Hoisting Grip, Lace-Up, single loop configuration	HOIST1-078L
Hoisting grip, Lace-Up, two loop configuration	HOIST2-L05
Bending Tool Kit	BENDTOOL-065078
Bending Tool Kit	BENDTOOL-058078
Wall/Roof Feed-Through, Aluminum plate	WFT-078
Wall/Roof Feed-Through, Stainless Steel plate	WF-078/L15
Feed Through Boot Assembly w/1 hole - 4"	BOOT4-078
Flanging die, basic Tool	FDIE-B078*
Basic Tool	FTOOL-B038150*
EP100 (9.0 - 10.0 GHz)	
Connector, PBR100, 9.0 - 10.0 GHz, Plast 2000	B100-100FP-U
Grounding Kit	GKIT-ST-100
Universal clamp with clamp lining	CLAMP-R-100
Hoisting grip, Lace-Up, two loop configuration	HOIST2-L04

EP100 (9.0 - 10.0 GHz) CONT'D	
Bending Tool Kit	BENDTOOL-100220
Wall/Roof Feed-Through, Stainless Steel plate	WF-100
Flanging die, basic Tool	FDIE-B100*
Basic Tool	FTOOL-B038150*
E105 SERIES (10.7 - 11.7 GHz)	
Splice, 10.5 - 11.70 GHz, Gasket	SPLICE-105
Connector, CPR90G, 10.50 - 11.70 GHz, Gasket, only E105	C90-105FG
Connector, PDR100, 10.0 - 11.7 GHz, Plast 2000	D100-105FP-W
Connector, CPR90G, 10.50 - 11.70 GHz, Gasket, only E105	C90-105TG
Grounding Kit, Pre-formed Copper Strap-Factory attached Lug-24" Wire	GKIT-24-105
Grounding Kit, Pre-formed Copper Strap-Field attachable Lug-60" Wire	GKIT-60-105
Grounding Kit	GKIT-ST-105
Standard Hanger Kit, Non-insulated, stainless steel	CLAMP-105
Universal clamp with clamp lining	CLAMP-R-105
RSB Clip with clamp lining	RSB-105
Hoisting Grip, Lace-Up, single loop configuration	HOIST1-105L
Hoisting grip, Lace-Up, two loop configuration	HOIST2-L04
Bending Tool Kit	BENDTOOL-100220
Bending Tool Kit	BENDTOOL-105185
Wall/Roof Feed-Through, Aluminum plate	WFT-105
Wall/Roof Feed-Through, Stainless Steel plate	WF-105/L19
Feed Through Boot Assembly w/1 hole - 4"	BOOT4-105
Flanging die, basic Tool	FDIE-B105*
Flanging die, compact Tool	FDIE-C105*
Basic Tool	FTOOL-B038150*
Compact Tool	FTOOL-C105380*
E130 SERIES (10.7 - 13.25 GHz)	
Connector, WR75 choke/cover, 11.7 - 13.25 GHz, Gasket, only E130	G75-130FG
Connector, PDR120, 10.7 - 12.75 GHz, Plast 2000	D120-130FP-L
Connector, PDR120, 12.2 - 13.25 GHz, Plast 2000	D120-130FP-U
Connector, PBR120, 12.2 - 13.25 GHz, Plast 2000	B120-130FP-U
Connector, WR75 choke/cover, 11.7 - 13.25 GHz, Gasket, only E130	G75-130TG
Splice, 10.95 - 13.25 GHz, Gasket	SPLICE-130
Grounding Kit, Pre-formed Copper Strap-Factory attached Lug-24" Wire	GKIT-24-130
Grounding Kit, Pre-formed Copper Strap-Field attachable Lug-60" Wire	GKIT-60-130
Grounding Kit	GKIT-ST-130
Standard Hanger Kit, Non-insulated, stainless steel	CLAMP-130
Universal clamp with clamp lining	CLAMP-R-130
RSB Clip with clamp lining	RSB-130
Hoisting Grip, Lace-Up, single loop configuration	HOIST1-130L
Hoisting grip, Lace-Up, two loop configuration	HOIST2-L03
Bending Tool Kit	BENDTOOL-100220
Bending Tool Kit	BENDTOOL-105185
Wall/Roof Feed-Through, Aluminum plate	WFT-130
Wall/Roof Feed-Through, Stainless Steel plate	WF-130
Feed Through Boot Assembly w/1 hole - 4"	BOOT4-130
Flanging die, compact Tool	FDIE-C130*
Compact Tool	FTOOL-C105380*
E150 SERIES (13.4 - 15.35 GHz)	
Connector, UG-419/541/U, 13.40 - 15.35 GHz, Gasket, only E150	G419-150FG
Connector, PBR120, 13.4 - 14.5 GHz, Plast 2000	B120-150FP
Connector, PDR140, 14.0 - 15.35 GHz, Plast 2000	D140-150FP

* Not applicable for gasket type connectors

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E150 SERIES (13.4 - 15.35 GHz) CONT'D	
Connector, PBR140, 14.0 - 15.35 GHz, Plast 2000	B140-150FP
Connector, UG-419/541/U, 14.40 - 15.35 GHz, Gasket, only E150	G419-150TG
Connector, PBR140, 13.40 - 15.35 GHz, Gasket	B140-150TG
Connector, WR75 contact, 13.40 - 14.50 GHz, Gasket	K75-150TG
Connector, WR75 choke/cover, 13.40 - 14.50 GHz, Gasket	Z75-150TG
Splice, N/A, 13.40 - 15.35 GHz, Gasket	SPLICE-150
Grounding Kit, Pre-formed Copper Strap-Factory attached Lug-24" Wire	GKIT-24-150
Grounding Kit, Pre-formed Copper Strap-Field attachable Lug-60" Wire	GKIT-60-150
Grounding Kit	GKIT-ST-150
Standard Hanger Kit, Non-insulated, stainless steel	CLAMP-150
Universal clamp with clamp lining	CLAMP-R-150
RSB Clip with clamp lining	RSB-150
Hoisting Grip, Lace-Up, single loop configuration	HOIST1-150L
Hoisting grip, Lace-Up, two loop configuration	HOIST2-L03
Bending Tool Kit	BENDTOOL-100220
Bending Tool Kit	BENDTOOL-105185
Wall/Roof Feed-Through, Aluminum plate	WFT-150
Wall/Roof Feed-Through, Stainless Steel plate	WF-150
Feed Through Boot Assembly w/1 hole - 4"	BOOT4-150
Flanging die, compact Tool	FDIE-C150*
Compact Tool	FTOOL-C105380*
E185 SERIES (17.3 - 19.7 GHz)	
Connector, PDR180, 17.3 - 19.7 GHz, Plast 2000	D180-185FP
Connector, PBR220, 17.7 - 19.7 GHz, Plast 2000	B220-185FP
Connector, UG-595/596/U, 17.70 - 19.70 GHz, Gasket, only E185	G595-185TG
Splice, N/A, 17.70 - 19.70 GHz, Gasket	SPLICE-185
Grounding Kit, Pre-formed Copper Strap-Factory attached lug-24" Wire	GKIT-24-185
Grounding Kit, Pre-formed Copper Strap-Field attachable lug-60" Wire	GKIT-60-185
Grounding Kit	GKIT-ST-185
High Speed Grounding Kit	GKIT-HS-185
Standard Hanger Kit, Non-insulated, stainless steel	CLAMP-185
Universal clamp with clamp lining	CLAMP-R-185
RSB Clip with clamp lining	RSB-185
Hoisting Grip, Lace-Up, single loop configuration	HOIST1-185L
Hoisting grip, Lace-Up, two loop configuration	HOIST2-L02
Bending Tool Kit	BENDTOOL-100220
Bending Tool Kit	BENDTOOL-105185
Wall/Roof Feed-Through , Aluminum plate	WFT-185
Wall/Roof Feed-Through, Stainless Steel plate	WF-185
Feed Through Boot Assembly w/1 hole - 4"	BOOT4-185
Flanging die, compact Tool	FDIE-C185*
Flanging die, mini Tool	FDIE-M185*
Compact Tool	FTOOL-C105380*
Mini Tool	FTOOL-M185380*
E220 (21.2 - 23.6 GHz)	
Connector, PBR220, 21.2 - 23.6 GHz, Plast 2000	B220-220FP
Grounding Kit	GKIT-ST-220
Universal clamp with clamp lining	CLAMP-R-220
RSB Clip with clamp lining	RSB-220
Hoisting grip, Lace-Up, two loop configuration	HOIST2-L02
Bending Tool Kit	BENDTOOL-100220
Wall/Roof Feed-Through, Stainless Steel plate	WF-220/L38
Flanging die, compact Tool	FDIE-C220*
Flanging die, mini Tool	FDIE-M220*

E220 (21.2 - 23.6 GHz) CONT'D	
Compact Tool	FTOOL-C105380*
Mini Tool	FTOOL-M185380*
E250 (24.25 - 26.5 GHz)	
Connector, PBR220, 24.25 - 26.5 GHz, Gasket with Shrinking Sleeve	B220-250FP
Connector, PBR260, 24.25 - 26.5 GHz, Gasket with Shrinking Sleeve	B260-250FP
Grounding Kit	GKIT-ST-250
RSB Clip with clamp lining	RSB-250
Hoisting grip, Lace-Up, two loop configuration	HOIST2-L01
Wall/Roof Feed Through	WFS-2
Flanging die, compact Tool	FDIE-C250
Flanging die, mini Tool	FDIE-M250
Compact Tool	FTOOL-C105380
Mini Tool	FTOOL-M185380
E300 (27.5 - 33.4 GHz)	
Connector, PBR320, 27.5 - 33.4 MHz, Gasket with Shrinking Sleeve	B320-300FP
Grounding Kit	GKIT-ST-300
RSB Clip with clamp lining	RSB-300
Hoisting grip, Lace-Up, two loop configuration	HOIST2-L01
Wall/Roof Feed-Through	WFS-2
Flanging die, compact Tool	FDIE-C300
Flanging die, mini Tool	FDIE-M300
Compact Tool	FTOOL-C105380
Mini Tool	FTOOL-M185380
E380 (37.0 - 39.5 GHz)	
Connector, PBR320, 37.0 - 39.5 GHz, Gasket with Shrinking Sleeve	B320-380FP
Grounding Kit	GKIT-ST-380
RSB Clip with clamp lining	RSB-380
Hoisting grip, Lace-Up, two loop configuration	HOIST2-L01
Wall/Roof Feed Through	WFS-1
Bending Tool Kit	BENDTOOL-L38380
Flanging die, compact Tool	FDIE-C380
Flanging die, mini Tool	FDIE-M380
Compact Tool	FTOOL-C105380
Mini Tool	FTOOL-M185380
EO11 (10.7 - 11.7 GHz)	
Connector, PDR100, 10.7 - 11.7 GHz, Gasket with Shrinking Sleeve	D100-L11FP
Grounding Kit	GKIT-ST-L11
Universal clamp with clamp lining	CLAMP-R-L11
Hoisting grip, Lace-Up, two loop configuration	HOIST2-L05
Bending Tool Kit	BENDTOOL-058078
Wall/Roof Feed-Through, Stainless Steel plate	WF-L11
Flanging die, basic Tool	FDIE-BL11
Basic Tool	FTOOL-B038150
EO15 (12.75 - 15.35 GHz)	
Connector, PDR120, 12.7 - 14.5 GHz, Gasket with Shrinking Sleeve	D120-L15FP
Connector, PDR140, 14.0 - 15.35 GHz, Gasket with Shrinking Sleeve	D140-L15FP
Grounding Kit	GKIT-ST-L15
Universal clamp with clamp lining	CLAMP-R-L15
Hoisting grip, Lace-Up, two loop configuration	HOIST2-L05
Bending Tool Kit	BENDTOOL-058078
Wall/Roof Feed-Through, Stainless Steel plate	WF-078/L15
Flanging die, basic Tool	FDIE-BL15
Basic Tool	FTOOL-B038150

* Not applicable for gasket type connectors

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Connector & Accessory Reference Guide (See installation hardware on separate table)

EO19 (17.7 - 19.7 GHz)	
Connector, PBR220, 17.7 - 19.7 GHz, Gasket with Shrinking Sleeve	B220-L19FP
Grounding Kit	GKIT-ST-L19
Universal clamp with clamp lining	CLAMP-R-L19
Hoisting grip, Lace-Up, two loop configuration	HOIST2-L04
Bending Tool Kit	BENDTOOL-100220
Wall/Roof Feed-Through, Stainless Steel plate	WF-105/L19
Flanging die, compact Tool	FDIE-CL19
Compact Tool	FTOOL-C105380

EO22 (21.2 - 23.6 GHZ)	
Connector, PBR220, 21.2 - 23.6 GHz, Gasket with Shrinking Sleeve	B220-L22FP
Grounding Kit	GKIT-ST-L22
Universal clamp with clamp lining	CLAMP-R-L22
Hoisting grip, Lace-up, two loop configuration	HOIST2-L03
Wall/Roof Feed-Through	WFS-4
Bending Tool Kit	BENDTOOL-100220
Flanging die, compact Tool	FDIE-CL22
Compact Tool	FTOOL-C105380

EO38 (37.0 - 39.5 GHz)	
Connector, PBR320, 37.0 - 39.5 GHz, Gasket with Shrinking Sleeve	B320-L38FP
Grounding Kit	GKIT-ST-L38
High Speed Grounding Kit	GKIT-HS-L38
RSB Clip with clamp lining	RSB-L38
Hoisting grip, Lace-Up, two loop configuration	HOIST2-L02
Bending Tool Kit	BENDTOOL-L38380
Wall/Roof Feed-Through, Stainless Steel plate	WF-220/L38
Flanging die, compact Tool	FDIE-CL38
Flanging die, mini Tool	FDIE-ML38
Compact Tool	FTOOL-C105380
Mini Tool	FTOOL-M185380

Installation Hardware

INSTALLATION HARDWARE	MODEL NUMBER	USABLE WITH
AC-profile 200mm with 2 holes	AC7-020H	
Universal clamping plate for slot anchor bar (Kit of 10)	HUA-M8	Universal clamp, Standard Hanger Kit
Universal installation cleat including screw M8 (Kit of 10)	MKD-001-01	Universal clamp, Standard Hanger Kit
Angle Member Adapter, 3/8"	ANGLE-CLPI	Standard Hanger Kit, non insulated
Hardware for clamps on tubes bigger 1"	TRB-8	RSB-clip, Universal clamp, Standard Hanger Kit
RSB Cleat	RSB-310	RSB-clip
RSB clamping plate for anchor bar	RSB-315	RSB-clip
Rucksack option for RSB Clip	RSB-78-R	RSB-clip
Round Member Adapter, 25-40 mm	RMA-40	RSB-clip , TRB-8
Round Member Adapter, 40-60 mm	RMA-60	RSB-clip , TRB-8
Round Member Adapter, 60-80 mm	RMA-80	RSB-clip , TRB-8
Round Member Adapter, 80-100 mm	RMA-100	RSB-clip , TRB-8
Round Member Adapter, 100-120 mm	RMA-120	RSB-clip , TRB-8
Round Member Adapter, 120-140 mm	RMA-140	RSB-clip , TRB-8
Round Member Adapter, 140-160 mm	RMA-160	RSB-clip , TRB-8
Round Member Adapter, 1-2"	RMA-AI	
Round Member Adapter, 2-3"	RMA-BI	
Round Member Adapter, 3-4"	RMA-CI	
Round Member Adapter, 4-5"	RMA-DI	
Round Member Adapter, 5-6"	RMA-EI	
Round Member Adapter, 6-7"	RMA-FI	
Stainless stell strapping kit	STRAP-1	
Stainless stell strapping kit, tube mounting with fasteners	STRAP-2	

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Rectangular Waveguide Components

Ordering information

Different Rectangular waveguide components are available to simplify the installation especially in a shelter or to connect a radio placed near to the antenna.

The following components are offered:

- Straight sections
- 90 deg E-Bends
- 90 deg H-Bends
- 90 deg Twist sections
- Twistflex
- Pressure windows
- Shims
- Transitions
- Flange Adaptors

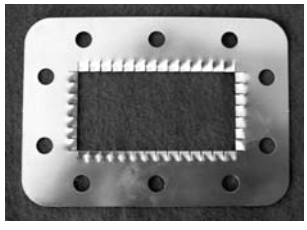
Straight Sections

For flange installation hardware and blanking plates with absorbing material contact RFS.

Waveguide Bends and Twist Sections

WAVEGUIDE BENDS AND TWIST SECTIONS					
Freq. Range, GHz	E Bend 90°	H Bend 90°	Twist 90°	Straight 100mm (3.9 in)	Flange Type
3.3 - 4.2	EB040-DV	HB040-DV	TS040-DV	SW040-DV	PDR40, UDR40
	EB229-CC	HB229-CC	TS229-CC		CPR229G, CPR229G
4.4 - 5.0	EB048-DV	HB048-DV	TS048-DV	SW048-DV	PDR48, UDR48
	EB187-CC	HB187-CC	TS187-CC		CPR187G, CPR187G
5.725 - 7.75	EB070-DV	HB070-DV	TS070-DV	SW070-DV	PDR70, UDR70
	EB137-ZU	HB137-ZU	TS137-ZU		UG-343/U, UG-343/U
7.125 - 8.5	EB084-DV	HB084-DV	TS084-DV	SW084-DV	PDR84, UDR84
	EB084-BW	HB084-BW	TS084-BW	SW084-BW	PBR84, UBR84
	EB112-ZU	HB112-ZU	TS112-ZU		UG-51/U, UG-52/U
	EB112-CC	HB112-CC	TS112-CC		CPR112G, CPR112G
10.2 - 11.7	EB100-DV	HB100-DV	TS100-DV	SW100-DV	PDR100, UDR100
	EB100-BW	HB100-BW	TS100-BW	SW100-BW	PBR100, UBR100
	EB090-ZU	HB090-ZU	TS090-ZU		UG-39/U, UG-40/U
	EB090-CC	HB090-CC	TS090-CC		CPR090G, CPR090G
12.2 - 13.25	EB120-DV	HB120-DV	TS120-DV	SW120-DV	PDR120, UDR120
	EB120-BW	HB120-BW	TS120-BW	SW120-BW	PBR120, UBR120
	EB075-ZU	HB075-ZU	TS075-ZU		WR75 choke, WR75 cover
14.2 - 15.35	EB140-DV	HB140-DV	TS140-DV	SW140-DV	PDR140, UDR140
	EB140-BW	HB140-BW	TS140-BW	SW140-BW	PBR140, UBR140
17.3 - 26.5	EB220-BW	HB220-BW	TS220-BW	SW220-BW	PBR220, UBR220
27.3 - 40.0	EB320-BW	HB320-BW	TS320-BW	SW320-BW	PBR320, UBR320

SHIMS		
Model Number	Flange	Product information
SHIM-B084	UBR84	Silver plated
SHIM-B100	UBR100	Silver plated
SHIM-B120	UBR120	Silver plated
SHIM-B140	UBR140	Silver plated
SHIM-B220	UBR220	Silver plated
SHIM-B260	UBR260	Silver plated
SHIM-B320	UBR320	Silver plated
SHIM-D040	UDR40	Silver plated
SHIM-D048	UDR48	Silver plated
SHIM-D070	UDR70	Silver plated
SHIM-D084	UDR84	Silver plated
SHIM-D100	UDR100	Silver plated
SHIM-D120	UDR120	Silver plated
SHIM-D140	UDR140	Silver plated



Shim

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Ordering information

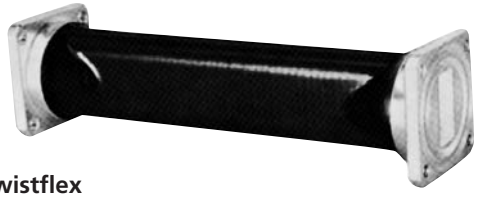
PRESSURE WINDOWS: IEC FLANGES	
Model Number	**Flange**
PW-W084	UBR84
PW-W100	UBR100
PW-W120	UBR120
PW-W140	UBR140
PW-W180	UBR180
PW-W220	UBR220
PW-W260	UBR260
PW-W320	UBR320
PW-V040	UDR40
PW-V048	UDR48
PW-V058	UDR58
PW-V070	UDR70
PW-V084	UDR84
PW-V100	UDR100
PW-V120	UDR120
PW-V140	UDR140
PW-V180	UDR180
PW-BW120	UBR120, PBR120
PW-BW140	UBR140, PBR140
PW-BW220	UBR220, PBR220
PW-BW260	UBR260, PBR260
PW-BW320	UBR320, PBR320
PW-DV070	UDR70, PDR70

Pressure Windows

PRESSURE WINDOWS: EIA FLANGES	
Model Number	**Flange**
PW-C229	CPR229G
PW-C187	CPR187G
PW-G187	UG-148/149/U
PW-C159	CPR159G
PW-C137	CPR137G
PW-G137	UG-343/344/U
PW-C112	CPR112G
PW-G112	UG-51/52/U
PW-C090	CPR90G
PW-G090	UG-39/40/U
PW-G075	WR75 choke/cover
PW-G062	UG-419/541/U
PW-G042-L	UG-595/596/U
PW-G042-H	UG-595/596/U

Twistflex

Twistflex are fabricated from spiral wounded silver plated bronze strip covered by a pressure tight protective neoprene jacket. Twistflex sections are available in standard lengths with EIA- or IEC-flanges.



Twistflex

TWISTFLEX					
	Nominal length, mm (inch)				
Frequency Range, GHz	**300 (12)**	**600 (24)**	**900 (36)**	**1200 (24)**	**Flange Type**
3.3 - 4.2	TF040-DV2-030M	TF040-DV2-060M	TF040-DV2-090M	TF040-DV2-120M	PDR40, UDR40
	TF229-CC1-012I	TF229-CC1-024I	TF229-CC1-036I		CPR229G, CPR229G
4.4 - 5.0	TF048-DV2-030M	TF048-DV2-060M	TF048-DV2-090M	TF048-DV2-120M	PDR48, UDR48
	TF187-CC1-012I	TF187-CC1-024I	TF187-CC1-036I		CPR187G, CPR187G
5.725 - 7.75	TF070-DV2-030M	TF070-DV2-060M	TF070-DV2-090M	TF070-DV2-120M	PDR70, UDR70
	TF137-CC1-012I	TF137-CC1-024I	TF137-CC1-036I		CPR137G, CPR137G
7.125 - 8.5	TF084-DV2-030M	TF084-DV2-060M	TF084-DV2-090M	TF084-DV2-120M	PDR84, UDR84
	TF084-BW2-030M	TF084-BW2-060M	TF084-BW2-090M	TF084-BW2-120M	PBR84, UBR84
	TF112-CC1-012I	TF112-CC1-024I	TF112-CC1-036I		CPR112G, CPR112G
10.2 - 11.7	TF100-DV2-030M	TF100-DV2-060M	TF100-DV2-090M	TF100-DV2-120M	PDR100, UDR100
	TF100-BW2-030M	TF100-BW2-060M	TF100-BW2-090M	TF100-BW2-120M	PBR100, UBR100
	TF090-CC1-012I	TF090-CC1-024I	TF090-CC1-036I		CPR090G, CPR090G
12.2 - 13.25	TF120-DV2-030M	TF120-DV2-060M	TF120-DV2-090M	TF120-DV2-120M	PDR120, UDR120
	TF120-BW2-030M	TF120-BW2-060M	TF120-BW2-090M	TF120-BW2-120M	PBR120, UBR120
	TF075-UZ1-012I	TF075-UZ1-024I	TF075-UZ1-036I		WR75 choke, WR75 cover
14.2 - 15.35	TF140-DV2-030M	TF140-DV2-060M	TF140-DV2-090M	TF140-DV2-120M	PDR140, UDR140
	TF140-BW2-030M	TF140-BW2-060M	TF140-BW2-090M	TF140-BW2-120M	PBR140, UBR140
	TF062-UZ1-012I	TF062-UZ1-024I	TF062-UZ1-036I		WR62 choke, WR62 cover
17.3 - 26.5	TF220-BW2-030M	TF220-BW2-060M	TF220-BW2-090M	TF220-BW2-120M	PBR220, UBR220
	TF042-UZ1-012I	TF042-UZ1-024I	TF042-UZ1-036I		UG-595/U, UG-596/U
27.3 - 40.0	TF320-BW2-030M	TF320-BW2-060M	TF320-BW2-090M	TF320-BW2-120M	PBR320, UBR320

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Waveguide Transition

Taper transition between waveguide sizes. Maximum VSWR,1.05 across specified band. 1/pkg

Waveguide Transition

ORDERING INFORMATION FOR TRANSITIONS: IEC FLANGES			
Frequency GHz	Model Number	Length mm (in)	Flange
7.1 - 8.6	TRAN-D070-D084	50 (1.9)	PDR70, PDR84
14.0 - 15.5	TRAN-B120-B140	40 (1.6)	PBR120, PBR140
17.7 - 20.3	TRAN-B180-B220	20 (0.8)	PBR180, PBR220
24.0 - 26.5	TRAN-B220-B260	20 (0.8)	PBR220, PBR260

ORDERING INFORMATION FOR TRANSITIONS: EIA FLANGES			
Frequency GHz	Model Number	Length mm (inch)	Flanges
5.85-7.05	TRAN-C137-C159	152 (6)	CPR137G, CPR-159G
5.85 - 7.05	TRAN-U137-C159	152 (6)	UG-344/U, CPR-159G
7.05-8.40	TRAN-C137-C112	305 (12)	CPR137G, CPR-112G
7.05-8.40	TRAN-U112-U137	305 (12)	UG-51/U, UG-344/U
7.125-7.750	TRAN-C137-C112-W	152 (6)	CPR137G, CPR-112G
7.05-8.4	TRAN-U12-U137	305 (12)	UG-51/U, UG-344/U
8.20-10.0	TRAN-U090-U112	203 (8)	UG-39/U, UG-51/U
10.0-12.4	TRAN-U075-U090	152 (6)	WR75 cover, UG-39/U

Flange Adapter

Straight waveguide sections with different flanges on each end. Pressure gaskets included. 1/pkg

ORDERING INFORMATION FOR FLANGE ADAPTERS: IEC FLANGES			
Frequency GHz	Model Number	Length mm (in)	Flange
4.4 - 5.0	FADP048-DP1	100 (3.8)	PDR48/PAR48
5.72 - 7.75	FADP070-DB1	100 (3.8)	PDR70/PBR70
6.57 - 9.99	FADP084-DB1	50 (1.9)	PDR84/PBR84
8.2 - 12.5	FADP100-DB1	50 (1.9)	PDR100/PBR100
9.84 - 15.0	FADP120-DB1	50 (1.9)	PDR120/PBR120
11.9 - 18.0	FADP140-DB1	50 (1.9)	PDR140/PBR140
17.3 - 26.5	FADP220-DB1	50 (1.9)	PDR220/PBR220

ORDERING INFORMATION FOR FLANGE ADAPTERS: EIA FLANGES			
Waveguide size	Model Number	Length mm (inch)	Flanges
WR90	FADP-C090-M090	105 (4)	CPR90G, CMR90
WR90	FADP-C090-U090	105 (4)	CPR90G, UG39/U
WR112	FADP-C112-Z112	105 (4)	CPR112G, UG-52/U
WR112	FADP-C112-M112	105 (4)	CPR112G, CMR-112
WR112	FADP-C112-U112	105 (4)	CPR112G, UG-51/U
WR137	FADP-C137-Z137	105 (4)	UG-343A/U, CPR-137G
WR137	FADP-C137-U137	105 (4)	UG-344/U, CPR-137G
WR137	FADP-C137-M137	105 (4)	CMR137, CPR-137G

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Waveguide to Type N Female Adapter

Waveguide installation –

- The rectangular waveguide component provides simple installation in particular difficult cases
- The flange Adapter provides proper matching of rectangular waveguide flanges to N-female connector
- It provides outstanding electrical performance

N Female Adapter

ORDERING INFORMATION FOR WAVEGUIDE TO COAX ADAPTER: IEC FLANGES

Frequency GHz	Model Number	Length mm (in)	Flange
3.22 - 4.9	NADP-D040	46.5 (1.8)	PDR40
3.94 - 5.99	NADP-D048	37.5 (1.5)	PDR48
5.38 - 8.17	NADP-D070	38.5 (1.5)	PDR70
6.57 - 9.99	NADP-D084	35 (1.4)	PDR84
9.84 - 15.0	NADP-D120	37.5 (1.5)	PDR120
9.84 - 15.0	NADP-W120	20 (0.8)	UBR120
11.9 - 18.0	NADP-B140	37.5 (1.5)	PBR140

ORDERING INFORMATION FOR WAVEGUIDE TO COAX ADAPTER: EIA FLANGES

Waveguide Size	Model Number	Flange
WR90	NADP-U090	UG-39/U
WR90	NADP-C090	CPR90G
WR112	NADP-U112	UG-51/U
WR112	NADP-C112	CPR112G
WR137	NADP-U137	UG-344/U
WR137	NADP-C137	CPR137G
WR159	NADP-C159	CPR159G

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Dehydration Methods

Elliptical waveguide, air dielectric coaxial and rigid line should be pressurized with dry air or dry inert gas in order to prevent moisture condensation and the resultant degradation in electrical performance and possible damage to the transmission line. Radio Frequency Systems offers a comprehensive range of dehydration systems designed to meet both the technical and economic needs of our global customers.

Thermodynamic background

The air is a gas mix of dry air and water. The water can occur as overheated steam, liquid or ice. At the triple point these three variants are balanced. The triple point lies at +0.01°C and a partial pressure of the water of 611.2 Pa.

The highest partial pressure possible for the water in the mixture is the corresponding saturation pressure of the relevant temperature. This pressure is shown in the steam pressure curve (Fig.1).

The point where the air pressure equals the saturation pressure of the water, determines the temperature of ebullition.

If the partial pressure pp lies below the saturation pressure ps(T), all the water is present as overheated steam in the mixture.

Cooling lowers the saturation pressure of the water together with the temperature, while the partial pressure remains constant. Supposing a constant ratio in the mixture of the quantities of water and dry air, the temperature at which ps(T) = pp is quickly reached. This temperature is the temperature of dew point.

A further cooling causes a part of the water to separate as liquid (T > 0.01°C) or ice (T < 0.01°C). Up to this point, where all the water is present as overheated steam, the equations of the ideal gas are valid at a sufficient accuracy, as long as the changes of pressure and temperature lie within the range of atmospheric values and the physical characteristics are nearly constant.

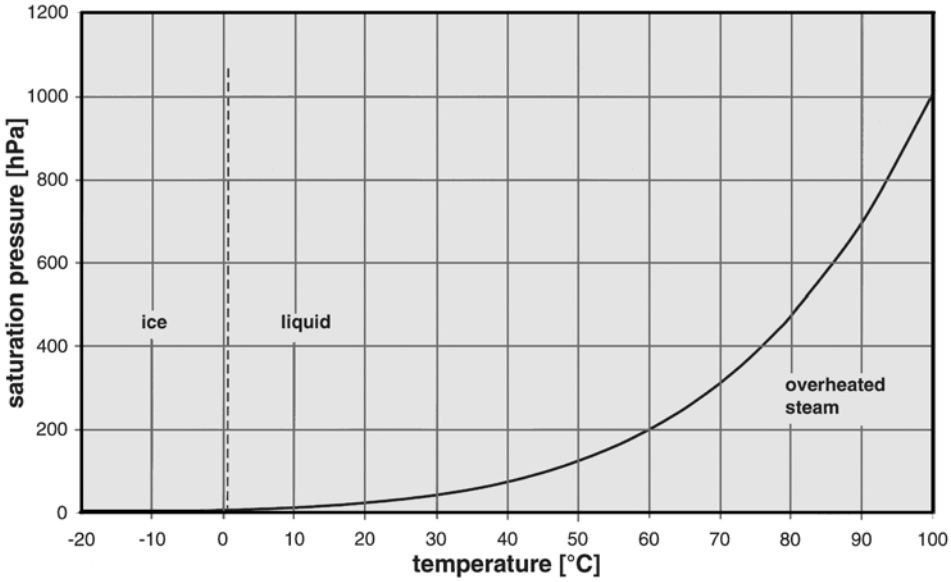

Figure 1. Steam pressure curve of the water

Increasing use of higher frequency ranges, particularly in mobile communication networks, has resulted in greater use of smaller cross sections of elliptical FLEXWELL® transmission lines and shorter feeder runs.

This, together with the decreasing costs of microwave links, has led RFS to develop less expensive dehydrators.

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Dehydration Methods

However, in many cases these solutions are not economical for the microwave systems, which are used to link mobile radio base stations. For these low cost systems a simpler but equally effective dehydration system is required.

The results of long term investigations have led RFS to consider different methods of dehydration suitable for all possible installations

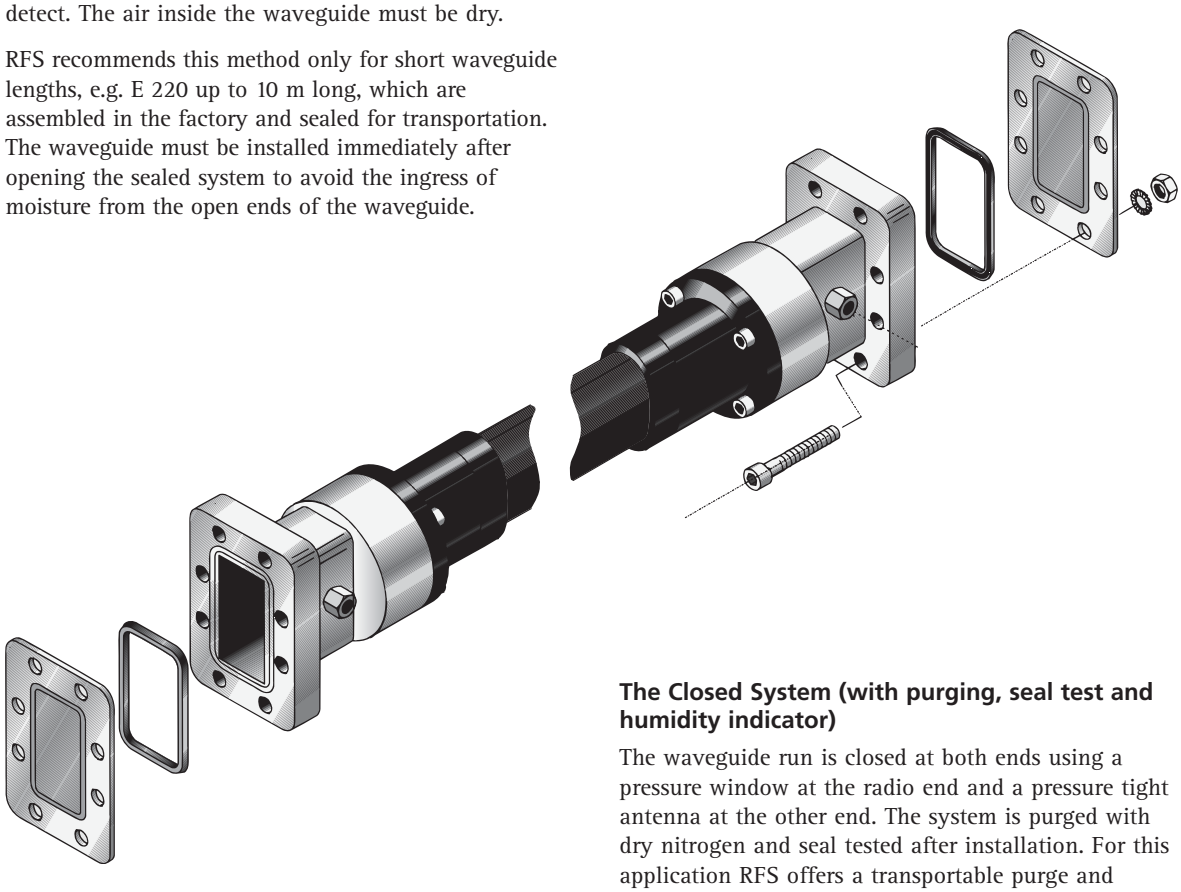
The Closed System (without additional measures)

Both ends of the waveguide run are closed by use of a pressure window at the radio end and a pressure tight antenna at the other end.

This method prevents the ingress of humidity over a long period of time It requires highly trained installation staff because incorrect installation is difficult to detect. The air inside the waveguide must be dry.

RFS recommends this method only for short waveguide lengths, e.g. E 220 up to 10 m long, which are assembled in the factory and sealed for transportation. The waveguide must be installed immediately after opening the sealed system to avoid the ingress of moisture from the open ends of the waveguide.

FLEXWELL® WAVEGUIDE	LENGTH
E380	≤ 30 m
E300	≤ 15 m
E250	≤ 12 m
E220	≤ 10 m
EO38	≤ 10 m
E185	≤ 7 m
E150	≤ 4 m
E130	≤ 2.5 m
EO22	≤ 2.5 m



The Closed System (with purging, seal test and humidity indicator)

The waveguide run is closed at both ends using a pressure window at the radio end and a pressure tight antenna at the other end. The system is purged with dry nitrogen and seal tested after installation. For this application RFS offers a transportable purge and sealing device.

This method ensures that, after correct installation and purging with dry nitrogen, moisture is eliminated from the waveguide even where extreme temperature variations are experienced.

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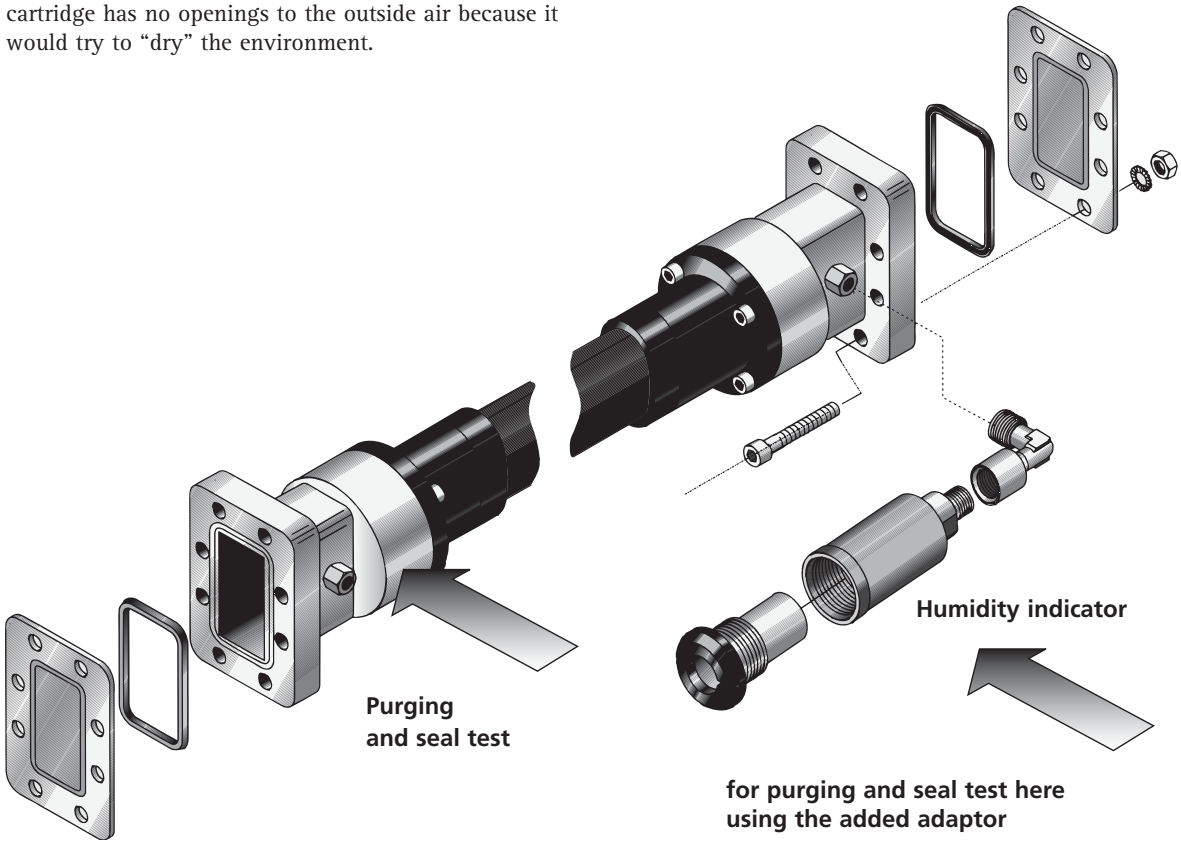
Dehydration Methods

The maximum waveguide volume is determined by the size of the nitrogen bottle, which must be brought close to the waveguide for the purging and seal test operation. RFS provides a case containing all the necessary items for these tasks.

A desiccant cartridge is connected to the system and the humidity indicator will provide an early warning (long before link failure) if moisture has entered the system in spite of all the precautionary measures taken.

It is very important to ensure that the desiccant cartridge has no openings to the outside air because it would try to “dry” the environment.

FLEXWELL® WAVEGUIDE	LENGTH
E380	≤ 75 m
E300	≤ 40 m
E250	≤ 30 m
E220	≤ 25 m
EO38	≤ 25 m
E185	≤ 16 m
E150	≤ 10 m
E130	≤ 8 m
EO22	≤ 8 m
E105	≤ 6 m



The system with dehydrator and low pressure alarm

The waveguide run is closed with pressure windows at both ends (or at one end by the pressure tight antenna). A dehydrator is used to remove any moisture from the system.

This is the classical method used for dehydrating a waveguide feeder system. A dehydrator must be used if a system with remote alarm is required or if the waveguide run has become leaky due to mechanical effects.

In a pressure tight system the dehydrator will operate very infrequently and intervals of 3 month are possible.

In spite of over pressure, this can lead to an accumulation of humidity that has entered the system by steam diffusion through the connecting hose or sealing disks. This can be remedied by purging the waveguide with dry air at fixed intervals, e.g. annual maintenance periods for the radio equipment.

There are no limitations on waveguide length in the range of technical interest with this method of dehydration.

RFS offers automatic as well as semi-automatic dehydrators.

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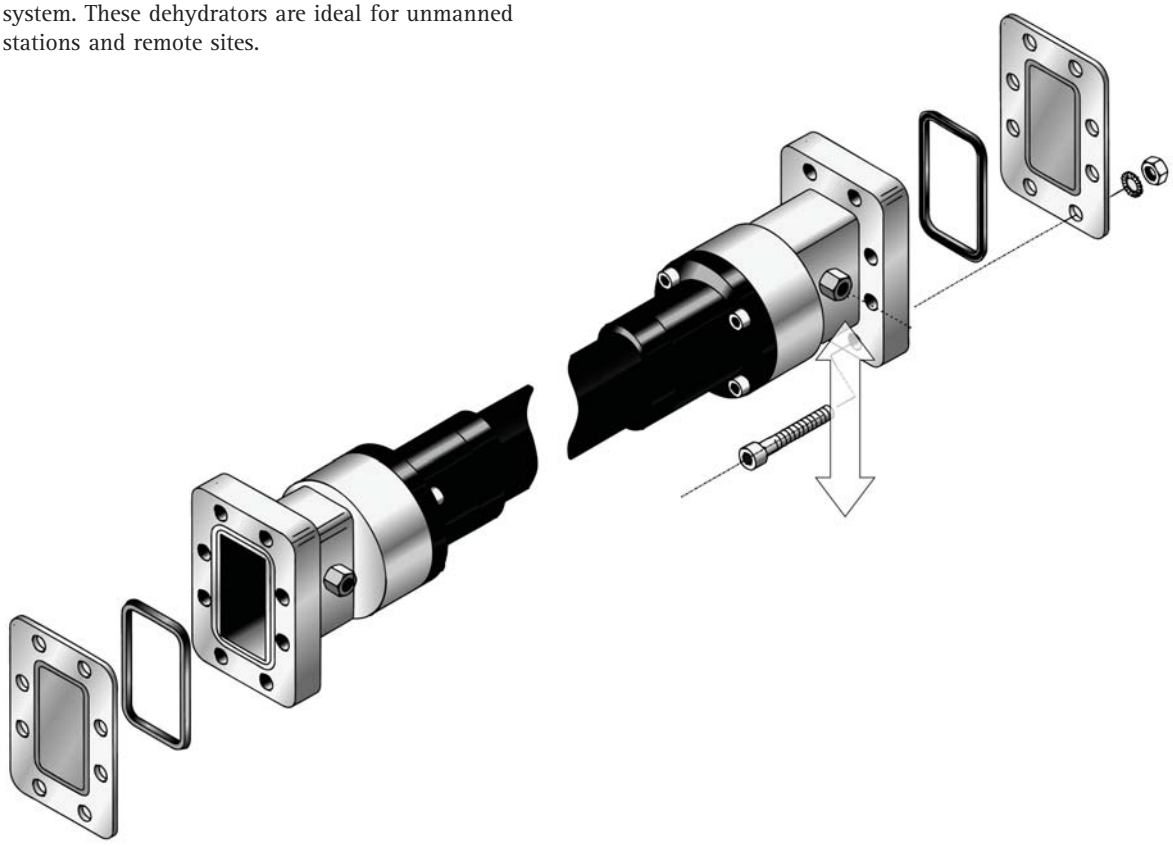
Dehydration Methods

The automatic series APD and LAB4 utilize a twin chamber system completely automated air drying system. These dehydrators are ideal for unmanned stations and remote sites.



Transportable purge and sealing device

RFS offers a handy check fitting to carry out the purging and the check for pressure tightness.

This fitting can be conveniently used for waveguide runs with up to approx. 2 liters of volume, as for instance (see table below).

In all such cases time for purging and for pressure tightness checking are of the areas of a few minutes. For larger and longer waveguides, having a much greater volume, the nitrogen bottles become less handy, and the purge and checking times become much longer, and therefore we recommend to use dehydrators for these waveguides.

- E220 up to 25 m
- E250 up to 30 m
- E300 up to 40 m
- E380 up to 75 m

Fittings to refill the nitrogen bottle are depending on local standards and therefore not part of the device.

Model Purge/SealtestDevice (PSD-T)

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Product Overview

PRODUCT OVERVIEW

Model Number	Type	Power	Output Capacity Liters/sec (SCFM) 60Hz	50Hz
LAB4AC	Automatic	230V 50/60Hz	0.03 (0.06)	0.03 (0.06)
LAB4DC	Automatic	36-72VDC	0.03 (0.06)	0.03 (0.06)
LAB2AC-B	Semi-Automatic	230V 50/60Hz	0.03 (0.06)	0.03 (0.06)
LAB2DC-B	Semi-Automatic	24-72VDC	0.03 (0.06)	0.03 (0.06)
APD-20	Automatic	115V 50/60 Hz	0.09 (0.2)	0.08 (0.17)
APD-22	Automatic	230V 50/60 Hz	0.09 (0.2)	0.08 (0.17)
APD-70	Automatic	115V 60 Hz	0.32 (0.7)	0.27 (0.58)
APD-72	Automatic	230V 50 Hz	0.32 (0.7)	0.27 (0.58)
APD-73	Automatic	230V 60 Hz	0.32 (0.7)	0.27 (0.58)
DC-KIT-B	Desiccant Cartridge	Not applicable	Not applicable	Not applicable
DC-KIT-220-B	Desiccant Cartridge	Not applicable	Not applicable	Not applicable
DC-KIT-260-B	Desiccant Cartridge	Not applicable	Not applicable	Not applicable
DC-KIT-320-B	Desiccant Cartridge	Not applicable	Not applicable	Not applicable

Desiccant Cartridge

The RFS desiccant cartridge is a compact and economical solution designed to protect antenna/feeder systems against moisture. The desiccant cartridge is connected to the system and the humidity indicator will provide an early warning (long before link failure) if moisture has entered the system in spite of all the precautionary measures taken. In this case, the capacity of the cartridge will be reached sooner. This is indicated by the desiccant changing it's color from blue to violet. It is very important to ensure that the desiccant cartridge has no opening to the outside air because it would try to dry the environment.

The cartridge is installed at the waveguide connector in general. For installation on small-size waveguides the kit includes an additional waveguide component.

ORDERING INFORMATION FOR DESICCANT CARTRIDGE KITS

Model Number	Product Information
DC-KIT-B	Desiccant Cartridge Kit
DC-001	Replacement Cartridge for DC-Kit
DC-KIT-220-B	Desiccant Cartridge Kit for R220
DC-KIT-260-B	Desiccant Cartridge Kit for R260
DC-KIT-320-B	Desiccant Cartridge Kit for R320

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Dehydrator Series LAB4

The LAB4 dehydrator supplies continuous dry air up to 100 Nl/h with a dew point better than –40°C, and an output pressure programmable from 0 to 6 kPa.

Two drying towers operating an alternate cycles contain the desiccant which dries the air through chemical absorption; while the first tower dries, the second one regenerates the desiccant by heating and backwashing with a reverse dry air flow.

The amount of air supplied determines the exchange interval between the two drying towers, thereby reducing the power consumption.

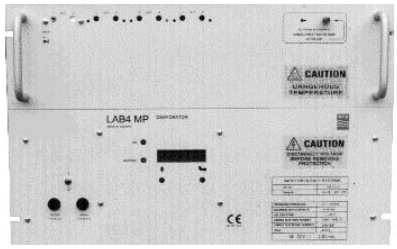
The operating pressure is set by the keys located on the front panel.

A fundamental characteristic of this dehydrator is the automatic flow rate regulation by the two pumps due to feed-back control of the output pressure. The dehydrator's flow rate is controlled according to the plant's requirements by the control and operating logic which maintains the output pressure at set point value by adjusting the pump's speed. This limits to a minimum the pump's duty, reduces wear and tear, power consumption and noise level, makes the dehydrator flexible enough to meet the plant's requirements and, lastly increases the system's overall reliability.

Automatic control of the pump's speed eliminates mechanical pressure regulators that introduce undesirable pressure losses and a worse response to flow rate regulations.

The following devices are located on the front panel:

- Power switch and fuses
- Function keys
- Led indications (power on, failure, warning)
- On/off outlet valves



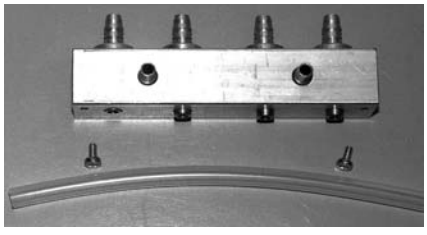
LAB 4

The actual output pressure and the elapsed time are available on the liquid crystal display on the front panel.

On the top of the panel are located: the power connector, the outlets with hose-tail fittings and the remote alarm connector.

The version comes with power failure, low pressure and humidity warning. All of the alarms are signalled locally and can be remoted as option.

LAB4 series dehydrators are prepared for the addition of a 4-outlet extension kit, model number ADD-ON4, which increases the number of outlets to 8. The outlet extension kit has a 6mm (1/4") hose tube outlet fitting.



ADD-ON 4

PRODUCT SPECIFICATIONS	
Operating Voltage	
LAB4DC	36-72VDC
LAB4AC	230V 50/60Hz
Number of outlets	4
Power consumption, maximum	110 watts
60Hz output capacity, liters/min (SCFM)	0.03 (0.06)
50Hz output capacity, liters/min (SCFM)	0.03 (0.06)
Output dew point	-40°C (-40°F) dew point at 20°C (68°F) 80% RH
Factory set output pressure, kPa (psig)	2 (0.3)
Field adjustable output pressure, kPa (psig)	Programmable up to 6 (0.9)
High pressure safety relief Valve, kPa (psig)	6.0 (0.9) ± 15%
Low pressure alarm	Programmable up to output
Low pressure alarm contacts	All local alarms are remoted
Output fitting	7mm (1/4") for 6mm (1/4") hose tube fitting
Dimensions H x W x D, mm (in)	
Wall mounting	311 x 486 x 135 (12.2 x 19.2 x 5.3)
19" rack	310 x 482 x 110 (12.2 x 18.9 x 4.3)
N3 rack according to ETS 300 119-(1-4)	310 x 533 x 110 (12.2 x 20.9 x 4.3)
Net weight, rack mounting, kg (lb)	11 (24.25)
Net weight, wall mounting, kg (lb)	14 (25.77)

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Dehydrator Series LAB2

The LAB2 dehydrator is designed for a continuous duty and capable for supplying dry air up to 100 Nl/h with a dew point better than –40°C, and an adjustable pressure range from 0 to 4 kPa.

The air is dried through chemical absorption by granular substances contained in a disposable cartridge accessible from the front panel.

The cartridge must be replaced when the color of the detector integrated in the desiccant cartridge, visible on the front panel, changes color from blue to pink. At the same time, when saturation occurs, an electronic humidity probe in the output air flow triggers an alarm so that continuous check by the operator is not necessary.

The liquid crystal display shows the actual output pressure measured by a digital manometer.

The unit has all the outlets with hose-tail fittings on the rear panel and on-off valves operable from the front panel.

The basic version comes with power off and low pressure alarm. The alarm is signalled locally and can be remote as an option.

The unit is a 19" standard, 2 units high and is either wall or rack-mountable. A wall mounting rack and ETSI N3 brackets are provided. Two brackets, that can be shifted according to the type of mounting required are provided.

Lab 2

A fundamental characteristic of this dehydrator is its pump's automatic flow rate regulation due to feedback control of the output pressure. The dehydrator's flow rate is controlled according to the plant's requirements by the control and operating logic which maintains the output pressure at set point value by adjusting the pump's speed. This limits to a minimum the pump's activity, reduces wear and tear, absorption and noise level, makes the dehydrator flexible enough to meet the plant's requirements and, lastly increases the system's overall reliability.

Automatic control of the pump's speed eliminates mechanical pressure losses and a worse response to flow rate regulations.

The standard power supply may be in direct current or in alternating current.

PRODUCT SPECIFICATIONS	
Operating Voltage	
LAB2DC-B	24-72VDC
LAB2AC-B	230V 50/60Hz
Number of outlets	4
Power consumption	5 watts
60Hz output capacity, liters/min (SCFM)	0.03 (0.06)
50Hz output capacity, liters/min (SCFM)	0.03 (0.06)
Output dew point	-40°C (-40°F) dew point at 20°C (68°F) 80% RH
Factory set output pressure, kPa (psig)	2 (0.3)
Field adjustable output pressure, kPa (psig)	Programmable up to 4 (0.6)
High pressure safety valve, kPa (psig)	Factory set
Low pressure alarm	Programmable up to output
Output fitting	7mm (1/4") for 6mm (1/4") hose tube fitting
Dimensions H x W x D, mm (in)	88 x 482 x 208 (3 x 19 x 8.2)
Net weight, kg (lb)	5 (11.1)

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.2 SCFM Automatic Dehydrators APD-20 Series

The APD-20 Automatic Pressurization Dehydrator is designed for reliable pressurization of elliptical waveguide, coaxial cable and rigid transmission line systems. The dehydrator includes a self contained completely automated air drying system that utilizes a pressure swing moisture absorption cycle to provide pressurized dry air while continuously purging the collected moisture to the atmosphere. This eliminates the need for replacement or manual reactivation of the desiccant and makes our APD-20 and APD-70 series dehydrators ideal for unattended operation at even remote sites. Dehydrators are also suitable for the average manned working environment since they typically run less than 5% of the time. In most normal applications, APD series dehydrators can be expected to operate for up to five years before any maintenance activities are required.

The APD-20 is rated at .09 liter/sec.(2 SCFM) and -40°C (-40°F) dry air dew point output at a 35°C (95°F) 95% relative humidity input. For normal room environments the dehydrator output air has a typical dew point of -46°C (-55°F). System pressure is controlled by the dehydrator pressure switch settings. Normally, this is factory adjusted to 20.7kPa (3 psig) “on” and 34.5 kPa (5 psig) “off”, but may be readjusted in the field to operate anywhere between 13.8 kPa and 103.4 kPa (2 and 15 psig). An internal 40 psig check valve guarantees that the customer system stays isolated from the dehydrator’s internal system and prevents loss of system pressure due to leakage in the dehydrator. For additional safety, a standard low pressure alarm switch factory-set at 6.9 kPa (1 psig), is installed in the dehydrator. The alarm switch contains a set of SPST contacts that can be used for both local and remote monitoring or alarming.

Additional standard features include a 0-15 psig pressure gauge, indicating power light, and a visual moisture monitor which is dark blue when dry and turns pink when wet.

The units may be shelf mounted or placed in a 19” EIA relay rack. A vented back cover for the dehydrator may be ordered as an optional accessory.

Series APD-20

ORDERING INFORMATION	
Accessories/ Items Supplied	**Model Number**
20 ft. of 3/8” plastic tubing	913348-240
Connector, 3/8” tubing to 1/8” MPT	913344
Optional Accessories	
Maintenance Parts Kit for APD-20 or APD-22	920641
High Pressure Alarm (0.5 lbs.)	920184
Floor Stand (31 lbs.)	914710
Dehydrator Rack Mount	913907
Wall Shelf	940008
Pressure and Humidity Monitor for APD-20	920717-001
Pressure and Humidity Monitor for APD-22	920717-003
Vented Back Cover Kit (wt. 1.5 lbs.)	933639

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.2 SCFM Automatic Dehydrators APD-20 Series

PRODUCT SPECIFICATIONS	
Power Source	
APD-20 P/N 920635	115 V 50/60 Hz
APD-22 P/N 920637	230 V 50/60 Hz
Output Ratings	
60 Hz	0.09 liters/sec. (0.2 SCFM)
50 Hz	0.08 liters/sec. (0.17 SCFM)
Output Dew Point	-40°C (-40°F)
Ambient Inlet Temperature	1°C - 49°C (33°F -120°F)
Ambient Humidity	95% maximum
Output Pressure (on/off)	
Factory Set	20.7-34.5 kPa (3/5 psig)
Field Adjustable	13.8-103.4 kPa (2-15 psig)
Output Differential	13.8 kPa (2 psig) minimum
Compressor Rating	1/12 hp
Power Consumption	
Pumping	350 watts
Idle	10 watts
Low Pressure Alarm	Factory set for 1 psig
P/N 916814-001	0.5 psig differential
Output Fitting	1/8" FPT to 3/8" plastic tube fitting
Dimensions, H x W x D mm (Inches)	355 x 450 x 203 (14 x 17-11/16 x 8)
Net Weight	22 kg (47 lbs.)
Shipping Weight	25 kg (55 lbs.)

APD-20 MAXIMUM DEHYDRATOR CAPACITY RATINGS	
Transmission Line m (ft)	**Approximate Length**
7/8"	6,400 (21,000)
1-5/8"	2,100 (7,000)
3-1/8"	600 (2,100)
6-1/8"	150 (500)
6 to 12 GHz Waveguide	2,400 (8,000)
4 to 5 GHz Waveguide	1,200 (4,000)

Based on 2 psi leakage in 24 hours and 5% running time for 60 Hz operation.
For 50 Hz operation, multiply capacity ratings by 5/6 (a reduction of 17%).

ORDERING INFORMATION	
Spare Parts for APD Series	**Model Number**
Amber Light**	913654-002
Color-Change Moisture Indicator Gel (1 lb.)	913632
Filter Assembly**	914714
Male Connector 3/8" Tubing to 1/8" MPT**	913344
Maintenance Parts Kit	920641
Pressure Switch	913481
Red Light**	913654-001
1/4" Polyethylene Tubing (black)**	913566
3/8" Polyethylene Tubing (black)**	913348
3/8" Nylon Tubing (white)**	913928

**Included in APD-20 and APD-70 Series Maintenance Parts Kit

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.7 SCFM Automatic Dehydrators APD-70 Series

The APD-70 is similar in design and features to the APD-20 series, except that the APD-70 has the larger 0.7 SCFM capacity and includes a protective metal rear cover as standard equipment. Like the APD-20 dehydrator, the APD -70 systems utilizes a pressure swing moisture absorption drying system that provides pressurized dry air to the system and continuously purges the collected moisture to the atmosphere. This eliminates the need for replacement or manual reactivation of the desiccant and makes our APD-20 and APD-70 series dehydrators ideal for unattended operation at even remote sites. In most normal applications, APD series dehydrators can be expected to operate for up to five years before any maintenance activities are required.

Series APD-70

The APD-70 Automatic Pressurization Dehydrator is rated at 0.7 SCFM at 115 volts 60 Hz and is designed for operation in larger systems with up to 1,700 ft. of 6-1/8" diameter transmission line. From normal room environments the output air has typical dew points of -60°F (-53°C). System pressure is controlled by the dehydrator pressure switch settings. Normally, this is factory adjusted to 3 psig (20.7kPa) "on" and 5 psig (34.5 kPa) "off", but may be readjusted in the field to operate anywhere between 2 and 15 psig (13.8 kPa and 103.4 kPa). An internal 40 psig check valve guarantees that the customer system stays isolated from the dehydrator's internal system and prevents loss of system pressure due to leakage in the dehydrator. For additional safety, a standard low pressure alarm switch , factory-set at 1 psig (6.9 kPa), is installed in the dehydrator. The alarm switch contains a set of SPST contacts that can be used for both local and remote monitoring or alarming. Additional standard features include a 0-15 psig pressure gauge, indicating power light, and a visual moisture monitor which is dark blue when dry and turns pink when wet.

The units may be shelf mounted or placed in a 19" EIA relay rack.

ORDERING INFORMATION	
Accessories/ Items Supplied	**Model Number**
20 ft. of 3/8" plastic tubing	913348-240
Connector, 3/8" tubing to 1/8" MPT	913344
Optional Accessories	
Maintenance Parts Kit for APD-70, APD-72, or APD-73	920641
High Pressure Alarm (0.5 lbs.)	920184
Floor Stand (31lbs.)	914710
Dehydrator Rack Mount	913907
Wall Shelf	940008
Pressure and Humidity Monitor for APD-70	920717-001
Pressure and Humidity Monitor for APD-72 or APD-73	920717-003

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.7 SCFM Automatic Dehydrators APD-70 Series

PRODUCT SPECIFICATIONS	
Power Source	
APD-70 P/N 940019	115 V 60 Hz
APD-72 P/N 940020	230 V 50 Hz
APD-73 P/N 940022	230 V 60 Hz
Output Ratings	
60 Hz	0.7 SCFM (0.32 liters/sec.)
50 Hz	0.58 SCFM (0.27 liters/sec.)
Output Dew Point	-40°F (-40°C)
Ambient Inlet Temperature	33°F -120°F (1°C - 49°C)
Ambient Humidity	95% maximum
Output Pressure (on/off)	
Factory Set	3/5 psig (20.7-34.5 kPa)
Field Adjustable	2-15 psig (13.8-103.4 kPa)
Output Differential	2 psig (13.8 kPa) minimum
Compressor Rating	1/4 hp
Power Consumption	
Pumping	600 watts
Idle	10 watts
Low Pressure Alarm	Factory set for 1 psig
P/N 916814-001	0.5 psig differential
Output Fitting	1/8" FPT to 3/8" plastic tube fitting
Dimensions, H x W x D Inches (mm)	14 x 17-11/16 x 8 (355 x 450 x 203)
Net Weight	54 lbs. (25 kg)
Shipping Weight	64 lbs. (29 kg)

APD-70 MAXIMUM DEHYDRATOR CAPACITY RATINGS	
Transmission Line Feet (m)	**Approximate Length**
7/8"	73,000 (22,200)
1-5/8"	24,000 (7,300)
3-1/8"	7,300 (2,200)
6-1/8"	1,700 (500)
6 to 12 GHz Waveguide	28,000 (8,500)
4 to 5 GHz Waveguide	14,000 (4,300)

Based on 2 psi leakage in 24 hours and 5% running time for 60 Hz operation.
For 50 Hz operation, multiply capacity ratings by 5/6 (a reduction of 17%).

ORDERING INFORMATION	
Spare Parts for APD Series	**Model Number**
Amber Light**	913654-002
Back Cover Kit for APD Series	933639
Color-Change Moisture Indicator Gel (1 lb.)	913632
Filter Assembly**	914714
Male Connector 3/8" Tubing to 1/8" MPT**	913344
Pressure Switch	913481
Red Light**	913654-001
1/4" Polyethylene Tubing (black)**	913566
3/8" Polyethylene Tubing (black)**	913348
3/8" Nylon Tubing (white)**	913928

**Included in APD-20 and APD-70 Series Maintenance Parts Kit

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Accessories

Run Timer Alarm Kit

The Run Timer Alarm is an adjustable timer/alarm system designed to signal a warning in the event of excessive dehydrator operation. Dehydrator operation in excess of 5 hours or more (dependent on system volume) usually indicates abnormal system leakage.

The electronic Run Timer starts its programmed timing sequence when the dehydrator compressor is turned on, and automatically resets when the compressor is turned off. In the event that the timer is run to its programmed limit, a relay within the timer module activates a SPST switch to signal a remote alarm- supplied by user. The Run Timer does not control dehydrator operation, but is meant only as a device to signal excessive run time.The Run Timer may be programmed by the user for an activation delay of up to 10 hours. The relay switch contacts are rated for 110 VAC, 10 Amp.

Run Timer Alarm Kit

ORDERING INFORMATION	
Description	**Model Number**
Run Timer Alarm	914976

Pressure & Humidity Monitor Kit for APD series Dehydrators

The Pressure and Humidity Monitor Kit is designed for reliable monitoring of pressurized waveguide, coaxial cable and rigid line transmission systems. The humidity monitor features remote alarm relay contacts configured as normally open SPDT rated at 3 amps, 120 VAC or 1.5 amps, 240 VAC. Sensor threshold is factory set for 10% relative humidity.

Pressure Alarm thresholds of 1 psig (low) and 10 psig (high) activate SPST alarm contacts rated at 4 amps 24 VDC. All necessary assembly components have been supplied. Some drilling is required. Tools: Drill (5/32 inch), Screwdriver (1/4 inch blade), Pliers, 7/16 inch wrench.

Pressure & Humidity Monitor Kit

Principle of Operation

The Humidity Monitor controller provides on/off control of alarms, dialers and other signaling devices when system humidity exceeds a fixed set point. The controller also provides an analog output (0-100uA DC) that can be used to monitor humidity conditions.

ORDERING INFORMATION	
Description	**Model Number**
Pressure and Humidity Monitor Kit for APD-20 and APD-70	920717-001
Pressure & Humidity Monitor Kit for APD-22, APD-72 and APD-73	920717-003

Needle Release Valve

ORDERING INFORMATION	
Description	**Model Number**
1/8" MPT each end	913302

Pipe Nipple

ORDERING INFORMATION	
Description	**Model Number**
1 inch Long,1/8 inch MPT each end	920126
1-1/2 inch Long, 1/8 inch MPT each end	913438

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Accessories

Gas Distribution Manifold Kit GDM- (*) (0-15 psig gauge)

Used for pressure distribution to several transmission lines. Allows easy maintenance checks of individual lines. Includes 1/8" FPT input, distribution manifold block and one needle release valve. 0-15 psig pressure gauge, 15 ft. (4.5m) 3/8" plastic tubing for each outlet.

Also included are four 3/8" plastic tubing racks (10 slots per rack), one roll of teflon tape and 24 nylon ties. Designate number of outlets by suffix number, i.e., GDM-2 for two outlets, GDM-3 for three outlets, etc.

ORDERING INFORMATION

Type (suffix number designates number of outlets)	Model Number	Approx wt. kg (lbs)
GDM-1	920201	1.7 (3.7)
GDM-2	920202	1.9 (4.2)
GDM-3	920203	2.2 (4.8)
GDM-4	920204	2.8 (6.2)
GDM-5	920205	4.1 (9.0)
GDM-6	920206	4.4 (9.6)
GDM-7	920207	4.8 (10.5)
GDM-8	920208	5.0 (11.0)
GDM-9	920209	5.7 (12.5)
GDM-10	920210	5.9 (13.0)

Low Pressure Distribution Manifold Kit LDM-(*) (0-5 psig gauge)

ORDERING INFORMATION

Type	Model Number	Approx wt. (lbs)
LDM-1	920211-001	4.9
LDM-2	920211-002	5.7
LDM-3	920211-003	7.1
LDM-4	920211-004	8.0
LDM-5	920211-005	9.2
LDM-6	920211-006	10.5
LDM-7	920211-007	12.0
LDM-8	920211-008	13.0
LDM-9	920211-009	14.2
LDM-10	920211-010	15.0

High & Low Pressure Alarms

The high pressure alarm is suitable for field installation or may be ordered factory installed. The alarm sensor is set at 10 psig (68.9 kPa). May be special ordered for any pressure between 7 and 30 psig (48.2 and 206.7 kPa). Provides SPST contact rated at 4 amps 24 VDC.

The low pressure alarm is factory installed on all dehydrators or may be ordered separately for field installation to GDM gas distribution manifold. Pressure end mounts to 1/8 inch FPT. Sensor factor set for 1 psig (6.9 kPa). May be special ordered for any value between 1psig and 7 psig. Provides SPST contact rated at 4 amps 24 VDC.

High Pressure Alarm

ORDERING INFORMATION

Description	Model Number
High Pressure Alarm	920184
Low Pressure Alarm	916814-001

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Accessories

Nitrogen Tank Regulator Kit

Used with locally obtained nitrogen tank. Includes a reliable single stage regulator, high pressure gauge (0-4,000 psig), low pressure gauge (0-30 psig) and 10 ft. (3 m) 3/8 inch plastic tubing with 1/8 inch MPT fitting. Regulator fits CGA 580 (0.965 right hand internal) nitrogen tank connection, which is standard for most US sources (Approx. wt. 4 lbs)

Nitrogen Tank Regulator kit

ORDERING INFORMATION	
Model Number	920188

Plastic Tubing Support Rack

For securing plastic tubing to wall. Rack will support up to 10 tubes.

ORDERING INFORMATION	
Description	Model Number
3/8″	913368
1/4″	914063

Low Pressure Gauge

0-5 PSIG

1/4 inch MPT, indoor use only

Low Pressure Gauge

ORDERING INFORMATION	
Model Number	514857

Pressure Gauge 0-15 psig

Pressure Gauge 0-15 psig

ORDERING INFORMATION	
Description	Model Number
1/8″ MPT, indoor use only	511675
1/8″ MPT, outdoor use only	915965

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Introduction to WINS

Why RF coverage in confined areas?

In the early days of mobile communication there was only outdoor coverage. The outmost 'confined area' at that scenario was the private car where an external antenna was linked to the mobile inside.

Times have changed dramatically. Only a couple of years later the mobile communication became the driving force of the entire communication industry. This breathtaking development has not slowed down. With 3G, UMTS and W-CDMA mobile access to the Internet world will become reality in the very near future.

These highly sophisticated services cannot be restricted to only open air. Instead, coverage of confined areas becomes a key issue for the mobility of the modern society and with independency in communication wherever people go. Most 3G traffic, for example, is expected in confined areas.

Operator's benefit

Mobile users want to be independent. No matter where they actually are they expect to be reachable around the world. People have the tendency to choose those service providers that offer the best coverage. That means operators attract more subscribers for their services if the offered grade of coverage satisfy the expectations of the user.

Emergency communication

Confined areas are often susceptible to damaging incidents. Past accidents clearly show that a proper working (wireless) communication system is required for rescue forces to save lives. In many places like tunnels and public buildings it is a must to install an independently working communication system for rescue workers, fire brigade and police.

Trunk radio

Due to the high complexity of our traffic systems it is a necessity to provide wireless services to keep communication contact between train personnel and the operation headquarters. Those services have the same importance as the emergency radio.

RFS has the full range of products for all kind of system needs

Whatever kind of services is needed, RFS has the complete solution using state-of-the-art and reliable techniques. RFS will help you choose the most cost effective solution for the coverage whether it is a passive or an active network, antennas, or leaky cable.

Confined areas

There is a growing number of inside areas where wireless RF coverage for mobile communication is not sufficient. Those areas often need to be covered with multiple service providers and are usually linked to the mobile networks either via an antenna with adjacent booster amplifier or using a carrier's base station (BTS).

What does WINS stand for?

WINS stands for Wireless Indoor Solutions offering to customers RF communication systems for confined areas. It enables people to use their mobile radios and cellular phones in areas not normally covered with RF signals.

WINS provides solutions

Throughout the world RFS provides complete broadband wireless solutions for most kinds of confined areas such as those found in metros, tunnels, buildings, and other covered structures.
As an experienced leader in this marketplace RFS has the expertise combined with innovative products. These products include passive (cable, antennas, filters, combiners, etc.), and optical (fiber optic converters, etc.) that are internally designed and manufactured.

Solutions for...

WINS provides coverage for:

- **Analog security and emergency services, in the frequency range of 75 to 150 MHz**

  Police
  Fire brigade
  Rescue service

- **Paging in the range of 150 MHz**
- **Analog cellular networks, in the frequency range of 400 to 900 MHz**

  NMT
  AMPS

- **Digital cellular networks, in the frequency range of 380 to 2,650 MHz**

  TETRA 380 (Europe, emergency)
  TETRA 450 (Europe, trunking)
  TETRA 800 (Asia)
  CDMA/TDMA 800
  SMR (US)
  GSM-R (European railway)
  PMRS (Asia)
  GSM 900
  GSM DCS 1800
  PCN/PCS 1900
  UMTS 2100
  W-CDMA 2100
  Others

- **Wireless data transmission at 2.4 GHz, 3.5 GHz, 5.2 GHz and 5.8 GHz**

  WLAN
  WiFi
  WiMax
  802.1 Ethernet
  Bluetooth

- **Broadcast services in the frequency range of FM, VHF, and UHF DAB and DVB**

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Wireless Indoor Solutions

Applications

The RF applications for confined areas are numerous. In structural areas where people are cut off cellular networks because they are in tunnels or behind building walls there is a need for additional broadband wireless coverage RFS has a proven track record of providing wireless systems in the following confined areas:

- **Tunnels**

  Metros, train tunnels
  Street tunnels
  Service tunnels

- **Buildings**

  High rise buildings
  Corporate buildings
  Campus areas
  Arenas
  Airports
  Train stations
  Shopping centers

- **Vehicles**

  In-train
  Aircraft
  Offshore oil platforms
  Vessels (commercial and military)

- **Mines**

Application driven solutions

For more than 30 years RFS has been a major leader in the WINS business worldwide. Our extensive experience in RF distribution enables RFS to offer the newest and most reliable technology in the market. RFS has the ability to offer customized solutions as well as 'standardized' approaches for easy system designs and cost effective installations.

Depending on the application there are different system approaches from a purely passive network solutions to a highly sophisticated active networks with fiber optic backbone and remote surveillance. RFS can provide solutions from simple antenna to broadband leaky feeder cable distribution or a combination of both.

Underground Systems

WINS started with providing essential services for police, fire brigade, and train control in major tunnels. Tunnels being absolutely RF dead once past the first bend from the portal provided a unique challenge for the RF engineer to provide wireless services. RFS, the first to develop modern corrugated cable, solved this problem with the development of radiating cable. Since a cable could be strung the entire length of a

tunnel the distributed antenna characteristics of the radiating cable provides a continuous wireless system.

With the use of radiating cable and bi-directional amplifiers to compensate for the insertion and coupling losses of the cable over long distances, wireless communication from the train cab and hand-held radios was possible to the outside world. For the first time in history wireless communications coverage was possible and extremely reliable in an underground environment.

In-building Structures

Large building structures often have poor RF characteristics. As an example, hospitals that are often made of RF absorbing concrete and steel inhibit wireless devices like pagers, mobiles and wireless test equipment. Doctors and nurses who must communicate with their patients and staff are unable to use their portable phones and pagers once inside the hospital. RFS's Wireless Indoor Solutions product line provides the solution to make communication possible in the environment. Wireless test equipment, pagers, mobiles can operate on the same backbone system comprised of RADIAFLEX® radiating cables and communication electronics.

Other large building structures like airports, shopping centers, and high rises often have the same poor RF characteristics. Again WINS can be used to simultaneously provide multiple services to many different wireless portable users. It is not good enough to have your wireless devices operate only in an outside environment or next to the nearest available window. Today's wireless users are demanding that their portable wireless devices work in all environments and through the entire building.

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Applications

Transportation

Vehicles carrying many people are mostly built of metal, which naturally shields RF penetration in both directions. Therefore, mobile communication is usually poor, especially in those trains in which windows of a vehicle are covered with a thin metal coat for better air conditioning purposes. Sea going ships also do not allow satisfying mobile communication due to the massive presence of steel.

The installation of distributed antennas in vehicles is often not suitable or recommended due to their placement and often being an obstruction. A simple radiating cable solution is often the answer. It is wideband, can be placed out of site, and is not obtrusive. The installation of radiating cables requires high mechanic properties of those like high flexible body and small bending radii in order to place it into narrow, pre-given spaces. RFS designed a special radiating cable, the RSF12-50, which fulfills those requirements.

Mines

Wireless communications underground has become more and more important. Besides the analogue technique already operating in most mines there is the need to install highly sophisticated wireless communication systems to remotely control machineries. Also the need for new TETRA systems for emergency services is required. Here, future proof applications require a broadband solution that can be supplied by RFS.

From cable deliverer to solution provider

RFS has long expertise in the RF coverage of confined areas, starting with the first radiating cable in the seventies for communication in tunnels. At that time no one could imagine the success story of the mobile consumer communication. Radiating cable was installed to enable analog trunk communication between the train driver and the related operation centers at a low RF frequencies in the range of 75 MHz to 150 MHz. Today the requirements and expectations in a RF communication network have changed greatly. Coverage must be provided for a number of different services at different frequencies. Broadband technique is now requested transmitting mainly digital signals up to 2.4 GHz including WLAN services and more.

RFS offers complete RF system solutions for nearly every kind of confined area. These systems vary from specific solutions for large tunnel projects to a cost-effective modular system for In-building; from passive system approach to active driven systems with an optical fiber backbone structure. Last but not least RFS rounds up their spectrum offering complete remote surveillance systems for active equipment like amplifiers and electro-optical converters.

All services – one stop shopping

The development of high performance RF equipment and components combined with quality products has made RFS very successful in the global marketplace.

Besides the development and production of system equipment, RFS has extensive experience in the international markets in providing the complete range of services from basic system design to full turnkey solutions. Complex broadband wireless turnkey solutions have been designed, installed, and commissioned in Hong Kong, Singapore, China, Europe, and the Americas.

RFS provides the following services:

- Consulting
- Site survey
- System design
- Project management
- Installation
  (also subcontracting to local companies)
- Supervision
- Commissioning
- Acceptance tests
- Training
- Maintenance
- Turnkey

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Introduction to RADIAFLEX®

RADIAFLEX® radiating cables facilitate radio communication where the usual free space propagation of electromagnetic waves is hampered, undesired or impossible- in tunnels, mines, buildings, alongside tracks or lines and in large complexes like exhibition grounds or airports.

RFS has a wide range of radiating cables available, each optimized for the following fields of application:

- ALF, RLF series for heavy duty wideband and multiuse applications in tunnels of all kinds; easy system planning.
- RLK series for applications in tunnels and buildings, where low coupling loss variations are required.
- RLV series for tunnel applications, with graded coupling loss (VARIO) performing nearly constant system loss and low amplitude variation.
- RAY series for tunnels and buildings, optimized for high frequencies and digital transmission, where low coupling loss variations are required.
- RCF series for easy installation in buildings and mining, where particularly small bending radii are required and for heavy duty applications.
- RSF series preferable for installations in vehicles where narrow space requires sharp bending radii.
- RHCA series for use in buildings where the highest level of fire retardant standards are required. Plenum rated RHCA cables utilize an air-dielectric design. The dielectric support is wrapped Teflon tube.

TYPICAL APPLICATIONS	
Analog security and trunk services	In the range of 75 MHz and 150 MHz
Digital security and trunk service	TETRA 380, TETRA 410, TETRA 450, TETRA 800, GSM-R, in the range of 380 MHz and 900 MHz
Digital broadcasting	DAB, DVB, in the ranges of 170 MHz and 240 MHz, and around 1.5 GHz
Digital cellular networks	DAMPS, GSM, DCS, PCN/PCS, UMTS, W-CDMA, in the range of 800 MHz and 2.2 GHz
Wireless LAN, WiFi, Bluetooth	2.4 GHz, 5.2 GHz, 5.8 GHz
WiMAX	3.5 GHz

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How to Select the Best Suited RADIAFLEX® Cable for a Given Purpose

All RADIAFLEX® cables belong to one of these sizes. For a given size, all smooth wall RADIAFLEX® cables have the same basic structure of inner conductor, foam dielectric, copper strip outer conductor and jacket, thus allowing identical connectors and clamps to be used (except of the RCF/RSF series and RHCA series with their corrugated outer conductor).

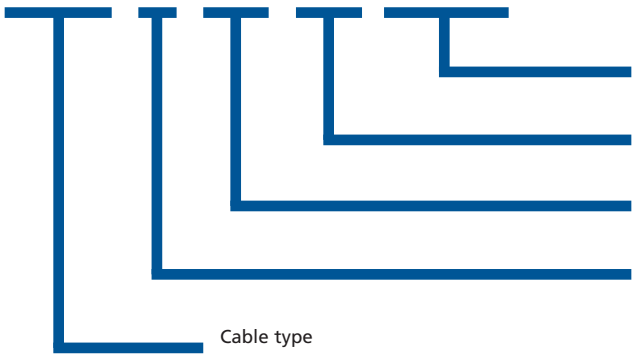
The differences between the cable versions of one given nominal diameter are solely attributable to the configuration of the outer conductor apertures. This configuration determines the kind of interaction between the inner coaxial system and the outside environment, and thus it influences all the cable's important electrical parameters like frequency range, attenuation, coupling loss, reflection factor and susceptibility to environmental conditions (such as lossy walls, accumulation of dust or salt and moisture etc.).

The best suited cable would have optimum values for all of these parameters, and knowing the particular application (service length, frequency range of operation etc.), this best suited cable can be determined. Following are a few indications about that. The comparisons are made for achieving minimum system loss, i.e. minimum of the sum of attenuation and coupling loss, and for maximum useful length.

EACH RADIAFLEX® CABLE IS CLASSIFIED ACCORDING TO ITS NOMINAL DIELECTRIC DIAMETER						
1/2"	11 mm	ALF 12-50	RLK 12-50		RCF/RSF 12-50	RHCA 12-50*
7/8"	23 mm	RLF 78-50	RLK 78-50		RAY 78-50	RCF 78-50
1 1/4"	33 mm	RLF 114-50	RLK 114-50	RLV 114-50	RAY 114-50	RCF 114-50
1 5/8"	44 mm	RLF 158-50	RLK 158-50	RLV 158-50	RAY 158-50	RCF 158-50

For a given nominal diameter, connectors and clamps are the same for any cable type (exemption: types RCF/RSF and RHCA).
* Plenum rated version (JPL) only.

RLK U 78-50 XXX A



w/o suffix:	up to 900 MHz band
L:	up to 600 MHz band
W:	up to 1900 MHz band
U:	up to 2200 MHz band and above

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Cable	Nominal Size	System Loss in dB/km (dB/1,000 ft)				
		450 MHz	900 MHz	1800 MHz	2200 MHz	2400 MHz
RCF12-50 ****	1/2"	124 (84.4)	150 (91.6)	199 (107.9)	217 (114.8)	223 (116.6)
RSF12-50 ****	1/2"	155 (93.8)	202 (112.3)	264 (129.7)	295 (135.1)	301 (138.2)
RHCA12-50 ****	1/2"	153 (94.6)	199 (110.7)	271 (131.3)	293 (134.5)	310 (141.8)
RCF78-50 ****	7/8"	105.5 (84.3)	117 (86.4)	138 (90.7)	148 (93.8)	151 (93.3)
RCF114-50 ****	1 1/4"	103.2 (87.8)	113.1 (90.1)	128.8 (92.8)	136.2 (95)	140.9 (97.9)
RCF158-50 ****	1 5/8"	99 (87.9)	106.2 (89.4)	119 (92.6)	123.6 (93.3)	126.5 (94.2)
ALFU12-50 ***	1/2"	126.5 (90.7)	151 (98.2)	190 (113.4)	204 (117.8)	210 (119.5)
RLF78-50 ***	7/8"	91.2 (73)	105.2 (77.3)	-	-	-
RLFW78-50 ***	7/8"	99.8 (81.2)	113.1 (83.8)	147 (92.1)	-	-
RLFU78-50 ***	7/8"	93.6 (77.4)	106.9 (75.3)	138.7 (82.6)	165.2 (90.7)	185.2 (98.2)
RLF114-50 ***	1 1/4"	85.7 (71.3)	101.2 (76)	-	-	-
RLFW114-50 ***	1 1/4"	92.7 (79)	100.5 (79.3)	132.6 (87)	-	-
RLFU114-50 ***	1 1/4"	86.6 (73)	95.3 (73.5)	120.1 (78.3)	139.7 (83.6)	152.5 (88.2)
RLF158-50 ***	1 5/8"	81.4 (70.7)	88.8 (72.3)	-	-	-
RLFW158-50 ***	1 5/8"	89.6 (79.5)	92.5 (76.8)	113.7 (79.1)	-	-
RLFU158-50 ***	1 5/8"	82.3 (71.7)	90.1 (72.7)	116.2 (77.8)	137.5 (84.3)	156 (90)
RLKW12-50	1/2"	119.4 (79.5)	148.3 (88.3)	260 (116.8)	-	-
RLKU12-50	1/2"	125.4 (85.5)	154 (88.6)	277 (124)	310 (132.6)	333 (139.1)
RLKL78-50	7/8"	88.3 (68.6)	-	-	-	-
RLKW78-50	7/8"	89.8 (69.8)	109.2 (73.6)	185 (92.6)	-	-
RLKU78-50	7/8"	98.7 (80.1)	106.7 (78.4)	139 (85.5)	160.4 (91.3)	177 (95.6)
RLKL114-50	1 1/4"	85 (70.4)	-	-	-	-
RLK114-50	1 1/4"	78.7 (64.3)	101.8 (70)	-	-	-
RLKW114-50	1 1/4"	85.2 (71.9)	93.6 (71.6)	130 (77.2)	-	-
RLKU114-50	1 1/4"	94 (80.8)	97.6 (76.3)	118.12 (79.8)	134.4 (84.1)	144.9 (87.3)
RLKU158-50	1 5/8"	98.3 (88.4)	90.5 (74.9)	102.5 (75.7)	111.7 (77.8)	116.2 (77.8)
RLV114-50	1 1/4"	96 *	89*	-	-	-
RLVU114-50	1 1/4"	103 *	78 *	88 *	90 *	97 *
RLVU114-50B	1 1/4"	92 *	85 *	86 *	88 *	89 *
RLV158-50	1 5/8"	94 *	84 *	-	-	-
RLVU158-50	1 5/8"	99 *	82 *	95 *	97 *	102 *
RLVU158-50B	1 5/8"	99 *	90 *	94 *	96 *	99 *
RAY78-50	7/8"	88.7 (70.1)	113 (73.4)	-	-	-
RAY78-50B	7/8"	90.5 (70.7)	110 ** (75.3) **	-	-	-
RAY114-50	1 1/4"	84.4 (71.6)	95.4 (69.4)	-	-	-
RAY114-50B	1 1/4"	88.3 (74.2)	99.1 ** (73.3) **	-	-	-
RAY158-50	1 5/8"	81.9 (71.5)	89.2 (68.9)	-	-	-
RAYU158-50	1 5/8"	104.2 (93.6)	100.5 (84.2)	111.7 (83.4)	123.1 (83.1)	148.2 (89)
RAYU158-50T	1 5/8"	-	84.7 (67.5)	103 (71)	104 (75.5)	-

* Figures for manufacturing lengths
** Figures for 800 MHz
*** Due to the cable design single lengths should not be less than 80 m (262 ft).
**** Coupling loss values are given with a tolerance of 10 dB and longitudinal loss values with a tolerance of 5%.

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Length @ 120 dB system loss in m (ft)					Type of apertures	Remarks
450 MHz	900 MHz	1800 MHz	2200 MHz	2400 MHz		
930 (3,046)	643 (2,109)	397 (1,303)	340 (1,116)	327 (1,073)	Milled slots	• Corrugated outer conductor • Robust, low bending radii
602 (1,978)	364 (1,196)	254 (835)	239 (785)	226 (744)		
607 (1,992)	378 (1,240)	249 (816)	241 (791)	215 (705)		
1,475 (4,839)	1,068 (3,507)	735 (2,415)	641 (2,101)	627 (2,055)		
1,757 (5,735)	1,208 (3,960)	830 (2,722)	726 (2,389)	662 (2,169)		
2,313 (7,551)	1,570 (5,135)	1,026 (3,362)	917 (3,008)	860 (2,817)		
874 (2,866)	592 (1,940)	364 (1,198)	323 (1,058)	308 (1,013)	Groups of apertures at large intervals	• Corrugated outer conductor • Robust, low bending radii
2,099 (6,875)	1,368 (4,472)	-	-	-		
1,754 (5,732)	1,164 (3,828)	658 (2,158)	-	-		
1,957 (6,429)	1,305 (4,956)	768 (2,520)	578 (1,896)	479 (1,571)		
2,657 (8,730)	1,519 (5,000)	-	-	-		
2,386 (7,833)	1,639 (5,376)	808 (2,650)	-	-		
2,704 (8,833)	1,789 (5,895)	998 (3,279)	756 (2,480)	649 (2,128)		
3,506 (11,489)	2,311 (7,534)	-	-	-		
3,082 (10,000)	2,222 (7,353)	1,127 (3,709)	-	-		
3,464 (11,277)	2,191 (7,143)	1,069 (3,512)	771 (2,532)	621 (2,034)		
1,010 (3,314)	672 (2,205)	320 (1,051)	-	-	Groups of apertures at short intervals	Negligible influence of dust/salt/moisture accumulation on cable loss
906 (2,971)	638 (2,098)	286 (940)	255 (838)	237 (776)		
2,120 (6,977)	-	-	-	-		
2,049 (6,705)	1,211 (3,974)	511 (1,675)	-	-		
1,798 (5,926)	1,327 (4,355)	753 (2,468)	594 (1,947)	513 (1,685)		
2,667 (8,750)	-	-	-	-		
2,995 (9,841)	1,397 (4,571)	-	-	-		
2,813 (9,153)	1,835 (6,042)	868 (2,845)	-	-		
2,368 (7,759)	1,732 (5,699)	1,034 (3,393)	801 (2,624)	700 (2,292)		
2,517 (8,182)	2,311 (7,536)	1,455 (4,786)	1,170 (3,851)	1,069 (3,512)		
-	-	-	-	-	Vario cables • Graded groups of apertures	Standard length 1,000 m (3,281 ft)
-	-	-	-	-		Standard length 500 m (1,641 ft)
-	-	-	-	-		Standard length 500 m (1,641 ft)
-	-	-	-	-		Standard length 1,000 m (3,281 ft)
-	-	-	-	-		Standard length 800 m (2,625 ft)
-	-	-	-	-		Standard length 800 m (2,625 ft)
2,172 (7,160)	1,123 (3,678)	-	-	-	Groups of slope slots at short intervals	• Low coupling loss • Optimized for digital transmission
2,035 (6,667)	1,200 * (3,922) *	-	-	-		
2,935 (9,643)	1,658 (5,439)	-	-	-		
2,562 (8,387)	1,563 * (5,133) *	-	-	-		
3,557 (11,778)	2,055 (6,742)	-	-	-		
2,039 (6,739)	1,830 (5,972)	1,204 (3,952)	946 (3,158)	669 (2,192)		
-	2,429 (8,000)	1,370 (4,500)	1,390 (4,560)	-		

The 1 km (1,000 m) system loss is the sum of the attenuation of 1 km (1,000 m) of cable loss plus the 50% coupling loss figure - see pages 402-440 for the coupling loss of the applicable cable. The 120 dB length is the cable length at which the sum of its attenuation and the 50% coupling loss figure is 120 dB. As with any radiating cable, the performance in building or tunnel environments may deviate from figures based on the free space method.Coupling loss values are given with a tolerance of 5 dB and longitudinal loss values with a tolerance of 5%.

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Flame and Fire Retardant Jackets

The standard jacket material of all RADIAFLEX® cable is polyethylene, black. Those cable have the suffix J and meet the requirement of:

- IEC 60 754-1 (halogen-free, <0.2% Chlorine), and
- IEC 60 754-2 (non-corrosive, PH-value > 4.3, conductivity < 100 mSiemens/cm).

Smooth wall RADIAFLEX® cable with the suffix JFN meet the requirements of:

- IEC 60 754-1 and -2 (as above)
- IEC 60 332-1 (flame retardant, 'single cable'), and
- IEC 60 332-3-24 (fire retardant, 'cable bundle').

Cable sizes of 1/2" and 5/8" meet in addition:

- IEC 61 034 (low smoke).

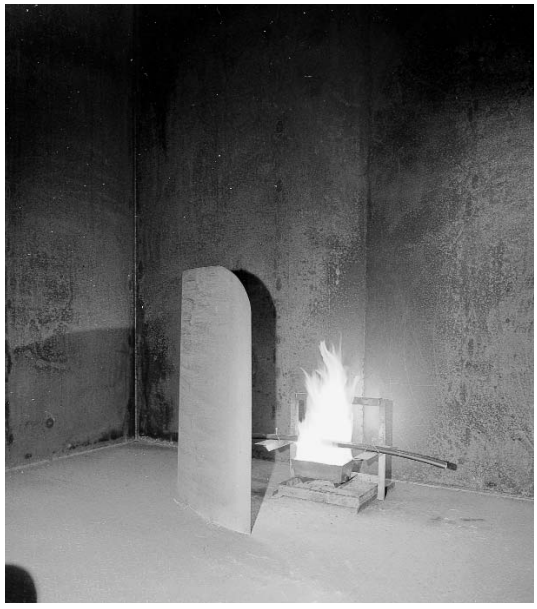
Smooth wall RADIAFLEX® cable with the suffix JFL meet the requirements of:

- IEC 60 754-1 and -2 (as above),
- IEC 60 332-1 and -3-24 (as above), and
- IEC 61 034 (low smoke)

The table on the next page identifies the requirements which are met by both foam-dielectric RADIAFLEX® cable types, with copper foil as outer conductor and the corrugated type.

It may be noted that the "cable bundle" test IEC 60 332-3 is not normally applicable to RADIAFLEX® cables as they are destined not to be installed in bundles.

Corrugated RHCA12-50 JPL Plenum rated cable utilizes an air-dielectric design. The dielectric support is wrapped Teflon tube. This special cable with suffix JPL meets the testing requirements of the UL 910 (Steiner Tunnel) test.



Test IEC 61 034, low smoke.

Test IEC 60 332-1, single cable

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Jackets Selection Guide

Flame and Fire Retarding Jackets

The below tables show the jacket types which are available to perform the different safety levels.

FOR THE RADIAFLEX® CABLE TYPES ALF, RLF, RLK, RLV, AND RAY:				
MEETS:	IEC 60 754-1/ -2	IEC 61 034	IEC 60 332-1	IEC 60 332-3-24
REQUIREMENTS:	smoke emission: halogen free, not corrosive	low smoke emission	flame retardant	fire retardant
SUFFIX FOR THE CABLE NAME:				
JA	✔			
JFNA	✔	✔*	✔	✔
JFLA	✔	✔	✔	✔

✔ Jacket Type Available
*for all 1/2" cable, not for 7/8", 1-1/4" and 1-5/8"

FOR THE RADIAFLEX® CABLE TYPES RCF AND RSF:				
MEETS:	IEC 60 754-1/ -2	IEC 61 034	IEC 60 332-1	IEC 60 332-3-24
REQUIREMENTS:	smoke emission: halogen free, not corrosive	low smoke emission	flame retardant	fire retardant
SUFFIX FOR THE CABLE NAME:				
J, JA	✔			
JFN, JFNA	✔		✔	
JFL, JFLA	✔	✔	✔	✔

✔ Jacket Type Available

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Description of Technical Parameters

Cable construction

RADIAFLEX® cables are designed to provide broadband wireless coverage for confined areas using trunking, cellular, and data communications.

RADIAFLEX® cables have an inner and outer conductor in coaxial configurations separated by a low loss foam dielectric. The polyethylene foam is applied to the center conductor by gas injection extrusion method. This process consistently produces a low-density, closed cell foam structure with low dielectric losses.

The outer conductor of the RADIAFLEX® cables are made of either an overlapping copper foil (ALF, RLF, RLK, RLV, RAY) or of seam welded and corrugated copper (RCF, RSF).

RADIAFLEX® cables have abrasion resistant black polyethylene jackets. The material is halogen free, UV resistant and non-corrosive. Flame and fire retardancy are standard options.

Technical parameters

The most important parameters to consider when specifying a RADIAFLEX® cable are:

- frequency range
- longitudinal loss
- coupling loss
- system loss

Frequency range

The design of the apertures in the outer conductor influences the frequency for which the cable is optimized. RADIAFLEX® cables are usually classified into three categories: for operation up to 900 MHz, 1900 MHz and 2200 MHz (2650 MHz). Cables optimized for special frequency ranges are available on request.

Longitudinal loss

The longitudinal loss describes the signal loss in the cable. Longitudinal loss and coupling loss are relating to each other. Lower coupling loss usually results in higher longitudinal loss and vice versa. Both values are frequency dependent.

The longitudinal loss values are given with a tolerance of ±5 %

Coupling loss

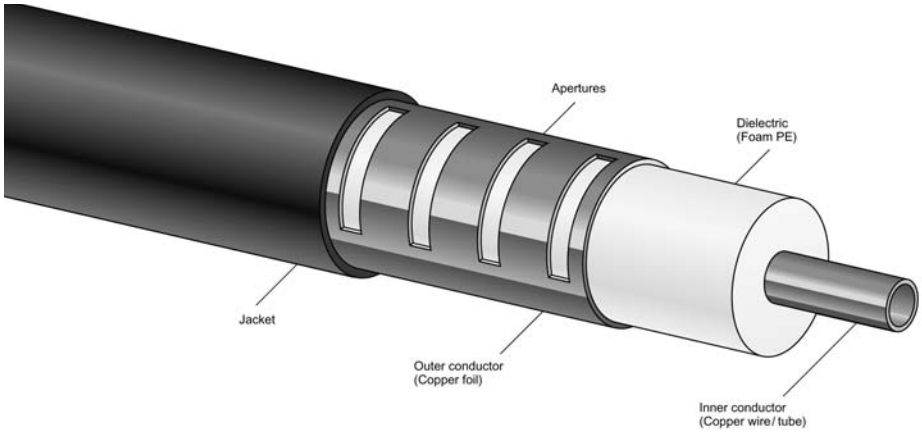
The coupling loss describes the signal loss between the cable and a test receiver at a distance of 2m (6ft). Generally two different physical modes carry the electromagnetic energy from the RADIAFLEX® cable into the air: the coupling mode and the radiating mode. Both modes are used with RADIAFLEX® cable. The kind of mode influences the values of the coupling loss.

The coupling loss values are given with a tolerance of ±5 dB (±10 dB for RCF, RSF, RHCA).

System loss

The system loss is the sum of longitudinal loss and coupling loss. For most of the cables the losses are given separately, whereas the Vario cables (RLV) are shown with system loss figures.

All those parameters as well as other specialties are described in more detail on the next pages.



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Frequency Ranges of RADIAFLEX® Cables

One of the major advantages of radiating cables is their ability to transmit and distribute RF broadband.

However, the frequency range to be transmitted and distributed depends on the design of the apertures. Physical reasons limit the performance of a radiating cable with regard to the broadband ability. A cable, for example, designed for up to GSM 900 will have better performance values over the defined operation range than a cable which is made for up to 1900 MHz or even for up to UMTS.

RFS categorized their RADIAFLEX® product families in four general sections which fits into the common applications for mobile telecommunication.

- Cables that are suitable for frequencies up to 1000 MHz and cover for example analogue emergency services of 75 MHz and 160 MHz, TETRA, CDMA/TDMA 800 and GSM900. Those cable types do not have any additional suffix to their cable type name.
- Cables that are specifically designed for applications below 600 MHz. Those cable types are indicated with a suffix L.
- Cables that are suitable for frequencies up to 1900 MHz. They cover in addition services like GSM 1800 and PCS 1900. Those cable types are indicated by the suffix W at the end of their cable type name.
- Cables that are suitable for frequencies up to 2200 MHz and more. They cover in addition services like UMTS, W-CDMA, wireless LAN and bluetooth. Those cable types are indicated by the suffix U at the end of their cable type name.

Whenever a certain wavelength interferes with the regular structure of the apertures of a cable, the reflection factor jumps up and with it the longitudinal loss drops to high values. Those stop bands are sharply limited by frequency and cannot be used. They vary from cable type to cable type and are indicated accordingly in the RADIAFLEX® selection guide. However, the design of the apertures are made in such a way that the not usable frequencies are located outside of the applicable frequency bands. In case a special application frequency collides with the stop band a customized cable can be designed to shift the stop band to areas which are not in use.

Due to the specific design the cable types ALF, RLF, RCF, and RSF do not show stop band characteristics.

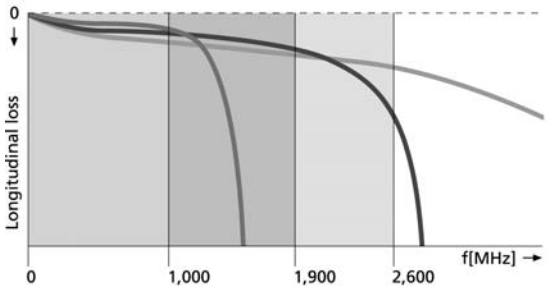
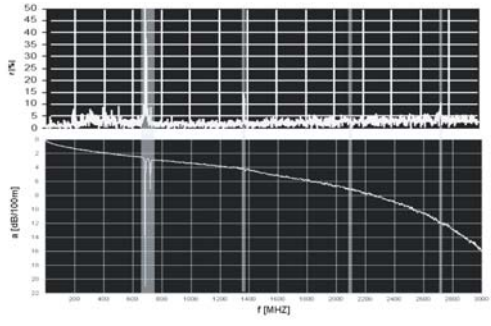


Diagram above:
Principal frequency ranges of RADIAFLEX® cables
gray line: up to 1000 MHz
black line: up to 1900 MHz
light gray line: up to 2200 MHz and higher

Installation of UMTS cables

For frequencies above 1900 MHz the radiation becomes more and more directive. Therefore, RADIAFLEX® cables suitable for UMTS and WLAN are either supplied with a guide (1-1/4" and 1-5/8") or a marking (1/2" to 7/8") on top of the jacket in order to easily allow to adjust the slots to the area to be covered.

Diagram below:
Principal stop band characteristic of a U-type of cable. The high stop band lays exactly between the uplink and downlink bands of UMTS and does not influences them. In the example shown below, the said stop band is highly suppressed and invisible.



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Coupling Loss Definition and Measurement

The radiation from a RADIAFLEX® cable is quantified by the coupling loss, being the ratio in dB between the signal in the RADIAFLEX® Cable and the signal received by a half-wavelength dipole antenna.

Coupling loss as well as longitudinal attenuation of RADIAFLEX® cables are measured by the free space method according to IEC 61 196-4. The cable is fixed 2 meters (6.5 ft) above ground.

A half-wavelength dipole antenna at a distance of 2 meters (6.5 ft) from the cable is then moved along the cable measuring the radiated signal level. A 6 meters (20ft) distance between antenna and cables (instead of 2 meters) results in coupling loss values that are approx. 5 dB higher than those obtained at 2 meters distance.

The sampled values of coupling loss vary along the cable due to the superposition of signals of varying phase (e.g. inside and outside of the cable). They also vary depending upon the spatial orientation of the half-wavelength dipole antenna.

For measurement repeatability, the coupling loss values in this catalog are therefore understood as average values, with a ±5 dB tolerance for smooth-wall radiating cable and a ±10 dB tolerance for corrugated radiating cable.

Two coupling loss figures are published:

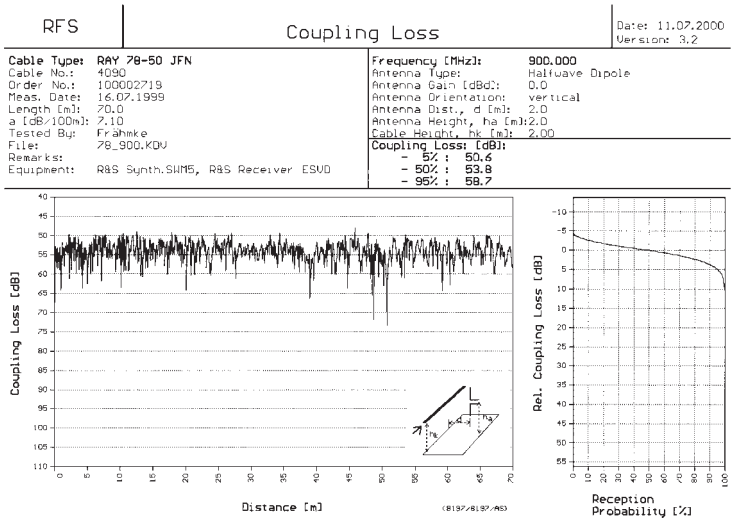
50% reception probability:

50% of all measured samples are better than the stated figure.

95% reception probability:

95% of all measured samples are better than the stated figure.

The 95% value, as well as the difference between the two values, helps the system designer in assessing/calculating availability of the link.



Test document for coupling loss measurements according to IEC 61 196-4

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System Loss in Practical Environments

System loss is the sum of longitudinal loss (attenuation) and coupling loss and is as such used in the table comparing various RADIAFLEX® cable series (see Comparison Table on page 392.)

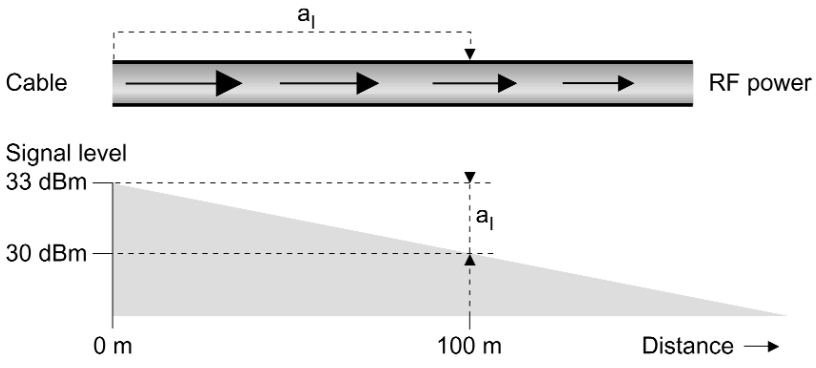
In practical environments (tunnels, buildings, underground garages, etc.), the influence of conducting/reflecting/lossy surfaces has to be considered. This is done by employing the following two measures:

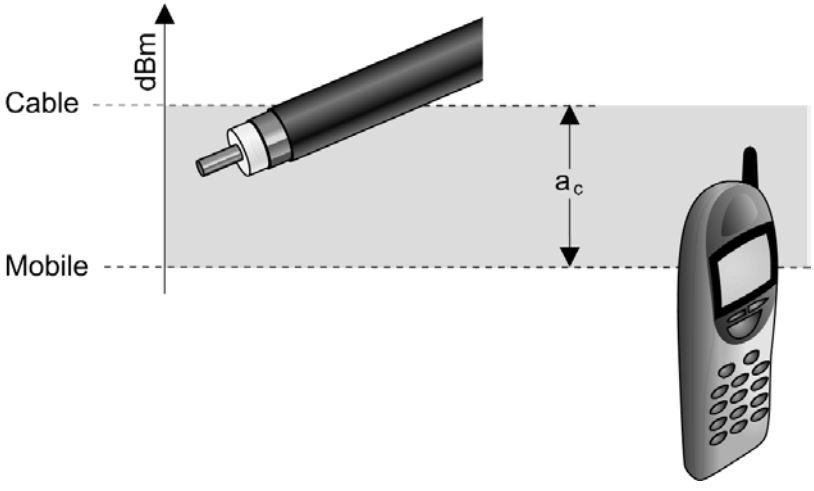
1. Installation with the help of stand-off clamps minimises the influence of lossy walls.
2. A 10 - 15 dB safety margin is adequate to cover the difference between the environment during factory measurement ("free space") and in the actual situation (buildings, unusual tunnel situation etc.)

Normally, the coupling loss in tunnel installations differs from the free space loss since more multipath effects occur. They depend on the tunnel cross section, material etc.

RFS has been collecting data on the effects of various profiles at various frequencies for more than 30 years and can assist the customer in quantifying these effects.

The sum of cable loss (a_l) and coupling loss (a_c) defines the system loss





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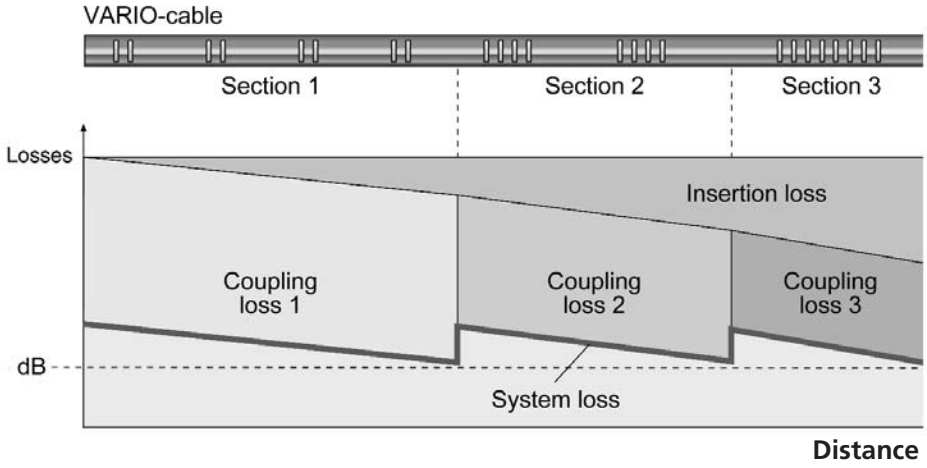
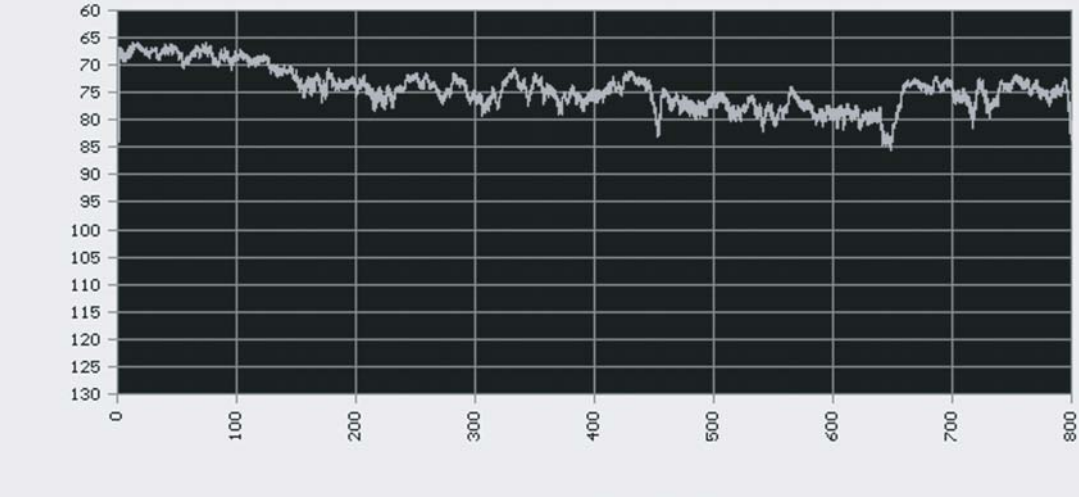
How Does Vario Cable Work?

Since system loss (attenuation plus coupling loss) increases as one moves down the radiating cable, its service length can be considerably increased by decreasing coupling loss gradually to the extent necessary for compensating longitudinal loss (attenuation). This may be done stepwise, and the result is a configuration where the radiating cable consists of sections of decreasing coupling loss.

A particulary attractive feature of this principle is the small dynamic range which is only a fraction of that of “normal” radiating cables.

The dynamic range is of importance for system planning. It is limited by the performance of the active components. Since cable attenuation varies with frequency, the compensation is precise only for one given frequency range. However, the cable performs adequately at those frequencies as well, even when total compensation does not take place (See performance figures in the cable comparison table on page 392.)





Example of a typical system loss measurement of a Vario cable

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A Vario Cable for UMTS Applications

UMTS coverage in tunnels

The start-ups for UMTS in many countries also require coverage in confined areas. As UMTS will be brought to operation in cities as the first step, there is a strong requirement to provide UMTS coverage in the metro nets as well.

Radiating cables for UMTS (and for wireless LAN) coverage are available. But due to the fact that the frequency range of this service is significantly higher than all the other well known mobile frequency bands, the losses for the UMTS band are higher and the transmitted length drops. Amplifiers have to be used at shorter distances which creates disadvantages:

- The requested higher number of amplifiers results in a higher system price.
- The higher number of amplifiers may complicate the concept of a multi-band system.
- The reduced coverage area may require amplifiers between two metro stations. This makes the maintenance less easy, because it is usually restricted to traffic free time periods during night time.

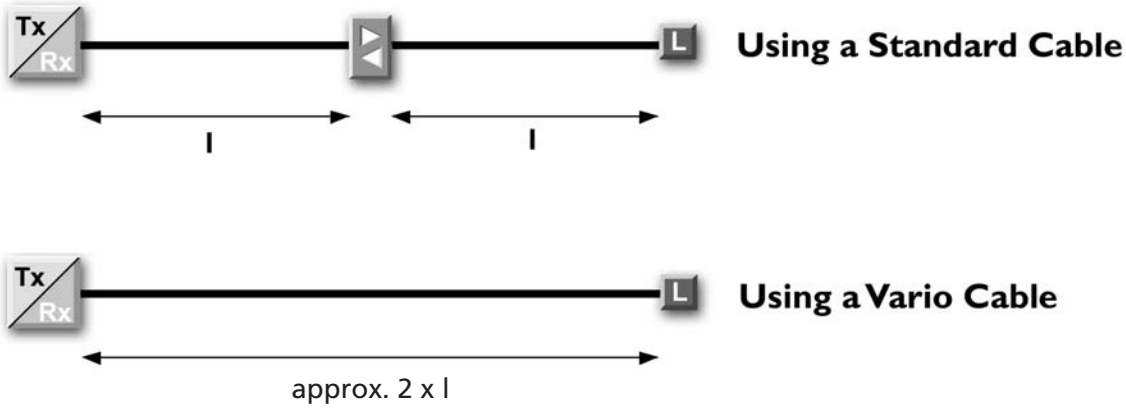
Solution: The vario cable RLVU158-50

RFS have newly designed the Vario cable RLVU158-50 which supports the economic coverage of UMTS in tunnels – and due to the broadband ability of that cable all the other mobile frequency bands above 380 MHz are covered as well.

The RLVU158-50 provides coverage for UMTS in tunnels at a maximum length of 800 m without the need of amplifying the RF signal in between. Other lengths are available, such as 600 m and 650 m. Which cable length has to be chosen depends on the length of the tunnel and on the minimum system loss required for a given application.

The advantages are clearly visible:

- Compared with a standard cable the RLVU158-50 nearly doubles the transmission length for UMTS in tunnels without the need of amplifiers.
- Therefore, the RLVU158-50 usually allows to design communications systems for UMTS without the need to install active equipment in the tunnel area between two stations. This eases the maintenance of the system.
- The RLVU158-50 is a broadband cable and supports mobile services from TETRA 380 MHz to UMTS 2100 MHz.



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1/2" RADIAFLEX® RCF Cable

RCF12 SERIES	
Cable Type	RCF/RSF
Size	1/2"
Slot Design	Milled (Two-Row)
Maximum Frequency, MHz	6000
STRUCTURE	
Inner Conductor Material	Copper Clad Aluminum Wire
Diameter Inner Conductor, mm (in)	4.8 (0.19)
Outer Conductor Material	Corrugated Copper Tube
Diameter Outer Conductor, mm (in)	13.8 (0.54)
Diameter over Jacket, mm (in)	16.2 (0.64)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	125 (4.9)
Tensile Force, N (lb)	1000 (225)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	0.6 (2.0)
Minimum Distance to Wall, mm (in)	50 (2)
Indication of Slot Alignment	None
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	88
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	1.57 (0.48)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	2.23 (0.68)
Stop bands, MHz	None

RCF12-50J/JFN/JFL

PERFORMANCE

Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	2.20 (0.67)	50/62
150	3.15 (0.96)	59/71
450	5.70 (1.74)	67/79
800	7.83 (2.39)	67/79
870	8.25 (2.51)	66/78
900	8.40 (2.56)	66/78
960	8.65 (2.64)	66/78
1800	13.1 (3.99)	68/80
1900	13.6 (4.15)	69/81
2000	14.0 (4.27)	72/84
2200	14.7 (4.48)	70/82
2400	15.3 (4.66)	70/82
2600	15.9 (4.85)	70/82
5000	24.8 (7.56)	75/87
5200	25.7 (7.83)	75/87
5800	27.6 (8.41)	75/87
6000	29.9 (8.81)	75/87

CONNECTOR & ACCESSORIES	
Connectors	See page 442
Accessories	See page 443

ORDERING INFORMATION

Model Number	Jacket	Cable Weight, kg/m (lb/ft)
RCF12-50J	Standard	0.22 (0.14)
RCF12-50JFN	Flame Retardant	0.26 (0.17)
RCF12-50JFL	Flame/Fire Retardant, Low Smoke	0.26 (0.17)

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RADIAFLEX® Radiating Cable

1/2" RADIAFLEX® RSF Cable

RSF12 SERIES	
Cable Type	RCF/RSF
Size	1/2"
Slot Design	Milled (Two-Row)
Maximum Frequency, MHz	6000
STRUCTURE	
Inner Conductor Material	Copper Clad Aluminum Wire
Diameter Inner Conductor, mm (in)	3.6 (0.14)
Outer Conductor Material	Corrugated Copper Tube
Diameter Outer Conductor, mm (in)	12.3 (0.48)
Diameter over Jacket, mm (in)	13.7 (0.54)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	32 (1.3)
Tensile Force, N (lb)	600 (135)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	0.3 (1.0)
Minimum Distance to Wall, mm (in)	50 (2)
Indication of Slot Alignment	None
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	88
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	2.9 (0.89)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	4.0 (1.22)
Stop bands, MHz	None

RSF12-50J/JFN/JFL

PERFORMANCE

Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	3.35 (1.02)	48/59
150	4.85 (1.48)	62/73
450	8.80 (2.68)	67/76
800	12.1 (3.68)	72/84
870	12.67 (3.86)	73/85
900	12.9 (3.93)	73/84
960	13.35 (4.07)	73/85
1800	19.3 (5.87)	71/81
1900	19.7 (5.99)	68/80
2000	20.55 (6.26)	66/77
2200	23.0 (7.01)	65/76
2400	23.4 (7.12)	67/78

CONNECTOR & ACCESSORIES	
Connectors	See page 442
Accessories	See page 443

ORDERING INFORMATION

Model Number	Jacket	Cable Weight, kg/m (lb/ft)
RSF12-50J	Standard	0.21 (0.14)
RSF12-50JFN	Flame Retardant	0.25 (0.16)
RSF12-50JFL	Flame/Fire Retardant, Low Smoke	0.25 (0.16)

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1/2" RADIAFLEX® RHCA Cable

RHCA12 SERIES	
Cable Type	RHCA
Size	1/2"
Slot Design	Milled (Two-Row)
Maximum Frequency, MHz	6000
STRUCTURE	
Inner Conductor Material	Copper Clad Aluminum Wire
Diameter Inner Conductor, mm (in)	4.8 (0.19)
Outer Conductor Material	Corrugated Copper Tube
Diameter Outer Conductor, mm (in)	14.0 (0.55)
Diameter over Jacket, mm (in)	15.5 (0.61)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	127 (5.0)
Tensile Force, N (lb)	900 (203)
Storage Temperature, °C (°F)	-40 to +85 (-40 to +185)
Operation Temperature, °C (°F)	-40 to +85 (-40 to +185)
Installation Temperature, °C (°F)	-40 to +60 (-40 to +140)
Recommended Clamp Spacing, m (ft)	0.6 (2.0)
Minimum Distance to Wall, mm (in)	50 (2)
Indication of Slot Alignment	None
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	91
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	1.48 (0.45)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	1.90 (0.58)
Stop bands, MHz	None

RHCA12-50JPL

PERFORMANCE		
Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	2.90 (0.83)	51/63
150	4.30 (1.31)	59/70
450	8.40 (2.56)	69/81
800	11.9 (3.63)	74/85
900	12.7 (3.87)	72/84
1800	20.1 (6.13)	70/81
1900	20.8 (6.34)	65/77
2200	22.8 (6.95)	65/77
2400	24.2 (7.38)	68/80

CONNECTOR & ACCESSORIES	
Connectors	See page 442
Accessories	See page 443

ORDERING INFORMATION		
Model Number	**Jacket**	**Cable Weight, kg/m (lb/ft)**
RHCA12-50JPL	Plenum Rated	0.27 (0.18)

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7/8" RADIAFLEX® RCF Cable, A-series

RCF78 SERIES	
Cable Type	RCF/RSF
Size	7/8"
Slot Design	Milled (Two-Row)
Maximum Frequency, MHz	2650
STRUCTURE	
Inner Conductor Material	Copper Tube
Diameter Inner Conductor, mm (in)	9.3 (0.37)
Outer Conductor Material	Corrugated Copper Tube
Diameter Outer Conductor, mm (in)	25.2 (0.99)
Diameter over Jacket, mm (in)	27.8 (1.09)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	250 (10.0)
Tensile Force, N (lb)	1440 (317)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	0.9 (3.0)
Minimum Distance to Wall, mm (in)	50 (2)
Indication of Slot Alignment	None
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	1.46 (0.44)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	1.22 (0.37)
Stop bands, MHz	None

RCF78-50JA/JFNA/JFLA

PERFORMANCE		
Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	1.20 (0.37)	56/66
150	1.75 (0.53)	66/75
450	3.05 (0.93)	75/86
800	4.20 (1.28)	73/83
870	4.3 (1.31)	73/83
900	4.40 (1.34)	73/83
960	4.6 (1.4)	73/83
1800	6.80 (2.07)	70/81
1900	7.00 (2.13)	70/81
2000	7.3 (2.23)	71/82
2200	7.80 (2.38)	70/81
2400	8.30 (2.53)	68/80
2600	8.80 (2.68)	68/80

CONNECTOR & ACCESSORIES	
Connectors	See page 442
Accessories	See page 443

ORDERING INFORMATION		
Model Number	**Jacket**	**Cable Weight, kg/m (lb/ft)**
RCF78-50JA	Standard	0.50 (0.34)
RCF78-50JFNA	Flame Retardant	0.60 (0.40)
RCF78-50JFLA	Flame/Fire Retardant, Low Smoke	0.60 (0.40)

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1-1/4" RADIAFLEX® RCF Cable, A-series

RCF114 SERIES	
Cable Type	RCF/RSF
Size	1-1/4"
Slot Design	Milled (Two-Row)
Maximum Frequency, MHz	2650
STRUCTURE	
Inner Conductor Material	Copper Tube
Diameter Inner Conductor, mm (in)	13.6 (0.54)
Outer Conductor Material	Corrugated Copper Tube
Diameter Outer Conductor, mm (in)	36.0 (1.42)
Diameter over Jacket, mm (in)	39.0 (1.54)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	380 (15.0)
Tensile Force, N (lb)	620 (137)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	1.0 (3.3)
Minimum Distance to Wall, mm (in)	50 (2)
Indication of Slot Alignment	None
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	1.94 (0.59)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	0.79 (0.24)
Stop bands, MHz	None

RCF114-50JA/JFNA/JFLA

PERFORMANCE		
Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	0.85 (0.26)	61/71
150	1.22 (0.37)	70/80
450	2.22 (0.68)	81/93
800	3.06 (0.93)	80/92
870	3.26 (0.99)	80/89
900	3.31 (1.01)	80/92
960	3.44 (1.05)	80/89
1800	5.18 (1.58)	77/88
1900	5.35 (1.63)	76/88
2000	5.54 (1.69)	77/88
2200	5.92 (1.80)	77/88
2400	6.19 (1.89)	79/90
2600	6.57 (2.00)	80/91

CONNECTOR & ACCESSORIES	
Connectors	See page 442
Accessories	See page 443

ORDERING INFORMATION		
Model Number	**Jacket**	**Cable Weight, kg/m (lb/ft)**
RCF114-50JA	Standard	0.85 (0.57)
RCF114-50JFNA	Flame Retardant	0.90 (0.61)
RCF114-50JFLA	Flame/Fire Retardant, Low Smoke	0.90 (0.61)

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RADIAFLEX® Radiating Cable

1-5/8" RADIAFLEX® RCF Cable, A-series

RCF158 SERIES	
Cable Type	RCF/RSF
Size	1-5/8"
Slot Design	Milled (Two-Row)
Maximum Frequency, MHz	2650
STRUCTURE	
Inner Conductor Material	Corrugated Copper Tube
Diameter Inner Conductor, mm (in)	17.6 (0.69)
Outer Conductor Material	Corrugated Copper Tube
Diameter Outer Conductor, mm (in)	46.5 (1.83)
Diameter over Jacket, mm (in)	50.3 (1.98)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	500 (19.7)
Tensile Force, N (lb)	1080 (238)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	1.2 (4.0)
Minimum Distance to Wall, mm (in)	50 (2)
Indication of Slot Alignment	None
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	1.26 (0.38)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	0.55 (0.17)
Stop bands, MHz	None

RCF158-50JA/JFNA/JFLA

PERFORMANCE		
Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	0.59 (0.18)	62/74
150	0.86 (0.26)	70/80
450	1.60 (0.49)	83/93
800	2.25 (0.69)	84/94
870	2.37 (0.72)	82/92
900	2.42 (0.74)	82/92
960	2.51 (0.77)	82/92
1800	3.80 (1.16)	81/91
1900	3.94 (1.20)	80/90
2000	4.08 (1.24)	80/90
2200	4.36 (1.33)	80/90
2400	4.65 (1.42)	80/90
2600	4.92 (1.50)	80/90

CONNECTOR & ACCESSORIES	
Connectors	See page 442
Accessories	See page 443

ORDERING INFORMATION		
Model Number	**Jacket**	**Cable Weight, kg/m (lb/ft)**
RCF158-50JA	Standard	1.20 (0.81)
RCF158-50JFNA	Flame Retardant	1.30 (0.87)
RCF158-50JFLA	Flame/Fire Retardant, Low Smoke	1.30 (0.87)

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RADIAFLEX® Radiating Cable

1/2" RADIAFLEX® ALFU Cable, A-series

ALFU12 SERIES	
Cable Type	ALF/RLF
Size	1/2"
Slot Design	Groups of slots at large intervals
Maximum Frequency, MHz	2650
STRUCTURE	
Inner Conductor Material	Copper Clad Aluminum Wire
Diameter Inner Conductor, mm (in)	4.4 (0.17)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	11.4 (0.45)
Diameter over Jacket, mm (in)	14.7 (0.58)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	200 (7.9)
Tensile Force, N (lb)	1300 (292)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	0.5 (1.6)
Minimum Distance to Wall, mm (in)	50 (2)
Indication of Slot Alignment	Bulge atop slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	88
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	2.0 (0.61)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	4.1 (1.25)
Stop bands, MHz	None

ALFU12-50JA/JFNA/JFLA

PERFORMANCE		
Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	1.95 (0.59)	70/82
150	2.85 (0.87)	70/82
450	5.15 (1.57)	75/87
800	7.05 (2.15)	75/87
900	7.60 (2.32)	75/87
1800	11.0 (3.34)	80/92
1900	11.4 (3.46)	80/92
2000	11.7 (3.57)	80/92
2200	12.4 (3.78)	80/92
2400	13.0 (3.95)	80/92
2600	13.5 (4.11)	80/92

CONNECTOR & ACCESSORIES	
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ORDERING INFORMATION		
Model Number	**Jacket**	**Cable Weight, kg/m (lb/ft)**
ALFU12-50JA	Standard	0.29 (0.20)
ALFU12-50JFNA	Flame/Fire Retardant, Low Smoke	0.34 (0.23)
ALFU12-50JFLA	Flame/Fire Retardant, Low Smoke	0.34 (0.23)

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RADIAFLEX® Radiating Cable

7/8" RADIAFLEX® RLF Cable, A-series

RLF78 SERIES	
Cable Type	ALF/RLF
Size	7/8"
Slot Design	Groups of slots at large intervals
Maximum Frequency, MHz	1000
STRUCTURE	
Inner Conductor Material	Copper Tube
Diameter Inner Conductor, mm (in)	9.3 (0.37)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	23.8 (0.94)
Diameter over Jacket, mm (in)	28.5 (1.12)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	350 (13.8)
Tensile Force, N (lb)	2300 (507)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	0.9 (3)
Minimum Distance to Wall, mm (in)	50 (2)
Indication of Slot Alignment	Bulge atop slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	1.46 (0.44)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	2.16 (0.66)
Stop bands, MHz	None

RLF78-50JA/JFNA/JFLA

PERFORMANCE		
Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	0.90 (0.27)	60/70
150	1.36 (0.41)	62/73
450	2.62 (0.80)	65/77
800	3.80 (1.16)	65/76
900	4.02 (1.23)	65/75

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ORDERING INFORMATION		
Model Number	**Jacket**	**Cable Weight, kg/m (lb/ft)**
RLF78-50JA	Standard	0.45 (0.30)
RLF78-50JFNA	Flame/Fire Retardant	0.60 (0.40)
RLF78-50JFLA	Flame/Fire Retardant, Low Smoke	0.60 (0.40)

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7/8" RADIAFLEX® RLFW Cable, A-series

RLFW78 SERIES	
Cable Type	ALF/RLF
Size	7/8"
Slot Design	Groups of slots at large intervals
Maximum Frequency, MHz	2000
STRUCTURE	
Inner Conductor Material	Copper Tube
Diameter Inner Conductor, mm (in)	9.3 (0.37)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	23.8 (0.94)
Diameter over Jacket, mm (in)	28.5 (1.12)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	350 (13.8)
Tensile Force, N (lb)	2300 (507)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	0.9 (3)
Minimum Distance to Wall, mm (in)	50 (2)
Indication of Slot Alignment	Bulge atop slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	1.46 (0.44)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	2.16 (0.66)
Stop bands, MHz	None

RLFW78-50JA/JFNA/JFLA

PERFORMANCE		
Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	1.03 (0.31)	70/82
150	1.49 (0.45)	70/81
450	2.68 (0.82)	73/84
800	3.90 (1.19)	73/84
900	4.21 (1.28)	71/82
1800	7.90 (2.41)	68/80
1900	8.71 (2.66)	68/80

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ORDERING INFORMATION		
Model Number	**Jacket**	**Cable Weight, kg/m (lb/ft)**
RLFW78-50JA	Standard	0.45 (0.30)
RLFW78-50JFNA	Flame/Fire Retardant	0.60 (0.40)
RLFW78-50JFLA	Flame/Fire Retardant, Low Smoke	0.60 (0.40)

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RADIAFLEX® Radiating Cable

7/8" RADIAFLEX® RLFU Cable, A-series

RLFU78 SERIES	
Cable Type	ALF/RLF
Size	7/8"
Slot Design	Groups of slots at large intervals
Maximum Frequency, MHz	2400
STRUCTURE	
Inner Conductor Material	Copper Tube
Diameter Inner Conductor, mm (in)	9.3 (0.37)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	23.8 (0.94)
Diameter over Jacket, mm (in)	28.5 (1.12)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	350 (13.8)
Tensile Force, N (lb)	2300 (507)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	0.9 (3)
Minimum Distance to Wall, mm (in)	50 (2)
Indication of Slot Alignment	Bulge atop slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	1.46 (0.44)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	2.16 (0.66)
Stop bands, MHz	None

RLFU78-50JA/JFNA/JFLA

PERFORMANCE

Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	1.02 (0.31)	63/73
150	1.48 (0.45)	62/75
450	2.76 (0.84)	66/78
800	3.93 (1.20)	67/77
870	4.10 (1.25)	62/74
900	4.29 (1.13)	64/74
960	4.37 (1.33)	66/77
1800	8.07 (2.46)	58/70
1900	8.81 (2.69)	59/70
2000	9.28 (2.83)	59/70
2200	10.72 (3.27)	58/69
2400	12.52 (3.82)	60/71

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ORDERING INFORMATION

Model Number	Jacket	Cable Weight, kg/m (lb/ft)
RLFU78-50JA	Standard	0.45 (0.30)
RLFU78-50JFNA	Flame/Fire Retardant	0.60 (0.40)
RLFU78-50JFLA	Flame/Fire Retardant, Low Smoke	0.60 (0.40)

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1-1/4" RADIAFLEX® RLF Cable, A-series

RLF114 SERIES	
Cable Type	ALF/RLF
Size	1-1/4"
Slot Design	Groups of slots at large intervals
Maximum Frequency, MHz	1000
STRUCTURE	
Inner Conductor Material	Copper Tube
Diameter Inner Conductor, mm (in)	13.1 (0.52)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	34.0 (1.34)
Diameter over Jacket, mm (in)	38.1 (1.50)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	500 (20.0)
Tensile Force, N (lb)	2000 (440)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	1.3 (4.25)
Minimum Distance to Wall, mm (in)	50 (2)
Indication of Slot Alignment	Bulge atop slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	0.80 (0.24)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	1.75 (0.53)
Stop bands, MHz	None

RLF114-50JA/JFNA/JFLA

PERFORMANCE		
Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	0.74 (0.23)	60/70
150	1.04 (0.32)	62/73
450	2.07 (0.63)	65/77
800	3.28 (1.00)	65/75
900	3.62 (1.10)	65/75

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ORDERING INFORMATION		
Model Number	**Jacket**	**Cable Weight, kg/m (lb/ft)**
RLF114-50JA	Standard	0.66 (0.44)
RLF114-50JFNA	Flame/Fire Retardant	0.90 (0.60)
RLF114-50JFLA	Flame/Fire Retardant, Low Smoke	0.90 (0.60)

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RADIAFLEX® Radiating Cable

1-1/4" RADIAFLEX® RLFW Cable, A-series

RLFW114 SERIES	
Cable Type	ALF/RLF
Size	1-1/4"
Slot Design	Groups of slots at large intervals
Maximum Frequency, MHz	2000
STRUCTURE	
Inner Conductor Material	Copper Tube
Diameter Inner Conductor, mm (in)	13.1 (0.52)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	34.0 (1.34)
Diameter over Jacket, mm (in)	38.1 (1.50)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	500 (20.0)
Tensile Force, N (lb)	2000 (440)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	1.3 (4.25)
Minimum Distance to Wall, mm (in)	50 (2)
Indication of Slot Alignment	Bulge atop slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	0.80 (0.24)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	1.75 (0.53)
Stop bands, MHz	None

RLFW114-50JA/JFNA/JFLA

PERFORMANCE		
Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	0.76 (0.23)	71/83
150	1.10 (0.33)	70/82
450	1.97 (0.60)	73/85
800	2.97 (0.91)	72/84
900	3.05 (0.93)	70/82
1800	6.56 (2.00)	67/79
1900	7.62 (2.32)	66/78

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ORDERING INFORMATION		
Model Number	**Jacket**	**Cable Weight, kg/m (lb/ft)**
RLFW114-50JA	Standard	0.66 (0.44)
RLFW114-50JFNA	Flame/Fire Retardant	0.90 (0.60)
RLFW114-50JFLA	Flame/Fire Retardant, Low Smoke	0.90 (0.60)

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1-1/4" RADIAFLEX® RLFU Cable, A-series

RLFU114 SERIES	
Cable Type	ALF/RLF
Size	1-1/4"
Slot Design	Groups of slots at large intervals
Maximum Frequency, MHz	2400
STRUCTURE	
Inner Conductor Material	Copper Tube
Diameter Inner Conductor, mm (in)	13.1 (0.52)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	34.0 (1.34)
Diameter over Jacket, mm (in)	38.1 (1.50)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	500 (20.0)
Tensile Force, N (lb)	2000 (440)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	1.3 (4.25)
Minimum Distance to Wall, mm (in)	50 (2)
Indication of Slot Alignment	Bulge atop slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	0.80 (0.24)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	1.75 (0.53)
Stop bands, MHz	None

RLFU114-50JA/JFNA/JFLA

PERFORMANCE

Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	0.74 (0.23)	67/80
150	1.07 (0.33)	66/76
450	1.96 (0.60)	67/76
800	2.95 (0.90)	66/77
870	3.02 (0.92)	65/77
900	3.13 (0.95)	64/75
960	3.44 (1.05)	64/75
1800	6.01 (1.83)	60/71
1900	6.53 (1.99)	61/72
2000	7.11 (2.17)	60/72
2200	8.07 (2.46)	59/69
2400	9.25 (2.82)	60/71

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ORDERING INFORMATION

Model Number	Jacket	Cable Weight, kg/m (lb/ft)
RLFU114-50JA	Standard	0.66 (0.44)
RLFU114-50JFNA	Flame/Fire Retardant	0.90 (0.60)
RLFU114-50JFLA	Flame/Fire Retardant, Low Smoke	0.90 (0.60)

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RADIAFLEX® Radiating Cable

1-5/8" RADIAFLEX® RLF Cable, A-series

RLF158 SERIES	
Cable Type	ALF/RLF
Size	1-5/8"
Slot Design	Groups of slots at large intervals
Maximum Frequency, MHz	1000
STRUCTURE	
Inner Conductor Material	Corrugated Copper Tube
Diameter Inner Conductor, mm (in)	17.6 (0.69)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	44.2 (1.74)
Diameter over Jacket, mm (in)	48.2 (1.90)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	700 (28.0)
Tensile Force, N (lb)	1200 (270)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	1.5 (5)
Minimum Distance to Wall, mm (in)	50 (2)
Indication of Slot Alignment	Bulge atop slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	1.30 (0.40)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	1.30 (0.40)
Stop bands, MHz	None

RLF158-50JA/JFNA/JFLA

PERFORMANCE		
Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	0.55 (0.17)	67/78
150	0.78 (0.24)	66/77
450	1.54 (0.47)	66/77
800	2.21 (0.67)	66/77
870	2.52 (0.77)	65/76
900	2.38 (0.73)	65/76
960	2.67 (0.81)	65/76

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ORDERING INFORMATION		
Model Number	**Jacket**	**Cable Weight, kg/m (lb/ft)**
RLF158-50JA	Standard	0.80 (0.54)
RLF158-50JFNA	Flame/Fire Retardant	1.10 (0.74)
RLF158-50JFLA	Flame/Fire Retardant, Low Smoke	1.10 (0.74)

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1-5/8" RADIAFLEX® RLFW Cable, A-series

RLFW158 SERIES	
Cable Type	ALF/RLF
Size	1-5/8"
Slot Design	Groups of slots at large intervals
Maximum Frequency, MHz	2000
STRUCTURE	
Inner Conductor Material	Corrugated Copper Tube
Diameter Inner Conductor, mm (in)	17.6 (0.69)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	44:2 (1.74)
Diameter over Jacket, mm (in)	48.2 (1.90)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	700 (28.0)
Tensile Force, N (lb)	1200 (270)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	1.5 (5)
Minimum Distance to Wall, mm (in)	50 (2)
Indication of Slot Alignment	Bulge atop slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	1.30 (0.40)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	1.30 (0.40)
Stop bands, MHz	None

RLFW158-50JA/JFNA/JFLA

PERFORMANCE

Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	0.57 (0.17)	68/79
150	0.82 (0.25)	73/84
450	1.46 (0.45)	75/86
800	2.03 (0.62)	72/84
900	2.25 (0.68)	70/81
1800	4.97 (1.51)	64/75
1900	5.85 (1.78)	63/74

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ORDERING INFORMATION

Model Number	Jacket	Cable Weight, kg/m (lb/ft)
RLFW158-50JA	Standard	0:80 (0.54)
RLFW158-50JFNA	Flame/Fire Retardant	1.10 (0:74)
RLFW158-50JFLA	Flame/Fire Retardant, Low Smoke	1.10 (0:74)

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RADIAFLEX® Radiating Cable

1-5/8" RADIAFLEX® RLFU Cable, A-series

RLFU158 SERIES	
Cable Type	ALF/RLF
Size	1-5/8"
Slot Design	Groups of slots at large intervals
Maximum Frequency, MHz	2400
STRUCTURE	
Inner Conductor Material	Corrugated Copper Tube
Diameter Inner Conductor, mm (in)	17.6 (0.69)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	44:2 (1.74)
Diameter over Jacket, mm (in)	48.2 (1.90)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	700 (28.0)
Tensile Force, N (lb)	1200 (270)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	1.5 (5)
Minimum Distance to Wall, mm (in)	50 (2)
Indication of Slot Alignment	Bulge atop slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	1.30 (0.40)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	1.30 (0.40)
Stop bands, MHz	None

RLFU158-50JA/JFNA/JFLA

PERFORMANCE		
Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	0.56 (0.17)	67/78
150	0.81 (0.25)	67/78
450	1.53 (0.47)	67/77
800	2.26 (0.69)	67/77
870	2.47 (0.75)	65/75
900	2.51 (0.77)	65/75
960	2.61 (0.80)	65/75
1800	5.52 (1.68)	61/71
1900	5.95 (1.81)	61/71
2000	6.45 (1.97)	61/71
2200	7.65 (2.33)	61/71
2400	9.50 (2.90)	61/71

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ORDERING INFORMATION		
Model Number	**Jacket**	**Cable Weight, kg/m (lb/ft)**
RLFU158-50JA	Standard	0:80 (0.54)
RLFU158-50JFNA	Flame/Fire Retardant	1.10 (0:74)
RLFU158-50JFLA	Flame/Fire Retardant, Low Smoke	1.10 (0:74)

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RADIAFLEX® Radiating Cable

1/2" RADIAFLEX® RLKW Cable, A-series

RLKW12 SERIES	
Cable Type	RLK
Size	1/2"
Slot Design	Groups of vertical slots at short intervals
Maximum Frequency, MHz	1950
STRUCTURE	
Inner Conductor Material	Copper Clad Aluminum Wire
Diameter Inner Conductor, mm (in)	4.4 (0.17)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	11.4 (0.45)
Diameter over Jacket, mm (in)	14.7 (0.58)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	200 (7.9)
Tensile Force, N (lb)	1300 (292)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	0.5 (1.6)
Minimum Distance to Wall, mm (in)	80 (3.15)
Indication of Slot Alignment	Bulge atop slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	88
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	2.0 (0.61)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	4.1 (1.25)
Stop bands, MHz	115-135, 235-255, 360-380, 475-505, 600-630, 720-750, 805-865, 970-1075, 1340-1460, 1590-1700

RLKW12-50JA/JFNA/JFLA

PERFORMANCE		
Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	2.17 (0.66)	49/60
150	3.10 (0.94)	58/67
450	5.74 (1.75)	62/66
800	7.89 (2.40)	62/66
870	8.33 (2.54)	62/69
900	8.63 (2.63)	62/69
960	8.92 (2.72)	62/69
1800	20.6 (6.28)	54/66
1900	21.6 (6.59)	53/65

CONNECTOR & ACCESSORIES	
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ORDERING INFORMATION		
Model Number	**Jacket**	**Cable Weight, kg/m (lb/ft)**
RLKW12-50JA	Standard	0.29 (0.20)
RLKW12-50JFNA	Flame/Fire Retardant, Low Smoke	0.34 (0.23)
RLKW12-50JFLA	Flame/Fire Retardant, Low Smoke	0.34 (0.23)

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RADIAFLEX® Radiating Cable

1/2" RADIAFLEX® RLKU Cable, A-series

RLKU12 SERIES	
Cable Type	RLK
Size	1/2"
Slot Design	Groups of vertical slots at short intervals
Maximum Frequency, MHz	2650
STRUCTURE	
Inner Conductor Material	Copper Clad Aluminum Wire
Diameter Inner Conductor, mm (in)	4.4 (0.17)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	11.4 (0.45)
Diameter over Jacket, mm (in)	14.7 (0.58)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	200 (7.9)
Tensile Force, N (lb)	1300 (292)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	0.5 (1.6)
Minimum Distance to Wall, mm (in)	80 (3.15)
Indication of Slot Alignment	Bulge atop slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	88
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	2.0 (0.61)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	4.1 (1.25)
Stop bands, MHz	650-750, 1330-1430, 2025-2100

RLKU12-50JA/JFNA/JFLA

PERFORMANCE

Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	2.17 (0.66)	53/63
150	3.10 (0.94)	61/72
450	5.74 (1.75)	68/79
800	8.75 (2.67)	59/65
870	9.21 (2.81)	60/66
900	9.40 (2.86)	60/66
960	9.73 (2.97)	60/66
1800	22.0 (6.70)	57/67
1900	22.7 (6.92)	57/67
2000	23.48 (7.16)	56/66
2200	25.5 (7.76)	55/63
2400	27.9 (8.51)	54/63
2600	30.5 (9.30)	54/63

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ORDERING INFORMATION

Model Number	Jacket	Cable Weight, kg/m (lb/ft)
RLKU12-50JA	Standard	0.29 (0.20)
RLKU12-50JFNA	Flame/Fire Retardant, Low Smoke	0.34 (0.23)
RLKU12-50JFLA	Flame/Fire Retardant, Low Smoke	0.34 (0.23)

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7/8" RADIAFLEX® RLKL Cable, A-series

RLKL78 SERIES	
Cable Type	RLK
Size	7/8"
Slot Design	Groups of vertical slots at short intervals
Maximum Frequency, MHz	600
STRUCTURE	
Inner Conductor Material	Copper Tube
Diameter Inner Conductor, mm (in)	9.3 (0.37)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	23.8 (0.94)
Diameter over Jacket, mm (in)	28.5 (1.12)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	350 (13.8)
Tensile Force, N (lb)	2300 (507)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	0.9 (3)
Minimum Distance to Wall, mm (in)	80 (3.15)
Indication of Slot Alignment	Bulge atop slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	1.46 (0.44)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	2.16 (0.66)
Stop bands, MHz	55-65, 115-130, 175-190, 235-250, 295-310, 355-375, 535-555

RLKL78-50JA/JFNA/JFLA

PERFORMANCE		
Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	1.00 (0.30)	50/59
150	1.48 (0.45)	56/63
450	2.83 (0.86)	60/69

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ORDERING INFORMATION		
Model Number	**Jacket**	**Cable Weight, kg/m (lb/ft)**
RLKL78-50JA	Standard	0.45 (0.30)
RLKL78-50JFNA	Flame/Fire Retardant	0.60 (0.40)
RLKL78-50JFLA	Flame/Fire Retardant, Low Smoke	0.60 (0.40)

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RADIAFLEX® Radiating Cable

7/8" RADIAFLEX® RLKW Cable, A-series

RLKW78 SERIES	
Cable Type	RLK
Size	7/8"
Slot Design	Groups of vertical slots at short intervals
Maximum Frequency, MHz	1950
STRUCTURE	
Inner Conductor Material	Copper Tube
Diameter Inner Conductor, mm (in)	9.3 (0.37)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	23.8 (0.94)
Diameter over Jacket, mm (in)	28.5 (1.12)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	350 (13.8)
Tensile Force, N (lb)	2300 (507)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	0.9 (3)
Minimum Distance to Wall, mm (in)	80 (3.15)
Indication of Slot Alignment	Bulge atop slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	1.46 (0.44)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	2.16 (0.66)
Stop bands, MHz	115-135, 235-255, 360-380, 475-505, 600-630, 720-750, 805-865, 970-1075, 1340-1460, 1590-1700

RLKW78-50JA/JFNA/JFLA

PERFORMANCE		
Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	1.05 (0.32)	52/63
150	1.52 (0.46)	60/68
450	2.88 (0.88)	61/65
800	4.44 (1.35)	61/65
870	5.14 (1.57)	58/64
900	5.12 (1.56)	58/66
960	5.47 (1.67)	58/64
1800	13.3 (4.06)	52/63
1900	14.6 (4.46)	52/63

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ORDERING INFORMATION		
Model Number	**Jacket**	**Cable Weight, kg/m (lb/ft)**
RLKW78-50JA	Standard	0.45 (0.30)
RLKW78-50JFNA	Flame/Fire Retardant	0.60 (0.40)
RLKW78-50JFLA	Flame/Fire Retardant, Low Smoke	0.60 (0.40)

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7/8" RADIAFLEX® RLKU Cable, A-series

RLKU78 SERIES	
Cable Type	RLK
Size	7/8"
Slot Design	Groups of vertical slots at short intervals
Maximum Frequency, MHz	2650
STRUCTURE	
Inner Conductor Material	Copper Tube
Diameter Inner Conductor, mm (in)	9.3 (0.37)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	23.8 (0.94)
Diameter over Jacket, mm (in)	28.5 (1.12)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	350 (13:8)
Tensile Force, N (lb)	2300 (507)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	0.9 (3)
Minimum Distance to Wall, mm (in)	80 (3.15)
Indication of Slot Alignment	Bulge atop slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	1.46 (0.44)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	2:16 (0.66)
Stop bands, MHz	650-750, 1330-1430, 2025-2100

RLKU78-50JA/JFNA/JFLA

PERFORMANCE

Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	1.02 (0.31)	56/68
150	1.46 (0.44)	65/77
450	2.67 (0.81)	72/84
800	4.07 (1.24)	69/77
870	4.23 (1.29)	66/74
900	4.07 (1.24)	66/74
960	4.62 (1.41)	66/74
1800	7.70 (2.35)	62/70
1900	8.18 (2.50)	62/70
2000	8.66 (2.64)	63/71
2200	9.94 (3.03)	61/69
2400	11.7 (3.56)	60/68
2600	13.7 (4.18)	60/68

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ORDERING INFORMATION

Model Number	Jacket	Cable Weight, kg/m (lb/ft)
RLKU78-50JA	Standard	0.45 (0.30)
RLKU78-50JFNA	Flame/Fire Retardant	0.60 (0.40)
RLKU78-50JFLA	Flame/Fire Retardant, Low Smoke	0.60 (0.40)

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RADIAFLEX® Radiating Cable

1-1/4" RADIAFLEX® RLKL Cable, A-series

RLKL114 SERIES	
Cable Type	RLK
Size	1-1/4"
Slot Design	Groups of vertical slots at short intervals
Maximum Frequency, MHz	600
STRUCTURE	
Inner Conductor Material	Copper Tube
Diameter Inner Conductor, mm (in)	13.1 (0.52)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	34.0 (1.34)
Diameter over Jacket, mm (in)	38.1 (1.50)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	500 (20.0)
Tensile Force, N (lb)	2000 (440)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	1.3 (4.25)
Minimum Distance to Wall, mm (in)	80 (3.15)
Indication of Slot Alignment	Bulge atop slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	0.80 (0.24)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	1.75 (0.53)
Stop bands, MHz	55-65, 115-130, 175-190, 235-250, 295-310, 355-375, 535-555

RLKL114-50JA/JFNA/JFLA

PERFORMANCE		
Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	0.80 (0.24)	55/66
150	1.00 (0.31)	60/68
450	2.10 (0.64)	64/68

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ORDERING INFORMATION		
Model Number	**Jacket**	**Cable Weight, kg/m (lb/ft)**
RLKL114-50JA	Standard	0.66 (0.44)
RLKL114-50JFNA	Flame/Fire Retardant	0.90 (0.60)
RLKL114-50JFLA	Flame/Fire Retardant, Low Smoke	0.90 (0.60)

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1-1/4" RADIAFLEX® RLK Cable, A-series

RLK114 SERIES	
Cable Type	RLK
Size	1-1/4"
Slot Design	Groups of vertical slots at short intervals
Maximum Frequency, MHz	980
STRUCTURE	
Inner Conductor Material	Copper Tube
Diameter Inner Conductor, mm (in)	13.1 (0.52)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	34.0 (1.34)
Diameter over Jacket, mm (in)	38.1 (1.50)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	500 (20.0)
Tensile Force, N (lb)	2000 (440)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	1.3 (4.25)
Minimum Distance to Wall, mm (in)	80 (3.15)
Indication of Slot Alignment	Bulge atop slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	0.80 (0.24)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	1.75 (0.53)
Stop bands, MHz	325-375, 660-750

RLK114-50JA/JFNA/JFLA

PERFORMANCE		
Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	0.73 (0.22)	57/68
150	1.05 (0.32)	66/76
450	2.07 (0.63)	58/63
800	3.83 (1.17)	55/65
870	4.29 (1.31)	58/68
900	4.58 (1.40)	56/66
960	4.93 (1.50)	56/66

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ORDERING INFORMATION		
Model Number	**Jacket**	**Cable Weight, kg/m (lb/ft)**
RLK114-50JA	Standard	0.66 (0.44)
RLK114-50JFNA	Flame/Fire Retardant	0.90 (0.60)
RLK114-50JFLA	Flame/Fire Retardant, Low Smoke	0.90 (0.60)

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RADIAFLEX® Radiating Cable

1-1/4" RADIAFLEX® RLKW Cable, A-series

RLKW114 SERIES	
Cable Type	RLK
Size	1-1/4"
Slot Design	Groups of vertical slots at short intervals
Maximum Frequency, MHz	1950
STRUCTURE	
Inner Conductor Material	Copper Tube
Diameter Inner Conductor, mm (in)	13.1 (0.52)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	34.0 (1.34)
Diameter over Jacket, mm (in)	38.1 (1.50)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	500 (20.0)
Tensile Force, N (lb)	2000 (440)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	1.3 (4.25)
Minimum Distance to Wall, mm (in)	80 (3.15)
Indication of Slot Alignment	Bulge atop slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	0.80 (0.24)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	1.75 (0.53)
Stop bands, MHz	115-135, 235-255, 360-380, 475-505, 600-630, 720-750, 805-865, 970-1075, 1340-1460, 1590-1700

RLKW114-50JA/JFNA/JFLA

PERFORMANCE		
Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	0.69 (0.21)	57/68
150	1.03 (0.33)	62/68
450	1.92 (0.59)	66/70
800	2.84 (0.87)	64/70
870	3.04 (0.93)	62/67
900	3.16 (0.96)	62/67
960	3.37 (1.03)	62/67
1800	7.60 (2.32)	54/62
1900	8.52 (2.60)	50/58

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ORDERING INFORMATION		
Model Number	**Jacket**	**Cable Weight, kg/m (lb/ft)**
RLKW114-50JA	Standard	0.66 (0.44)
RLKW114-50JFNA	Flame/Fire Retardant	0.90 (0.60)
RLKW114-50JFLA	Flame/Fire Retardant, Low Smoke	0.90 (0.60)

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1-1/4" RADIAFLEX® RLKU Cable, A-series

RLKU114 SERIES	
Cable Type	RLK
Size	1-1/4"
Slot Design	Groups of vertical slots at short intervals
Maximum Frequency, MHz	2650
STRUCTURE	
Inner Conductor Material	Copper Tube
Diameter Inner Conductor, mm (in)	13.1 (0.52)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	34.0 (1.34)
Diameter over Jacket, mm (in)	38.1 (1.50)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	500 (20.0)
Tensile Force, N (lb)	2000 (440)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	1.3 (4.25)
Minimum Distance to Wall, mm (in)	80 (3.15)
Indication of Slot Alignment	Guides opposite to slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	0.80 (0.24)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	1.75 (0.53)
Stop bands, MHz	650-750, 1330-1430, 2025-2100

RLKU114-50JA/JFNA/JFLA

PERFORMANCE

Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	0.70 (0.21)	57/69
150	1.03 (0.31)	66/78
450	1.90 (0.58)	75/87
800	2.86 (0.87)	67/72
870	3.06 (0.93)	67/73
900	3.06 (0.93)	67/72
960	3.27 (1.00)	67/72
1800	5.51 (1.68)	63/68
1900	5.80 (1.77)	63/68
2000	6.15 (1.87)	62/67
2200	7.24 (2.21)	62/67
2400	8.29 (2.53)	62/67
2600	10.0 (3.05)	61/66

CONNECTOR & ACCESSORIES	
Connectors	See page 442
Accessories	See page 443

ORDERING INFORMATION

Model Number	Jacket	Cable Weight, kg/m (lb/ft)
RLKU114-50JA	Standard	0.66 (0.44)
RLKU114-50JFNA	Flame/Fire Retardant	0.90 (0.60)
RLKU114-50JFLA	Flame/Fire Retardant, Low Smoke	0.90 (0.60)

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1-5/8" RADIAFLEX® RLKU Cable, A-series

RLKU158 SERIES	
Cable Type	RLK
Size	1-5/8"
Slot Design	Groups of vertical slots at short intervals
Maximum Frequency, MHz	2650
STRUCTURE	
Inner Conductor Material	Corrugated Copper Tube
Diameter Inner Conductor, mm (in)	17.6 (0.69)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	44.2 (1.74)
Diameter over Jacket, mm (in)	48.2 (1.90)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	700 (28.0)
Tensile Force, N (lb)	1200 (270)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	1.5 (5)
Minimum Distance to Wall, mm (in)	80 (3.15)
Indication of Slot Alignment	Guides opposite to slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	1.30 (0.40)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	1.30 (0.40)
Stop bands, MHz	650-750, 1000-1050, 1330-1430, 2025-2100

RLKU158-50JA/JFNA/JFLA

PERFORMANCE

Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	0.54 (0.17)	65/77
150	0.77 (0.24)	74/84
450	1.43 (0.44)	84/92
800	2.10 (0.64)	68/71
870	2.22 (0.68)	68/72
900	2.25 (0.69)	68/72
1800	3.85 (1.17)	64/69
1900	4.06 (1.24)	64/70
2000	4.29 (1.31)	65/71
2200	4.87 (1.48)	63/68
2400	5.52 (1.68)	61/66
2600	6.39 (1.95)	61/66

CONNECTOR & ACCESSORIES	
Connectors	See page 442
Accessories	See page 443

ORDERING INFORMATION

Model Number	Jacket	Cable Weight, kg/m (lb/ft)
RLKU158-50JA	Standard	0.80 (0.54)
RLKU158-50JFNA	Flame/Fire Retardant	1.10 (0.74)
RLKU158-50JFLA	Flame/Fire Retardant, Low Smoke	1.10 (0.74)

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1-1/4" RADIAFLEX® RLV Cable, A-series

RLV114 SERIES	
Cable Type	RLV
Size	1-1/4"
Length, m (ft)	1000 (3281)
Slot Design	Groups of vertical slots of increasing density
Maximum Frequency, MHz	1000
STRUCTURE	
Inner Conductor Material	Copper Tube
Diameter Inner Conductor, mm (in)	13.1 (0.52)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	34.0 (1.34)
Diameter over Jacket, mm (in)	38.1 (1.50)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	500 (20.0)
Tensile Force, N (lb)	2000 (440)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	1.3 (4.25)
Minimum Distance to Wall, mm (in)	80 (3.15)
Indication of Slot Alignment	Bulge atop slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	0.80 (0.24)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	1.75 (0.54)
Stop bands, MHz	720-840

RLV114-50JA/JFNA/JFLA

PERFORMANCE		
Frequency, MHz	Longitudinal Loss of Cable Length, dB	System Loss 50%/95%, dB
150	11.1	85/97
450	19.7	96/108
900	34.2	89/97
960	35.5	91/99

Data for other cable lengths available upon request.

CONNECTOR & ACCESSORIES	
Connectors	See page 442
Accessories	See page 443

ORDERING INFORMATION		
Model Number	**Jacket**	**Cable Weight, kg/m (lb/ft)**
RLV114-50JA	Standard	0.66 (0.44)
RLV114-50JFNA	Flame/Fire Retardant	0.90 (0.60)
RLV114-50JFLA	Flame/Fire Retardant, Low Smoke	0.90 (0.60)

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RADIAFLEX® Radiating Cable

1-1/4" RADIAFLEX® RLVU Cable, A-series

RLVU114 SERIES	
Cable Type	RLV
Size	1-1/4"
Length, m (ft)	500 (1641)
Slot Design	Groups of vertical slots of increasing density
Maximum Frequency, MHz	2400
STRUCTURE	
Inner Conductor Material	Copper Tube
Diameter Inner Conductor, mm (in)	13.1 (0.52)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	34.0 (1.34)
Diameter over Jacket, mm (in)	38.1 (1.50)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	500 (20.0)
Tensile Force, N (lb)	2000 (440)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	1.3 (4.25)
Minimum Distance to Wall, mm (in)	80 (3.15)
Indication of Slot Alignment	Guides opposite to slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	0.80 (0.24)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	1.75 (0.54)
Stop bands, MHz	790-870, 1550-1650

RLVU114-50JA/JFNA/JFLA

PERFORMANCE

Frequency, MHz	Longitudinal Loss of Cable Length, dB	System Loss 50%/95%, dB
450	10.0	103/108
900	16.0	78/83
1800	24.0	88/93
2000	26.0	89/94
2200	29.0	90/95
2400	34.0	97/102

Data for other cable lengths available upon request.

CONNECTOR & ACCESSORIES	
Connectors	See page 442
Accessories	See page 443

ORDERING INFORMATION

Model Number	Jacket	Cable Weight, kg/m (lb/ft)
RLVU114-50JA	Standard	0.66 (0.44)
RLVU114-50JFNA	Flame/Fire Retardant	0.90 (0.60)
RLVU114-50JFLA	Flame/Fire Retardant, Low Smoke	0.90 (0.60)

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1-1/4" RADIAFLEX® RLVU Cable, A-series

RLVU114B SERIES	
Cable Type	RLV
Size	1-1/4"
Length, m (ft)	500 (1641)
Slot Design	Groups of vertical slots of increasing density
Maximum Frequency, MHz	2650
STRUCTURE	
Inner Conductor Material	Copper Tube
Diameter Inner Conductor, mm (in)	13.1 (0.52)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	34.0 (1.34)
Diameter over Jacket, mm (in)	38.1 (1.50)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	500 (20.0)
Tensile Force, N (lb)	2000 (440)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	1.3 (4.25)
Minimum Distance to Wall, mm (in)	80 (3.15)
Indication of Slot Alignment	Guides opposite to slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	0.80 (0.24)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	1.75 (0.54)
Stop bands, MHz	650-750, 1330-1430, 2025-2100

RLVU114-50JAB/JFNAB/JFLAB

PERFORMANCE

Frequency, MHz	Longitudinal Loss of Cable Length, dB	System Loss 50%/95%, dB
75	3.6	72/84
150	5.1	80/92
450	9.4	92/103
800	13.6	84/87
870	14.2	84/89
900	14.6	85/90
960	15.0	84/86
1800	23.4	86/91
2000	25.9	85/90
2200	28.7	88/92
2400	32.3	89/93
2600	37	96/101

Data for other cable lengths available upon request.

CONNECTOR & ACCESSORIES	
Connectors	See page 442
Accessories	See page 443

ORDERING INFORMATION

Model Number	Jacket	Cable Weight, kg/m (lb/ft)
RLVU114-50JAB	Standard	0.66 (0.44)
RLVU114-50JFNAB	Flame/Fire Retardant	0.90 (0.60)
RLVU114-50JFLAB	Flame/Fire Retardant, Low Smoke	0.90 (0.60)

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RADIAFLEX® Radiating Cable

1-5/8" RADIAFLEX® RLV Cable, A-series

RLV158 SERIES	
Cable Type	RLV
Size	1-5/8"
Length, m (ft)	1000 (3281)
Slot Design	Groups of vertical slots of increasing density
Maximum Frequency, MHz	1000
STRUCTURE	
Inner Conductor Material	Corrugated Copper Tube
Diameter Inner Conductor, mm (in)	17.6 (0.69)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	44.2 (1.74)
Diameter over Jacket, mm (in)	48.2 (1.90)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	700 (28.0)
Tensile Force, N (lb)	1200 (270)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	1.5 (5)
Minimum Distance to Wall, mm (in)	80 (3.15)
Indication of Slot Alignment	Guides opposite to slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	1.30 (0.40)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	1.30 (0.40)
Stop bands, MHz	720-840

RLV158-50JA/JFNA/JFLA

PERFORMANCE

Frequency, MHz	Longitudinal Loss of Cable Length, dB	System Loss 50%/95%, dB
450	16.0	94/105
870	30.0	80/85
900	30.7	83/88
960	31.6	84/89

Data for other cable lengths available upon request.

CONNECTOR & ACCESSORIES

Connectors	See page 442
Accessories	See page 443

ORDERING INFORMATION

Model Number	Jacket	Cable Weight, kg/m (lb/ft)
RLV158-50JA	Standard	0.80 (0.54)
RLV158-50JFNA	Flame/Fire Retardant	1.10 (0.74)
RLV158-50JFLA	Flame/Fire Retardant, Low Smoke	1.10 (0.74)

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1-5/8" RADIAFLEX® RLVU Cable, A-series

RLVU158 SERIES	
Cable Type	RLV
Size	1-5/8"
Length, m (ft)	800 (2625)
Slot Design	Groups of vertical slots of increasing density
Maximum Frequency, MHz	2400
STRUCTURE	
Inner Conductor Material	Corrugated Copper Tube
Diameter Inner Conductor, mm (in)	17.6 (0.69)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	44.2 (1.74)
Diameter over Jacket, mm (in)	48.2 (1.90)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	700 (28.0)
Tensile Force, N (lb)	1200 (270)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	1.5 (5)
Minimum Distance to Wall, mm (in)	80 (3.15)
Indication of Slot Alignment	Guides opposite to slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	1.30 (0.40)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	1.30 (0.40)
Stop bands, MHz	790-870, 1000-1050, 1550-1650

RLVU158-50JA/JFNA/JFLA

PERFORMANCE

Frequency, MHz	Longitudinal Loss of Cable Length, dB	System Loss 50%/95%, dB
450	11.5	99/111
900	18.1	82/87
1800	29.9	95/100
2000	33.4	96/101
2200	37.8	97/102
2400	44.1	102/107

Data for other cable lengths available upon request.

CONNECTOR & ACCESSORIES	
Connectors	See page 442
Accessories	See page 443

ORDERING INFORMATION

Model Number	Jacket	Cable Weight, kg/m (lb/ft)
RLVU158-50JA	Standard	0.80 (0.54)
RLVU158-50JFNA	Flame/Fire Retardant	1.10 (0.74)
RLVU158-50JFLA	Flame/Fire Retardant, Low Smoke	1.10 (0.74)

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1-5/8" RADIAFLEX® RLVU Cable, A-series

RLVU158B SERIES	
Cable Type	RLV
Size	1-5/8"
Length, m (ft)	800 (2625)
Slot Design	Groups of vertical slots of increasing density
Maximum Frequency, MHz	2650
STRUCTURE	
Inner Conductor Material	Corrugated Copper Tube
Diameter Inner Conductor, mm (in)	17.6 (0.69)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	44.2 (1.74)
Diameter over Jacket, mm (in)	48.2 (1.90)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	700 (28.0)
Tensile Force, N (lb)	1200 (270)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	1.5 (5)
Minimum Distance to Wall, mm (in)	80 (3.15)
Indication of Slot Alignment	Guides opposite to slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	1.30 (0.40)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	1.30 (0.40)
Stop bands, MHz	650-750, 1330-1430, 2025-2100

RLVU158-50JAB/JFNAB/JFLAB

PERFORMANCE

Frequency, MHz	Longitudinal Loss of Cable Length, dB	System Loss 50%/95%, dB
75	4.5	76/87
150	6.6	83/95
450	11.9	99/109
800	17.2	85/89
870	18.0	88/93
900	18.4	90/95
960	19.2	90/96
1800	29.7	94/98
2000	32.5	94/97
2200	35.8	96/99
2400	39.5	99/103
2600	44.2	102/106

Data for other cable lengths available upon request.

CONNECTOR & ACCESSORIES	
Connectors	See page 442
Accessories	See page 443

ORDERING INFORMATION

Model Number	Jacket	Cable Weight, kg/m (lb/ft)
RLVU158-50JAB	Standard	0.80 (0.54)
RLVU158-50JFNAB	Flame/Fire Retardant	1.10 (0.74)
RLVU158-50JFLAB	Flame/Fire Retardant, Low Smoke	1.10 (0.74)

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7/8" RADIAFLEX® RAY Cable, A-series

RAY78 SERIES	
Cable Type	RAY
Size	7/8"
Slot Design	Groups of slope slots at short intervals
Maximum Frequency, MHz	1000
STRUCTURE	
Inner Conductor Material	Copper Tube
Diameter Inner Conductor, mm (in)	9.3 (0.37)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	23.8 (0.94)
Diameter over Jacket, mm (in)	28.5 (1.12)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	350 (13.8)
Tensile Force, N (lb)	2300 (507)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	0.9 (3)
Minimum Distance to Wall, mm (in)	80 (3.15)
Indication of Slot Alignment	Bulge atop slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	1.46 (0.44)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	2.16 (0.66)
Stop bands, MHz	240-300, 500-590, 750-860

RAY78-50JA/JFNA/JFLA

PERFORMANCE		
Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	0.86 (0.26)	57/66
150	1.32 (0.40)	62/73
450	2.67 (0.81)	62/69
870	5.41 (1.65)	56/65
900	5.70 (1.74)	56/63
960	6.46 (1.97)	56/62

CONNECTOR & ACCESSORIES	
Connectors	See page 442
Accessories	See page 443

ORDERING INFORMATION		
Model Number	**Jacket**	**Cable Weight, kg/m (lb/ft)**
RAY78-50JA	Standard	0.45 (0.30)
RAY78-50JFNA	Flame/Fire Retardant	0.60 (0.40)
RAY78-50JFLA	Flame/Fire Retardant, Low Smoke	0.60 (0.40)

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RADIAFLEX® Radiating Cable

7/8" RADIAFLEX® RAY Cable, A-series

RAY78B SERIES	
Cable Type	RAY
Size	7/8"
Slot Design	Groups of slope slots at short intervals
Maximum Frequency, MHz	900
STRUCTURE	
Inner Conductor Material	Copper Tube
Diameter Inner Conductor, mm (in)	9.3 (0.37)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	23.8 (0.94)
Diameter over Jacket, mm (in)	28.5 (1.12)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	350 (13.8)
Tensile Force, N (lb)	2300 (507)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	0.9 (3)
Minimum Distance to Wall, mm (in)	80 (3.15)
Indication of Slot Alignment	Bulge atop slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	1.46 (0.44)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	2.16 (0.66)
Stop bands, MHz	285-350, 580-680

RAY78-50JAB/JFNAB/JFLAB

PERFORMANCE		
Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	1.03 (0.31)	56/65
150	1.45 (0.44)	64/76
450	2.85 (0.87)	62/68
800	5.00 (1.53)	60/68

CONNECTOR & ACCESSORIES	
Connectors	See page 442
Accessories	See page 443

ORDERING INFORMATION		
Model Number	**Jacket**	**Cable Weight, kg/m (lb/ft)**
RAY78-50JAB	Standard	0.45 (0.30)
RAY78-50JFNAB	Flame/Fire Retardant	0.60 (0.40)
RAY78-50JFLAB	Flame/Fire Retardant, Low Smoke	0.60 (0.40)

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1-1/4" RADIAFLEX® RAY Cable, A-series

RAY114 SERIES	
Cable Type	RAY
Size	1-1/4"
Slot Design	Groups of slope slots at short intervals
Maximum Frequency, MHz	1000
STRUCTURE	
Inner Conductor Material	Copper Tube
Diameter Inner Conductor, mm (in)	13.1 (0.52)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	34.0 (1.34)
Diameter over Jacket, mm (in)	38.1 (1.50)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	500 (20.0)
Tensile Force, N (lb)	2000 (440)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	1.3 (4.25)
Minimum Distance to Wall, mm (in)	80 (3.15)
Indication of Slot Alignment	Bulge atop slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	0.8 (0.24)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	1.75 (0.53)
Stop bands, MHz	240-300, 500-590, 750-860

RAY114-50JA/JFNA/JFLA

PERFORMANCE		
Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	0.68 (0.21)	62/72
150	0.97 (0.30)	70/80
450	1.84 (0.56)	66/70
870	3.62 (1.10)	58/67
900	3.74 (1.14)	58/67
960	4.27 (1.30)	58/65

CONNECTOR & ACCESSORIES	
Connectors	See page 442
Accessories	See page 443

ORDERING INFORMATION		
Model Number	**Jacket**	**Cable Weight, kg/m (lb/ft)**
RAY114-50JA	Standard	0.66 (0.44)
RAY114-50JFNA	Flame/Fire Retardant	0.90 (0.60)
RAY114-50JFLA	Flame/Fire Retardant, Low Smoke	0.90 (0.60)

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RADIAFLEX® Radiating Cable

1-1/4" RADIAFLEX® RAY Cable, A-series

RAY114B SERIES	
Cable Type	RAY
Size	1-1/4"
Slot Design	Groups of slope slots at short intervals
Maximum Frequency, MHz	900
STRUCTURE	
Inner Conductor Material	Copper Tube
Diameter Inner Conductor, mm (in)	13.1 (0.52)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	34.0 (1.34)
Diameter over Jacket, mm (in)	38.1 (1.50)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	500 (20.0)
Tensile Force, N (lb)	2000 (440)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	1.3 (4.25)
Minimum Distance to Wall, mm (in)	80 (3.15)
Indication of Slot Alignment	Bulge atop slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	0.8 (0.24)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	1.75 (0.53)
Stop bands, MHz	285-350, 580-680

RAY114-50JAB/JFNAB/JFLAB

PERFORMANCE		
Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	0.73 (0.22)	61/70
150	1.04 (0.32)	68/79
450	2.03 (0.62)	68/75
800	3.71 (1.13)	62/69
900	4.62 (1.41)	61/67

CONNECTOR & ACCESSORIES	
Connectors	See page 442
Accessories	See page 443

ORDERING INFORMATION		
Model Number	**Jacket**	**Cable Weight, kg/m (lb/ft)**
RAY114-50JAB	Standard	0.66 (0.44)
RAY114-50JFNAB	Flame/Fire Retardant	0.90 (0.60)
RAY114-50JFLAB	Flame/Fire Retardant, Low Smoke	0.90 (0.60)

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1-5/8" RADIAFLEX® RAY Cable, A-series

RAY158 SERIES	
Cable Type	RAY
Size	1-5/8"
Slot Design	Groups of slope slots at short intervals
Maximum Frequency, MHz	1000
STRUCTURE	
Inner Conductor Material	Corrugated Copper Tube
Diameter Inner Conductor, mm (in)	17.6 (0.69)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	44.2 (1.74)
Diameter over Jacket, mm (in)	48.2 (1.90)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	700 (28.0)
Tensile Force, N (lb)	1200 (270)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	1.5 (5)
Minimum Distance to Wall, mm (in)	80 (3.15)
Indication of Slot Alignment	Guides opposite to slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	1.30 (0.40)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	1.30 (0.40)
Stop bands, MHz	240-300, 500-590, 750-860

RAY158-50JA/JFNA/JFLA

PERFORMANCE

Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	0.56 (0.17)	65/75
150	0.78 (0.24)	72/83
450	1.49 (0.45)	67/72
870	2.85 (0.87)	60/66
900	2.92 (0.89)	60/66
960	3.38 (1.03)	60/66

CONNECTOR & ACCESSORIES	
Connectors	See page 442
Accessories	See page 443

ORDERING INFORMATION

Model Number	Jacket	Cable Weight, kg/m (lb/ft)
RAY158-50JA	Standard	0.80 (0.54)
RAY158-50JFNA	Flame/Fire Retardant	1.10 (0.74)
RAY158-50JFLA	Flame/Fire Retardant, Low Smoke	1.10 (0.74)

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1-5/8" RADIAFLEX® RAYU Cable, A-series

RAYU158 SERIES	
Cable Type	RAY
Size	1-5/8"
Slot Design	Groups of slope slots at short intervals
Maximum Frequency, MHz	2450
STRUCTURE	
Inner Conductor Material	Corrugated Copper Tube
Diameter Inner Conductor, mm (in)	17.6 (0.69)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	44.2 (1.74)
Diameter over Jacket, mm (in)	48.2 (1.90)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	700 (28.0)
Tensile Force, N (lb)	1200 (270)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	1.5 (5)
Minimum Distance to Wall, mm (in)	80 (3.15)
Indication of Slot Alignment	Guides opposite to slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	1.30 (0.40)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	1.30 (0.40)
Stop bands, MHz	400-430, 810-850, 1000-1050, 1200-1280, 1610-1690, 2025-2100

RAYU158-50JA/JFNA/JFLA

PERFORMANCE		
Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
75	0.56 (0.17)	77/88
150	0.92 (0.28)	87/98
450	1.52 (0.46)	89/97
870	2.31 (0.70)	77/82
900	2.35 (0.72)	77/82
960	2.47 (0.75)	77/82
1800	4.07 (1.24)	71/81
1900	4.34 (1.32)	70/81
2000	4.71 (1.43)	69/80
2200	5.71 (1.71)	66/78
2400	8.52 (2.60)	63/75

CONNECTOR & ACCESSORIES	
Connectors	See page 442
Accessories	See page 443

ORDERING INFORMATION		
Model Number	**Jacket**	**Cable Weight, kg/m (lb/ft)**
RAYU158-50JA	Standard	0.80 (0.54)
RAYU158-50JFNA	Flame/Fire Retardant	1.10 (0.74)
RAYU158-50JFLA	Flame/Fire Retardant, Low Smoke	1.10 (0.74)

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1-5/8" RADIAFLEX® RAYU Cable, A-series

RAYU158T SERIES	
Cable Type	RAY
Size	1-5/8"
Slot Design	Groups of slope slots at short intervals
Maximum Frequency, MHz	2200
STRUCTURE	
Inner Conductor Material	Corrugated Copper Tube
Diameter Inner Conductor, mm (in)	17.6 (0.69)
Outer Conductor Material	Overlapping Copper Foil
Diameter Outer Conductor, mm (in)	44.2 (1.74)
Diameter over Jacket, mm (in)	48.2 (1.90)
MECHANICAL SPECIFICATIONS	
Minimum Bending Radius, Single Bend, mm (in)	700 (28.0)
Tensile Force, N (lb)	1200 (270)
Storage Temperature, °C (°F)	-70 to +85 (-94 to +185)
Operation Temperature, °C (°F)	-50 to +85 (-58 to +185)
Installation Temperature, °C (°F)	-25 to +60 (-13 to +140)
Recommended Clamp Spacing, m (ft)	1.5 (5)
Minimum Distance to Wall, mm (in)	80 (3.15)
Indication of Slot Alignment	Guides opposite to slots
ELECTRICAL SPECIFICATIONS	
Impedance, ohm	50 +/-2
Velocity, %	89
Inner Conductor dc Resistance, ohm/1000 m (1000 ft)	1.30 (0.40)
Outer Conductor dc Resistance, ohm/1000 m (1000 ft)	1.30 (0.40)
Stop bands, MHz	1000-1650

RAYU158-50JAT/JFNAT/JFLAT

PERFORMANCE		
Frequency, MHz	Longitudinal Loss, dB/100 m (dB/100 ft)	Coupling Loss 50%/95%, dB
800	2.12 (0.65)	65/69
900	2.47 (0.75)	60/64
1800	4.60 (1.40)	57/60
1900	4.13 (1.26)	60/63
2000	3.90 (1.19)	63/66
2200	4.10 (1.25)	63/68

CONNECTOR & ACCESSORIES	
Connectors	See page 442
Accessories	See page 443

ORDERING INFORMATION		
Model Number	**Jacket**	**Cable Weight, kg/m (lb/ft)**
RAYU158-50JAT	Standard	0.80 (0.54)
RAYU158-50JFNAT	Flame/Fire Retardant	1.10 (0.74)
RAYU158-50JFLAT	Flame/Fire Retardant, Low Smoke	1.10 (0.74)

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RADIAFLEX® Connectors and Accessories

Connectors

The connector design offers a significant installation advantage due to a one-piece item. That means, no assembly or disassembly is required during installation. All connectors are available as N as well as 7-16 types, male or female.

Same connectors for all smooth wall cable types

All RADIAFLEX® smooth wall cables, these are the series ALF/RLF, RLK, RLV and RAY, fit to the same type of connectors. This simplifies everything around the cable – from ordering to installation.

Connectors for corrugated cable types

The RADIAFLEX® cables of the RCF, RSF, and RHCA series have a corrugated outer conductor requiring different connectors than the smooth wall radiating cables.

For all RADIAFLEX® cables with corrugated outer conductor the connectors of the CELLFLEX® series can be used. The RCF and RHCA leaky cable series are compatible to the connectors of type LCF and the RSF leaky cable series fits to connectors of type SCF.

Sealing

Sealing and mechanical load reduction for the smooth wall cables is performed by installing a heat shrinking sleeve that is provided with each connector. RADIAFLEX® cables with flame or fire retardant jackets (suffix JFN resp. JFL), with connectors sealed by shrinking sleeve, meet the requirements of IEC 60 332-1.

RADIAFLEX® cables with corrugated outer conductor are sealed like LCF feeders. Each connector is packed with a heat shrinking sleeve.

Tools

RADIAFLEX® smooth wall cables do not need special trimming tools. Instead, common tools like a saw and a cable knife are sufficient. The offered hand tool kit already comprises all necessary tools.

Corrugated RADIAFLEX® cables should be trimmed by special tools which are shown in the Transmission Line Products section of this catalog.

For instruction how to trim the cables see at the ‘Installation guide lines’ which are available on request.

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RADIAFLEX® Connectors and Trim Tools

Selection Guide

	ALFU12-50	RLKW12-50 RLKU12-50
CONNECTORS:		
Connector, N-male	NM-RA12-010	NM-RA12-010
Connector, N-female	NF-RA12-011	NF-RA12-011
Connector, 7-16-male	716M-RA12-010	716M-RA12-010
Connector, 7-16-female	716F-RA12-011	716F-RA12-011
Trimming tool for above connectors	–	–
Spare blade for trimming tool	–	–

	RLF78-50 RLFW78-50 RAY78-50 RAY78-50B RLFU78-50	RLKL78-50 RLKU78-50 RLKW78-50	RLF114-50 RLFW114-50 RAY114-50 RAY114-50B RLFU114-50	RLK114-50 RLKW114-50 RLKU114-50 RLKL114-50 RLV114-50 RLVU114-50 RLVU114-50B
CONNECTORS:				
Connector, N-male	NM-RA78-014	NM-RA78-014	NM-RA114-014	NM-RA114-014
Connector, N-female	NF-RA78-015	NF-RA78-015	NF-RA114-015	NF-RA114-015
Connector, 7-16-male	716M-RA78-014	716M-RA78-014	716M-RA114-014	716M-RA114-014
Connector, 7-16-female	716F-RA78-015	716F-RA78-015	716F-RA114-015	716F-RA114-015
Trimming tool for above connectors	–	–	TRIM-114-C12	TRIM-114-C12
Spare blade for trimming tool	–	–	TRIM-B04	TRIM-B04

	RLF158-50 RLFW158-50 RAY158-50 RAYU158-50 RLFU158-50 RAYU158-50T	RLKU158-50 RLVU158-50 RLVU158-50B RLV158-50
CONNECTORS:		
Connector, N-male	NM-RA158-014	NM-RA158-014
Connector, N-female	NF-RA158-015	NF-RA158-015
Connector, 7-16-male	716M-RA158-014	716M-RA158-014
Connector, 7-16-female	716F-RA158-015	716F-RA158-015
Trimming tool for above connectors	TRIM-114-C12	TRIM-114-C12
Spare blade for trimming tool	TRIM-B04	TRIM-B04

	RCF12-50	RSF12-50	RCF78-50
CONNECTORS:			
Connector, N-male	NM-LCF12-070	NM-SCF12-070	NM-LCF78-072
Connector, N-female	NF-LCF12-070	NF-SCF12-070	NF-LCF78-072
Connector, 7-16-male	716M-LCF12-070	716M-SCF12-070	716M-LCF78-072
Connector, 7-16-female	716F-LCF12-070	716F-SCF12-070	716F-LCF78-072
Trimming tool for above connectors	TRIM-12-L	TRIM-12-S-06	TRIM-78-L
Spare blade for trimming tool	TRIM-B03	TRIM-B01	TRIM-B03

	RCF114-50	RCF158-50	RHCA12-50
CONNECTORS:			
Connector, N-male	NM-LCF114-072	NM-LCF158-072	NM-LCF12-070
Connector, N-female	NF-LCF114-072	NF-LCF158-072	NF-LCF12-070
Connector, 7-16-male	716M-LCF114-072	716M-LCF158-072	716M-LCF12-070
Connector, 7-16-female	716F-LCF114-072	716F-LCF158-072	716F-LCF12-070
Trimming tool for above connectors	TRIM-114-C12	TRIM-114-C12	–
Spare blade for trimming tool	TRIM-B04	TRIM-B04	–

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Safe and efficient installation of RADIAFLEX® cable with clic-clamps

- Simple mounting of cables by using wall plugs and screws.
- Simply push in by hand, clamp will grip and click by applying slight pressure.

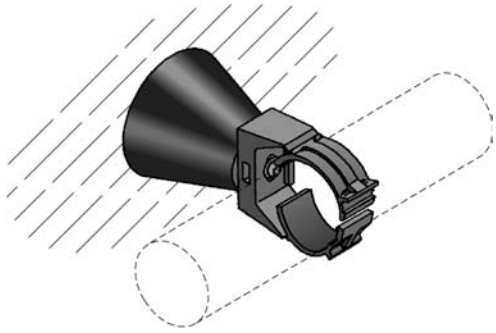
Material:

CLIC-CLAMP: Polyamide black, halogen free, fire class UL94HB

ROUND BASE: Polypropylene, black halogen free, fire class UL94HB

RSB CLIP/SCREWS: Stainless steel

OPERATING TEMPERATURE:
-40°C to 85°C (-40°F to 176°F)



	DIMENSIONS
Round base RB-50-4	50 mm (2'') in height
Round base RB-80-4	80 mm (3.15'') in height
Screw SC-4595-1	4.5 x 95 mm (.18 x 3.74'')
Screw SC-45125-2	4.5 x 125 mm (.18 x 4.92'')
Drilling hole for PLUG-6-1	6 x 35 mm (.24 x 1.38'')
Screw SC-865-1	M8 x 65 mm (M8 x 2.56")
Screw SC-895-1	M8 x 95 mm (M8 x 3.74")
Drilling hole for PLUG-8-2	10 x 35 mm (.39 x 1.38")

Standard Installation

TYPE	ROUND BASE	CLIC-CLAMP	SCREW	PLASTIC PLUG
Cable Size 1/2"				
ALF	RB-50-4	CC-12-2	SC-4595-1	PLUG-6-1
RLK	RB-80-4	CC-12-2	SC-45125-2	PLUG-6-1
RCF	RB-50-4	CC-12-2	SC-4595-1	PLUG-6-1
RSF	RB-50-4	CC-12-2	SC-4595-1	PLUG-6-1
Cable Size 7/8"				
RLF	RB-50-4	CC-78-2	SC-4595-1	PLUG-6-1
RLK	RB-80-4	CC-78-2	SC-45125-2	PLUG-6-1
RAY	RB-80-4	CC-78-2	SC-45125-2	PLUG-6-1
RLV	RB-80-4	CC-78-2	SC-45125-2	PLUG-6-1
RCF	RB-50-4	CC-78-2	SC-4595-1	PLUG-6-1
Cable Size 1-1/4"				
RLF	RB-50-4	CC-114-2	SC-4595-1	PLUG-6-1
RLK	RB-80-4	CC-114-2	SC-45125-2	PLUG-6-1
RAY	RB-80-4	CC-114-2	SC-45125-2	PLUG-6-1
RLV	RB-80-4	CC-114-2	SC-45125-2	PLUG-6-1
RCF	RB-50-4	CC-114-2	SC-4595-1	PLUG-6-1
Cable Size 1-5/8"				
RLF	RB-50-4	CC-158-2	SC-4595-1	PLUG-6-1
RLK	RB-80-4	CC-158-2	SC-45125-2	PLUG-6-1
RAY	RB-80-4	CC-158-2	SC-45125-2	PLUG-6-1
RLV	RB-80-4	CC-158-2	SC-45125-2	PLUG-6-1
RCF	RB-50-4	CC-158-2	SC-4595-1	PLUG-6-1

Fire Protection Installation

TYPE	ROUND BASE	STEEL CLAMP	SCREW/ WASHER	METAL PLUG
Cable Size 1/2"				
ALF	RB-50-4	RSB-12	SC-865-1, W-84-1	PLUG-8-2
RLK	RB-80-4	RSB-12	SC-895-1, W-84-1	PLUG-8-2
RCF	RB-50-4	RSB-12	SC-865-1, W-84-1	PLUG-8-2
RSF	RB-50-4	RSB-12	SC-865-1, W-84-1	PLUG-8-2
Cable Size 7/8"				
RLF	RB-50-4	RSB-78	SC-865-1, W-84-1	PLUG-8-2
RLK	RB-80-4	RSB-78	SC-895-1, W-84-1	PLUG-8-2
RAY	RB-80-4	RSB-78	SC-895-1, W-84-1	PLUG-8-2
RLV	RB-80-4	RSB-78	SC-895-1, W-84-1	PLUG-8-2
RCF	RB-50-4	RSB-78	SC-865-1, W-84-1	PLUG-8-2
Cable Size 1-1/4"				
RLF	RB-50-4	RSB-114	SC-865-1, W-84-1	PLUG-8-2
RLK	RB-80-4	RSB-114	SC-895-1, W-84-1	PLUG-8-2
RAY	RB-80-4	RSB-114	SC-895-1, W-84-1	PLUG-8-2
RLV	RB-80-4	RSB-114	SC-895-1, W-84-1	PLUG-8-2
RCF	RB-50-4	RSB-114	SC-865-1, W-84-1	PLUG-8-2
Cable Size 1-5/8"				
RLF	RB-50-4	RSB-158-001	SC-865-1, W-84-1	PLUG-8-2
RLK	RB-80-4	RSB-158-001	SC-895-1, W-84-1	PLUG-8-2
RAY	RB-80-4	RSB-158-001	SC-895-1, W-84-1	PLUG-8-2
RLV	RB-80-4	RSB-158-001	SC-895-1, W-84-1	PLUG-8-2
RCF	RB-50-4	RSB-158-001	SC-865-1, W-84-1	PLUG-8-2

Cable tie for installation of RADIAFLEX® cable to external messenger wire

MODEL NAME: TAS-100L
Use for all sizes of RADIAFLEX® cable

Base Material:

TIE: Polyamide 6.6 UV resistant

LOCK: Polypropylene, UV resistant

FIRE CLASS: UL94HB, halogen free

OPERATING TEMPERATURE: -40°C to 85°C (-40°F to 176°F)

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RADIAFLEX® Accessories

Considerations and clamp spacing

Installation of RADIAFLEX® cables

Together with the RADIAFLEX® cables complete sets of installation material are offered. This installation material has to fulfill various different requirement in order to ensure trouble-free RF operation during the entire lifetime of the radiating cable being installed. Moreover, the installation material has to fulfill safety aspects in case of a fire impact. RFS' installation material and installation method fit to all these requirements.

General consideration for installation

As a radiating cable has to be considered as a 'long antenna', the RF transmitted and received by the cable follows the same principal physical rules as for a common compact antenna. Therefore, there already has to be considered basic rules where to install the cable. For example, a radiating cable always requires a minimum distance from the walls and other cables. Putting it into cable ducts or behind false ceilings with screening effects would influence the performance severely. Generally, the radiating cable should always 'see' the mobile for proper operation. Obstacles between the radiating cable and the mobile user causes more or less losses depending on the material, which have to be considered during the system planning phase.

Installation on the wall

This is the most common kind of installation of RADIAFLEX®. Using clic-clamps and round bases ensures a quick fastening of the cable by just pushing the cable into the clamp by hand. The size of the round base guarantees the correct distance from the wall.

For fast speed train application in tunnels a special heavy-duty clamp has been developed for cable sizes of 1 1/4" and 1 5/8" (HDC series).

This heavy duty clamp features the additional assembling of up to four clic-clamps. Those clic-clamps are easily snapped onto the heavy-duty clamp without the need of any tool. It allows to install other cables, like fiber optic cables, along the RADIAFLEX® and is then useful for all kind of train tunnels.

Installation on messenger wire

The other method to install RADIAFLEX® cables is the use of messenger wires. Again, the offered installation material guarantees the correct installation of the cable for all frequencies.

Clamp spacing

For proper long-term operation, a minimum clamp spacing is recommended. It depends on the size of the cable to be installed. The recommended clamp spacing is valid for the installation with:

- clic-clamp and round base
- heavy duty clamp
- messenger wire with cable tie

Recommended clamp spacing

The following recommended clamp spacing is valid for all RADIAFLEX® series.

CABLE SIZE	SPACING
1/2"	0.3 m (12") for RSF12-50 0.5 m (20") for others
7/8"	0.9 m (3 ft)
1 1/4"	1.3 m (4.25 ft)
1 5/8"	1.5 m (5 ft)

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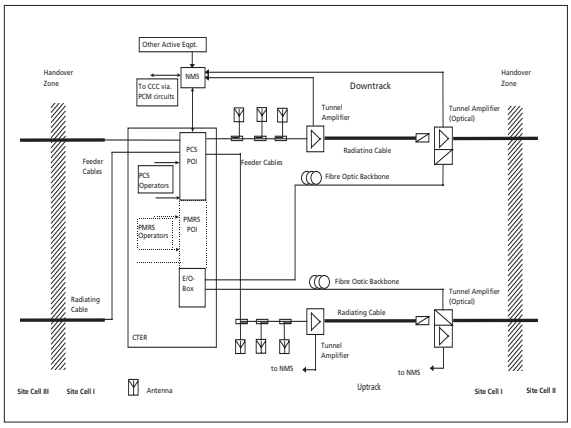
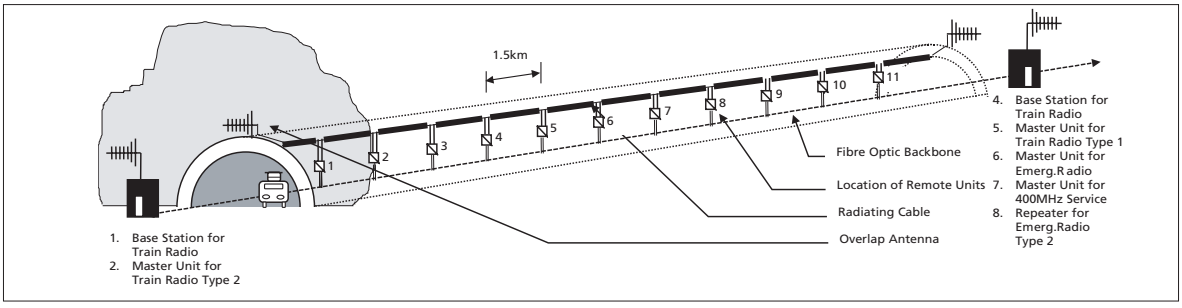
Tunnel Applications

RFS' comprehensive range of products for tunnel communication systems includes broadband passive components such as coaxial and radiating cables, antennas, power splitters, and accessories as well as bi-directional amplifiers, fiber-fed remote units, RF coupling systems (POI's) and network monitoring/management systems (NMS). This will allow deploying multi-band, multi-operator systems for voice and data in a shared infrastructure, minimizing CAPEX.

For complex multi-band applications with commercial and/or essential radio typically radiating cable solutions will be used for tunnel coverage while shorter tunnels (500 m 2G, 300 m 3G) or tunnels with a large cross section can be covered by point antennas, especially for single-band services.

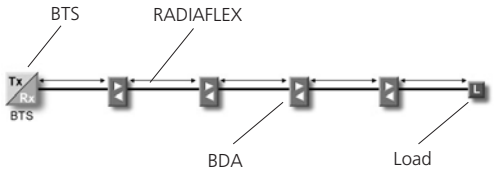


Case Study Metro Tunnel and Station



Case Study 17 km Railway Tunnel

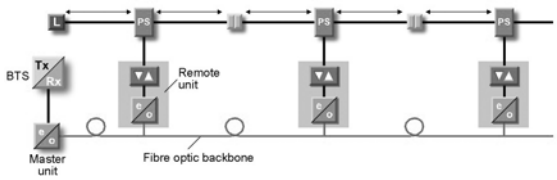
Active tunnel systems can be realized with cascaded bi-directional amplifiers (BDA), which re-amplify the RF signal after a certain distance. The spacing between those BDA's depends on the frequency and the diameter of the radiating cable. Due to noise and intermodulation performance BDA's can only be cascaded to a maximum of 6 in order to compensate for insertion loss of radiating cable runs and therefore are only suitable for medium to short tunnels. Systems of cascaded BDA's are cost effective but do not offer any system redundancy in those cases were the radiating cable is damaged/interrupted due to a fire or accident.



A more sophisticated approach is the use of fiber-fed remote units as shown in the case studies above. The fiber-fed remote units, as a matter of fact, are bi-directional amplifiers with integrated electric-optic converters. In this case the voice/data signal is being distributed via a low-loss fiber backbone throughout the tunnel.

Depending on the frequency and the radiating cable/antenna in use, remote units are placed in the tunnel and are feeding the signal in a T-shaped radiating cable/antenna configuration. In case the cable is damaged/interrupted due to a fire or accident, one still has RF power from both sides of the tunnel section.

The solution with fiber-optic backbone and remote units allows to cover tunnels up to a length of 20 km.



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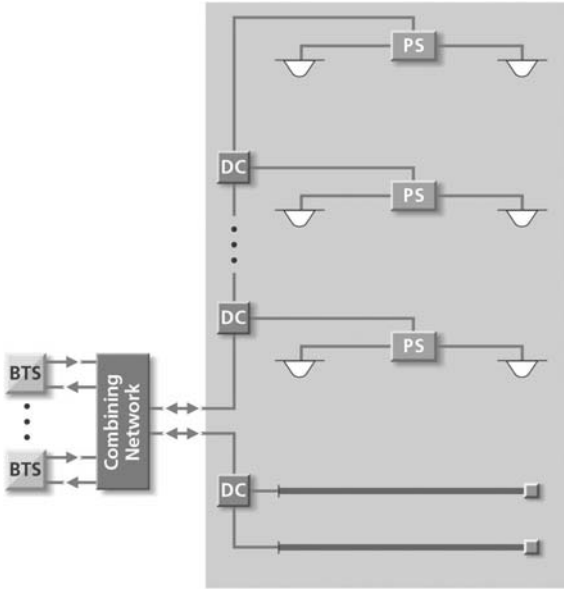
Passive and Hybrid Distributed Antenna Systems

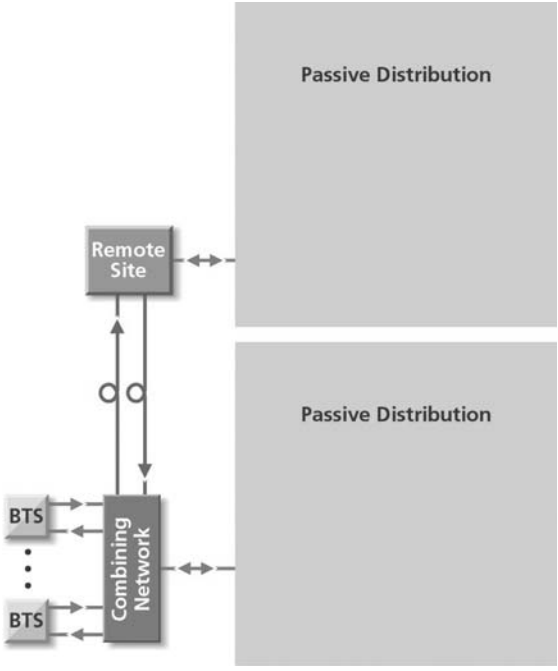
A passive DAS provides coverage for up to 50,000 sqm and consists of only passive components, such as coaxial and radiating cables, power splitters, directional couplers and indoor antennas. All these components are RF broadband, ensuring that a single deployed DAS can simultaneously support multiple applications such as 2G, 3G and WLAN/WiFi as well. A passive DAS ensures some major commercial and technical benefits:

- Technology neutral with no capacity limit – future-proof
- Ideal for multiple operator and multiple system needs – RFS In-building DAS is truly RF broadband catering for frequencies ranging between 300 MHz and 2.5 GHz. Operators may easily add new services to an existing In-Building DAS solution by simply adding a new Radio Port at the equipment room. The inclusion of new pilot tones or additional (independent) signaling (RF) carriers is straightforward with the DAS solution. There is practically no limitation in channel capacity.
- Solution for the majority of buildings in terms of size (up to 50,000 sqm for single passive DAS).
- Passive products require no adjustment or preventive maintenance; therefore a passive DAS is maintenance free and doesn't implicate any operational expenditure.
- The use of point antennas and/or radiating cables is possible - this enables the designer to provide optimum coverage profile for any particular building shape and design.
- Passive DAS introduces no additional noise or intermodulation to the signal path. This enables multi-channel (and multi-operator) signals to be distributed without fear of service degradation due to the interference problems usually experienced for such applications. Such low interference and noise is crucial for reliable high data rates especially required by 3G applications.

For large in-buildings the single passive DAS is extended to several additional passive DAS by using fiber-fed remote units (RF amplifiers). This is the hybrid-DAS solution. The design principles and products needed to implement each DAS are the same, thereby minimizing design time and installation experience required. The RFS hybrid solution has a very low number of easily accessible active parts (Master Unit and fiber-fed Remote Units) resulting in a high MTBF and system availability.



Passive DAS <50,000 sqm



Hybrid DAS >50,000 sqm

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WLAN in the RF Spotlight

As wireless local area networks explode onto the world mobile data scene, a spot of 'RF contouring' promises the perfect coverage solution.

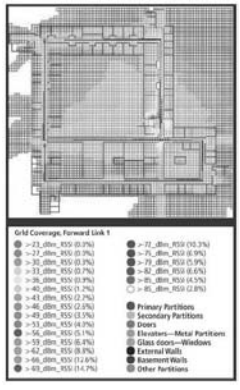
The rigours of contemporary business practices are demanding more and more out of communications systems. Once-coveted technologies such as e-mail and mobile telephony are now often taken for granted, their place on the technology frontier usurped by the need for mobile data access. Both third generation (3G) cellular technologies and wireless local area networks (WLAN) promise high bandwidth data services. However, while each has its strengths and weaknesses, WLAN technology is the more ready of the two, with the number of users escalating daily. This furious rate of deployment has for the moment placed WLAN firmly in the spotlight. Originally designed for extending the networks of private enterprises, WLANs provide high-speed data coverage to mobile wireless devices such as laptop computers and personal digital assistants (PDAs). Public WLAN access points, or 'hotspots', are materializing in all manner of locations where people are spending time: airport lounges, hotel lobbies, restaurants, university libraries, conference facilities-anywhere that Internet access might be required or desired.

RF Options

The majority of private and public WLAN deployments adhere to the global IEEE 802.11b standard, operating in the license-free 2.4 GHz band and delivering a maximum throughput of 11 megabits per second. Coverage is provided by a radio access point, similar in principle to a cellular base station, which sustains an RF link with one or more mobile clients over a distance of up to 100 meters. One popular deployment option is to install a separate point source antenna close to the access point. Accessory kits containing the required components are widely available and relatively simple to install. For small areas, point source antenna solutions are ideal; but there are some situations where a passive distributed antenna system provides a more sophisticated solution. A passive distribution system might involve a network of small point source antennas, connected via feeders to the main radio source. Alternatively, radiating cables-or leaky feeders-distribute the RF signal through thousands of slots along the cable length. Both systems permit extension of coverage area by rationalizing the RF power output across a larger number of emission points, while retaining a single radio source. For enterprise applications, where mobile wireless data terminals provide real-time batching and tracking to the main computer system, this type of solution is ideal.

Coverage Contouring

Passive distribution systems in the form of radiating cables also offer precise 'contouring' of the RF coverage. One can better control the coverage using a radiating cable than one can with a point source antenna. RF contouring minimizes the risk of co-channel interference between adjacent access points in larger systems, by preventing overlap of coverage zones. The WLAN systems of large campuses-such as hotels, universities and airports-require multiple access points to achieve the required coverage and capacity of the network. Depending on channel allocation and re-use, any overlap in coverage between zones or 'cells' will result in co-channel interference and increased bit error rates, unless the channels are separated adequately. Containing the RF signal to prevent interference is difficult using point source antennas, which have 'hot' spots at their source with decreasing RF signal strength further away. Radiating cable, on the other hand, can be laid out where coverage is required, dramatically increasing the number of effective RF emission points, and reducing the average distance between the source and wireless client. The power distribution of the WLAN is thereby tailored and kept optimally low to minimize the potential for interference.



The above plot illustrates the RF power distribution throughout the engineering quadrant of a major North American university. Utilizing about 330 meters of RFS radiating cable, the passive distribution system was designed around an existing access point. The RF power distribution extends from around -35 dBm at points nearest to the amplifier, to a minimum of around -80 dBm at the outside walls. Since minimum receiver sensitivity is typically -90 to -100 dBm, RFS designed the university WLAN system for a worst case at the outside walls of -85 dBm. Tailoring the RF coverage to this extent using radiating cable minimizes the potential for co-channel interference, and provides the university with maximum flexibility in channel allocations. Overall performance-for example, data rate-is also improved using radiating cable, which provides more direct 'line of sight' coverage to client devices than point-source antennas. This minimizes the impact of RF obstructions-such as steel filing cabinets and bookcases. Combined with the low emitting power used in radiating cable, the shorter signal path also reduces the effects of multi-path interference, which occurs due to 'out of phase' reflections of the RF signal.

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WLAN Kit

WLAN Series

The transition from the wired local area network (LAN) to wireless LAN (WLAN) is performed by a device which is called Radio Access Point (RAP). Those RAPs support usually either built-in omni-directional antennas or provide a RF port to connect an external removable point antenna. In both cases the field strength of the RF coverage is more or less equally distributed in all directions.

In many WLAN applications the communication between the client and the RAP via an antenna does not satisfy the need of coverage of a specifically shaped area. Buildings are often rectangular, and it is more efficient to cover those floors using a radiating cable (A radiating cable can be seen as a long antenna and is built like a coax cable but with slots in the outer conductor for distribution of the radio frequency).

Package content:

1 pc of 50 m ring of radiating cable, RCF12-50, assembled ready for use with a N connector at one end and a termination cap at the other end,

50 pcs of plastic cable ties

installation instruction

Optional adapters:

N to SMA: ADAPTER_N(F)-SMA(M)
N to TNC: ADAPTER_N(F)-TNC(M)

- Smooth and equal coverage on both sides of the radiating cable for WLAN at 2.4 GHz, 5.2 GHz and 5.8 GHz
- Well-defined and controlled area of coverage
- Larger coverage area than using point antennas
- More security by avoiding undesired coverage, e.g. outside the building

Package of the WLAN-RCF12KIT

SPECIFICATIONS	WLAN-RCF12KIT
Application	Indoor
Frequency Range, MHz	800 - 6000
Connectors	N, other optional
Input Connector Type	N male
Impedance, Ohm	50
Coupling Value, dB	2.4 GHz - 70/82 @50%/95% reception; 5.2 GHz - 75/87 @50%/95% reception; 5.8 GHz - 75/87 @50%/95% reception
Weight, kg (lb)	13 (28.7)
Environmental Class	IP 65

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Crossband Coupler

MBC Series

The MBC-2-5 Crossband Coupler allows WLAN services to be added to indoor cellular distributed coverage systems.

- Radiating cable systems
- In-building distributed antenna systems (DAS)
- Broadband

2G/3G - WLAN Crossband Coupler MBC-2-5

SPECIFICATIONS	MBC-2-5
Application	Indoor
Frequency Range, MHz	800 - 1000 / 1700 - 2200, 2400 - 2500
Number of Input Ports	2
Number of Output Ports	1
Connectors	N
Input Connector Type	N female
Output Connector Type	N female
Impedance, Ohm	50
Insertion Loss, dB	< 0.3 (800-1000 MHz), < 1.5 (1700-2200 MHz), < 1.7 (2400-2500 MHz)
Isolation, dB	> 50
Return Loss - Input Port, dB	> 15
Input Power per Port, W	< 100 (800-1000/1700-2200 MHz), < 50 (2400-2500 MHz)
Temperature Range, °C (°F)	-40 to +65 (-40 to 149)
Height (Less Connectors), mm (in)	151 (5.95), excluding connectors
Width (Less Connectors), mm (in)	86 (3.39)
Length (Less Connectors), mm (in)	19 (0.75)
Mounts in 19" (483mm) EIA Rack	No
Weight, kg (lb)	0.8 (1.76)
Intermodulation (IM3)	< -130 dBc at 2 x 20 dBm inputs
Environmental Class	Indoor

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Directional Coupler

DC*-380/520 Series

This directional coupler series is designed to decouple a defined part of the RF signal off the main through line. It allows to provide side branches of a wireless system with the required signal strength. It covers 380-520 MHz. Indoor and outdoor versions are available.

- Low Loss.
- Low Profile.
- Flat Response.
- Indoor and outdoor version available.

30 dB Directional Coupler

SPECIFICATIONS (ALL MODELS)	
Number of Input Ports	1
Number of Output Ports	2
Impedance, Ohm	50
Directivity, dB	> 20
Total Input Power, W	< 200
Insertion Loss, dB	< 3.5 (through line)
VSWR (50 Ohm)	< 1.25
Temperature Range, °C (°F)	0 to +60 (32 to 140)
Height (Less Connectors), mm (in)	20.5 (0.80)
Width (Less Connectors), mm (in)	50 (1.96)
Length (Less Connectors), mm (in)	158 (6.22)
Mounts in 19" (483mm) EIA Rack	No

SPECIFICATIONS	DC3-380/520	DC3E-380/520	DC6-380/520	DC6E-380/520
Product Type	3dB Directional Coupler	3dB Directional Coupler	6dB Directional Coupler	6dB Directional Coupler
Application	Indoor	Outdoor	Indoor	Outdoor
Coupling Value, dB	3	3	6	6
Weight, kg (lb)	0.38 (0.83)	0.74 (1.6)	0.38 (0.83)	0.74 (1.6)
Environmental Class		IP 66		IP 66
Input Connector Type	N female	N female	N female	N female
Output Connector Type	N female	N female	N female	N female
SPECIFICATIONS	**DC10-380/520**	**DC10E-380/520**	**DC15-380/520**	**DC15E-380/520**
Product Type	10dB Directional Coupler	10dB Directional Coupler	15dB Directional Coupler	15dB Directional Coupler
Application	Indoor	Outdoor	Indoor	Outdoor
Coupling Value, dB	10	10	15	15
Weight, kg (lb)	0.38 (0.83)	0.74 (1.6)	0.38 (0.83)	0.74 (1.6)
Environmental Class		IP 66		IP 66
Input Connector Type	N female	N female	N female	N female
Output Connector Type	N female	N female	N female	N female
SPECIFICATIONS	**DC20-380/520**	**DC20E-380/520**	**DC30-380/520**	**DC30E-380/520**
Product Type	20dB Directional Coupler	20dB Directional Coupler	30dB Directional Coupler	30dB Directional Coupler
Application	Indoor	Outdoor	Indoor	Outdoor
Coupling Value, dB	20	20	30	30
Weight, kg (lb)	0.38 (0.83)	0.74 (1.6)	0.38 (0.83)	0.74 (1.6)
Environmental Class		IP 66		IP 66
Input Connector Type	N female	N female	N female	N female
Output Connector Type	N female	N female	N female	N female

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Directional Coupler

DC*-800/2500 Series

This directional coupler series is designed to decouple a defined part of the RF signal off the main through line. It allows to provide side branches of a wireless system with the required signal strength. It covers 800-2500 MHz. Indoor and outdoor versions are available.

- Low Loss.
- Low Profile.
- Flat Response.
- Indoor and outdoor version available.

10dB Directional Coupler

SPECIFICATIONS (ALL MODELS)	
Number of Input Ports	1
Number of Output Ports	2
Impedance, Ohm	50
Directivity, dB	> 18
Total Input Power, W	< 200
Insertion Loss, dB	< 3.5 (through line)
VSWR (50 Ohm)	< 1.3
Temperature Range, °C (°F)	0 to +60 (32 to 140)
Height (Less Connectors), mm (in)	19 (0.75)
Width (Less Connectors), mm (in)	57 (2.24)
Length (Less Connectors), mm (in)	85.5 (3.37)
Mounts in 19" (483mm) EIA Rack	No

SPECIFICATIONS	DC3-800/2500	DC3E-800/2500	DC6-800/2500	DC6E-800/2500
Product Type	3dB Directional Coupler	3dB Directional Coupler	6dB Directional Coupler	6dB Directional Coupler
Application	Indoor	Outdoor	Indoor	Outdoor
Coupling Value, dB	3	3	6	6
Weight, kg (lb)	0.30 (0.66)	0.55 (1.2)	0.30 (0.66)	0.55 (1.2)
Environmental Class		IP 66		IP 66
Input Connector Type	N female	N female	N female	N female
Output Connector Type	N female	N female	N female	N female
SPECIFICATIONS	**DC10-800/2500**	**DC10E-800/2500**	**DC15-800/2500**	**DC15E-800/2500**
Product Type	10dB Directional Coupler	10dB Directional Coupler	15dB Directional Coupler	15dB Directional Coupler
Application	Indoor	Outdoor	Indoor	Outdoor
Coupling Value, dB	10	10	15	15
Weight, kg (lb)	0.30 (0.66)	0.55 (1.2)	0.30 (0.66)	0.55 (1.2)
Environmental Class		IP 66		IP 66
Input Connector Type	N female	N female	N female	N female
Output Connector Type	N female	N female	N female	N female

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Directional Coupler

DC*-380/2500 Series

This directional coupler is designed to allow two signals to be combined and equally shared into the output ports.

- Ultra Wideband.
- 18dB Isolation over the whole band

3dB Directional Coupler

SPECIFICATIONS (ALL MODELS)	
Number of Input Ports	2
Number of Output Ports	2
Impedance, Ohm	50
Insertion Loss, dB	< 3.3 ±0.7
Temperature Range, °C (°F)	-10 to 50 (14 to 122)
Height (Less Connectors), mm (in)	47 (1.85)
Width (Less Connectors), mm (in)	250 (9.84)
Length (Less Connectors), mm (in)	136 (5.35)
Mounts in 19" (483mm) EIA Rack	No

SPECIFICATIONS	DC3-380/2500	DC3-380/2500-N
Product Type	3dB Directional Coupler	3dB Directional Coupler
Application	Indoor	Indoor
Weight, kg (lb)	2.6 (5.7)	2.6 (5.7)
Input Connector Type	7-16 female	N female
Output Connector Type	7-16 female	N female

OBSOLETE - NO LONGER AVAILABLE

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SCPD*-380/520 Series

This splitter series is designed to divide an incoming RF signal equally into 2, 3, 4 and 8 output ports. It covers 380-520 MHz. Indoor and outdoor versions are available.

- Low Loss.
- Low Profile.
- Flat Response.
- Indoor and outdoor version available.

2 Way Power Divider

SPECIFICATIONS (ALL MODELS)	
Number of Input Ports	1
Connectors	N
Input Connector Type	N female
Output Connector Type	N female
VSWR (50 Ohm)	< 1.3
Input Power (Splitter mode), W	< 100
Impedance, Ohm	50
Temperature Range, °C (°F)	0 to +60 (32 to 140)
Height (Less Connectors), mm (in)	20 (0.80)
Mounts in 19" (483mm) EIA Rack	No

SPECIFICATIONS	SCPD2-380/520	SCPD2E-380/520	SCPD3-380/520	SCPD3E-380/520
Product Type	2 Way Power Divider	2 Way Power Divider	3 Way Power Divider	3 Way Power Divider
Application	Indoor	Outdoor	Indoor	Outdoor
Number of Output Ports	2	2	3	3
Insertion Loss, dB	< 3.5	< 3.5	< 5.8	< 5.8
Isolation, dB	> 18	> 18	> 18	> 18
Inserts, Mounting Connectors, mm (in)	4@5.1mm, 115.9 x 34.4mm (4@0.2in, 4.6 x 1.35)	4@5.1mm, 115.9 x 34.4mm (4@0.2in, 4.6 x 1.35)	4@5.1mm, 115.9 x 34.4mm (4@0.2in, 4.6 x 1.35)	4@5.1mm, 115.9 x 34.4mm (4@0.2in, 4.6 x 1.35)
Width (Less Connectors), mm (in)	41 (1.61)	41 (1.61)	41 (1.61)	41 (1.61)
Length (Less Connectors), mm (in)	123 (4.84)	123 (4.84)	123 (4.84)	123 (4.84)
Weight, kg (lb)	0.26 (0.57)	0.51 (1.1)	0.28 (0.6)	0.55 (1.2)
Environmental Class		IP 66		IP 66

SPECIFICATIONS	SCPD4-380/520	SCPD4E-380/520
Product Type	4 Way Power Divider	4 Way Power Divider
Application	Indoor	Outdoor
Number of Output Ports	4	4
Insertion Loss, dB	< 6.5	< 6.5
Isolation, dB	> 18	> 18
Inserts, Mounting Connectors, mm (in)	4@ 5.1mm, 117.2 x 111.2mm (4@0.2in, 4.6 x 4.4)	4@ 5.1mm, 117.2 x 111.2mm (4@0.2in, 4.6 x 4.4)
Width (Less Connectors), mm (in)	124 (4.9)	124 (4.9)
Length (Less Connectors), mm (in)	118 (4.65)	118 (4.65)
Weight, kg (lb)	0.78 (1.7)	1.50 (3.3)
Environmental Class		IP 66

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SCPD*-800/2500 Series

This splitter series is designed to divide an incoming RF signal equally into 2, 3, 4 and 8 output ports. It covers 800-2500 MHz. Indoor and outdoor versions are available.

- Low Loss.
- Low Profile.
- Flat Response.
- Indoor and outdoor version available.

3 Way Power Divider

SPECIFICATIONS (ALL MODELS)	
Number of Input Ports	1
Connectors	N
Input Connector Type	N female
Output Connector Type	N female
VSWR (50 Ohm)	< 1.3
Input Power (Splitter mode), W	< 100
Impedance, Ohm	50
Temperature Range, °C (°F)	0 to +60 (32 to 140)
Height (Less Connectors), mm (in)	20 (0.80)
Mounts in 19" (483mm) EIA Rack	No

SPECIFICATIONS	SCPD2-800/2500	SCPD2E-800/2500	SCPD3-800/2500	SCPD3E-800/2500
Product Type	2 Way Power Divider	2 Way Power Divider	3 Way Power Divider	3 Way Power Divider
Application	Indoor	Outdoor	Indoor	Outdoor
Number of Output Ports	2	2	3	3
Insertion Loss, dB	< 3.5	< 3.5	< 5.5	< 5.5
Isolation, dB	> 20	> 20	> 20	> 20
Inserts, Mounting Connectors, mm (in)	4@5.1mm, 115.9 x 34.4mm (4@0.2in, 4.6 x 1.35)	4@5.1mm, 115.9 x 34.4mm (4@0.2in, 4.6 x 1.35)	4@5.1mm, 115.9 x 34.4mm (4@0.2in, 4.6 x 1.35)	4@5.1mm, 115.9 x 34.4mm (4@0.2in, 4.6 x 1.35)
Width (Less Connectors), mm (in)	41 (1.61)	41 (1.61)	41 (1.61)	41 (1.61)
Length (Less Connectors), mm (in)	123 (4.84)	123 (4.84)	123 (4.84)	123 (4.84)
Weight, kg (lb)	0.26 (0.57)	0.51 (1.1)	0.28 (0.6)	0.55 (1.2)
Environmental Class		IP 66		IP 66

SPECIFICATIONS	SCPD4-800/2500	SCPD4E-800/2500
Product Type	4 Way Power Divider	4 Way Power Divider
Application	Indoor	Outdoor
Number of Output Ports	4	4
Insertion Loss, dB	< 7	< 7
Isolation, dB	> 20	> 20
Inserts, Mounting Connectors, mm (in)	4@ 5.1mm, 117.2 x 111.2mm (4@0.2in, 4.6 x 4.4)	4@ 5.1mm, 117.2 x 111.2mm (4@0.2in, 4.6 x 4.4)
Width (Less Connectors), mm (in)	124 (4.9)	124 (4.9)
Length (Less Connectors), mm (in)	118 (4.65)	118 (4.65)
Weight, kg (lb)	0.65 (1.43)	1.3 (2.9)
Environmental Class		IP 66

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UWBS* Series

Ultra Wide Band Splitters (UWBS) are used in the distribution of in-building or tunnel communication. The 70 - 2500 MHz bandwidth passes VHF, UHF, CDMA, GSM, UMTS and WLAN communications bands, allowing a single network to provide multiple services.

- Ultra wide band.
- Low Loss.
- Low Profile.
- Flat Response.

2 Way Ultra Wideband Power Divider

SPECIFICATIONS (ALL MODELS)	
Number of Input Ports	1
Connectors	N
Input Connector Type	N female
Output Connector Type	N female
Input Power (Splitter mode), W	< 100
Impedance, Ohm	50
Temperature Range, °C (°F)	-10 to +60 (14 to 140)
Height (Less Connectors), mm (in)	24 (0.94)
Mounts in 19" (483mm) EIA Rack	No

SPECIFICATIONS	UWBS-3-70/2500	UWBS-6-70/2400
Product Type	2 Way Ultra Wideband Power Divider	4 Way Ultra Wideband Power Divider
Application	Outdoor,Indoor	Outdoor,Indoor
Number of Output Ports	2	4
Insertion Loss, dB	< 3.8 at 70-1000 MHz, < 4.0 at 1000-2000 MHz, < 4.4 at 2000-2400 MHz, <4.6 at 2400-2500 MHz	< 7.2 at 70-1000 MHz, < 7.6 at 1000-2000 MHz, < 7.8 at 2000-2400 MHz
Isolation, dB	> 7.5 at 70-150 MHz, > 13.5 at 150-2500 MHz	> 6.0 at 70-150 MHz, > 14.0 at 150-2400 MHz (Isolation between non adjacent ports: > 14.0 at 70-150 MHz, > 20.0 at 150-2400 MHz)
Return Loss - Output Port, dB	> 11.0 at 70-150 MHz, > 13.5 at 150-2500 MHz	> 8.0 at 70-150 MHz, > 12.0 at 150-2400 MHz
Return Loss - Input Port, dB	> 14.0 at 70-2400 MHz, > 11.0 at 2400-2500 MHz	> 14.0 at 70 - 150 MHz, > 12.0 at 150 - 2400 MHz
Width (Less Connectors), mm (in)	150 (5.9)	308 (12.13)
Length (Less Connectors), mm (in)	390 (15.35)	404 (15.39)
Weight, kg (lb)	1.7 (3.75)	4.2 (9.2)
Environmental Class	IP 66	IP 66

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Combining Network

Whenever more than one BTS has to be connected into RF distribution system there is a need for a combining network.

This can be as simple as a crossband coupler for a two BTS system with bi-directional ports, each working on a different frequency band.

This can also be a complex system combining many services spread over a number of frequency bands, all switched onto the same RF distribution network.

The performance of these combining networks strongly influences the transmission quality of the entire WINS system in both directions, up link and down link, as there are for example: intermodulation products, frequency band separation, and up/down link separation. RFS has the knowledge and many years of experience in developing and producing this equipment.

RFS offer equipment for combining of one service per frequency band as well as of multi services per band, and multi band applications.

Larger complex combining networks are often customized equipment, developed or adapted to the special requirements of special applications.

RFS also offers standardized combiner modules in 19" rack technology that are suitable for many in-building and tunnel applications. One module generally features separated Rx and Tx ports for each of 4 BTS links combining them to one common port. One module serves one frequency band. Combiner modules are developed for all common mobile bands worldwide including:

- TETRA 380 MHz
- CDMA 800 MHz
- GSM 900 MHz
- GSM 1800 MHz
- PCS 1900 MHz
- UMTS 2100 MHz

Each combiner module can also be equipped with an additional RF port interface to link fiber optic converters.

A 19" multi-port module can combine up to four frequency bands providing two or four common bi-directional RF ports for distribution.

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Multi-channel combining system

MCC* Series

The MCC series of multi-channel combiners allow the co-siting of a number of BTS' onto the one in-building or tunnel communication system. It is available in a modular system to maximize flexibility. These 19" modules are available in the TETRA, CDMA800, GSM900, GSM1800 and UMTS bands. Each combiner module can also be equipped with an additional RF port interface to link fiber optic converters.

- Modular System for Plug and Play.
- 4 high power input ports per band.
- Separate TX and RX ports to BTS.
- 1 common RF port to distribution network.
- Additional RF interface for fiber optic converters.
- Modules available for TETRA, CDMA800, GSM900, GSM1800, and UMTS.

Multi Carrier Combiner

SPECIFICATIONS (ALL MODELS)	
Product Type	Multi Carrier Combiner
Application	Indoor
Number of Input Ports	4 x Tx, 4 x Rx
Number of Output Ports	1
Connectors	7-16
Input Connector Type	7-16 female
Output Connector Type	7-16 female
Impedance, Ohm	50
Return Loss - Output Port, dB	> 15
Return Loss - Input Port, dB	> 17
Input Power per Port, W	< 50
Temperature Range, °C (°F)	-10 to +50 (14 to 122)
Height (Less Connectors), mm (in)	4RU, 178 (7.0)
Width (Less Connectors), mm (in)	483 (19.0)
Length (Less Connectors), mm (in)	510 (20.08)
Mounts in 19" (483mm) EIA Rack	Yes
Weight, kg (lb)	24.0 (53.0)

SPECIFICATIONS	MCC-4T4R-TETRA380	MCC-4T4R-CDMA800	MCC-4T4R-GSM900	MCC-4T4R-GSM1800
Frequency Range, MHz	380 - 395	820 - 886	890 - 960	1710 - 1880
Isolation, dB	> 30 (DL-DL), > 20 (UL-DL), > 70 (DL-UL), > 80 (between bands)	> 30 (DL-DL), > 20 (UL-DL), > 70 (DL-UL), > 80 (between bands)	> 30 (DL-DL), > 20 (UL-DL), > 70 (DL-UL), > 80 (between bands)	> 30 (DL-DL), > 20 (UL-DL), > 70 (DL-UL), > 80 (between bands)

SPECIFICATIONS	MCC-4T4R-UMTS2100
Frequency Range, MHz	1920 - 2170
Isolation, dB	> 30 (DL-DL), > 20 (UL-DL), > 70 (DL-UL), > 80 (between bands)

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Multi service combiner

MSC* series

This high isolation, low loss Point of Interface unit combines 3x4 duplex ports of GSM 900, GSM 1800, and UMTS into 4 output ports.

- Wideband.
- Low insertion loss.
- High isolation.
- All duplex ports.
- Compact size.

Multi Service Combiner

SPECIFICATIONS (ALL MODELS)	
Product Type	Multi Service Combiner
Application	Indoor
Number of Input Ports	12
Number of Output Ports	4
Connectors	7-16
Input Connector Type	7-16 female
Output Connector Type	7-16 female
Impedance, Ohm	50
Return Loss - Output Port, dB	> 17.0 at GSM 900, > 15.0 at GSM 1800, > 14.0 at UMTS
Return Loss - Input Port, dB	> 16.0 (GSM 900 and 1800, UMTS)
Input Power per Port, W	< 50
Temperature Range, °C (°F)	-10 to +50 (14 to 122)
Height (Less Connectors), mm (in)	8RU, 356 (14.0)
Width (Less Connectors), mm (in)	483 (19.0)
Length (Less Connectors), mm (in)	320 (12.6)
Mounts in 19" (483mm) EIA Rack	Yes
Weight, kg (lb)	32 (71)

SPECIFICATIONS	MSC-4G-4D-4W-1
Frequency Range, MHz	870 - 2170
Isolation, dB	See Note

Isolation Note: >18.0 GSM 900 to GSM 900 ports, >20.0 GSM 1800 to GSM 1800 ports, >18.0 UMTS to UMTS ports; > 18.0 any common ports in GSM 900 band, > 20.0 any common ports in GSM 1800 band, > 18.0 any common ports in UMTS band; > 80.0 GSM 900 to GSM 1800 ports in GSM 900 band, > 48.0 GSM 900 to GSM 1800 ports in GSM 1800 band, > 80.0 GSM 900 to UMTS ports in GSM 900 band, > 48.0 GSM 900 to UMTS ports in UMTS band, > 60.0 GSM 1800 to UMTS ports in GSM 1800 band, > 70.0 GSM 1800 to UMTS ports in UMTS band

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Multi-channel combining system

BBC-*/*-380/2500 Series

This broadband multi operator combiner allows the co-siting of a number of remote RF units (I-RFU series) into an in-building communication system. It distributes the combined signals into 4 output ports. All ports are broadband from TETRA to WLAN.

- Ultra Wideband.
- Low insertion loss.
- Low Passive Intermodulation.
- All ports broadband from TETRA to WLAN.

Broadband Coupler

SPECIFICATIONS	BBC-4/4-380/2500	BBC-4/4-380/2500-SMA-N	BBC-2/2-380/2500
Application	Indoor	Indoor	Indoor
Frequency Range, MHz	380 - 2500	380 - 2500	380 - 2500
Number of Input Ports	4	4	2
Number of Output Ports	4	4	2
Connectors	7-16	SMA, N	7-16
Input Connector Type	7-16 female	SMA female	7-16 female
Output Connector Type	7-16 female	N female	7-16 female
Impedance, Ohm	50	50	50
Insertion Loss, dB	< 7.2 ±1.6	< 7.2 ±1.6	< 3.6 ±0.8
Isolation, dB	> 15 (> 20 typical) between all ports	> 15 (> 20 typical) between all ports	> 15 (> 20 typical) between all ports
Return Loss - Output Port, dB	> 13.0 (> 18.0 typical)	> 13.0 (> 18.0 typical)	> 14.0 (> 18.0 typical)
Return Loss - Input Port, dB	> 13.0 (> 18.0 typical)	> 13.0 (> 18.0 typical)	> 14.0 (> 18.0 typical)
Input Power per Port, W	< 50	< 50	< 100
Temperature Range, °C (°F)	-10 to +50 (14 to 122)	-10 to +50 (14 to 122)	-10 to +50 (14 to 122)
Height (Less Connectors), mm (in)	4RU, 178 (7.0)	4RU, 178 (7.0)	2RU, 88 (3.5)
Width (Less Connectors), mm (in)	483 (19.0)	483 (19.0)	483 (19.0)
Length (Less Connectors), mm (in)	320 (12.6)	320 (12.6)	320 (12.6)
Mounts in 19" (483mm) EIA Rack	Yes	Yes	Yes
Weight, kg (lb)	17.0 (37.4)	17.0 (37.4)	7.0 (15.4)
Intermodulation (IM3)	< -140 dBc at 2 x 43 dBm in TETRA, CDMA, GSM 900 Rx bands, < -140 dBc at 2 x 38 dBm in GSM 1800, UMTS Rx bands		< -140 dBc at 2 x 43 dBm in TETRA, CDMA, GSM 900 Rx bands, < -140 dBc at 2 x 38 dBm in GSM 1800, UMTS Rx bands
Environmental Class	Indoor	Indoor	Indoor

SPECIFICATIONS	BBC-2/2-380/2500-SMA-N	BBC-2/2-380/2500-N-N
Application	Indoor	Indoor
Frequency Range, MHz	380 - 2500	380 - 2500
Number of Input Ports	2	2
Number of Output Ports	2	2
Connectors	SMA, N	N
Input Connector Type	SMA female	N female
Output Connector Type	N female	N female
Impedance, Ohm	50	50
Insertion Loss, dB	< 3.6 ±0.8	< 3.6 ±0.8
Isolation, dB	> 15 (> 20 typical) between all ports	> 15 (> 20 typical) between all ports
Return Loss - Output Port, dB	> 14.0 (> 18.0 typical)	> 14.0 (> 18.0 typical)
Return Loss - Input Port, dB	> 14.0 (> 18.0 typical)	> 14.0 (> 18.0 typical)
Input Power per Port, W	< 100	< 100
Temperature Range, °C (°F)	-10 to +50 (14 to 122)	-10 to +50 (14 to 122)
Height (Less Connectors), mm (in)	2RU, 88 (3.5)	2RU, 88 (3.5)
Width (Less Connectors), mm (in)	483 (19.0)	483 (19.0)
Length (Less Connectors), mm (in)	320 (12.6)	320 (12.6)
Mounts in 19" (483mm) EIA Rack	Yes	Yes
Weight, kg (lb)	7.0 (15.4)	7.0 (15.4)
Intermodulation (IM3)		
Environmental Class	Indoor	Indoor

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Dual Band Diplexer

DBC* Series

This dual band diplexer is used to combine a GSM900 and a GSM1800 BTS onto the one RF network. It is also available with 7-16 sockets.

- Flat Response.
- Low Loss.
- Compact size.

Dual Band Diplexer

SPECIFICATIONS	DBC-2N
Application	Indoor
Frequency Range, MHz	820 - 1880
Number of Input Ports	2
Number of Output Ports	1
Connectors	N
Input Connector Type	N female
Output Connector Type	N female
Impedance, Ohm	50
Insertion Loss, dB	< 0.3
Isolation, dB	> 45 (CDMA 800/GSM 900), > 55 (GSM 1800)
Return Loss - Output Port, dB	> 15 (CDMA 800), > 20 (GSM 900 and 1800)
Return Loss - Input Port, dB	> 15 (CDMA 800), > 20 (GSM 900 and 1800)
Input Power per Port, W	< 250
Temperature Range, °C (°F)	-30 to +60 (-22 to 140)
Height (Less Connectors), mm (in)	41 (1.61)
Width (Less Connectors), mm (in)	155 (6.1)
Length (Less Connectors), mm (in)	200 (7.87)
Mounts in 19" (483mm) EIA Rack	No
Weight, kg (lb)	2.0 (4.2)

OBSOLETE - NO LONGER AVAILABLE

Branchline Coupler

BLC* Series

This wideband branchline coupler is designed to combine 2 signals to a common port or to split an incoming signal equally to 2 output ports.

- Wide band.
- High Power.
- Compact Size.
- Low Loss.

Branchline Coupler

SPECIFICATIONS	BLC19-1700/2200
Application	Outdoor,Indoor
Frequency Range, MHz	1710 - 2170
Number of Input Ports	2
Number of Output Ports	2
Connectors	7-16
Input Connector Type	7-16 female
Output Connector Type	7-16 female
Impedance, Ohm	50
Insertion Loss, dB	< 4
Isolation, dB	> 20
Return Loss - Output Port, dB	> 20
Return Loss - Input Port, dB	> 20
Total Input Power, W	< 200
Temperature Range, °C (°F)	-30 to +60 (-22 to 140)
Height (Less Connectors), mm (in)	35 (1.38)
Width (Less Connectors), mm (in)	134 (5.28)
Length (Less Connectors), mm (in)	105 (4.13)
Mounts in 19" (483mm) EIA Rack	No
Weight, kg (lb)	1.2 (2.6)
Environmental Class	IP 66

OBSOLETE - NO LONGER AVAILABLE

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DC Block

DC Block* Series

DC Blocks are used to prevent the flow of direct current and low frequency current surges along the inner and outer conductors of a transmission line, while permitting the unimpeded flow of RF signals. Applications include the blocking of current surges in subway and train tunnels.

DC Block

SPECIFICATIONS	DC-BLOCK-4-NMF	DC-BLOCK-4-NFF	DC-BLOCK-4-7MF
Application	Outdoor	Outdoor	Outdoor
Frequency Range, MHz	160 - 2500	160 - 2500	160 - 2500
Number of Input Ports	1	1	1
Number of Output Ports	1	1	1
Connectors	N	N	7-16
Input Connector Type	N male	N female	7-16 male
Output Connector Type	N female	N female	7-16 female
Impedance, Ohm	50	50	50
Insertion Loss, dB	< 0.1	< 0.1	< 0.1
VSWR (50 Ohm)	<1.17 (160-300 MHz), <1.10 (300-2500 MHz)	<1.17 (160-300 MHz), <1.10 (300-2500 MHz)	<1.17 (160-300 MHz), <1.10 (300-2500 MHz)
Total Input Power, W	<500	<500	<500
Max. RF Peak Power, W	<1,000	<1,000	<1,000
Max. RF Peak Voltage, kV	4	4	4
Temperature Range, °C (°F)	-40 to +85 (-40 to 185)	-40 to +85 (-40 to 185)	-40 to +85 (-40 to 185)
Weight, kg (lb)	0.46 (1.0)	0.46 (1.0)	0.46 (1.0)
Intermodulation (IM3)	< -150 dBc typ.	< -150 dBc typ.	< -150 dBc typ.
Environmental Class	IP 66	IP 66	IP 66

SPECIFICATIONS	DC-BLOCK-4-7FF	DC-BLOCK-15-NMF	DC-BLOCK-15-NFF
Application	Outdoor	Outdoor	Outdoor
Frequency Range, MHz	160 - 2500	180 - 2500	180 - 2500
Number of Input Ports	1	1	1
Number of Output Ports	1	1	1
Connectors	7-16	N	N
Input Connector Type	7-16 female	N male	N female
Output Connector Type	7-16 female	N female	N female
Impedance, Ohm	50	50	50
Insertion Loss, dB	< 0.1	< 0.5	< 0.5
VSWR (50 Ohm)	<1.17 (160-300 MHz), <1.10 (300-2500 MHz)	<1.38 (180-380 MHz), <1.22 (380-2500 MHz)	<1.38 (180-380 MHz), <1.22 (380-2500 MHz)
Total Input Power, W	<500	<80	<80
Max. RF Peak Power, W	<1,000	<250	<250
Max. RF Peak Voltage, kV	4	15	15
Temperature Range, °C (°F)	-40 to +85 (-40 to 185)	-40 to +85 (-40 to 185)	-40 to +85 (-40 to 185)
Weight, kg (lb)	0.46 (1.0)	0.66 (1.45)	0.66 (1.45)
Intermodulation (IM3)	< -150 dBc typ.	< -150 dBc typ.	< -150 dBc typ.
Environmental Class	IP 66	IP 66	IP 66

SPECIFICATIONS	DC-BLOCK-15-7MF	DC-BLOCK-15-7FF
Application	Outdoor	Outdoor
Frequency Range, MHz	180 - 2500	180 - 2500
Number of Input Ports	1	1
Number of Output Ports	1	1
Connectors	7-16	7-16
Input Connector Type	7-16 male	7-16 female
Output Connector Type	7-16 female	7-16 female
Impedance, Ohm	50	50
Insertion Loss, dB	< 0.5	< 0.5
VSWR (50 Ohm)	<1.38 (180-380 MHz), <1.22 (380-2500 MHz)	<1.38 (180-380 MHz), <1.22 (380-2500 MHz)
Total Input Power, W	<80	<80
Max. RF Peak Power, W	<250	<250
Max. RF Peak Voltage, kV	15	15
Temperature Range, °C (°F)	-40 to +85 (-40 to 185)	-40 to +85 (-40 to 185)
Weight, kg (lb)	0.66 (1.45)	0.66 (1.45)
Intermodulation (IM3)	< -150 dBc typ.	< -150 dBc typ.
Environmental Class	IP 66	IP 66

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Indoor Omnidirectional Antenna

I-ATO* Series

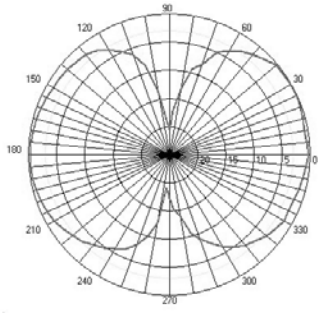
This omnidirectional antenna is specifically designed for broadband in-building distributed antenna systems for 2G, 3G and WLAN (WiFi)

The off-white radome blends easily into most building aesthetics.

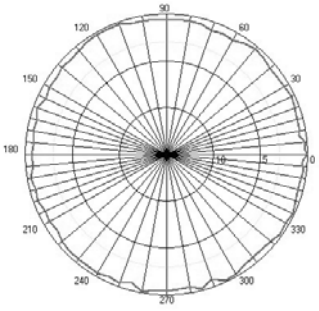
The unit is suitable for either wall or ceiling mountings

- Input power 50 watts maximum.
- Full wide band 800-2500 MHz.
- Aesthetically designed, compact and light weight.

Indoor Omnidirectional Antenna



Vertical Pattern



Horizontal Pattern

ELECTRICAL SPECIFICATIONS	
Application	Indoor
Number of Input Ports	1
Impedance, Ohm	50
VSWR (50 Ohm)	< 1.5
Total Input Power, W	< 50
Gain, dBi (dBd)	Nominal 3.0 (0.9)
Polarization	Vertical
Horizontal Beamwidth, deg	360
Vertical Beamwidth, deg	Nominal 90

MECHANICAL SPECIFICATIONS	
Radiating Element Material	Brass
Radome Material	ABS
Radome Color	White
Mounting Hardware included	Ceiling Mount
Temperature Range, °C (°F)	0 to +60 (32 to 140)
Height (Less Connectors), mm (in)	90 (3.54)
Length (Less Connectors), mm (in)	180 (7.09)
Weight, kg (lb)	0.25 (0.55)
Environmental Class	Indoor

ORDERING INFORMATION

Model Number	Frequency Range, MHz	Connectors	Input Connector Type
I-ATO2-800/2500	806 - 960, 1710 - 2500	N	N female

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Indoor Panel Antenna

I-ATP* Series

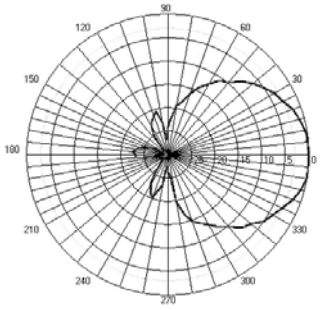
Specifically designed for broadband in-building distributed antenna systems for 2G, 3G and WLAN (WiFi)

The off-white radome blends easily into most building aesthetics.

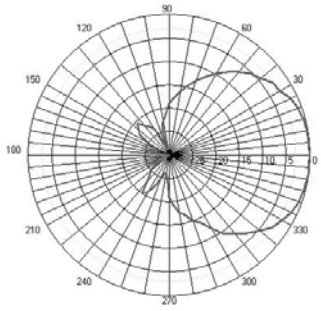
This unit is suitable for wall mounting.

- Input power 50 watts maximum.
- Full wide band 800-2500 MHz.
- Aesthetically designed, compact and light weight.

Indoor Panel Antenna



Vertical Pattern



Horizontal Pattern

ELECTRICAL SPECIFICATIONS	
Application	Indoor
Number of Input Ports	1
Impedance, Ohm	50
VSWR (50 Ohm)	< 1.5
Total Input Power, W	< 50
Gain, dBi (dBd)	Nominal 7.0 (4.9)
Polarization	Vertical
Horizontal Beamwidth, deg	70
Vertical Beamwidth, deg	Nominal 50

MECHANICAL SPECIFICATIONS	
Connector Cable, mm (in)	390 (15.35)
Radiating Element Material	Silver-gilt brass
Radome Material	ABS
Radome Color	White
Mounting Hardware included	Wall bracket, screws
Temperature Range, °C (°F)	0 to +60 (32 to 140)
Height (Less Connectors), mm (in)	44 (1.73)
Width (Less Connectors), mm (in)	180 (7.09)
Length (Less Connectors), mm (in)	210 (8.27)
Weight, kg (lb)	0.6 (1.32)
Environmental Class	Indoor

ORDERING INFORMATION

Model Number	Frequency Range, MHz	Connectors	Input Connector Type
I-ATP2-800/2500	806 - 960, 1710 - 2500	N	N female

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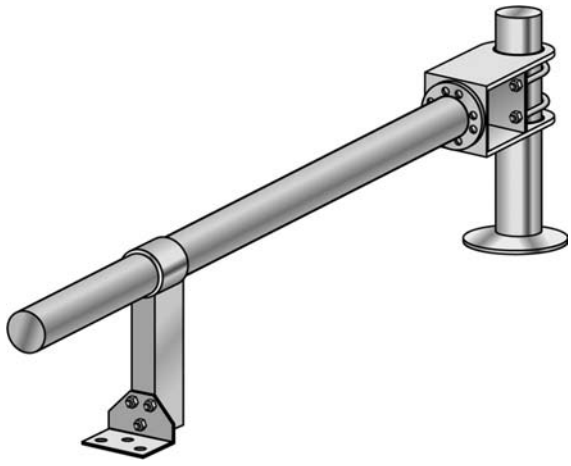
Tunnel Helical Antenna

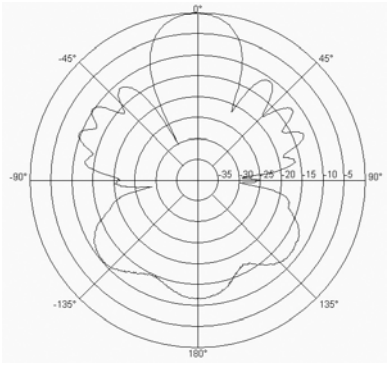
T-ASD* series

This helical antenna is specifically designed for tunnel coverage applications. Its robust construction is suitable for environments with high train speeds of up to 350 km/h (217 mph).

- For CDMA 800, GSM 900 and GSM-R.
- For heavy duty environment.
- For high speed train applications.



Tunnel Helical Antenna



Horizontal & Vertical Pattern

ELECTRICAL SPECIFICATIONS	
Application	Outdoor
Number of Input Ports	1
Impedance, Ohm	50
VSWR (50 Ohm)	< 1.5
Total Input Power, W	< 400
Gain, dBi (dBd)	> 8.0 (5.9)
Polarization	Circular
Horizontal Beamwidth, deg	32
Vertical Beamwidth, deg	32

MECHANICAL SPECIFICATIONS	
Connector Cable, mm (in)	300 (11.8)
Radiating Element Material	Copper
Radome Material	Fiberglass
Radome Color	White
Mounting Hardware included	Wall mounting for heavy duty
Temperature Range, °C (°F)	-30 to +60 (-22 to 140)
Height (Less Connectors), mm (in)	510 (20.1)
Width (Less Connectors), mm (in)	120 (4.7)
Length (Less Connectors), mm (in)	1859 (73.2)
Weight, kg (lb)	7.8 (17.2)
Environmental Class	IP 66

ORDERING INFORMATION

Model Number	Frequency Range, MHz	Connectors	Input Connector Type
T-ASD1-824/960	824 - 960	7-16	7-16 female

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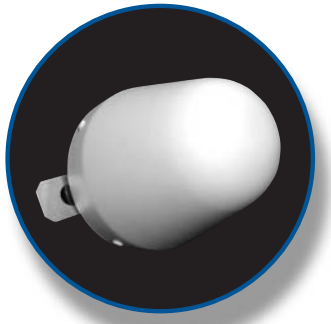
Bi-Directional Amplifier System Overview

Band Specific Repeaters

ClearFill®
RF distribution networks



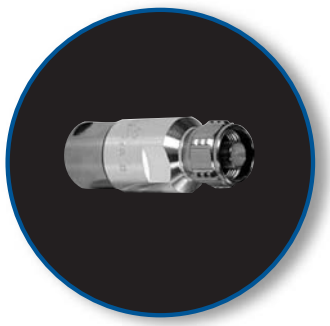
RFS has the total package for cost-effective in-building solutions. Key elements of our ClearFILL RF Distribution Networks are band specific repeaters providing low cost coverage improvement in convention centers, airports, shopping malls, subways and other RF shielded environments.

The basic band specific repeater (BSR) is optimized for weather protected installations, thus reducing the cost significantly compared to similar repeater products. However, unlike low cost in-building signal boosters, the BSR has ultrahigh dynamic range to prevent overdrive and interference. All models are certified by the FCC and Industry Canada for analog and digital modulations.

The models 48710 and 48920 are designed for use in the 800 MHz SMR/public safety band, the 48722 and 48930 for use in the 900 MHz SMR/public safety band. The models 48760 and 48960 are designed for SMR800/900 dual-band applications. The 48910 is 800 MHz Cellular band specific, the 48750 and 48751 are A and B Cellular band specific respectively. The 48810A and 48810B are designed for use in the A/B/C and D/E/F blocks of the PCS 1900 band respectively.

The 48700 series can cover up to 50.000 m2 (1/2 million sq. ft.) with multiple indoor antennas. Multiple BSRs can be used for larger installations. The RFS ClearFILL approach is to use all passive RF distribution networks for low cost and high reliability.

ClearFILL BSRs are fast and easy to install. Hand held performance monitors for local diagnostics and a remote performance monitoring system are available.



BSRs from RFS are highly reliable thanks to our 30 years of experience in amplifier manufacturing and to the application of an industry leading cooling technique.

RFS offers the total package of technical support services, from product operation and maintenance training to complete network design and installation.

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Intermodulation in Linear Amplifiers

Intermodulation distortions are an important factor of power amplifiers for Wireless Distributed Communication Systems. The characteristic curve between the input signal and the output signal of a linear amplifier is a linear transfer function.

For example, an increase of the input signal by 5dB results in an increase by 5dB of the output signal as well. The output signal level (in dBm) equals the input signal level (in dBm) amplified by the amplifier gain (in dB).

This linear transfer function is limited by the saturation effect of the amplifier. While increasing the input signal, the output level approaches a limit which is typical for each amplifier. In this region of non-linear characteristics the amplifier generates harmonics at multiple frequencies of the input signal.

From single carrier to multi carrier applications

More than one input signal applied to the amplifier leads to intermodulation (IM) products. These unwanted output signals represent spurious emissions when falling into other frequency channels or bands of operation. The IM products can lead to severe distortions and signal degradation especially in the receive path of other channels.

When increasing the input power of an amplifier, the undesired IM products grow more rapidly than the linearly amplified input signals. The so-called '3rd order intercept point' (IP3) denotes the output power of a linear amplifier where, theoretically, the 3rd order IM products generated by amplification of two input signals would equal the wanted output signals.

Consequently, the actual output power of a linear amplifier shall be below a certain limit in order not to exceed a maximum level of spurious emissions i.e. to meet a specified intermodulation reduction. This output power limit is dependent on the IP3 value of the amplifier and on the numbers of input signals i.e. carriers.

The table below provides the maximum output power levels of RFS WDCS multi carrier amplifiers for various numbers of carriers and for three typically tolerated levels of spurious emissions (-13dBm, -30dBm, -36dBm).

IP3 LEVEL # of carriers	54 dBm	50 dBm	44 dBm	40 dBm	27 dBm
2	32/26/24 dBm	29/23/21 dBm	25/19/17 dBm	22/16/14 dBm	14/8/6 dBm
4	29/23/21 dBm	26/20/18 dBm	22/16/14 dBm	19/13/11 dBm	11/5/3 dBm
8	26/20/18 dBm	23/17/15 dBm	19/13/11 dBm	16/10/8 dBm	8/2/0 dBm
16	24/18/16 dBm	21/15/13 dBm	17/11/9 dBm	14/8/6 dBm	6/0/-2 dBm

Output power level for multi carrier amplifiers and remote units. This look-up table shows the max. carrier level based on available IP3 level and max. tolerated spurious emissions (-13/-30/-36 dBm)

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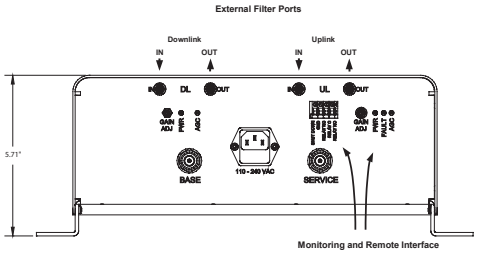
I-BDA 48900 series

The 48000 series of off-air bi-directional amplifiers (BDAs) are certified by the FCC and IC Canada for use by service providers. Off-air BDAs receive and amplify the donor base transmit signals into the coverage area while receiving and amplifying the subscriber signals back to the base. Thus, these BDAs maximize capacity in the coverage area at the lowest cost while allowing the service provider to centralize base radios for better spectrum use and control with lower maintenance costs.

- High reliability/no maintenance
- High dynamic range
- Fast and easy set up
- Supports hundreds of analog and / or digital subscribers.
- Output limiting circuitry
- Maintains low IMD and prevents oscillation.
- External filter ports
- Remote monitoring option.



48900 Series BDA

External filter ports allow for the connection of externally mounted filtering. The external filter modifies the pass band and can be field changed as needed.

The 48900 series BDAs include Power, AGC Active and Fault LEDs for visual diagnostics and a NC/NO fault relay, with remote shut down for remote monitoring. The RPM900 remote monitor provides dial out on fault condition over POTS line to preprogrammed pager or ASCII terminal. The RPM900 can be polled via DTMF and will shut down the 48900 BDA on command.

SYSTEM INTEGRATION	
Application	In-building
Number of Carriers	Multi carrier
Amplifying System	Off-air, bi-directional
Max. Cascading	3 BDAs
PERFORMANCE	
Composite Output Power, DL/UL dBm	23 / 23
3rd Intercept Point, DL/UL, dBm	> 42 / > 42
Gain, DL/UL, dB	35 - 65 variable, manually
Return Loss, dB	> 14
Noise figure, dB	< 4 at max. gain DL / UL

POWER/MECHANICAL SPEC./ENVIRONMENT	
Power Consumption, VA	36
Cooling	Convection
MTBF	> 43,680 h total
RF Ports	2 connectors, N-female, 50 ohms
Housing	Metal casing, coated, wall mount
Color	Semi gloss, grey
Dimensions, W x H x D, mm (in)	394x293x145 (15.5x11.54x5.7)
Weight, kg (lb)	< 7.65 (17)
Operation Temperature, °C (°F)	-10 to +45 (+14 to + 113)
Humidity, %	90, non condensing
MONITORING	
Remote Monitoring	Optional
Alarm Interface	Potential free relay contacts, normally closed

ORDERING INFORMATION

Model Number	Frequency Band	Frequency Range UL, MHz	Frequency Range DL, MHz
I-BDA-48910	CELLULAR	824-849	869-894
I-BDA-48920	SMR 800	806-821	851-866
I-BDA-48930	SMR 900	896-902	935-941

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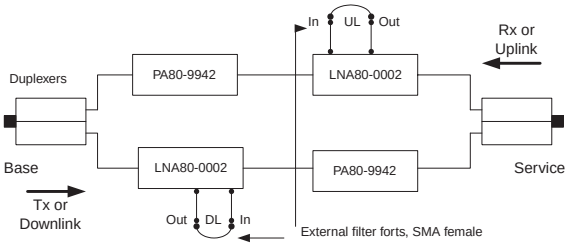
I-BDA 48000 series for SMR 800/900

The 48000 series of off-air bi-directional amplifiers (BDAs) are certified by the FCC and IC Canada for use by service providers. Off-air BDAs receive and amplify the donor base transmit signals into the coverage area while receiving and amplifying the subscriber signals back to the base. Thus, these BDAs maximize capacity in the coverage area at the lowest cost while allowing the service provider to centralize base radios for better spectrum use and control with lower maintenance costs.

- External filter ports to customize the pass band in the field
- High dynamic range to support hundreds of analog and / or digital subscribers
- Output limiting circuitry - maintains low IMD and prevents oscillation
- Low on-going cost of use - fast set up, high MTBF and no maintenance
- Modular components replaced in minutes with a screwdriver for easy field repair



48000 Series BDA

External filter ports allow for the connection of externally mounted filtering. The external filter modifies the pass band and can be field changed as needed.

High visibility power and fault LEDs are located on the faceplate of the BDA. Additionally, the PM800 performance monitor connects to the 15-pin test port for detailed diagnostics. The PM800 can be permanently mounted near the BDA via a 10-foot extension cable (included) or up to 100 feet away with optional extension cables. For remote surveillance, the RPM800 will dial out on alarms and provide remote shutdown over a POTs line.

SYSTEM INTEGRATION	
Application	In-building
Number of Carriers	Multi carrier
Amplifying System	Off-air, bi-directional
Max. Cascading	6 BDAs
PERFORMANCE	
Composite Output Power, DL/UL dBm	30 / 30
3rd Intercept Point, DL/UL, dBm	> 45 / > 45
Gain, DL/UL, dB	60 - 80 variable, manually
Return Loss, dB	> 14
Noise figure, dB	< 3 at max. gain DL / UL

POWER/MECHANICAL SPEC./ENVIRONMENT	
Power Consumption, VA	115
Cooling	Convection
MTBF	> 100,000 h total
RF Ports	2 connectors, N-female, 50 ohms
Housing	Metal casing, coated, wall mount
Color	Semi gloss, grey
Dimensions, W x H x D, mm (in)	470x343x185 (18.5x13.5x7.3)
Weight, kg (lb)	< 12.6 (28)
Operation Temperature, °C (°F)	-30 to +50 (-22 to + 122)
Humidity, %	90, non condensing
MONITORING	
Remote Monitoring	Optional
Alarm Interface	TTL

ORDERING INFORMATION

Model Number	Frequency Band	Frequency Range UL, MHz	Frequency Range DL, MHz
I-BDA-48710	SMR 800	806 - 824	851 - 869
I-BDA-48722	SMR 900	896 - 902	935 - 941

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I-BDA 48000 series for dualband SMR 800/900

The 48760 RF signal booster is designed to improve 800/900 SMR band radio coverage in RF isolated areas. The 48760 has one set of RF ports, one for the base donor antenna and one for the service area antenna(s). Internally, the 48760 filters and amplifies both the downlink (DL) and uplink (UL) signals for 800 and 900 SMR. Isolation is provided between the DL and UL of both bands as well DL to DL and UL to UL.

- SMR800 and SMR900
- High Reliability: industry leading fan-less cooling technique results in a MTBF of better than 10 years.
- AGC circuitry automatically prevents interference from strong signals or oscillation.
- No Maintenance: no tuning or maintenance required.
- Set up is fast and easy using the performance monitor (no computer is required).
- Modular components and auto-balance control circuitry make field repair a snap
- All models include a PM800 performance monitor and 3.3 m (10 ft) extension cable.
- High dynamic range.

48760 Dual-Band BDA

SYSTEM INTEGRATION	
Application	In-building
Number of Carriers	Multi carrier
Amplifying System	Off-air, bi-directional
Max. Cascading	3 BDAs
PERFORMANCE	
Composite Output Power, DL/UL dBm	26 / 26
3rd Intercept Point, DL/UL, dBm	> 44 / > 44
Gain, DL/UL, dB	59 - 79 variable, manually
Return Loss, dB	> 10
Noise figure, dB	< 5 at max. gain DL / UL

POWER/MECHANICAL SPEC./ENVIRONMENT	
Power Consumption, VA	90
Cooling	Convection
RF Ports	2 connectors, N-female, 50 ohms
Housing	Metal casing, coated, wall mount
Color	Semi gloss, grey
Dimensions, W x H x D, mm (in)	470x343x185 (18.5x13.5x7.3)
Weight, kg (lb)	< 19.5 (43)
Operation Temperature, °C (°F)	-30 to +50 (-22 to + 122)
MONITORING	
Remote Monitoring	Optional
Alarm Interface	TTL

ORDERING INFORMATION

Model Number	Frequency Band	Frequency Range UL, MHz	Frequency Range DL, MHz
I-BDA-48760	SMR 800/900	806 - 824, 896 - 902	851 - 869, 935 - 941
I-BDA-48960	SMR 800/900	806 - 824, 896 - 902	851 - 869, 935 - 941

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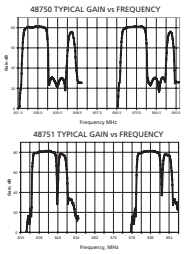
I-BDA 48000 series for Cellular 800 A/B

The 48000 series of off-air bi-directional amplifiers (BDAs) are certified by the FCC and IC Canada for use by service providers. Off-air BDAs receive and amplify the donor base transmit signals into the coverage area while receiving and amplifying the subscriber signals back to the base. Thus, these BDAs maximize capacity in the coverage area at the lowest cost while allowing the service provider to centralize base radios for better spectrum use and control with lower maintenance costs.

- Band-specific filtering
- Full band with best out-of-band rejection.
- High dynamic range
- Supports hundreds of analog and / or digital subscribers.
- Output limiting circuitry
- Maintains low IMD and prevents oscillation.
- Low on-going cost of use
- Fast set up, high MTBF and no maintenance.
- Field repairable – modular components replace in minutes with a screwdriver.



48000 Series BDA

Band-specific filtering in the 48750, 48751, and 48810A and 48810B provides full use of the desired spectrum with superior out-of-band rejection. This simplifies set-up and reduces maintenance while minimizing interference.

High visibility power and fault LEDs are located on the faceplate of the BDA. Additionally, the PM800 performance monitor connects to the 15-pin test port for detailed diagnostics. The PM800 can be permanently mounted near the BDA via a 10-foot extension cable (included) or up to 100 feet away with optional extension cables. For remote surveillance, the RPM800 will dial out on alarms and provide remote shutdown over a POTs line.

SYSTEM INTEGRATION	
Application	In-building
Number of Carriers	Multi carrier
Amplifying System	Off-air, bi-directional
Max. Cascading	3 BDAs
PERFORMANCE	
Composite Output Power, DL/UL dBm	30 / 30
3rd Intercept Point, DL/UL, dBm	> 45 / > 45
Gain, DL/UL, dB	60 - 80 variable, manually
Return Loss, dB	> 14
Noise figure, dB	< 9 at max. gain DL / UL

POWER/MECHANICAL SPEC./ENVIRONMENT	
Power Consumption, VA	184
Cooling	Convection
MTBF	> 85,200 h total
RF Ports	2 connectors, N-female, 50 ohms
Housing	Metal casing, coated, wall mount
Color	Semi gloss, grey
Dimensions, W x H x D, mm (in)	470x343x185 (18.5x13.5x7.3)
Weight, kg (lb)	< 16.3 (36)
Operation Temperature, °C (°F)	-30 to +50 (-22 to + 122)
Humidity, %	90, non condensing
MONITORING	
Remote Monitoring	Optional
Alarm Interface	TTL

ORDERING INFORMATION

Model Number	Frequency Band	Frequency Range UL, MHz	Frequency Range DL, MHz
I-BDA-48750	CELLA 800	824 - 835, 845 - 846.5	869 - 880, 890 - 891.5
I-BDA-48751	CELLB 800	835 - 845, 846.5 - 849	880 - 890, 891.5 - 894

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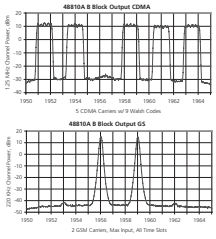
I-BDA 48000 series for PCS 1900

The 48000 series of off-air bi-directional amplifiers (BDAs) are certified by the FCC and IC Canada for use by service providers. Off-air BDAs receive and amplify the donor base transmit signals into the coverage area while receiving and amplifying the subscriber signals back to the base. Thus, these BDAs maximize capacity in the coverage area at the lowest cost while allowing the service provider to centralize base radios for better spectrum use and control with lower maintenance costs.

- Band-specific filtering
- Full band with best out-of-band rejection.
- High dynamic range
- Supports hundreds of analog and / or digital subscribers.
- Output limiting circuitry
- Maintains low IMD and prevents oscillation.
- Low on-going cost of use
- Fast set up high MTBF and no maintenance.
- Field repairable – modular components replace in minutes with a screwdriver.



48000 Series BDA

Band-specific filtering in the 48750, 48751, and 48810A and 48810B provides full use of the desired spectrum with superior out-of-band rejection. This simplifies set-up and reduces maintenance while minimizing interference.

High visibility power and fault LEDs are located on the faceplate of the BDA. Additionally, the PM800 performance monitor connects to the 15-pin test port for detailed diagnostics. The PM800 can be permanently mounted near the BDA via a 10-foot extension cable (included) or up to 100 feet away with optional extension cables. For remote surveillance, the RPM800 will dial out on alarms and provide remote shutdown over a POTs line.

SYSTEM INTEGRATION	
Application	In-building
Number of Carriers	Multi carrier
Amplifying System	Off-air, bi-directional
Max. Cascading	3 BDAs
PERFORMANCE	
Composite Output Power, DL/UL dBm	21 / 15
3rd Intercept Point, DL/UL, dBm	> 42 / > 42
Gain, DL/UL, dB	60 - 80 variable, manually
Return Loss, dB	> 14
Noise figure, dB	< 4 at max. gain DL / UL

POWER/MECHANICAL SPEC./ENVIRONMENT	
Power Consumption, VA	120
Cooling	Convection
MTBF	> 85,200 h total
RF Ports	2 connectors, N-female, 50 ohms
Housing	Metal casing, coated, wall mount
Color	Semi gloss, grey
Dimensions, W x H x D, mm (in)	470x343x185 (18.5x13.5x7.3)
Weight, kg (lb)	< 14.9 (33)
Operation Temperature, °C (°F)	-30 to +50 (-22 to + 122)
Humidity, %	90, non condensing
MONITORING	
Remote Monitoring	Optional
Alarm Interface	TTL

ORDERING INFORMATION

Model Number	Frequency Band	Frequency Range UL, MHz	Frequency Range DL, MHz
I-BDA-48810A	PCS 1900	15 MHz A, B or C Block Selectable	15 MHz A, B or C Block Selectable
I-BDA-48810B	PCS 1900	5 MHz D, E, or F Block Selectable	5 MHz D, E, or F Block Selectable

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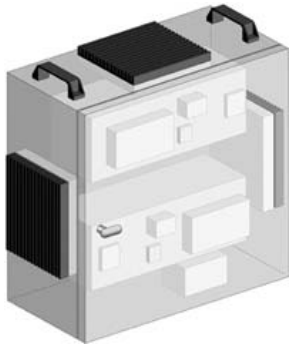
T-BDA series

When a tunnel is too long for proper coverage, then the RF signals have to be regenerated – in both directions, for uplink and downlink. This can be done with a bi-directional amplifier (BDA). It is an amplifying device operating on single frequency bands for multi carriers. Up to a maximum of 6 BDAs can be cascaded, i.e. the common coverage length could be extended by a factor of 7.

- Designed for rough tunnel environment
- High reliability
- Band selective operation
- Multi-carrier
- Built-in soft redundancy for all amplifier modules
- Low noise amplification
- Low intermodulation products
- Up to 6 BDAs in line
- Individual adjustment of the required gain for each path, UL and DL
- Built-in alarm interface for remote monitoring
- Convection cooling
- Maintenance friendly



Bi-directional amplifier (BDA) for tunnels

Cascaded BDAs

SYSTEM INTEGRATION	
Application	Tunnel
Number of Carriers	Multi Carrier
Amplifying System	Cascaded, bi-directional
Max. Cascading	6 BDAs
Redundancy	Soft redundancy for all amplifier modules
PERFORMANCE	
Note	See page 466 for Output Power information.
Composite Output Power, DL/UL dBm	24 / 15
3rd Intercept Point, DL/UL, dBm	> 50/40
Gain, DL/UL, dB	> 40/40, in 2 dB steps manually adjustable
Return Loss, dB	> 14 for each RF port
Noise figure, dB	< 6 in DL and UL at max. gain

POWER/MECHANICAL SPEC./ENVIRONMENT	
Power Consumption, VA	< 250
Cooling	Convection
MTBF	> 80,000 h
RF Ports	2 connectors, N-female, 50 ohms
Housing	Metal casing, coated, with front door
Sealing	IP 65
Color	Semi gloss, grey, RAL 7032
Dimensions, W x H x D, mm (in)	720x730x260 (28.3x28.7x10.2), incl. heat sinks
Weight, kg (lb)	< 56 (123)
Operation Temperature, °C (°F)	-20 to +45 (-4 to + 113)
Humidity, %	0-99, non condensing
MONITORING	
Remote Monitoring	Optional
Alarm Interface	Potential free relay contacts,

ORDERING INFORMATION

Model Number	Frequency Band	Frequency Range UL, MHz	Frequency Range DL, MHz
T-BDA-TETRA380	TETRA 380	380 - 385	390 - 395
T-BDA-SMR800	SMR 800	806 - 824	851 - 869
T-BDA-CDMA800	CDMA 800	824 - 835	869 - 880
T-BDA-CELLA800	CELLA 800	824 - 835, 845 - 846.5	869 - 880, 890 - 891.5
T-BDA-CELLB800	CELLB 800	835 - 845, 846.5 - 849	880 - 890, 891.5 - 894
T-BDA-GSM900	GSM 900	935 - 960	890 - 915
T-BDA-GSM1800	GSM 1800	1710 - 1785	1805 - 1880
T-BDA-PCS1900	PCS 1900	1850 - 1910	1930 - 1990
T-BDA-UMTS2100	UMTS 2100	1920 - 1980	2110 - 2170

Additional frequency bands available upon request.

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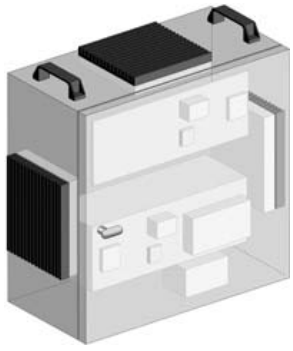
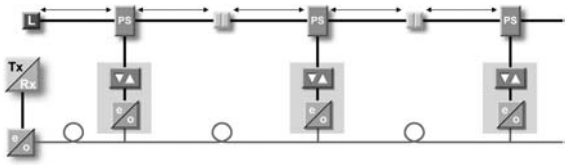
T-RU series

Wireless distributed communication systems require the installation of repeaters in longer tunnel sections. One method is the use of a fiber optic backbone system. The high power Remote Unit converts the analogue optical DL signal into RF and amplifies it - and vice versa for the UL. The Remote Unit is a single band multicarrier unit which is available for all common frequency bands used for digital mobile radio.

- Designed for rough tunnel environment
- Up to 20 km (12.5 miles) of tunnel coverage
- Optical transmitter and receiver integrated
- High reliability
- Band selective operation
- Multi carrier
- Available for various frequency bands
- Built-in soft redundancy for all amplifier modules
- Low noise amplification
- Low intermodulation products
- Individual adjustment of the required gain for each path, UL and DL
- Built-in alarm interface for remote monitoring
- Convection cooling
- Maintenance friendly



Remote unit for tunnels



Block diagram of the optical backbone link

SYSTEM INTEGRATION	
Application	Tunnel
Number of Carriers	Multi Carrier
Amplifying System	Fiber optical backbone
Max. Backbone Length, km (miles)	20 (12.5)
Redundancy	Soft redundancy for all amplifier modules
PERFORMANCE	
Note	See page xxx for Output Power information.
Composite Output Power, DL/UL dBm	24 / 15
3rd Intercept Point, DL/UL, dBm	> 50/40
Gain, DL/UL, dB	> 60/40, in 2 dB steps manually adjustable
Return Loss, dB	> 14
Noise figure, dB	< 6 in DL and UL at max. gain

POWER/MECHANICAL SPEC./ENVIRONMENT	
Power Consumption, VA	< 250
Cooling	Convection
MTBF	> 50,000 h
RF Ports	1 connector, N-female, 50 ohms, to radiating network or antenna
Housing	Metal casing, coated, with front door
Sealing	IP 65
Color	Semi gloss, grey, RAL 7032
Dimensions, W x H x D, mm (in)	720x730x260 (28.3x28.7x10.2), incl. heat sinks
Weight, kg (lb)	< 56 (123)
Operation Temperature, °C (°F)	-20 to +45 (-4 to + 113)
Humidity, %	0-99, non condensing
MONITORING	
Remote Monitoring	Optional
Alarm Interface	Potential free relay contacts,

ORDERING INFORMATION

Model Number	Frequency Band	Frequency Range UL, MHz	Frequency Range DL, MHz
T-RU-TETRA380	TETRA 380	380 - 385	390 - 395
T-RU-SMR800	SMR 800	806 - 824	851 - 869
T-RU-CDMA800	CDMA 800	824 - 835	869 - 880
T-RU-CELLA800	CELLA 800	824 - 835, 845 - 846.5	869 - 880, 890 - 891.5
T-RU-CELLB800	CELLB 800	835 - 845, 846.5 - 849	880 - 890, 891.5 - 894
T-RU-GSM900	GSM 900	935 - 960	890 - 915
T-RU-GSM1800	GSM 1800	1710 - 1785	1805 - 1880
T-RU-PCS1900	PCS 1900	1850 - 1910	1930 - 1990
T-RU-UMTS2100	UMTS 2100	1920 - 1980	2110 - 2170

Additional frequency bands available upon request.

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I-RFU series

Wireless distributed communication systems for in-building applications. The RF Unit (together with the optical backbone) extends the coverage in large buildings. It is designed to amplify DL and UL signals frequency band wise for multi carrier applications.

- Extension for RFS's in-building system
- Suitable for all main digital frequency bands
- Band selective operation
- Multi-carrier
- Built-in soft redundancy for all amplifier modules
- Low noise amplification
- Low intermodulation products
- For optical backbone
- Low noise, high reliability
- State-of-the-art, modular design in 19" technology
- Maintenance friendly

RF Unit for in-building

SYSTEM INTEGRATION	
Application	In-building
Number of Carriers	Multi Carrier
Amplifying System	Fiber optical backbone
Redundancy	Soft redundancy for all amplifier modules
PERFORMANCE	
Note	See page 466 for Output Power information.
Composite Output Power, DL/UL dBm	24 / 15
3rd Intercept Point, DL/UL, dBm	> 50/40
Gain, DL/UL, dB	> 50/50, in 2 dB steps manually adjustable
Return Loss, dB	> 14 for each RF port
Noise figure, dB	< 6 in DL and UL at max. gain

POWER/MECHANICAL SPEC./ENVIRONMENT	
Power Consumption, VA	< 100
Cooling	Fan
MTBF	> 200,000 h excl. fan, > 40,000 h incl. fan
RF Ports	3 connectors, SMA-female, 50 ohms
Housing	19" sub-rack
Sealing	IP20
Color	Semi gloss, black, RAL 9005
Dimensions, W x H x D, mm (in)	19" x 4 units in height
Weight, kg (lb)	15 (33)
Operation Temperature, °C (°F)	0 to +45 (+32 to + 113)
Humidity, %	0-99, non condensing
MONITORING	
Remote Monitoring	Optional
Alarm Interface	Potential free relay contacts,

ORDERING INFORMATION

Model Number	Frequency Band	Frequency Range UL, MHz	Frequency Range DL, MHz
I-RFU-TETRA380	TETRA 380	380 - 385	390 - 395
I-RFU-SMR800	SMR 800	806 - 824	851 - 869
I-RFU-CDMA800	CDMA 800	824 - 835	869 - 880
I-RFU-CELLA800	CELLA 800	824 - 835, 845 - 846.5	869 - 880, 890 - 891.5
I-RFU-CELLB800	CELLB 800	835 - 845, 846.5 - 849	880 - 890, 891.5 - 894
I-RFU-GSM900	GSM 900	935 - 960	890 - 915
I-RFU-GSM1800	GSM 1800	1710 - 1785	1805 - 1880
I-RFU-PCS1900	PCS 1900	1850 - 1910	1930 - 1990
I-RFU-UMTS2100	UMTS 2100	1920 - 1980	2110 - 2170

Additional frequency bands available upon request.

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I-PSU-800

Wireless distributed communication systems for in-building applications. The Power Supply Unit delivers the necessary power for up to four RF Units at the backend site of the in-building system.

- Extension for RFS' in-building system
- Provides power for up to four RF units
- Individual ON/OFF switches for each of the DC output ports
- High reliability
- Modular design in 19" technology
- Maintenance friendly

Power Supply Unit for in-building

SYSTEM INTEGRATION	
Application	In-building
Amplifying System	Fiber optical backbone
POWER/MECHANICAL SPEC./ENVIRONMENT	
Power Consumption, VA	< 900
Cooling	Fan
MTBF	> 200,000 h excl. fan, > 50,000 h incl. fan
Housing	19" sub-rack
Sealing	IP20
Color	Semi gloss, black, RAL 9005
Dimensions, W x H x D, mm (in)	19" x 3 units in height
Weight, kg (lb)	9 (20)
Operation Temperature, °C (°F)	0 to +45 (+32 to + 113)
Humidity, %	0-99, non condensing
MONITORING	
Remote Monitoring	Optional
Alarm Interface	Potential free relay contacts, normally closed, Sub D 25 female

ORDERING INFORMATION
Model Number
I-PSU-800

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I-MOU-19

Wireless distributed communication systems for in-building applications. The Monitoring Unit collects all alarm signals of up to four RF units, the power unit, and the optical unit. Summary alarms can be provided by an internal wiring structure. The unit operates as a passive alarm interface.

- Collects the alarm signals of up to four RF Units, the Power Supply Unit and the optical unit
- High reliability through passive structure
- Summary alarm can be provided by internal wiring option

Monitoring Unit for in-building

SYSTEM INTEGRATION	
Application	In-building
Amplifying System	Fiber optical backbone
POWER/MECHANICAL SPEC./ENVIRONMENT	
Housing	19" sub-rack
Sealing	IP20
Color	Semi gloss, black, RAL 9005
Dimensions, W x H x D, mm (in)	19" x 1 unit in height
Weight, kg (lb)	3 (7)
Operation Temperature, °C (°F)	0 to +45 (+32 to + 113)
Humidity, %	0-99, non condensing
MONITORING	
Alarm Interface	Sub D 9 pol for OSR-19, Sub D 25 pol for I-RFU series and I-PSU-800

ORDERING INFORMATION
Model Number
I-MOU-19

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OSR-19

Wireless distributed communication systems for in-building and tunnel applications. The 19" sub-rack is designed to take in the converters for the fiber optical backbone system.

- Ready to plug-in one or two power supply modules (OPS) and up to 8 modules either optical transmitters (OTM) or optical receivers (ORM)

19" sub-rack for e/o conversion

SYSTEM INTEGRATION	
Application	Tunnel,In-building
Amplifying System	Fiber optical backbone
Redundancy	Provided for hot standby power supply
POWER/MECHANICAL SPEC./ENVIRONMENT	
Power Consumption, VA	< 50, fully assembled
Housing	19" sub-rack with back panel, slots for max. 2 x power supply and 4 x optical transmitter and 4 x optical receiver (other configurations optional)
Sealing	IP20
Color	Semi gloss, black, RAL 9005
Dimensions, W x H x D, mm (in)	19" x 3 units in height
Weight, kg (lb)	3 (7)
Operation Temperature, °C (°F)	0 to +45 (+32 to + 113)
Humidity, %	0-99, non condensing
MONITORING	
Remote Monitoring	Optional
Alarm Interface	Potential free relay contacts, normally closed, Sub D 9 female

ORDERING INFORMATION
Model Number
OSR-19

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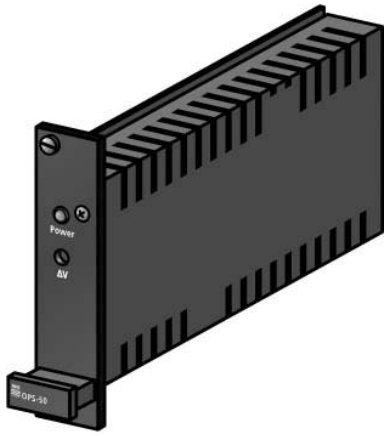
OPS-50

Wireless distributed communication systems for in-building and tunnel applications. The power supply is designed as plug-in module and fits into the 19" sub-rack OSR-19. It powers the electric-optical converters. A second OPS-50 can be plugged in order to provide redundancy.

- High reliability
- Long lifetime



Power supply plug-in module for e/o conversion

SYSTEM INTEGRATION	
Application	Tunnel,In-building
Amplifying System	Fiber optical backbone
POWER/MECHANICAL SPEC./ENVIRONMENT	
Power Consumption, VA	< 50
MTBF	> 500,000 h
Housing	Plug-in module
Sealing	IP20
Color	Semi gloss, black, RAL 9005
Dimensions, W x H x D, mm (in)	6 units in width, 3 units in height
Weight, kg (lb)	0.5 (1)
Operation Temperature, °C (°F)	0 to +45 (+32 to + 113)
Humidity, %	0-99, non condensing
MONITORING	
Remote Monitoring	Optional
Alarm Interface	Potential free relay contact, normally closed

ORDERING INFORMATION
Model Number
OPS-50

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OTM-FC/APC

Wireless distributed communication systems for in-building and tunnel applications. The optical transmitter is designed as plug-in module and fits into the 19" sub-rack OSR-19. It converts an electrical RF signal into an optical analog signal.

- Designed for analog RF signals
- Independent on RF modulation
- High linearity
- DFB laser
- Low noise

Electrical-optical converter (transmitter)

SYSTEM INTEGRATION	
Application	Tunnel,In-building
Amplifying System	Fiber optical backbone
Max. Backbone Length, km (miles)	20 (12.5)
PERFORMANCE	
Composite Output Power, DL/UL dBm	3 (typical optical output power)
3rd Intercept Point, DL/UL, dBm	> 27

POWER/MECHANICAL SPEC./ENVIRONMENT	
Power Consumption, VA	< 5
MTBF	> 200,000 h
RF Ports	1 connector, SMA-female, 50 ohms
Housing	Plug-in module
Sealing	IP20
Color	Semi gloss, black, RAL 9005
Dimensions, W x H x D, mm (in)	7 units in width, 3 units in height
Weight, kg (lb)	0.5 (1)
Operation Temperature, °C (°F)	0 to +45 (+32 to + 113)
Humidity, %	0-99, non condensing
MONITORING	
Remote Monitoring	Optional
Alarm Interface	Potential free relay contact, normally closed

ORDERING INFORMATION

Model Number	Frequency Band	Frequency Range UL, MHz	Frequency Range DL, MHz
OTM-FC/APC	N/A	50 ... 2400	50 ... 2400

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ORM-FC/APC

Wireless distributed communication systems for in-building and tunnel applications. The optical receiver is designed as plug-in module and fits into the 19" sub-rack OSR-19. It reconverts an optical analog signal into an electrical RF signal.

- Designed for multi carrier application using extremely linear and low noise 30 dB broad band amplifier
- High dynamic range

Optical-electrical converter (receiver)

SYSTEM INTEGRATION	
Application	Tunnel,In-building
Amplifying System	Fiber optical backbone
Max. Backbone Length, km (miles)	20 (12.5)
PERFORMANCE	
3rd Intercept Point, DL/UL, dBm	> 27
Gain, DL/UL, dB	30
Noise figure, dB	< 2

POWER/MECHANICAL SPEC./ENVIRONMENT	
Power Consumption, VA	< 5
MTBF	> 400,000 h
RF Ports	1 connector, SMA-female, 50 ohms
Housing	Plug-in module
Sealing	IP20
Color	Semi gloss, black, RAL 9005
Dimensions, W x H x D, mm (in)	7 units in width, 3 units in height
Weight, kg (lb)	0.5 (1)
Operation Temperature, °C (°F)	0 to +45 (+32 to + 113)
Humidity, %	0-99, non condensing
MONITORING	
Remote Monitoring	Optional
Alarm Interface	Potential free relay contact, normally closed

ORDERING INFORMATION

Model Number	Frequency Band	Frequency Range UL, MHz	Frequency Range DL, MHz
ORM-FC/APC	N/A	50 ... 2400	50 ... 2400

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OSM Series

Wireless distributed communication systems for in-building and tunnel applications. The optical splitter module is designed as plug-in module and fits into the 19" sub-rack OSR-19. It splits one optical signal into 4 signals. In addition a RF signal can be looped through for level adjustments.

- Splits equally one optical signal into 4 optical signals
- Additionally, the common RF signal can be manually adjusted by 20 dB
- Module fits into the 19" sub-rack OSR-19
- SMA connectors for RF In and Out
- FC/APC connectors for the 5 optical ports

Optical splitter unit

SYSTEM INTEGRATION	
Application	Tunnel,In-building
Amplifying System	Fiber optical backbone
PERFORMANCE @ 20°C (68°F)	
Return Loss, dB	> 9 (S11, RF output port), > 9 (S22, RF path)
Attenuation variation, dB	0 - 20 ±2
OPTICAL SPECIFICATION	
Wave Length, nm	1310
Optical Interface	5 x FC/APC

POWER/MECHANICAL SPEC./ENVIRONMENT	
RF Ports	2 connectors, SMA-female, 50 ohms
Housing	Plug-in module
Sealing	IP20
Color	Semi gloss, black, RAL 9005
Dimensions, W x H x D, mm (in)	10 units in width, 3 units in height
Weight, kg (lb)	0.5 (1)
Operation Temperature, °C (°F)	0 to +45 (+32 to + 113)
Humidity, %	0-99, non condensing

ORDERING INFORMATION

Model Number	Frequency Range UL, MHz	Frequency Range DL, MHz
OSM-1		380 - 960

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OPP-FC/APC

Wireless distributed communication systems for in-building and tunnel applications. The patch panel comprises a splicing cassette for up to 8 splices and provides 8 optical FC/APC ports for distribution to the electrical-optical converters.

- 8 optical ports
- FC/APC connectors, pigtails inside for splicing (mono mode, 9/125/900 µm, 2m (6.5 ft) long), gland at the front side for fiber cable of 10 mm (0.4 in) in diameter

19" patch panel

SYSTEM INTEGRATION	
Application	Tunnel,In-building
Amplifying System	Fiber optical backbone
OPTICAL SPECIFICATION	
Optical Interface	8 x FC/APC to the converters, 8x pigtails to the fiber optical cable
POWER/MECHANICAL SPEC./ENVIRONMENT	
Housing	19" sub-rack
Sealing	IP20
Color	Semi gloss, black, RAL 9005
Dimensions, W x H x D, mm (in)	19" x 1 unit in height
Weight, kg (lb)	4 (9)
Operation Temperature, °C (°F)	0 to +45 (+32 to + 113)
Humidity, %	0-99, non condensing

ORDERING INFORMATION
Model Number
OPP-FC/APC

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SCAM2* Series

Wireless distributed communication systems for in-building and tunnel applications. The RF splitter/combiner module is designed as plug-in module and fits into a 19" sub-rack. It splits/combines 2 RF signals

- Attenuates 2 RF signals
- Splits/Combines 2 RF signals
- Module fits into 19" sub-rack
- SMA connectors for RF In and Out

RF splitter/combiner module

SYSTEM INTEGRATION	
Application	Tunnel,In-building
Amplifying System	Fiber optical backbone
PERFORMANCE @ 20°C (68°F)	
Return Loss, dB	> 12
Attenuation variation, dB	0 - 20 ±2

POWER/MECHANICAL SPEC./ENVIRONMENT	
RF Ports	3 connectors, SMA-female, 50 ohms
Housing	Plug-in module
Sealing	IP20
Color	Semi gloss, black, RAL 9005
Dimensions, W x H x D, mm (in)	7 units in width, 3 units in height
Weight, kg (lb)	0.5 (1)
Operation Temperature, °C (°F)	0 to +45 (+32 to + 113)
Humidity, %	0-99, non condensing

ORDERING INFORMATION

Model Number	Frequency Range UL, MHz	Frequency Range DL, MHz
SCAM2-380/1000	380 - 1000	380 - 1000

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SCAM4* Series

Wireless distributed communication systems for in-building and tunnel applications. The RF splitter/combiner module is designed as plug-in module and fits into a 19" sub-rack. It splits/combines 4 RF signals

- Attenuates 4 RF signals
- Splits/Combines 4 RF signals
- Module fits into 19" sub-rack
- SMA connectors for RF In and Out

RF splitter/combiner module

SYSTEM INTEGRATION	
Application	Tunnel,In-building
Amplifying System	Fiber optical backbone
PERFORMANCE @ 20°C (68°F)	
Return Loss, dB	> 12
Attenuation variation, dB	0 - 20 ±2

POWER/MECHANICAL SPEC./ENVIRONMENT	
RF Ports	5 connectors, SMA-female, 50 ohms
Housing	Plug-in module
Sealing	IP20
Color	Semi gloss, black, RAL 9005
Dimensions, W x H x D, mm (in)	7 units in width, 3 units in height
Weight, kg (lb)	0.5 (1)
Operation Temperature, °C (°F)	0 to +45 (+32 to + 113)
Humidity, %	0-99, non condensing

ORDERING INFORMATION

Model Number	Frequency Range UL, MHz	Frequency Range DL, MHz
SCAM4-380/1000	380 - 1000	380 - 1000

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SCM2* Series

Wireless distributed communication systems for in-building and tunnel applications. The RF splitter/combiner module is designed as plug-in module and fits into a 19" sub-rack. It splits/combines 2 RF signals

- Splits/Combines 2 RF signals
- Module fits into 19" sub-rack
- SMA connectors for RF In and Out

RF splitter/combiner module

SYSTEM INTEGRATION	
Application	Tunnel,In-building
Amplifying System	Fiber optical backbone
PERFORMANCE @ 20°C (68°F)	
Return Loss, dB	> 12 (380 - 1000 MHz), > 17 (1000 - 2500 MHz)

POWER/MECHANICAL SPEC./ENVIRONMENT	
RF Ports	3 connectors, SMA-female, 50 ohms
Housing	Plug-in module
Sealing	IP20
Color	Semi gloss, black, RAL 9005
Dimensions, W x H x D, mm (in)	6 units in width, 3 units in height
Weight, kg (lb)	0.5 (1)
Operation Temperature, °C (°F)	0 to +45 (+32 to + 113)
Humidity, %	0-99, non condensing

ORDERING INFORMATION

Model Number	Frequency Range UL, MHz	Frequency Range DL, MHz
SCM2-380/2500	380 - 2500	380 - 2500

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SCM4* Series

Wireless distributed communication systems for in-building and tunnel applications. The RF splitter/combiner module is designed as plug-in module and fits into a 19" sub-rack. It splits/combines 4 RF signals

- Splits/Combines 4 RF signals
- Module fits into 19" sub-rack
- SMA connectors for RF In and Out

RF splitter/combiner module

SYSTEM INTEGRATION	
Application	Tunnel,In-building
Amplifying System	Fiber optical backbone
PERFORMANCE @ 20°C (68°F)	
Return Loss, dB	> 12 (380 - 1000 MHz), > 17 (1000 - 2500 MHz)

POWER/MECHANICAL SPEC./ENVIRONMENT	
RF Ports	5 connectors, SMA-female, 50 ohms
Housing	Plug-in module
Sealing	IP20
Color	Semi gloss, black, RAL 9005
Dimensions, W x H x D, mm (in)	6 units in width, 3 units in height
Weight, kg (lb)	0.5 (1)
Operation Temperature, °C (°F)	0 to +45 (+32 to + 113)
Humidity, %	0-99, non condensing

ORDERING INFORMATION

Model Number	Frequency Range UL, MHz	Frequency Range DL, MHz
SCM4-380/2500	380 - 2500	380 - 2500

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AM Series

Wireless distributed communication systems for in-building and tunnel applications. The RF attenuator module is designed as plug-in module and fits into a 19" sub-rack. It attenuates 2 RF signals individually.

- Attenuates 2 RF signals
- Module fits into 19" sub-rack
- SMA connectors for RF In and Out
- RF Broadband

AM2 Attenuator

SYSTEM INTEGRATION	
Application	Tunnel,In-building
Amplifying System	Fiber optical backbone
PERFORMANCE @ 20°C (68°F)	
Return Loss, dB	> 18 (380 - 1000 MHz), > 12 (1000 - 2500 MHz)
Attenuation variation, dB	0 - 29 ±2 in 1 dB steps

POWER/MECHANICAL SPEC./ENVIRONMENT	
RF Ports	4 connectors, SMA-female, 50 ohms
Housing	Plug-in module
Sealing	IP20
Color	Semi gloss, black, RAL 9005
Dimensions, W x H x D, mm (in)	12 units in width, 3 units in height
Weight, kg (lb)	0.5 (1)
Operation Temperature, °C (°F)	0 to +45 (+32 to + 113)
Humidity, %	0-99, non condensing

ORDERING INFORMATION

Model Number	Frequency Range UL, MHz	Frequency Range DL, MHz
AM2-380/2500	380 - 2500	380 - 2500

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Surveillance System

Application

The surveillance system is used to monitor the status of the active equipment of a wireless distributed communication system. The offered surveillance system can be easily adapted to the requirements of the actual communication installation. For example, it could be a highly sophisticated and complex subway system or an in-building system. In all cases the system owner requires a centralized surveillance from an operation room. The location of this operation room is independent of the system to be monitored.

The monitoring operator uses a standard PC being linked via modem and the public telephone network to one or several master unit(s) depending on the size of the communication system. The operator is able to call the actual status of the active equipment. Vice versa, each equipment is able to send alarm messages to the operator.

The surveillance system bases on the PROFIBUS platform which is a well introduced industrial standard. The transmission of the data could be done on copper using the protocols RS-485 or RS-232. For longer distances the fiber optic solution is available.

Features

- Surveillances system for active equipment
- Monitoring the status of the equipment
- Equipment sends alarm messages to the operation room
- Operator calls the actual status from the various active equipment
- PROFIBUS platform
- Wired and optical transmission
- Flexible adaptation from small to complex surveillance solutions
- Control center based on PC running under Windows®
- Alarm documentation:
  Print-out
  Log file, incl. location and time
- Optional extensions for alarms messages:
  Pager
  LAN
  TCP/IP protocol
  ASCII for the text messages
  Automatic appearance of status information window on the screen

SYSTEM DATA	
Platform	PROFIBUS standard
Surveillance modes	1. supervision of one line (master unit mode) 2. supervision of several lines (OEM mode)
Interface master unit level	RS-485
Interface OEM level	RS-232
No. of functions per unit	max. 8, monitoring dry relay contacts
No. of units per location	max. 5
No. of locations per master unit	max. 20
No. of sub-systems in OEM mode	max. 10
Extension of the above limitations	optional, on request
Computer equipment	PC, running Windows®
ELECTRICAL TRANSMISSION	
Transmission modus	wired transmission using modems
Electrical transmission length	max. 1.2 km (0.75 miles) per segment, max. 9 segments using RS-485 links
Cable type	PROFIBUS cables for RS-485 links, common twisted pair cables for RS-232 links
OPTICAL TRANSMISSION	
Transmission modus	optical transmission using optical modules
Optical transmission length	max. 10 km (6.2 miles) per segment, no. of segments not limited
Wave length	1310 nm
Cable type	mono mode

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Introduction

A total solution for Broadcasters worldwide is available from RFS.

Radio Frequency Systems manufactures a complete range of broadcast antennas and combining equipment for VHF/UHF TV and FM services. All of our products are supported with design, project management, installation and commissioning services.

Radio Frequency Systems represents a strategic platform for Broadcasters, providing:

- Access to the very latest advanced technologies through our own Research and Development facilities
- A worldwide network from fellow members of the worldwide Radio Frequency Systems group
- A commitment to maintaining accreditation to the highest international quality standards
- A market focused responsiveness.

With over 25 years of proven experience, we not only aim to design and manufacture products of the highest quality, we are also committed to talking with our customers to ensure that we offer the most cost effective solutions that are fully tailored to our customers' needs. Every aspect of our operation is focused to ensure the end customer receives the best value solutions and service.

Meeting and Exceeding Requirements

Engineering Services

Both commercial and specialized RFS–development software form a comprehensive resource to allow synthesis and analysis of antenna and filter networks. When coupled with our sophisticated computer aided measuring equipment, including antenna test range facilities we ensure our customers' needs are totally satisfied. These tools are crucial for us to minimize product development lead times.

Quality System – ISO9001

At Radio Frequency Systems we define quality to be the value you, the customer, enjoy over a long association with us. We are committed to a philosophy of total quality and have a corporate goal of meeting international quality standards as they become effective.

Radio Frequency Systems is certified to International Standard ISO9001 which spans every aspect of our operations from product design through to post installation. This ensures that clients receive systems that meet their needs over a long period.

Manufacturing

Our factory production system is controlled by a computer based purchasing and scheduling system which helps to ensure cost effectiveness and reliability of product delivery dates. We are also able to confirm progress during manufacturing and take corrective action as necessary.

The extensive use of CNC machines and advanced welding techniques give us an advantage in providing precision equipment at cost effective prices.

Broadcast Products

Radio Frequency Systems provides an extensive range of products for television transmission in the VHF and UHF Bands. We can also provide assistance in designing the optimum solution for your transmission requirements now and in the future. Our panel antennas provide the flexibility to provide customized coverage and power handling requirements.

Television

Panel Arrays

These are designed as building blocks to provide customized radiation patterns with or without beam tilt and null fill for specific coverage requirements. These arrays are suitable for multi-station use and have high power ratings which is essential where multichannel operation is required. Their versatility also means that they can be used as single components for simple transposer systems. Panel arrays are available for the following bands:

- Band I

606L Series - Used for high power, broadband VHF services (44 - 88MHz) with either horizontal or vertical polarization. Ideally suits four sided arrays.

607L Series - Similar to the 606 series but has a broader beam designed for triangular arrays.

- Band III

655, 656, 659, 660 Series - Used for high power, broadband VHF services (174 - 230MHz) with either horizontal, vertical or circular (model 662) polarization. Ideally suits four sided arrays and Band III DTV and/or DAB.

657, 658 Series - Used for single or dual channel services (174 - 230MHz) with horizontal polarization. Designed for triangular towers.

- Bands IV and V

PHP and PVP series - Used for high power, broadband UHF services (470 - 860MHz). The PHP is horizontally polarized whilst the PVP is vertically polarized. Both cover the full band. Designed for four or five sided arrays but can be designed for a variety of configurations. These antennas are ideally suited for DTV by providing the ultimate in flexibility.

Further information on balanced combiners and uHF panel antennas can be found in the technical notes section.

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Television

Slots and Dipole Arrays

The antennas available in this range include:

- RD Series

Horizontally polarized wideband slot antennas used for UHF services with power handling up to 160kW.

- CBS Series

Horizontally polarized slot antennas used for multichannel UHF services with power handling up to 1.3kW.

- UD Series

Vertically polarized dipole arrays used for multichannel UHF services. Ideally suited to translator services as they are fully sealed and self-contained.

- Combiners

A range of commutating line and balanced combiners are available for Bands III, IV and V depending on the number of channels to be combined and required isolation between channels.

- CC Series - Commutating Line Combiners.

These constant impedance combiners are ideally suited where wide channel spacings are used (minimum two channel spacing). Up to eight channels can be combined into one antenna system.

- CA, CW Series - Balanced Combiners.

These combiners are balanced, constant impedance and suitable for adjacent and non-adjacent channel TV combining. Three, four, five, six and eight pole bandpass filters are available using coaxial and waveguide technology. Invar temperature compensation, field proven power ratings, compact size and expansion capability make these units ideal for DTV applications.

Other Products

Other supporting products for television which RFS provide include:

- Yagis and log periodics (Bands I and III)
- Gridkit parabolic antennas (UHF)
- Switchframes and U-Link panels
- Power dividers
- Couplers
- Rigid transmission line
- Flexible air and foam dielectric cable
- Dehydrators
- Waveguide components
- Antenna Test Sections

FM Radio

Radio Frequency Systems provides an extensive range of products for FM broadcasting.

Panel Arrays

Like their television counterparts, these are designed as building blocks to provide customized radiation patterns with high power capabilities.

- 903 Series - Used for multichannel Band II services (87.5 - 108MHz). Available with horizontal, vertical or circular polarization. Ideally suited to three sided arrays.
- 904 Series - Used for multichannel Band II services (87.5 - 108MHz). This panel has horizontal and vertical dipoles and can be configured for horizontal, vertical or circular polarization. Ideally suited to four sided arrays.

Sidemount Antennas

- 828 Series - Broadband antennas providing circular polarization with an approximately omnidirectional pattern. A reflector element can be incorporated to provide a more directional pattern where such coverage is desired.
- 902 Series - CP Yagi antennas providing circular or elliptical polarization.
- SL1 and 818 Series - Vertically polarized antenna suitable for low windload, low power applications.
- CPF Series - Circularly polarized single channel antenna with low windload – a low cost solution for low to medium power levels.

Combiners

A range of balanced and star-point (branched) FM combiners is available depending on the frequency spacing and required performance.

- CA Series – Balanced Combiners

  The balanced bandpass design offers an expandable system to enable additional stations to be added in the future. Channel spacing as close as 800KHz can be provided for and between 2 and 16 channels can be combined into one antenna system.

- CS Series – Starpoint Combiners

  For up to 4 channel applications. Other combining networks comprising hybrid balanced/commutating line systems can be designed to meet particular needs.

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Band II (VHF) FM Panel Arrays 87.5 - 108 MHz

904 Series

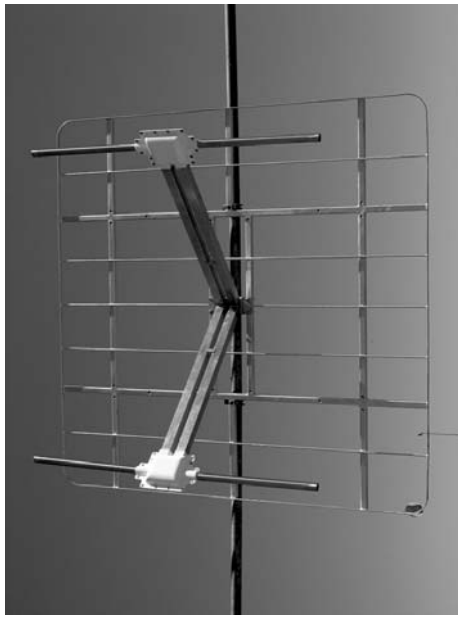
The 904 series of panels are designed as building blocks for broadband, high power FM arrays for broadcasting in the FM band (87.5 -108MHz).

- Full band (87.5 - 108MHz) operation
- Low VSWR over full band
- Ideal for multichannel use
- Horizontal, vertical or circular polarization depending on model
- Solid stainless steel construction, galvanized screen
- Cyclone rated
- Optional radome available for icing conditions
- Temperature range -40 to +60 degrees C available

The 904CP panels comprise a pair of horizontal and a pair of vertical dipoles in a square configuration mounted off a reflective screen. In this configuration RH or LH circular polarization is possible. There are four input connectors on each panel. The 904VP and 904HP panels are supplied with either a vertical or horizontal pair of dipoles for vertical or horizontal polarization. Radomes are available for these models. The 904HPS panel comprises a radiator dipole assembly mounted off a reflective screen. In this configuration vertical or horizontal polarization is possible. These panels have a single input connector to simplify the feed system. An integrated feed-point radome is supplied. The 904CPX panels comprise two crossed dipoles mounted off a reflective screen. This configuration provides circular polarization. There are two input connectors on each panel. The extremely low VSWR performance of all models together with high power capacity provides the broadcaster with the optimum solutions for multi-channel operation. The design utilizes stainless steel radiators with galvanized screen and ensures a very long trouble free life, even when installed in remote hostile environments. All panels are suitable to be used as elements in an array on a 4-sided tower.

The 904 panels can be arranged to provide the required coverage for a particular service area. Array design can be carried out by RFS engineers. Both directional and omnidirectional patterns are available and beam tilt and null fill can be customized to specification. Panels are fed through a power divider network that is designed to meet the power handling requirements of the array.

Model 904CP panel



Model 904HPS panel

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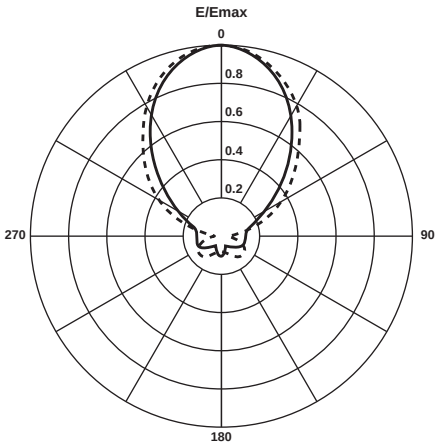
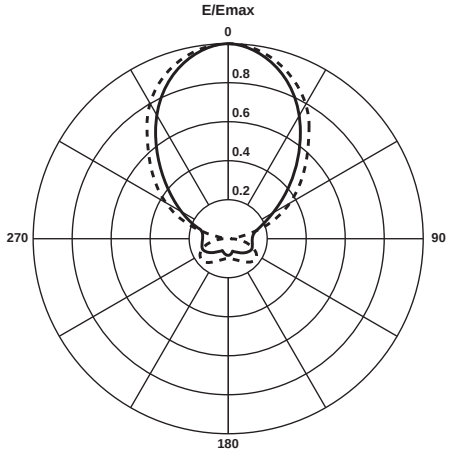
904 Series

SPECIFICATIONS	904HP	904VP	904CP	904HPS
Frequency Range, MHz	87.5 - 108	87.5 - 108	87.5 - 108	87.5 - 108
Polarization	Horizontal	Vertical	Circular	Horizontal
Gain per Plane of Polarization, dBd	7.5	7.5	4.5	7.5
Half Power Beamwidth Azimuth, degrees	65	65	65	65
Return Loss, dB	20	20	26	20
Input Connector	2 x 7-16 DIN; 2 x 7/8" EIA Flange	2 x 7-16 DIN; 2 x 7/8" EIA Flange	4 x 7-16 DIN; 4 x 7/8" EIA Flange	7-16 DIN; 7/8" EIA Flange
Power Rating per Input, kW	3.5 (7-16 DIN); 5 (7/8" EIA)	3.5 (7-16 DIN); 5 (7/8" EIA)	3.5 (7-16 DIN); 5 (7/8" EIA)	3.5 (7-16 DIN); 5 (7/8" EIA)
Impedance, ohms	50 unbalanced	50 unbalanced	50 unbalanced	50 unbalanced
Weight, kg (lb)	70 (154)	70 (154)	96 (212)	76 (168)
Mounting (Standard), mm (in)	4 x U bolts	4 x U bolts	4 x U bolts	4 mounting points at 1030mm centers
Effective Area Front (full antenna), sq m (sq ft)	1.07 (11.52)	1.08 (11.63)	1.26 (13.56)	1.08 (11.63)
Effective Area Side (full antenna), sq m (sq ft)	0.72 (7.75)	0.89 (9.58)	1.03 (11.09)	0.72 (7.75)
Design Wind Speed (max), km/h (mph)	240 (150)	240 (150)	240 (150)	240 (150)
Pressurization Operational, kPa (psi)	10 - 35 (1.5 - 5) 7/8" EIA Version	10 - 35 (1.5 - 5) 7/8" EIA Version	10 - 35 (1.5 - 5) 7/ 7/8" EIA Version	10 - 35 (1.5 - 5) 7/8" EIA Version
Pressurization Test, kPa (psi)	100 (15) 7/8" EIA Version	100 (15) 7/8" EIA Version	100 (15) 7/8" EIA Version	100 (15) 7/8" EIA Version
Material - Insulators	PTFE	PTFE	PTFE	PTFE
Material - Radiators	Stainless steel	Stainless steel	Stainless steel	Stainless steel
Material - Reflecting Screen	Galvanized steel	Galvanized steel	Galvanized steel	Galvanized steel



Horizontal Radiation Patterns per plane of Polarization



Vertical Radiation Patterns per plane of Polarization

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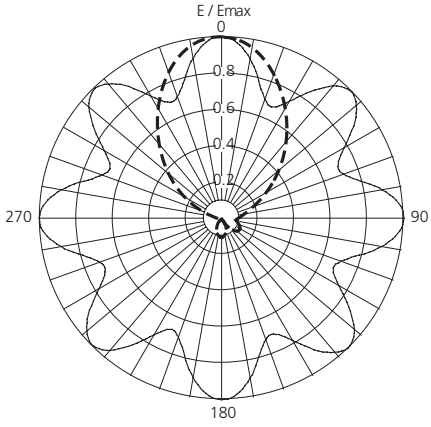
904 Series

SPECIFICATIONS	904VPS	904CPX
Frequency Range, MHz	87.5 - 108	87.5 - 108
Polarization	Vertical	Circular
Gain per Plane of Polarization, dBd	7.5	4.0
Half Power Beamwidth Azimuth, degrees	65	65
Return Loss, dB	20	>20 (typically >26 in array)
Input Connector	7-16 DIN; 7/8" EIA Flange	2 x 7-16 DIN; 2 x 7/8" EIA Flange
Power Rating per Input, kW	3.5 (7-16 DIN); 5 (7/8" EIA)	3.5 (7-16 DIN); 5 (7/8" EIA)
Impedance, ohms	50 unbalanced	50 unbalanced
Weight, kg (lb)	76 (168)	98 (216)
Mounting (Standard), mm (in)	4 mounting points at 1030mm centers	4 x M12 x 80mm (3-5/32) bolts
Effective Area Front (full antenna), sq m (sq ft)	1.08 (11.63)	1.58 (17)
Effective Area Side (full antenna), sq m (sq ft)	0.89 (9.58)	1.37 (14.7)
Design Wind Speed (max), km/h (mph)	240 (150)	240 (150)
Pressurization Operational, kPa (psi)	10 - 35 (1.5 - 5) 7/8" EIA Version	10 - 35 (1.5 - 5) 7/8" EIA Version
Pressurization Test, kPa (psi)	100 (15) 7/8" EIA Version	100 (15) 7/8" EIA Version
Material - Insulators	PTFE	PTFE
Material - Radiators	Stainless steel	Stainless steel
Material - Reflecting Screen	Galvanized steel	Galvanized steel

Model CPX array



Horizontal Radiation Pattern
- - - - - - - - Single Antenna
——— 4-Antenna Array

904CPX Horizontal Radiation Pattern

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903 Series

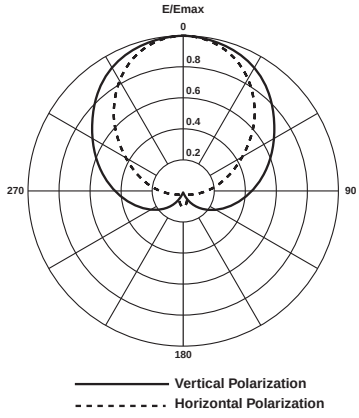
The 903 series is designed as a building block for broadband high power FM arrays for broadcasting in the FM Band (87.5 – 108 MHz). The 903 series is designed for use on triangular cross section masts.

- Full band (87.5 - 108MHz) operation
- Low cost alternative to the 4 sided antenna
- Low VSWR
- Suitable for multichannel use
- Circular polarization
- Two inputs per panel
- Available in pressurized or unpressurized versions
- Solid galvanized steel screen construction
- Dipole elements are stainless steel
- Cyclone rated
- Designed for minimum windload
- Radomes and special 'O' rings available for icing conditions
- Temperature range -40 to +60 degrees C available

The 903CP panel comprises two crossed dipoles mounted off a reflective screen. This configuration allows circular polarization. The 903HP comprises two horizontal dipoles mounted off a reflective screen for horizontal polarization. Similarly the 903VP comprises two vertically mounted dipoles off a reflective screen for vertical polarization. In some configurations the dipoles are angled towards the screen reducing backlobes and making the panel ideal as an array element on 3 sided towers or masts. The design utilizes stainless steel radiators with galvanized screen and ensures a very long trouble free life, even when installed in remote hostile environments.

The 903 panels can be arranged to provide the required coverage for a particular service area. Array design can be carried out by RFS engineers. Both directional and omnidirectional patterns are available as well as beam tilt and null fill to customer specification. Panels are fed through a power divider network which is designed to meet the power handling requirements of the array. As each panel is rated at 2 x 5kW, higher power ratings are easily achievable. The system should be fully pressurized in a high power configuration. For low to medium power applications a power distribution and cable network utilizing foam feeders and unpressurized power dividers is available.

903CP-2



903 CP Series Horizontal Radiation Patterns per Plane of Polarization

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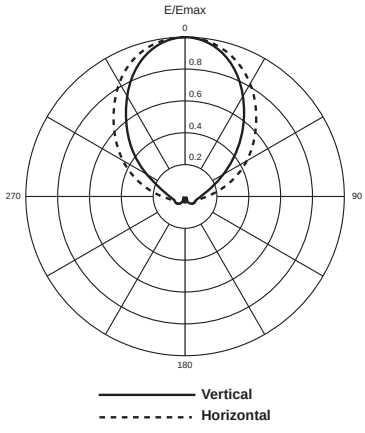
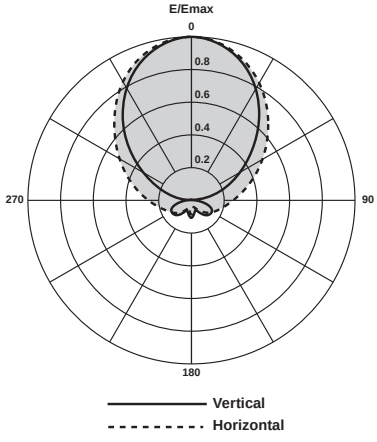
903 Series

SPECIFICATIONS	903CP	903HP	903VP
Frequency Range, MHz	87.5 - 108	87.5 - 108	87.5 - 108
Polarization	Circular	Horizontal	Vertical
Nominal Gain (Mid-band), dBd	3.5	7	6.1
Gain per Plane of Polarization, dBd	3.5		
Return Loss, dB	20	20	20
Input Connector	2 x 7-16 DIN; 2 x 7/8" EIA Flange	2 x 7-16 DIN; 2 x 7/8" EIA Flange	2 x 7-16 DIN; 2 x 7/8" EIA Flange
Power Rating per Input, kW	4; 5 Note#1	4; 5 Note#1	4; 5 Note#1
Impedance, ohms	50 unbalanced	50 unbalanced	50 unbalanced
Weight, kg (lb)	61 (135)	47 (103)	69 (152)
Mounting (Standard), mm (in)	4 x M12 x 80mm (3-5/32) bolts	4 x U bolts	4 x U bolts
Recommended Spacing between Bays, cm (in)	280 (108)	280 (108)	280 (108)
Effective Area Front (full antenna), sq m (sq ft)	1.0 (10.8)	0.48 (5.16)	0.91 (9.8)
Effective Area Side (full antenna), sq m (sq ft)	0.65 (7.00)	0.47 (5.06)	0.84 (9.04)
Design Wind Speed (max), km/h (mph)	240 (150)	240 (150)	240 (150)
Pressurization Operational, kPa (psi)	10 - 35 (1.5 - 5) 7/8" EIA Version	10 - 35 (1.5 - 5) 7/8" EIA Version	10 - 35 (1.5 - 5) 7/8" EIA Version
Pressurization Test, kPa (psi)	100 (15) 7/8" EIA Version	100 (15) 7/8" EIA Version	100 (15) 7/8" EIA Version
Material - Insulators	PTFE	PTFE	PTFE
Material - Radiators	Stainless steel	Stainless steel	Stainless steel
Material - Reflecting Screen	Galvanized steel	Galvanized steel	Galvanized steel

Note 1
Power rating per input is limited by input connector. 4kW for 7-16 DIN, 5kW for 7/8" EIA



903 HP Series Radiation Patterns



903 VP Series Radiation Patterns

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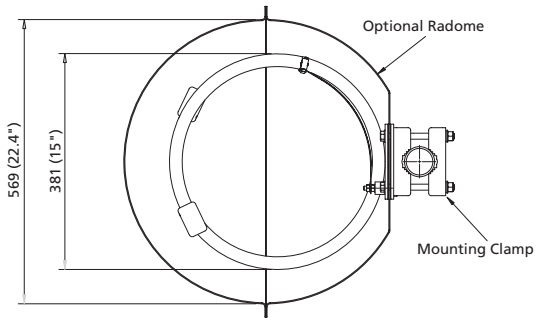
CPF Series

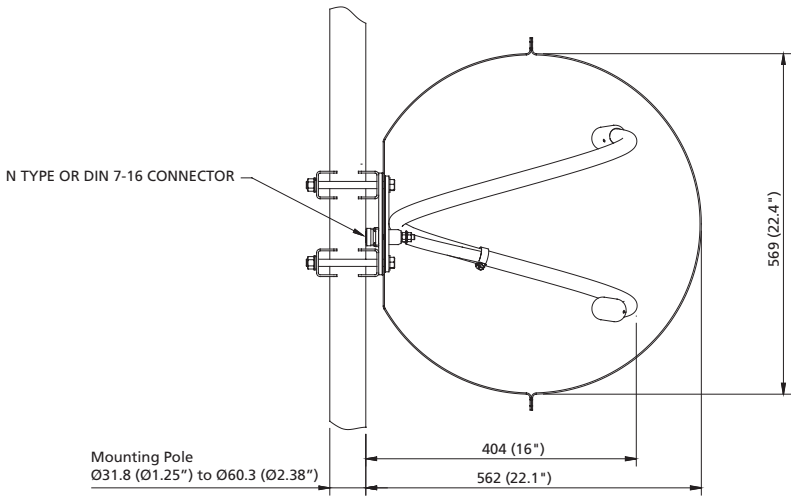
The CPF series of FM antennas are designed for low wind load, low cost, single channel requirements. These antenna elements are circularly polarized with an omnidirectional pattern. A choice of two input connector sizes provides power ratings of 500 W or 2.5 kW per bay. An optional radome fully enclosing the radiating element is also available for sites where icing is likely. The antennas are designed to be sidemounted to a vertical pole and a wide range of mounting brackets are available for this purpose.

- Single channel operation.
- Rugged stainless steel construction.
- Low cost.
- Low windload.
- Power rating of up to 20kW for an 8 bay antenna.
- Optional radome available for icing conditions.
- Optional Input tuner ensures optimum VSWR.
- Parallel (Corporate) feed network provides low downward radiation.

Multiple element arrays are supplied as a complete package including power dividers and distribution cables. An optional input tuner ensures optimum VSWR performance after installation as it enables the effects of tower steelwork to be eliminated. Beam tilt and null fill can be provided on request.

CPF500





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CPF Series

SPECIFICATIONS (ALL MODELS)	
Frequency Range, MHz	87.5 - 108
Polarization	Circular
Circularity, dB	+/- 2dB in free space
Return Loss, dB	>20 (typically >26dB)
Impedance, ohms	50 unbalanced
Mounting (Standard), mm (in)	38 to 64 mm diameter mounting pipe (not supplied)
Effective Area Side (full antenna), sq m (sq ft)	0.033 (0.35) - Single Bay
Material	Stainless Steel

SPECIFICATIONS	CPF500-1	CPF500-2	CPF500-3	CPF500-4
Number of Levels	1	2	3	4
Gain per Plane of Polarization, dBd	-3.5	-0.3	1.7	3
Input Connector	Single element N type	Single element N type, Array N type; 7/8" EIA	Single element N type, Array N type; 7/8" EIA	Single element N type, Array N type; 7/8" EIA
Power Rating, kW	0.5	1.0 (7/8" EIA i/p connector)	1.5 (7/8" EIA i/p connector)	2.0 (7/8" EIA i/p connector)
Weight, kg (lb)	4 (9)	11.3 (25)	17.2 (38)	23.1 (51)
Effective Area Front (full antenna), sq m (sq ft)	0.055 (0.59)	0.11 (1.2)	0.17 (1.8)	0.22 (2.4)

SPECIFICATIONS	CPF500-6	CPF500-8	CPF2500-1	CPF2500-2
Number of Levels	6	8	1	2
Gain per Plane of Polarization, dBd	4.8	6	-3.5	-0.3
Input Connector	Single element N type, Array N type; 7/8" EIA	Single element N type, Array N type; 7/8" EIA	Single element 7-16 DIN	Single element 7-16 DIN, Array 7-16 DIN; 1-5/8" EIA
Power Rating, kW	3.0 (7/8" EIA i/p connector)	4.0 (7/8" EIA i/p connector)	2.5	5.0 (1-5/8" EIA i/p connector)
Weight, kg (lb)	35.3 (78)	47.2 (104)	4 (9)	11.3 (25)
Effective Area Front (full antenna), sq m (sq ft)	0.33 (3.6)	0.44 (4.8)	0.055 (0.59)	0.11 (1.2)

SPECIFICATIONS	CPF2500-3	CPF2500-4	CPF2500-6	CPF2500-8
Number of Levels	3	4	6	8
Gain per Plane of Polarization, dBd	1.7	3	4.8	6
Input Connector	Single element 7-16 DIN, Array 7-16 DIN; 1-5/8" EIA	Single element 7-16 DIN, Array 7-16 DIN; 1-5/8" EIA	Single element 7-16 DIN, Array 7-16 DIN; 3-1/8" EIA	Single element 7-16 DIN, Array 7-16 DIN; 3-1/8" EIA
Power Rating, kW	7.5 (1-5/8" EIA i/p connector)	10.0 (1-5/8" EIA i/p connector)	15.0 (3-1/8" EIA i/p connector)	20.0 (3-1/8" EIA i/p connector)
Weight, kg (lb)	17.2 (38)	23.1 (51)	35.3 (78)	47.2 (104)
Effective Area Front (full antenna), sq m (sq ft)	0.17 (1.8)	0.22 (2.4)	0.33 (3.6)	0.44 (4.8)

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828 Series

These FM sidemount antennas are designed for FM broadcasting applications which require circular polarization and low windloads.

- Rugged stainless steel construction for maximum corrosion protection
- Low downward radiation
- Various power ratings available
- Mixed polarization
- Broadband operation to facilitate antenna sharing
- 828 and 828HP series pressurized
- 828MP series designed specifically for un-pressurized operation
- Low windload to minimize tower or mast costs
- Radomes are an available option for all 828 series
- Temperature range – 40 to + 60 degrees C available

The stainless steel design ensures that the antenna will give years of trouble free performance in the most hostile environments. The higher power series are pressurized to add further environmental protection. The elements will tolerate a degree of light icing but for more severe environments, optional radomes are available for all series. Contact RFS for details.

All 828 series antennas can be arrayed in any number of levels to suit most applications. The parallel feed system facilitates the customization of null fill and beam tilt to suit customer requirements. The standard 828 antenna series is a high power series and is also available in a medium power series, 828MP. There are 3 versions in each series, each with a designed bandwidth of 10 MHz. Additional factory tuning is available to achieve superior return loss specifications. A wideband series of the 828 antenna, 828HP, is also available. This series has a bandwidth covering the entire FM band from 88 to 108 MHz and utilizes half wavelength spacing. The wide variety of possible configurations ensures that the needs of most users will be met in terms of both price and performance.

828HP-8 Antenna Array

SPECIFICATIONS (ALL MODELS)	
Frequency Range, MHz	88 - 108
Polarization	Circular
Return Loss, dB	20 Note#1
Impedance, ohms	50 unbalanced
Mounting (Standard), mm (in)	Brackets for 60mm (2-3/8) pole mount;Brackets for 90mm (3-1/2) pole mount

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828 Series

SPECIFICATIONS	828MP-1	828MP-2	828MP-3	828MP-4
Operating Frequency Ranges, MHz	88 - 98,94 - 104,98 - 108	88 - 98,94 - 104,98 - 108	88 - 98,94 - 104,98 - 108	88 - 98,94 - 104,98 - 108
Number of Levels	1	2	3	4
Gain per Plane of Polarization, dBd	-1.8	1.31	3.08	4.06
Input Connector	7-16 DIN	Single element 7-16 DIN, Array 7-16 DIN; 7/8" EIA;1-5/8" EIA	Single element 7-16 DIN, Array 7-16 DIN; 7/8" EIA;1-5/8" EIA	Single element 7-16 DIN, Array 7-16 DIN; 7/8" EIA;1-5/8" EIA
Power Rating, kW	3	4.5 Note#2	6 Note#2	7.5 Note#2
Weight, kg (lb)	7.5 (17) Single Bay	7.5 (17) Single Bay	7.5 (17) Single Bay	7.5 (17) Single Bay
Effective Area Front (full antenna), sq m (sq ft)	0.05 (0.54) Single Bay	0.05 (0.54) Single Bay	0.05 (0.54) Single Bay	0.05 (0.54) Single Bay
Effective Area Side (full antenna), sq m (sq ft)	0.19 (2.04) Single Bay	0.19 (2.04) Single Bay	0.19 (2.04) Single Bay	0.19 (2.04) Single Bay

SPECIFICATIONS	828MP-5	828MP-6	828MP-8	828MP-10
Operating Frequency Ranges, MHz	88 - 98,94 - 104,98 - 108	88 - 98,94 - 104,98 - 108	88 - 98,94 - 104,98 - 108	88 - 98,94 - 104,98 - 108
Number of Levels	5	6	8	10
Gain per Plane of Polarization, dBd	5	5.77	7	7.96
Input Connector	Single element 7-16 DIN, Array 7-16 DIN; 7/8" EIA;1-5/8" EIA	Single element 7-16 DIN, Array 7-16 DIN; 7/8" EIA;1-5/8" EIA	Single element 7-16 DIN, Array 7-16 DIN; 7/8" EIA;1-5/8" EIA	Single element 7-16 DIN, Array 7-16 DIN; 7/8" EIA;1-5/8" EIA
Power Rating, kW	9 Note#2	10.5 Note#2	13.5 Note#2	15 Note#2
Weight, kg (lb)	7.5 (17) Single Bay	7.5 (17) Single Bay	7.5 (17) Single Bay	7.5 (17) Single Bay
Effective Area Front (full antenna), sq m (sq ft)	0.05 (0.54) Single Bay	0.05 (0.54) Single Bay	0.05 (0.54) Single Bay	0.05 (0.54) Single Bay
Effective Area Side (full antenna), sq m (sq ft)	0.19 (2.04) Single Bay	0.19 (2.04) Single Bay	0.19 (2.04) Single Bay	0.19 (2.04) Single Bay

SPECIFICATIONS	828MP-12	828-1	828-2	828-3
Operating Frequency Ranges, MHz	88 - 98,94 - 104,98 - 108	88 - 98,94 - 104,98 - 108	88 - 98,94 - 104,98 - 108	88 - 98,94 - 104,98 - 108
Number of Levels	12	1	2	3
Gain per Plane of Polarization, dBd	8.76	-1.8	1.31	3.08
Input Connector	Single element 7-16 DIN, Array 7-16 DIN; 7/8" EIA;1-5/8" EIA	7/8" EIA	Single element 7/8" EIA, Array 7/8" EIA; 1-5/8" EIA; 3-1/8" EIA	Single element 7/8" EIA, Array 7/8" EIA; 1-5/8" EIA; 3-1/8" EIA
Power Rating, kW	15 Note#2	5	10 Note#2	15 Note#2
Weight, kg (lb)	7.5 (17) Single Bay	7.5 (17) Single Bay	7.5 (17) Single Bay	7.5 (17) Single Bay
Effective Area Front (full antenna), sq m (sq ft)	0.05 (0.54) Single Bay	0.05 (0.54) Single Bay	0.05 (0.54) Single Bay	0.05 (0.54) Single Bay
Effective Area Side (full antenna), sq m (sq ft)	0.19 (2.04) Single Bay	0.19 (2.04) Single Bay	0.19 (2.04) Single Bay	0.19 (2.04) Single Bay
Pressurization Operational, kPa (psi)		10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)
Pressurization Test, kPa (psi)		100 (15)	100 (15)	100 (15)

Note 1

Arrays are factory tuned for a broadband performance and a return loss of 20dB across the specified bandwidth is achieved. Optional factory tuning for optimum narrow band performance will achieve a 30dB return loss over +/- 500KHz from the specified frequency. Arrays may be supplied un-tuned with a resulting return loss of 17 dB.

Note 2

Array power ratings are limited by the radiator and power divider input connectors used. Typical limits are : 7-16 DIN 3.5kW, 7/8" EIA 5kW, 1-5/8" EIA 10kW and 3-1/8" EIA 40kW

Note 3

Mechanical specifications: For 828MP and 828 the single bay Effective Area Front is 0.05 sq m (0.54 sq ft), Effective Area Side is 0.19 sq m (2.04 sq ft). For 828HP, single bay Effective Area Front is 0.06 sq m (0.65 sq ft), Effective Area Side is 0.25 sq m (2.35 sq ft).

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828 Series

SPECIFICATIONS	828-4	828-5	828-6	828-8
Operating Frequency Ranges, MHz	88 - 98,94 - 104,98 - 108	88 - 98,94 - 104,98 - 108	88 - 98,94 - 104,98 - 108	88 - 98,94 - 104,98 - 108
Number of Levels	4	5	6	8
Gain per Plane of Polarization, dBd	4.06	5	5.77	7
Input Connector	Single element 7/8" EIA, Array 7/8" EIA; 1-5/8" EIA; 3-1/8" EIA	Single element 7/8" EIA, Array 7/8" EIA; 1-5/8" EIA; 3-1/8" EIA	Single element 7/8" EIA, Array 7/8" EIA; 1-5/8" EIA; 3-1/8" EIA	Single element 7/8" EIA, Array 7/8" EIA; 1-5/8" EIA; 3-1/8" EIA
Power Rating, kW	20 Note#2	25 Note#2	30 Note#2	40 Note#2
Weight, kg (lb)	7.5 (17) Single Bay	7.5 (17) Single Bay	7.5 (17) Single Bay	7.5 (17) Single Bay
Effective Area Front (full antenna), sq m (sq ft)	0.05 (0.54) Single Bay	0.05 (0.54) Single Bay	0.05 (0.54) Single Bay	0.05 (0.54) Single Bay
Effective Area Side (full antenna), sq m (sq ft)	0.19 (2.04) Single Bay	0.19 (2.04) Single Bay	0.19 (2.04) Single Bay	0.19 (2.04) Single Bay
Pressurization Operational, kPa (psi)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)
Pressurization Test, kPa (psi)	100 (15)	100 (15)	100 (15)	100 (15)

SPECIFICATIONS	828-10	828-12	828HP-2	828HP-4
Operating Frequency Ranges, MHz	88 - 98,94 - 104,98 - 108	88 - 98,94 - 104,98 - 108	88 - 108	88 - 108
Number of Levels	10	12	2	4
Gain per Plane of Polarization, dBd	7.96	8.76	-0.1	2.61
Input Connector	Single element 7/8" EIA, Array 7/8" EIA; 1-5/8" EIA; 3-1/8" EIA	Single element 7/8" EIA, Array 7/8" EIA; 1-5/8" EIA; 3-1/8" EIA	Single element 7/8" EIA, Array 7/8"EIA; 1-5/8" EIA; 3-1/8" EIA; 4-1/2" EIA	Single element 7/8" EIA, Array 7/8"EIA; 1-5/8" EIA; 3-1/8" EIA; 4-1/2" EIA
Power Rating, kW	50 Note#2	50 Note#2	10 Note#2	20 Note#2
Weight, kg (lb)	7.5 (17) Single Bay	7.5 (17) Single Bay	10 (22) Single Bay	10 (22) Single Bay
Effective Area Front (full antenna), sq m (sq ft)	0.05 (0.54) Single Bay	0.05 (0.54) Single Bay	0.06 (0.65) Single Bay	0.06 (0.65) Single Bay
Effective Area Side (full antenna), sq m (sq ft)	0.19 (2.04) Single Bay	0.19 (2.04) Single Bay	0.25 (2.35) Single Bay	0.25 (2.35) Single Bay
Pressurization Operational, kPa (psi)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)
Pressurization Test, kPa (psi)	100 (15)	100 (15)	100 (15)	100 (15)

Note 1
Arrays are factory tuned for a broadband performance and a return loss of 20dB across the specified bandwidth is achieved. Optional factory tuning for optimum narrow band performance will achieve a 30dB return loss over +/- 500KHz from the specified frequency. Arrays may be supplied un-tuned with a resulting return loss of 17 dB.
Note 2
Array power ratings are limited by the radiator and power divider input connectors used. Typical limits are : 7-16 DIN 3.5kW, 7/8" EIA 5kW, 1-5/8" EIA 10kW and 3-1/8" EIA 40kW
Note 3
Mechanical specifications: For 828MP and 828 the single bay Effective Area Front is 0.05 sq m (0.54 sq ft), Effective Area Side is 0.19 sq m (2.04 sq ft). For 828HP, single bay Effective Area Front is 0.06 sq m (0.65 sq ft), Effective Area Side is 0.25 sq m (2.35 sq ft).

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828 Series

SPECIFICATIONS	828HP-6	828HP-8	828HP-10	828HP-12
Operating Frequency Ranges, MHz	88 - 108	88 - 108	88 - 108	88 - 108
Number of Levels	6	8	10	12
Gain per Plane of Polarization, dBd	4.05	5.2	6.12	7.33
Input Connector	Single element 7/8" EIA, Array 7/8"EIA; 1-5/8" EIA; 3-1/8" EIA; 4-1/2" EIA	Single element 7/8" EIA, Array 7/8"EIA; 1-5/8" EIA; 3-1/8" EIA; 4-1/2" EIA	Single element 7/8" EIA, Array 7/8"EIA; 1-5/8" EIA; 3-1/8" EIA; 4-1/2" EIA	Single element 7/8" EIA, Array 7/8"EIA; 1-5/8" EIA; 3-1/8" EIA; 4-1/2" EIA
Power Rating, kW	30 Note#2	40 Note#2	50 Note#2	60 Note#2
Weight, kg (lb)	10 (22) Single Bay	10 (22) Single Bay	10 (22) Single Bay	10 (22) Single Bay
Effective Area Front (full antenna), sq m (sq ft)	0.06 (0.65) Single Bay	0.06 (0.65) Single Bay	0.06 (0.65) Single Bay	0.06 (0.65) Single Bay
Effective Area Side (full antenna), sq m (sq ft)	0.25 (2.35) Single Bay	0.25 (2.35) Single Bay	0.25 (2.35) Single Bay	0.25 (2.35) Single Bay
Pressurization Operational, kPa (psi)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)
Pressurization Test, kPa (psi)	100 (15)	100 (15)	100 (15)	100 (15)

SPECIFICATIONS	828HP-16
Operating Frequency Ranges, MHz	88 - 108
Number of Levels	16
Gain per Plane of Polarization, dBd	8.33
Input Connector	Single element 7/8" EIA, Array 7/8"EIA; 1-5/8" EIA; 3-1/8" EIA; 4-1/2" EIA
Power Rating, kW	70 Note#2
Weight, kg (lb)	10 (22) Single Bay
Effective Area Front (full antenna), sq m (sq ft)	0.06 (0.65) Single Bay
Effective Area Side (full antenna), sq m (sq ft)	0.25 (2.35) Single Bay
Pressurization Operational, kPa (psi)	10 - 35 (1.5 - 5)
Pressurization Test, kPa (psi)	100 (15)

Note 1
Arrays are factory tuned for a broadband performance and a return loss of 20dB across the specified bandwidth is achieved. Optional factory tuning for optimum narrow band performance will achieve a 30dB return loss over +/- 500KHz from the specified frequency. Arrays may be supplied un-tuned with a resulting return loss of 17 dB.

Note 2
Array power ratings are limited by the radiator and power divider input connectors used. Typical limits are : 7-16 DIN 3.5kW, 7/8" EIA 5kW, 1-5/8" EIA 10kW and 3-1/8" EIA 40kW

Note 3
Mechanical specifications: For 828MP and 828 the single bay Effective Area Front is 0.05 sq m (0.54 sq ft), Effective Area Side is 0.19 sq m (2.04 sq ft). For 828HP, single bay Effective Area Front is 0.06 sq m (0.65 sq ft), Effective Area Side is 0.25 sq m (2.35 sq ft).

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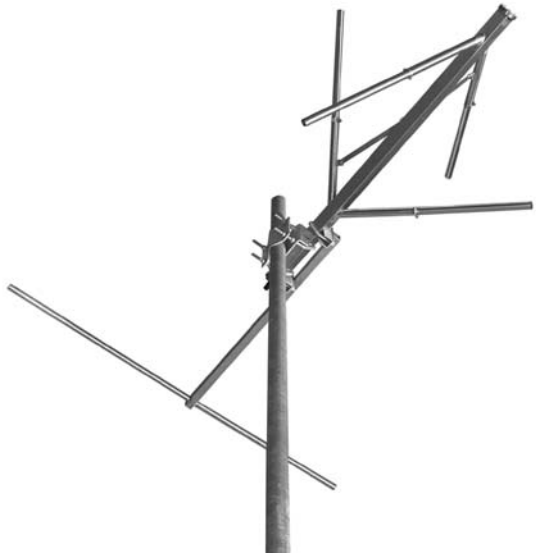
828DA Series

These FM sidemount antennas are designed for FM broadcasting applications which require circular polarization and low windloads.

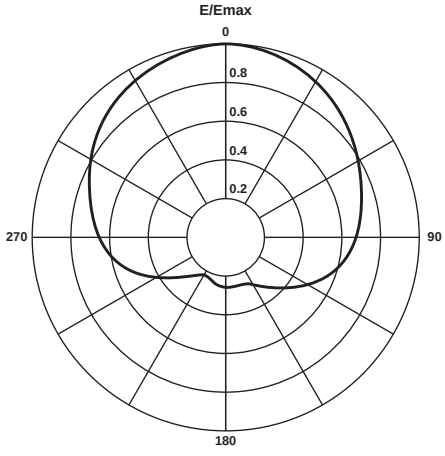
- Directional horizontal radiation pattern
- Low downward radiation
- Rugged stainless steel construction for maximum corrosion protection
- Various power ratings available
- Mixed polarization
- Broadband operation to facilitate antenna sharing
- 828DA and 828HPDA models pressurized
- 828MPDA series designed specifically for un-pressurized operation
- Optional optimal array tuning
- Low windload to minimize tower or mast costs
- Radomes are an available option for all 828DA series
- Temperature range – 40 to + 60 degrees C available



828-1DA Antenna

The 828DA series of antennas are circularly polarized Band II antennas with a nominal gain of –1dBd per plane of polarization. The antennas are fitted with a horizontal reflecting element to provide some improvement in the directionality of the horizontal radiation pattern. The stainless steel design ensures that the antenna will give years of trouble free performance in the most hostile environments. The higher power series are pressurized to add further environmental protection. The elements will tolerate a degree of light icing but for more severe environments, optional radomes are available. Contact RFS for details.

All 828DA series antennas can be arrayed in any number of levels to suit most applications. The parallel feed system facilitates the customization of null fill and beam tilt to suit customer requirements. The standard 828DA antenna series is a high power series and is also available in a medium power series, 828MPDA. There are 3 versions in each series, each with a designed bandwidth of 10MHz. Additional factory tuning is available to achieve superior return loss specifications. A wideband series of the 828DA antenna, the 828HPDA, is also available. This series has a bandwidth covering the entire FM band from 88 to 108MHz and utilizes half wavelength spacing. The 828HPDA series antennas are high power arrays. The wide variety of possible configurations ensures that the needs of most users will be met in terms of both price and performance.



Horizontal Radiation Pattern for Combined Horizontal and Vertical Polarization

SPECIFICATIONS (ALL MODELS)	
Frequency Range, MHz	88 - 108
Polarization	Circular
Return Loss, dB	20 Note#1
Impedance, ohms	50 unbalanced
Mounting (Standard), mm (in)	Brackets for 60mm (2-3/8) pole mount;Brackets for 90mm (3-1/2) pole mount

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828DA Series

SPECIFICATIONS	828MP-1DA	828MP-2DA	828MP-3DA	828MP-4DA
Operating Frequency Ranges, MHz	88 - 98,94 - 104,98 - 108	88 - 98,94 - 104,98 - 108	88 - 98,94 - 104,98 - 108	88 - 98,94 - 104,98 - 108
Number of Levels	1	2	3	4
Gain per Plane of Polarization, dBd	-0.25	2.86	4.63	5.61
Input Connector	7-16 DIN	Single element 7-16 DIN, Array 7-16 DIN;7/8" EIA; 1-5/8" EIA	Single element 7-16 DIN, Array 7-16 DIN;7/8" EIA; 1-5/8" EIA	Single element 7-16 DIN, Array 7-16 DIN;7/8" EIA; 1-5/8" EIA
Power Rating, kW	3	4.5 Note#2	6 Note#2	7.5 Note#2
Weight, kg (lb)	12 (27) Single Bay	12 (27) Single Bay	12 (27) Single Bay	12 (27) Single Bay
Effective Area Front (full antenna), sq m (sq ft)	0.05 (0.54) Single Bay	0.05 (0.54) Single Bay	0.05 (0.54) Single Bay	0.05 (0.54) Single Bay
Effective Area Side (full antenna), sq m (sq ft)	0.19 (2.04) Single Bay	0.19 (2.04) Single Bay	0.19 (2.04) Single Bay	0.19 (2.04) Single Bay

SPECIFICATIONS	828MP-5DA	828MP-6DA	828MP-8DA	828MP-10DA
Operating Frequency Ranges, MHz	88 - 98,94 - 104,98 - 108	88 - 98,94 - 104,98 - 108	88 - 98,94 - 104,98 - 108	88 - 98,94 - 104,98 - 108
Number of Levels	5	6	8	10
Gain per Plane of Polarization, dBd	6.55	7.32	8.55	9.51
Input Connector	Single element 7-16 DIN, Array 7-16 DIN;7/8" EIA; 1-5/8" EIA	Single element 7-16 DIN, Array 7-16 DIN;7/8" EIA; 1-5/8" EIA	Single element 7-16 DIN, Array 7-16 DIN;7/8" EIA; 1-5/8" EIA	Single element 7-16 DIN, Array 7-16 DIN;7/8" EIA; 1-5/8" EIA
Power Rating, kW	9 Note#2	10.5 Note#2	13.5 Note#2	15 Note#2
Weight, kg (lb)	12 (27) Single Bay	12 (27) Single Bay	12 (27) Single Bay	12 (27) Single Bay
Effective Area Front (full antenna), sq m (sq ft)	0.05 (0.54) Single Bay	0.05 (0.54) Single Bay	0.05 (0.54) Single Bay	0.05 (0.54) Single Bay
Effective Area Side (full antenna), sq m (sq ft)	0.19 (2.04) Single Bay	0.19 (2.04) Single Bay	0.19 (2.04) Single Bay	0.19 (2.04) Single Bay

SPECIFICATIONS	828MP-12DA	828-1DA	828-2DA	828-3DA
Operating Frequency Ranges, MHz	88 - 98,94 - 104,98 - 108	88 - 98,94 - 104,98 - 108	88 - 98,94 - 104,98 - 108	88 - 98,94 - 104,98 - 108
Number of Levels	12	1	2	3
Gain per Plane of Polarization, dBd	10.31	-0.25	2.86	4.63
Input Connector	Single element 7-16 DIN, Array 7-16 DIN;7/8" EIA; 1-5/8" EIA	7/8" EIA	Single element 7/8" EIA, Array 7/8" EIA; 1-5/8" EIA; 3-1/8" EIA	Single element 7/8" EIA, Array 7/8" EIA; 1-5/8" EIA; 3-1/8" EIA
Power Rating, kW	15 Note#2	5	10 Note#2	15 Note#2
Weight, kg (lb)	12 (27) Single Bay	12 (27) Single Bay	12 (27) Single Bay	12 (27) Single Bay
Effective Area Front (full antenna), sq m (sq ft)	0.05 (0.54) Single Bay	0.05 (0.54) Single Bay	0.05 (0.54) Single Bay	0.05 (0.54) Single Bay
Effective Area Side (full antenna), sq m (sq ft)	0.19 (2.04) Single Bay	0.19 (2.04) Single Bay	0.19 (2.04) Single Bay	0.19 (2.04) Single Bay
Pressurization Operational, kPa (psi)		10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)
Pressurization Test, kPa (psi)		100 (15)	100 (15)	100 (15)

Note 1

Arrays are factory tuned for a broadband performance and a return loss of 20dB across the specified bandwidth is achieved. Optional factory tuning for optimum narrow band performance will achieve a 30dB return loss over +/- 500KHz from the specified frequency. Arrays may be supplied un-tuned with a resulting return loss of 17 dB.

Note 2

Array power ratings are limited by the radiator and power divider input connectors used. Typical limits are : 7-16 DIN 3.5kW, 7/8" EIA 5kW, 1-5/8" EIA 10kW and 3-1/8" EIA 40kW

Note 3

Mechanical specifications: For 828MP and 828 the single bay Effective Area Front is 0.05 sq m (0.54 sq ft), Effective Area Side is 0.19 sq m (2.04 sq ft). For 828HP, single bay Effective Area Front is 0.06 sq m (0.65 sq ft), Effective Area Side is 0.25 sq m (2.35 sq ft).

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828DA Series

SPECIFICATIONS	828-4DA	828-5DA	828-6DA	828-8DA
Operating Frequency Ranges, MHz	88 - 98,94 - 104,98 - 108	88 - 98,94 - 104,98 - 108	88 - 98,94 - 104,98 - 108	88 - 98,94 - 104,98 - 108
Number of Levels	4	5	6	8
Gain per Plane of Polarization, dBd	5.61	6.55	7.32	8.55
Input Connector	Single element 7/8" EIA, Array 7/8" EIA; 1-5/8" EIA; 3-1/8" EIA	Single element 7/8" EIA, Array 7/8" EIA; 1-5/8" EIA; 3-1/8" EIA	Single element 7/8" EIA, Array 7/8" EIA; 1-5/8" EIA; 3-1/8" EIA	Single element 7/8" EIA, Array 7/8" EIA; 1-5/8" EIA; 3-1/8" EIA
Power Rating, kW	20 Note#2	25 Note#2	30 Note#2	40 Note#2
Weight, kg (lb)	12 (27) Single Bay	12 (27) Single Bay	12 (27) Single Bay	12 (27) Single Bay
Effective Area Front (full antenna), sq m (sq ft)	0.05 (0.54) Single Bay	0.05 (0.54) Single Bay	0.05 (0.54) Single Bay	0.05 (0.54) Single Bay
Effective Area Side (full antenna), sq m (sq ft)	0.19 (2.04) Single Bay	0.19 (2.04) Single Bay	0.19 (2.04) Single Bay	0.19 (2.04) Single Bay
Pressurization Operational, kPa (psi)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)
Pressurization Test, kPa (psi)	100 (15)	100 (15)	100 (15)	100 (15)

SPECIFICATIONS	828-10DA	828-12DA	828HP-2DA	828HP-4DA
Operating Frequency Ranges, MHz	88 - 98,94 - 104,98 - 108	88 - 98,94 - 104,98 - 108	88 - 108	88 - 108
Number of Levels	10	12	2	4
Gain per Plane of Polarization, dBd	9.51	10.31	1.45	4.16
Input Connector	Single element 7/8" EIA, Array 7/8" EIA; 1-5/8" EIA; 3-1/8" EIA	Single element 7/8" EIA, Array 7/8" EIA; 1-5/8" EIA; 3-1/8" EIA	Single element 7/8" EIA, Array 7/8"EIA; 1-5/8" EIA; 3-1/8" EIA; 4-1/2" EIA	Single element 7/8" EIA, Array 7/8"EIA; 1-5/8" EIA; 3-1/8" EIA; 4-1/2" EIA
Power Rating, kW	50 Note#2	50 Note#2	10 Note#2	20 Note#2
Weight, kg (lb)	12 (27) Single Bay	12 (27) Single Bay	14.5 (32) Single Bay	14.5 (32) Single Bay
Effective Area Front (full antenna), sq m (sq ft)	0.05 (0.54) Single Bay	0.05 (0.54) Single Bay	0.06 (0.65) Single Bay	0.06 (0.65) Single Bay
Effective Area Side (full antenna), sq m (sq ft)	0.19 (2.04) Single Bay	0.19 (2.04) Single Bay	0.25 (2.35) Single Bay	0.25 (2.35) Single Bay
Pressurization Operational, kPa (psi)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)
Pressurization Test, kPa (psi)	100 (15)	100 (15)	100 (15)	100 (15)

Note 1

Arrays are factory tuned for a broadband performance and a return loss of 20dB across the specified bandwidth is achieved. Optional factory tuning for optimum narrow band performance will achieve a 30dB return loss over +/- 500KHz from the specified frequency. Arrays may be supplied un-tuned with a resulting return loss of 17 dB.

Note 2

Array power ratings are limited by the radiator and power divider input connectors used. Typical limits are : 7-16 DIN 3.5kW, 7/8" EIA 5kW, 1-5/8" EIA 10kW and 3-1/8" EIA 40kW

Note 3

Mechanical specifications: For 828MP and 828 the single bay Effective Area Front is 0.05 sq m (0.54 sq ft), Effective Area Side is 0.19 sq m (2.04 sq ft). For 828HP, single bay Effective Area Front is 0.06 sq m (0.65 sq ft), Effective Area Side is 0.25 sq m (2.35 sq ft).

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828DA Series

SPECIFICATIONS	828HP-6DA	828HP-8DA	828HP-10DA	828HP-12DA
Operating Frequency Ranges, MHz	88 - 108	88 - 108	88 - 108	88 - 108
Number of Levels	6	8	10	12
Gain per Plane of Polarization, dBd	5.6	6.75	7.67	8.88
Input Connector	Single element 7/8" EIA, Array 7/8"EIA; 1-5/8" EIA; 3-1/8" EIA; 4-1/2" EIA	Single element 7/8" EIA, Array 7/8"EIA; 1-5/8" EIA; 3-1/8" EIA; 4-1/2" EIA	Single element 7/8" EIA, Array 7/8"EIA; 1-5/8" EIA; 3-1/8" EIA; 4-1/2" EIA	Single element 7/8" EIA, Array 7/8"EIA; 1-5/8" EIA; 3-1/8" EIA; 4-1/2" EIA
Power Rating, kW	30 Note#2	40 Note#2	50 Note#2	60 Note#2
Weight, kg (lb)	14.5 (32) Single Bay	14.5 (32) Single Bay	14.5 (32) Single Bay	14.5 (32) Single Bay
Effective Area Front (full antenna), sq m (sq ft)	0.06 (0.65) Single Bay	0.06 (0.65) Single Bay	0.06 (0.65) Single Bay	0.06 (0.65) Single Bay
Effective Area Side (full antenna), sq m (sq ft)	0.25 (2.35) Single Bay	0.25 (2.35) Single Bay	0.25 (2.35) Single Bay	0.25 (2.35) Single Bay
Pressurization Operational, kPa (psi)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)
Pressurization Test, kPa (psi)	100 (15)	100 (15)	100 (15)	100 (15)

SPECIFICATIONS	828HP-16DA
Operating Frequency Ranges, MHz	88 - 108
Number of Levels	16
Gain per Plane of Polarization, dBd	9.88
Input Connector	Single element 7/8" EIA, Array 7/8"EIA; 1-5/8" EIA; 3-1/8" EIA; 4-1/2" EIA
Power Rating, kW	70 Note#2
Weight, kg (lb)	14.5 (32) Single Bay
Effective Area Front (full antenna), sq m (sq ft)	0.06 (0.65) Single Bay
Effective Area Side (full antenna), sq m (sq ft)	0.25 (2.35) Single Bay
Pressurization Operational, kPa (psi)	10 - 35 (1.5 - 5)
Pressurization Test, kPa (psi)	100 (15)

Note 1

Arrays are factory tuned for a broadband performance and a return loss of 20dB across the specified bandwidth is achieved. Optional factory tuning for optimum narrow band performance will achieve a 30dB return loss over +/- 500KHz from the specified frequency. Arrays may be supplied un-tuned with a resulting return loss of 17 dB.

Note 2

Array power ratings are limited by the radiator and power divider input connectors used. Typical limits are : 7-16 DIN 3.5kW, 7/8" EIA 5kW, 1-5/8" EIA 10kW and 3-1/8" EIA 40kW

Note 3

Mechanical specifications: For 828MP and 828 the single bay Effective Area Front is 0.05 sq m (0.54 sq ft), Effective Area Side is 0.19 sq m (2.04 sq ft). For 828HP, single bay Effective Area Front is 0.06 sq m (0.65 sq ft), Effective Area Side is 0.25 sq m (2.35 sq ft).

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818 Series

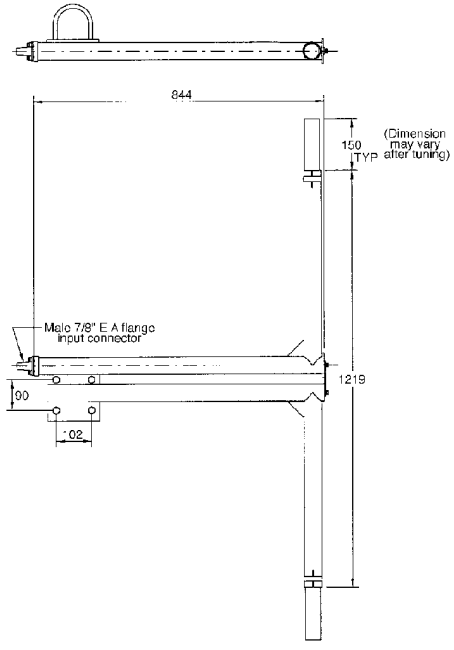
These vertically polarized antennas for FM broadcasting applications are intended for use where low wind loadings are required. They are designed to be sidemounted to a tower leg or pole and optional mounting brackets are available for this purpose.

- Rugged construction for maximum corrosion protection
- Broadband operation
- Multichannel use if required
- Optional pressurization
- Low windload to minimize tower or mast costs
- Vertical polarization
- Temperature range -40 to +60 degrees C available

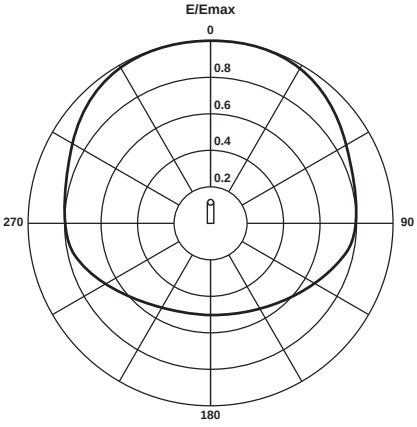
The 818 series are fabricated from stainless steel and will handle up to 5kW per bay.

Multiple element arrays are supplied as a complete package including power dividers and distribution cables. An optional input tuner ensures optimum VSWR performance after installation as it enables the effects of tower steelwork to be eliminated. Beam tilt and null fill can be provided on request. The 818 series can be arrayed in multiple bays as required.

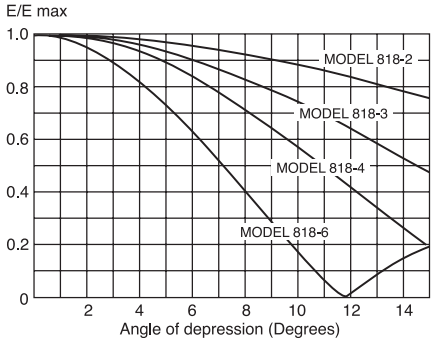
818-4



818-1 Antenna



Azimuth Radiation Pattern (Typical)



Vertical Radiation Pattern

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818 Series

SPECIFICATIONS (ALL MODELS)	
Frequency Range, MHz	87.5 - 108
Polarization	Vertical
Azimuth Radiation Pattern	Omni directional + 3 dB Note#1
Return Loss, dB	Typically 20 over 6MHZ bandwidth . Tunable within band
Impedance, ohms	50 unbalanced
Dimensions (Height or Length), cm (in)	151(59-1/2) Single antenna
Dimensions (Width), cm (in)	6 (2-3/8) Single antenna
Dimensions (Depth), cm (in)	84 (33-1/8) Single antenna
Mounting (Standard), mm (in)	Brackets for clamp diameter 43 - 76mm (1-3/4 - 3)
Pressurization Operational, kPa (psi)	10 - 35 (1.5 - 5) 7/8" EIA Version
Pressurization Test, kPa (psi)	100 (15) 7/8" EIA Version

SPECIFICATIONS	818-1	818-2	818-3	818-4
Nominal Gain (Mid-band), dBd	1.94	4.94	6.64	7.94
Input Connector	7-16 DIN; 7/8" EIA Flange	7-16 DIN; 7/8" EIA Flange ; 1-5/8" EIA Flange	7/8" EIA Flange ; 1-5/8" EIA Flange	7/8" EIA Flange ; 1-5/8" EIA Flange; 3-1/8" EIA Flange
Power Rating, kW	5 Note#2	10 Note#2	15 Note#2	20 Note#2
Weight, kg (lb)	11 (24)	38 (84)	60 (132)	82 (181)
Effective Area Front (full antenna), sq m (sq ft)	0.20 (2.15) Note#3	0.40 (4.3) Note#3	0.60 (6.5) Note#3	0.80 (8.6) Note#3
Effective Area Power Divider, sq m (sq ft)	Note#3	0.09 (1.0) Note#3	0.13 (1.4) Note#3	0.13 (1.4) Note#3
Wind Load @ 50 m/sec Front, kN (lb)	0.24 (50) Note#5	0.58 (130) Note#4 #5	0.87 (196) Note#4 #5	1.10 (247) Note#4 #5

SPECIFICATIONS	818-6
Nominal Gain (Mid-band), dBd	9.74
Input Connector	3 1/8" EIA Flange
Power Rating, kW	30 Note#2
Weight, kg (lb)	135 (298)
Effective Area Front (full antenna), sq m (sq ft)	1.00 (1.08) Note#3
Effective Area Power Divider, sq m (sq ft)	0.25 (2.7) Note#3
Wind Load @ 50 m/sec Front, kN (lb)	1.48 (330) Note#4 #5

Note 1
When antenna is mounted on a mast/tower with a face width of less than 150mm (5.9").
Note 2
Input power is limited to 5kW if a 7/8" connector is used.
Note 3
Connecting cables are not included in calculations - 0.03sq m. per metre length should be allowed.
Note 4
Power divider included and considered adjacent to antennas.
Note 5
Calculated in accordance with AS1170-1981, Part 2 "SAA Loading Code - Wind Forces".

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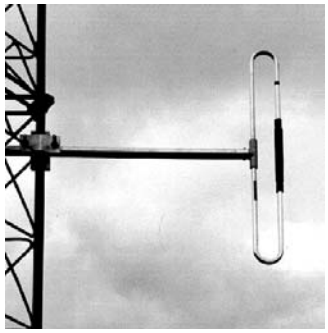
SL1 Series

These vertically polarized antennas for FM broadcasting applications are intended for use where low wind loadings are required. They are designed to be sidemounted to a tower leg or pole and optional mounting brackets are available for this purpose.

- Rugged construction for maximum corrosion protection
- Broadband operation
- Multichannel use if required
- Low windload to minimize tower or mast costs
- Vertical polarization

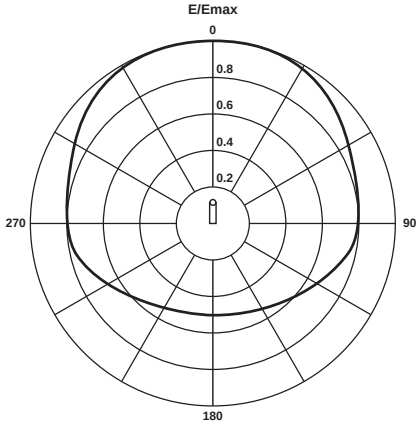
The SL1 series is intended for low power applications, with a maximum of 500W input power. These versions cover the full FM band without adjustment, although factory optimization on the frequencies of operation is possible. SL1 antennas are constructed of heavy gauge, corrosion resistant aluminum tubing (6000 series) and are extremely robust whilst having very low weights and wind loads. A variety of mounting clamps are available to facilitate mounting to most tubular or lattice structures.



SL1

Multiple element arrays are supplied as a complete package including power dividers and distribution cables. An optional input tuner ensures optimum VSWR performance after installation as it enables the effects of tower steelwork to be eliminated. Beam tilt and null fill can be provided on request.

SPECIFICATIONS	SL1-1	SL1-2	SL1-4
Frequency Range, MHz	87.5 - 108	87.5 - 108	87.5 - 108
Polarization	Vertical	Vertical	Vertical
Nominal Gain (Mid-band), dBd	0	3	6
Return Loss, dB	Typically 17 over 87.5 - 108MHZ band	Typically 17 over 87.5 - 108MHZ band	Typically 17 over 87.5 - 108MHZ band
Input Connector	N type	N type	N type
Power Rating, kW	0.5	0.5	0.5
Impedance, ohms	50 unbalanced	50 unbalanced	50 unbalanced
Weight, kg (lb)	3.5 (7.7)	10 (22)	24 (53)
Dimensions (Height or Length), cm (in)	130 (51)	390 154)	600 (236)
Effective Area Front (full antenna), sq m (sq ft)	0.2 (2.15)	0.45 (4.8)	0.87 (9.4)



Azimuth Radiation Pattern (Typical)

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902CP Series

These FM Yagi antennas are designed for FM broadcasting applications which require circular or elliptical polarization and low windload.

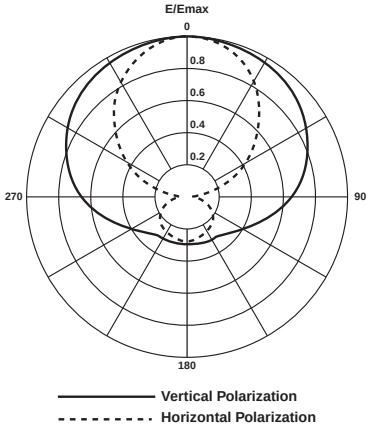
- The 902CP series have been developed to provide broadband operation over the range 87.5 to 108MHz. This provides broadcasters with the advantage of sharing antenna systems and reducing establishment costs.

The 902CP antenna elements are of stainless steel construction thus guaranteeing long life and maintenance free operation.

The antenna can be designed for any number of levels and is designed for easy sidemounting installation. Tower or mast costs are also minimized because of the low antenna windload. Multiple arrays are supplied as a complete package including 50 ohm flexible interconnecting cables and an appropriate power divider.

902CP

SPECIFICATIONS	902CP
Frequency Range, MHz	87.5 - 108
Polarization	Circular,Elliptical
Gain per Plane of Polarization, dBd	1-Bay 1.0;2-Bay 4.0;3-Bay 5.8;4-Bay 7.3;6-Bay 9.2;8-Bay 10.8
Return Loss, dB	> 20
Input Connector	2 x 7/8" EIA Flange
Power Rating per Input, kW	1-Bay 5;2-Bay 10;3-Bay 15;4-Bay 20;6-Bay 30;8-Bay 40
Impedance, ohms	50 unbalanced
Weight, kg (lb)	23 (51) Single Bay
Mounting (Standard), mm (in)	Suitable for 60mm (2-3/8) or 90mm (3-1/2) OD pole
Effective Area Front (full antenna), sq m (sq ft)	0.34 (3.66)
Effective Area Side (full antenna), sq m (sq ft)	0.30 (3.23)
Wind Load @ 50 m/sec Front, kN (lb)	0.5 (100)



Horizontal Radiation Patterns

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606L Series

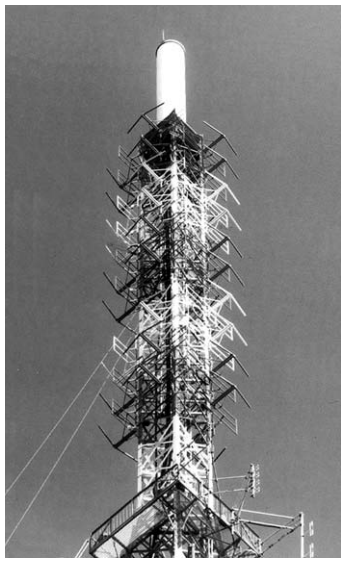
The 606L series of panels are low wind load antennas suitable to provide a customized coverage for any single TV channel in Band I.

- Low wind load
- Pressurizable to dipole feed points
- Feed system radomes available for snow and ice conditions
- Temperature range -40 to +60 degrees C available
- Knocked down for easy transport
- Four sided array design
- Rugged galvanized steel construction
- Horizontal polarization - 606L
- Vertical polarization - 606LV
- Array design provides both directional and omnidirectional patterns as well as beam tilt and null fill to suit individual customer requirements, contact RFS for details

The 606L (and 606LV) panel comprises two separate dipole and screen assemblies vertically spaced a half wavelength apart. Each assembly has a half wave dipole mounted on a screen with a 7/8" EIA input and must be mounted in pairs. Both the dipole and screen are made from galvanized steel tube for maximum strength and minimum wind load. The open construction of these panels permits easy inspection and maintenance after installation.

The 606L (and 606LV) antenna can be arrayed to provide the required coverage for a particular service area. Array design is carried out by RFS engineers to provide both directional and omnidirectional patterns as well as beam tilt and null fill tailored to the customer's specification. Panels are fed through a power divider network which is usually fully pressurizable and designed to meet the power handling requirements of the array. As each half panel is rated at 5kW, high power ratings are easily achievable. To minimize shipping costs panels are supplied in "knock down" form with dipoles, screens, power dividers and interconnecting cables in separate packages.

606L



606L-20D

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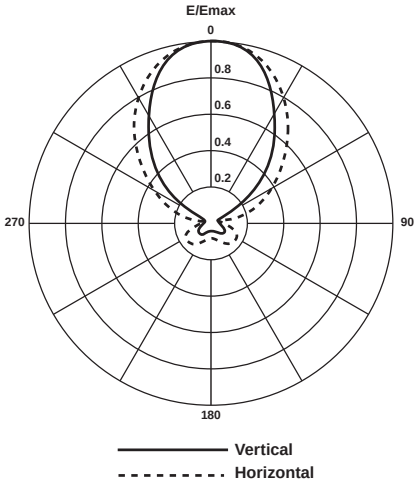
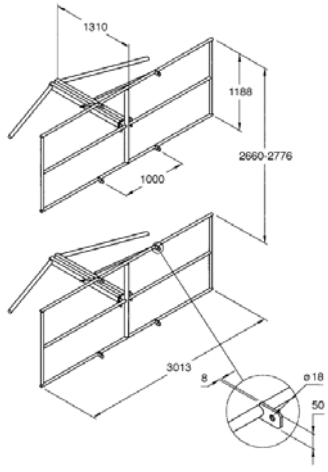
606L Series

SPECIFICATIONS	606L	606LV
Frequency Range, MHz	44 - 88	44 - 88
Polarization	Horizontal	Vertical
Number of Channels	Single	Single
Nominal Gain (Mid-band), dBd	7.5	7.5
Half Power Beamwidth Azimuth, degrees	64	64
Return Loss, dB	26 Vision, 23 across channel	26 Vision, 23 across channel
Input Connector	2 x 7/8" EIA Flange / Panel	2 x 7/8" EIA Flange / Panel
Power Rating per Input, kW	5	5
Impedance, ohms	50 unbalanced	50 unbalanced
Weight, kg (lb)	130 (287)	130 (287)
Mounting (Standard), mm (in)	8 x 16mm (5/8) bolts	8 x 16mm (5/8) bolts
Recommended Spacing between Bays, cm (in)	273 (107)	273 (107)
Effective Area Front (full antenna), sq m (sq ft)	1.38 (14.85)	1.38 (14.85)
Effective Area Side (full antenna), sq m (sq ft)	0.78 (8.39)	1.2 (12.9)
Design Wind Speed (max), km/h (mph)	240 (150)	240 (150)
Pressurization Operational, kPa (psi)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)
Material - Insulators	PTFE	PTFE
Material - Radiators	Hot Dipped Galvanized steel	Hot Dipped Galvanized steel
Material - Reflecting Screen	Hot Dipped Galvanized steel	Hot Dipped Galvanized steel

Note 1
Dimensions and weights are for Ch E3 (54 to 61 MHz). These figures will vary with the selected channel.



Radiation Pattern



606L Antenna

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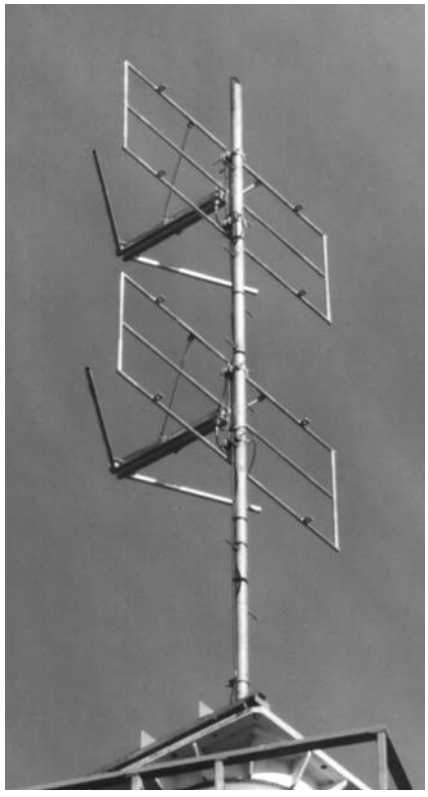
607L Series

The 607L series of panels are similar to the 606L having a low wind load and suitable for providing a customized coverage for any single TV channel in Band I. Whereas the 606L is designed for four sided array design, the 607L has a broader beamwidth suitable for arrays mounted on triangular towers.

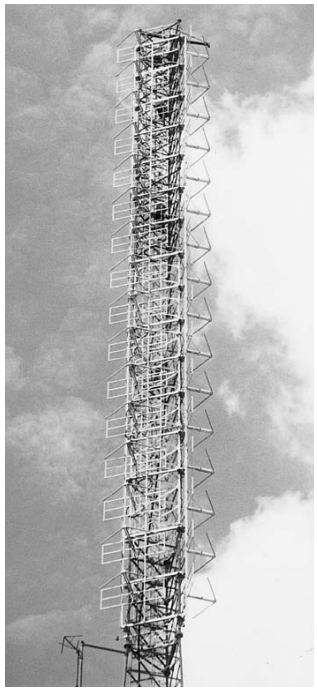
- Low wind load
- Pressurizable to dipole feed points
- Feed system radomes available for snow and ice conditions
- Temperature range -40 to +60 degrees C available
- Knocked down for easy transport
- Three sided array design
- Rugged galvanized steel construction
- Horizontal polarization
- Array design by RFS engineers provides both directional or omnidirectional patterns as well as beam tilt and null fill tailored to individual customer requirements, contact RFS for details

The 607L panel comprises two separate dipole and screen assemblies vertically spaced a half wavelength apart. Each assembly has a half wave dipole mounted on a screen with a 7/8" EIA input and must be mounted in pairs. Both the dipole and screen are made from galvanized steel tube for maximum strength and minimum wind load. The open construction of these panels permits easy inspection and maintenance after installation.

The 607L antenna can be arrayed to provide the required coverage for a particular service area. Array design is carried out by RFS engineers to provide both directional and omnidirectional patterns as well as beam tilt and null fill tailored to the customer's specification. Panels are fed through a power divider network which is usually fully pressurizable and designed to meet the power handling requirements of the array. As each half panel is rated at 5kW, high power ratings are easily achievable. To minimize shipping costs panels are supplied in "knock down" form with dipoles, screens, power dividers and interconnecting cables in separate packages.



607L



607L-24

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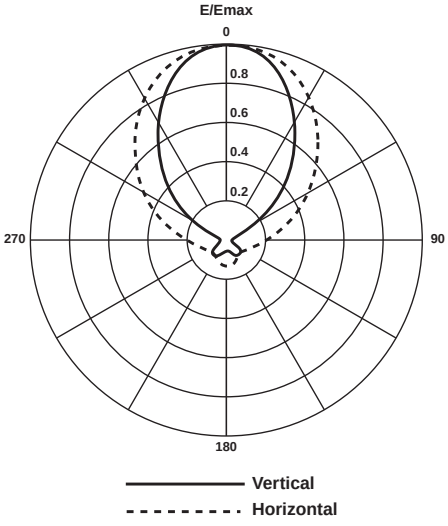
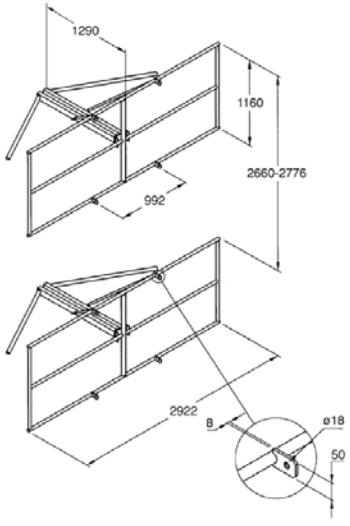
607L Series

SPECIFICATIONS	607L
Frequency Range, MHz	47 - 88
Polarization	Horizontal
Number of Channels	Single
Nominal Gain (Mid-band), dBd	7.0
Half Power Beamwidth Azimuth, degrees	77
Return Loss, dB	23 Vision, 20 across channel
Input Connector	2 x 7/8" EIA Flange / Panel
Power Rating per Input, kW	5
Impedance, ohms	50 unbalanced
Weight, kg (lb)	120 (265)
Mounting (Standard), mm (in)	8 x 16mm (5/8) bolts
Recommended Spacing between Bays, cm (in)	273 (107)
Effective Area Front (full antenna), sq m (sq ft)	1.28 (13.77)
Effective Area Side (full antenna), sq m (sq ft)	1.08 (11.62)
Design Wind Speed (max), km/h (mph)	240 (150)
Pressurization Operational, kPa (psi)	10 - 35 (1.5 - 5)
Pressurization Test, kPa (psi)	100 (15)
Material - Insulators	PTFE
Material - Radiators	Hot Dipped Galvanized steel
Material - Reflecting Screen	Hot Dipped Galvanized steel

Note 1
Dimensions and weights are for Ch E3 (54 to 61 MHz). These figures will vary with the selected channel.



Radiation Pattern



607L Antenna

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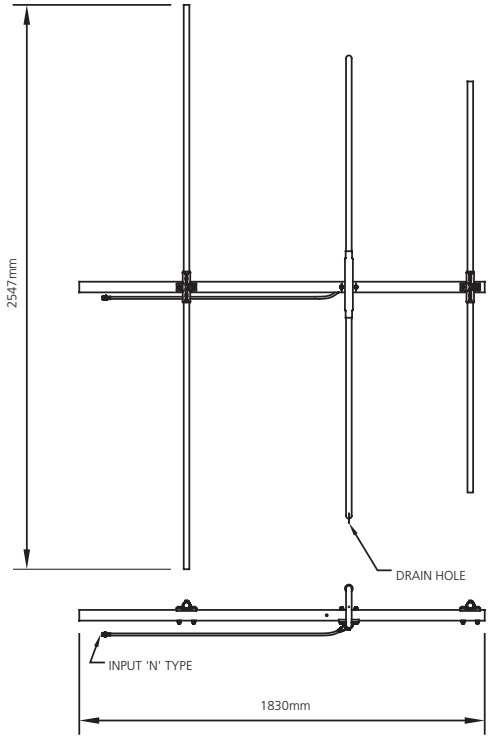
YLV Series

The YLV3 yagi antenna is suitable for use as an element in VHF transmitting arrays. By arranging a number of these elements around a suitable tower or mast an omnidirectional or a number of directional radiation patterns can be achieved. The YLV3 can also be used as a stand alone antenna.

- Suitable for use as an array element or for stand alone operation
- Engineered for transmission of both Digital and Analog TV/Radio
- Light weight and low wind
- All elements are DC grounded for lightning protection

The antenna can be center mounted for single antenna applications or by an extended boom for mounting to tower or mast in an array configuration. Bracing kits are supplied as standard with antennas that require them. Mounting hardware is stainless steel. To facilitate package and transport, yagi antennas are transported as components. Detailed assembly instructions are provided. Mounting clamps and tower brackets are available to suit a range of tower types. Contact RFS with your requirements.



Y203 Yagi Antenna

YLV3 - Dimensions shown for the model covering 47 - 54 MHz

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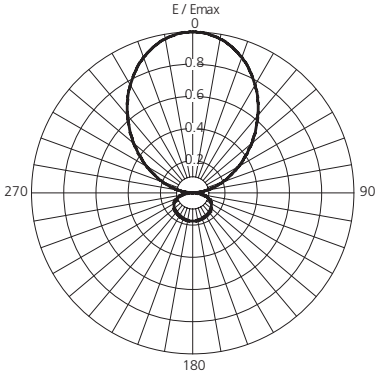
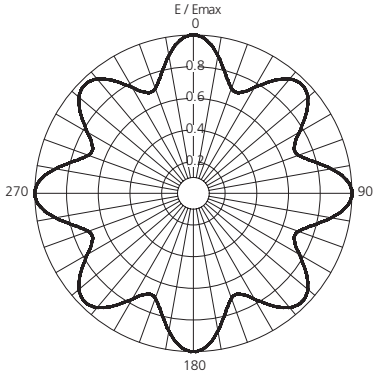
YLV Series

SPECIFICATIONS	YLV3
Frequency Range, MHz	47 - 108
Polarization	Horizontal
Number of Channels	Single channel up to 8 MHz
Nominal Gain (Mid-band), dBd	4.2
Return Loss, dB	>21 (typically 26 across channel)
Input Connector	N type
Power Rating per Input, kW	0.5
Impedance, ohms	50 unbalanced
Operating Temperature Range, degrees C	-10 to +50
Weight, kg (lb)	17 (37)
Dimensions (Height or Length), cm (in)	20
Dimensions (Width), cm (in)	325.4
Dimensions (Depth), cm (in)	222.0
Effective Area Front (full antenna), sq m (sq ft)	0.46 (4.95)
Effective Area Side (full antenna), sq m (sq ft)	0.13 (1.4)
Design Wind Speed (max), km/h (mph)	240 (150)
Wind Load @ 50 m/sec Front, kN (lb)	0.69 (155)
Wind Load @ 50 m/sec Side, kN (lb)	0.2 (45)
Material - Support Pole / Mounting	Stainless Steel
Material - Radiators	6000 Series aluminum alloy



Azimuth Radiation Pattern
Single Antenna

RADIATION PATTERN - Typical Azimuth Single antenna



Azimuth Radiation Pattern
4-Antenna array

RADIATION PATTERN - Typical Azimuth Array of four antennas on square mast

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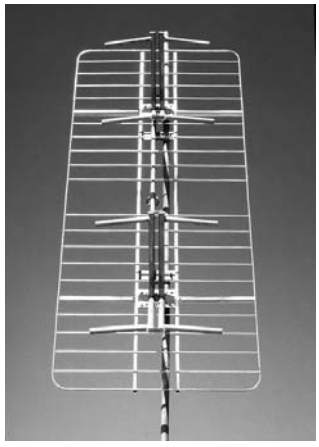
655, 656 Series

This series of panel antennas is ideal for four sided array design to provide a customized coverage for single or multi-station use in Band III. Model 655 has a nominal gain of 8 dBd and can be used for horizontally polarized services. Model 656 is horizontally polarized and provides a nominal gain of 11dBd.

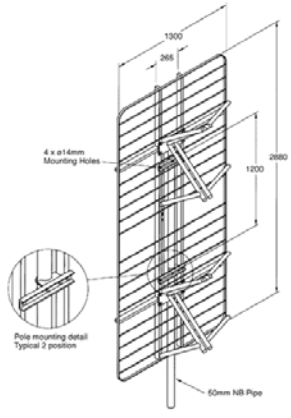
- Cyclone rated
- Rugged galvanized steel construction for maximum corrosion protection
- Stainless steel version available on request
- Low wind load
- Pressurizable coaxial feed
- Four sided array design
- Low VSWR full band operation
- Suitable for multi-station use, DAB and DTV
- High power rating
- Ideal array element allowing for a variety of horizontal radiation patterns to suit most requirements, contact RFS for details
- Medium power, unpressurized version available
- Temperature range -40 to +60 degrees C available

Construction from thick walled tube and solid steel bar gives a heavy duty panel which is designed for operation in very harsh environments. This design also ensures ideal hot dip galvanizing for optimum corrosion protection. Colors are available for aviation visibility and even further corrosion protection. The coaxial feed system can be fully pressurized and features twin 'O' ring seals on the feed point insulators. The panels are tolerant of light icing (radomes are available for use under heavy icing conditions down to -40 degrees C) and have a very low VSWR (typically less than 1.05:1) over the entire 174 - 230MHz band depending on the system configuration.

These panels are ideal array elements having low sidelobes, low mutual couplings between panels and high power ratings across the full band. This results in complete antenna systems that have very wide VSWR and pattern bandwidth. The ability to utilize larger tower cross sections allows support for a top mounted UHF antenna such as the PHP or PVP UHF antenna arrays. This provides a powerful combination for delivering DTV and/or DAB systems customized to suit the coverage requirements of the customer.



656 Panel



656 Panel

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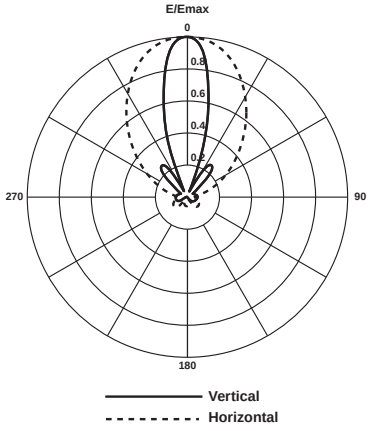
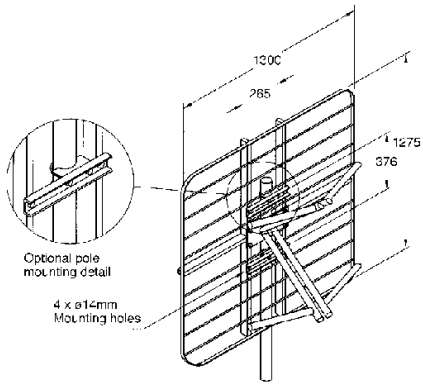
655, 656 Series

SPECIFICATIONS	655	656
Frequency Range, MHz	174 - 230	174 - 230
Polarization	Horizontal	Horizontal
Number of Channels	Multichannel	Multichannel
Nominal Gain (Mid-band), dBd	8.0	11.0
Half Power Beamwidth Azimuth, degrees	66	66
Return Loss, dB	26	26
Input Connector	7-16 DIN; 7/8" EIA Flange	7-16 DIN; 7/8" EIA Flange
Power Rating, kW	2.7; 4 Note#1	2.7; 4 Note#1
Impedance, ohms	50 unbalanced	50 unbalanced
Weight, kg (lb)	35 (77)	80 (177)
Mounting (Standard), mm (in)	4 x 12mm (1/2) bolts	4 x 12mm (1/2) bolts
Effective Area Front (full antenna), sq m (sq ft)	0.41 (4.45)	0.83 (8.90)
Effective Area Side (full antenna), sq m (sq ft)	0.53 (5.69)	1.06 (11.38)
Design Wind Speed (max), km/h (mph)	240 (150)	240 (150)
Pressurization Operational, kPa (psi)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)
Pressurization Test, kPa (psi)	100 (15) 7/8" EIA Version	100 (15) 7/8" EIA Version
Material - Insulators	PTFE	PTFE
Material - Radiators	Hot Dipped Galvanized steel	Hot Dipped Galvanized steel Note#2
Material - Reflecting Screen	Hot Dipped Galvanized steel	Hot Dipped Galvanized steel Note#2

Note1
Power rating is limited by the input connector type. 2.7kW for 7-16 DIN, 4kW for 7/8" EIA
Note2
Stainless steel version available on request



Radiation Pattern



655 Panel

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657, 658 series

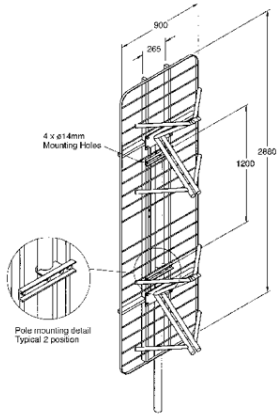
This series of panel antennas has been designed for three sided arrays and provides a customized horizontally polarized coverage for single or multi-station use in Band III. Model 657 has a nominal gain of 7dBd and the 658 has a nominal gain of 10dBd.

- Suitable for single or dual channel use
- Three sided array design - lower cost
- Cyclone rated
- Rugged galvanized steel construction for maximum corrosion protection
- Low wind load
- Pressurizable coaxial feed
- Horizontal polarization
- Array design allows a variety of standard horizontal radiation patterns as well as customized patterns, contact RFS for details
- Medium power, unpressurized version available
- Temperature range -40 to +60 degrees C available

Construction from thick walled tube and solid steel bar gives a heavy duty panel which is designed for operation in very harsh environments. This design also ensures ideal hot dip galvanizing for optimum corrosion protection. Colors are available for aviation visibility and even further corrosion protection. The coaxial feed system can be fully pressurized and features twin 'O' ring seals on the feed point insulators. The panels are tolerant of light icing (radomes are available for use under heavy icing conditions down to -40 degrees C) and has a very low VSWR (typically less than 1.05:1) over the entire 174 - 230MHz band depending on the system configuration.

These panels are ideal array elements for triangular mast with a 1.2m face and can provide omnidirectional patterns with less than ±1dB variation. By varying the number and positions of panels and feed amplitude/phase, patterns can be customized to optimize coverage over a given service area. The use of three panels around the structure offers significant cost and wind load reduction over four sided arrangements.

657 Panel



658 Panel

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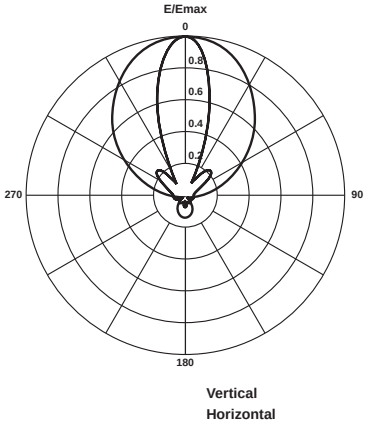
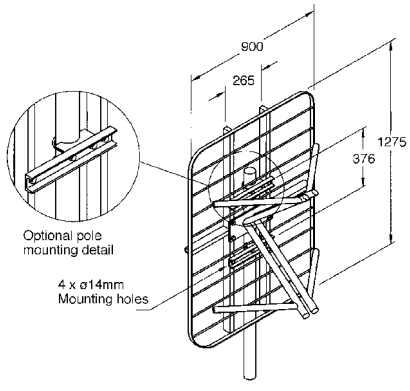
657, 658 series

SPECIFICATIONS	657	658
Frequency Range, MHz	174 - 230	174 - 230
Operating Frequency Ranges, MHz	174 - 202,202 - 230	174 - 202,202 - 230
Number of Channels	Multichannel	Multichannel
Nominal Gain (Mid-band), dBd	7.0	10.0
Half Power Beamwidth Azimuth, degrees	77	77
Return Loss, dB	23	23
Input Connector	7-16 DIN; 7/8" EIA Flange	7-16 DIN; 7/8" EIA Flange
Power Rating, kW	2.7; 4 Note#1	2.7; 4 Note#1
Impedance, ohms	50 unbalanced	50 unbalanced
Weight, kg (lb)	33 (73)	75 (166)
Mounting (Standard), mm (in)	4 x 12mm (1/2) bolts	4 x 12mm (1/2) bolts
Effective Area Front (full antenna), sq m (sq ft)	0.40 (4.30)	0.80 (8.61)
Effective Area Side (full antenna), sq m (sq ft)	0.50 (5.38)	1.10 (11.83)
Design Wind Speed (max), km/h (mph)	240 (150)	240 (150)
Pressurization Operational, kPa (psi)	10 - 35 (1.5 - 5) 7/8" EIA Version	10 - 35 (1.5 - 5) 7/8" EIA Version
Pressurization Test, kPa (psi)	100 (15) 7/8" EIA Version	100 (15) 7/8" EIA Version
Material - Insulators	PTFE	PTFE
Material - Radiators	Hot Dipped Galvanized steel	Hot Dipped Galvanized steel
Material - Reflecting Screen	Hot Dipped Galvanized steel	Hot Dipped Galvanized steel

Note1
Power rating is limited by the input connector type. 2.7kW for 7-16 DIN, 4kW for 7/8" EIA



Radiation Pattern



657 Panel

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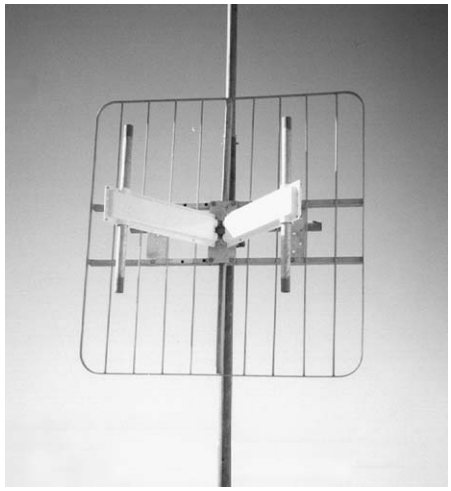
659, 660 Series

This series of panel antennas is ideal for four sided array design to provide a customized coverage for vertically polarized use in Band III. Model 659 has a nominal gain of 8dBd and the model 660 has a nominal gain of 11dBd.

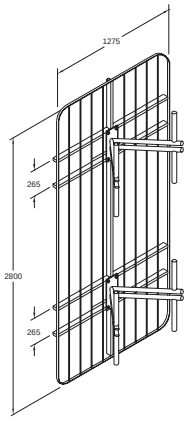
- Suitable for multi station use, DAB and DTV
- Vertical polarization
- Cyclone rated
- Rugged galvanized steel construction for maximum corrosion protection
- Low wind load
- Pressurizable coaxial feed
- Low VSWR full band operation
- Ideal array element allowing for a number of standard horizontal radiation patterns as well as customized patterns, contact RFS for details
- Medium power, unpressurized version available
- Temperature range -40 to +60 degrees C available

Construction from thick walled tube and solid steel bar gives a heavy duty panel which is designed for operation in very harsh environments. This design also ensures ideal hot dip galvanizing for optimum corrosion protection. The coaxial feed system can be fully pressurized and features twin 'O' ring seals on the feed point insulators. The panels are tolerant of light icing (radomes are available for use under heavy icing conditions down to -40 degrees C) and has a very low VSWR (typically less than 1.05:1) over the entire 174 - 230 MHz band depending on the system configuration.

These panels are ideal array elements having low sidelobes, low mutual couplings between panels and high power ratings across the full band. This results in complete antenna systems that have very wide VSWR and pattern bandwidth. The ability to utilize larger tower cross sections allows support for a top mounted UHF antenna such as our PHP or PVP UHF antenna arrays. This provides a powerful combination for delivering DTV and/or DAB systems customized to suit the coverage requirements of the customer.



659 Panel



660 Panel

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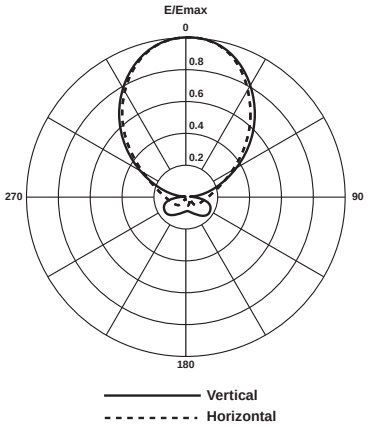
Band III (High VHF) TV/DAB Panel Arrays 174 - 240 MHz

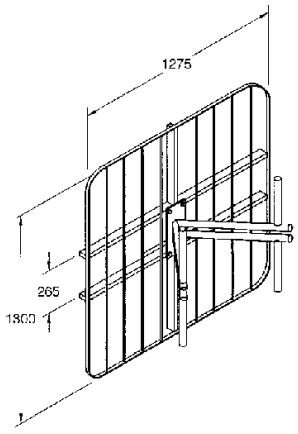
659, 660 Series

SPECIFICATIONS	659	660
Frequency Range, MHz	174 - 240	174 - 240
Polarization	Vertical	Vertical
Number of Channels	Multichannel	Multichannel
Nominal Gain (Mid-band), dBd	8.0	11.0
Half Power Beamwidth Azimuth, degrees	64	64
Return Loss, dB	26	26
Input Connector	7-16 DIN; 7/8" EIA Flange	7-16 DIN; 7/8" EIA Flange
Power Rating, kW	2.7; 4 Note#1	2.7; 4 Note#1
Impedance, ohms	50 unbalanced	50 unbalanced
Weight, kg (lb)	35 (77)	80 (177)
Mounting (Standard), mm (in)	4 x 12mm (1/2) bolts	4 x 12mm (1/2) bolts
Effective Area Front (full antenna), sq m (sq ft)	0.40 (4.30)	0.80 (8.61)
Effective Area Side (full antenna), sq m (sq ft)	0.50 (5.38)	1.10 (11.83)
Design Wind Speed (max), km/h (mph)	240 (150)	240 (150)
Pressurization Operational, kPa (psi)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)
Pressurization Test, kPa (psi)	100 (15) 7/8" EIA Version	100 (15) 7/8" EIA Version
Material - Insulators	PTFE	PTFE
Material - Radiators	Hot Dipped Galvanized steel	Hot Dipped Galvanized steel
Material - Reflecting Screen	Hot Dipped Galvanized steel	Hot Dipped Galvanized steel

Note1
Power rating is limited by the input connector type. 2.7kW for 7-16 DIN, 4kW for 7/8" EIA
Note2
The 659 antenna has been primarily designed as a vertically polarized array element where low levels of mutual coupling exist between vertically stacked radiators. It may be used as a horizontally polarized panel in situations where a single bay (or level) of panels is used. This will provide better array VSWR in that circumstance. Where multiple levels of horizontally polarized antennas are needed, the 655 panel is recommended.



Radiation Pattern



659 Panel

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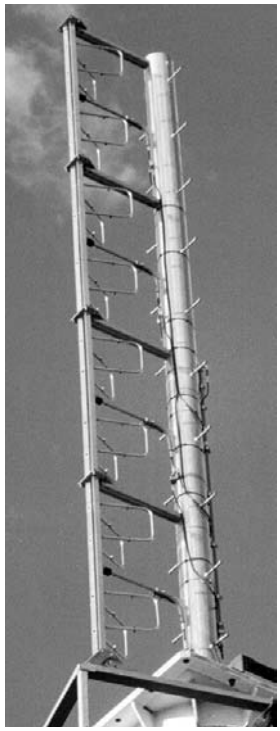
661 Series

Quadrant antennas provide a cost effective top or side mount TV antenna for omnidirectional coverage in Band III.

- Designed for high corrosion resistance and long life in harsh environments
- Includes top mounted hot dip galvanized support pole
- All solid outer, jacketed cables for high reliability
- Stainless steel radiators
- Omnidirectional coverage
- Horizontal polarization
- Available in low power (unpressurized) and medium power (pressurized) versions

Quadrant antennas are ideal for low and medium power single channel Band III TV applications. Coverage is basically omnidirectional and may be altered somewhat by adjustment of the positions of the radiators on the RFS antenna test range. Each bay comprises two radiating elements to give approximately 3.5dBd gain. Up to six bays are available to meet higher gain needs. The antenna system may be operated with pressurized or unpressurized feeders.



661-4

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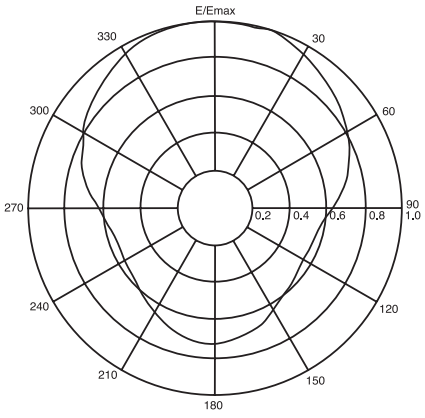
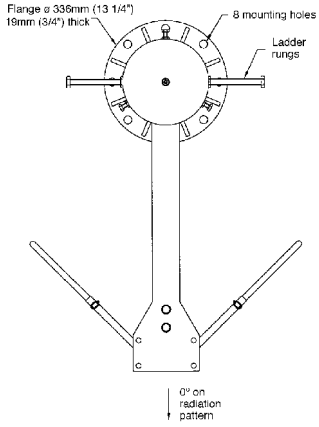
661 Series

SPECIFICATIONS (ALL MODELS)	
Frequency Range, MHz	174 - 230
Polarization	Horizontal
Number of Channels	Single
Return Loss, dB	26 Vision, 23 across channel
Input Connector	7/8" EIA Flange
Power Rating, kW	0.25/bay unpressurized; 2.5/bay pressurized
Impedance, ohms	50 unbalanced
Base Diameter, mm (in)	336 (13-1/4)
Mounting (Standard), mm (in)	8 x 20mm (3/4) bolts on 297mm (11-3/4) PCD
Design Wind Speed (max), km/h (mph)	240 (150)
Pressurization Operational, kPa (psi)	10 - 35 (1.5 - 5)
Pressurization Test, kPa (psi)	100 (15)
Material - Insulators	PTFE
Material - Support Pole / Mounting	Galvanized Steel
Material - Radiators	Stainless Steel

SPECIFICATIONS	661-1	661-2	661-4	661-6
Nominal Gain (Mid-band), dBd	3.5	6.5	9.5	11.0
Weight, kg (lb)	90 (198)	190 (419)	275 (606)	675 (1488)
Effective Area Front (full antenna), sq m (sq ft)	0.871 (9.40)	1.530 (16.50)	2.848 (30.60)	4.166 (44.80)
Effective Area Side (full antenna), sq m (sq ft)	0.823 (8.90)	1.447 (15.60)	2.693 (29.00)	3.939 (42.40)
Base Moment, kNm (lb-ft)	1.786	5.510	19.09	40.84
Base Shear, kN (lb)	1.854	3.256	6.06	8.864



Azimuth Radiation Pattern



Top View

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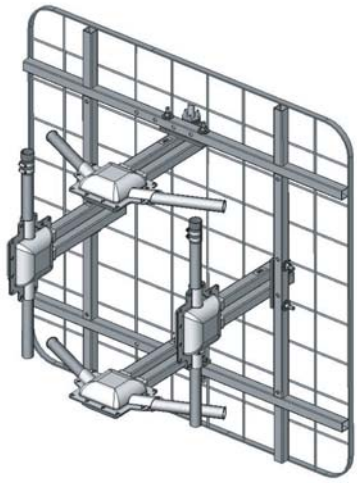
662 Series

The 662 series has been designed for circularly polarized Band III TV/DAB applications or alternatively, combined horizontal and vertical applications in the 174 - 230MHz frequency range and is extremely useful as an antenna building block.

- Horizontal, vertical or circular polarization, depending on model
- Full band (174 – 230MHz) operation is possible
- High power handling capacity
- Designed for high corrosion resistance and long life in harsh environments
- Array design allows a variety of standard radiation patterns and customized patterns to suit customer requirements. Contact RFS for details

Four dipoles are mounted in square configuration off a reflective screen to enable the horizontal and vertical components to be fed separately. It is possible to radiate separate services on horizontal, vertical or circular polarization using the one antenna system with a resultant saving on antenna and tower space and cost. The dipoles are fabricated from stainless steel for maximum corrosion protection. The screen is hot dipped galvanized to international standards. 662CP panels are available with either 2 or 4 input connectors while 662HP and 662VP panels are available with either 1 or 2 input connectors. All panels are available with either 7-16 DIN or 7/8" EIA flanged input connectors. The 7-16 DIN versions are un-pressurized. Contact RFS for details.



662 Antenna

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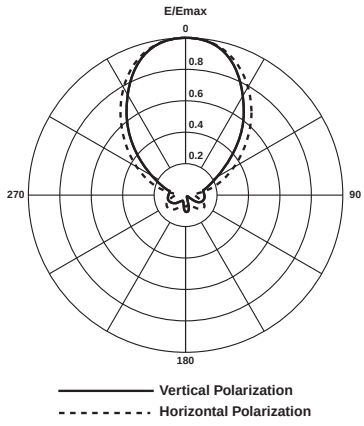
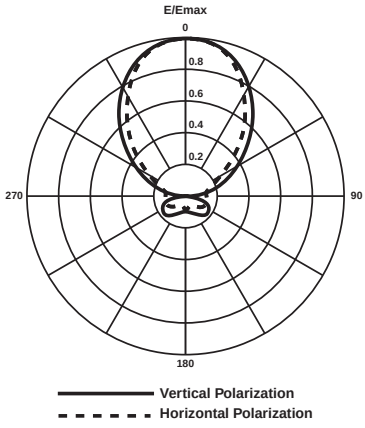
662 Series

SPECIFICATIONS	662CP	662HP	662VP
Frequency Range, MHz	174 - 230	174 - 230	174 - 210; 190 - 240
Polarization	Circular,Horizontal, Vertical	Horizontal	Vertical
Number of Channels	Multichannel	Multichannel	Multichannel
Nominal Gain (Mid-band), dBd	4.5/ plane	4.5/ plane	4.5/ plane
Half Power Beamwidth Azimuth, degrees	65	65	65
Return Loss, dB	26	26	26
Input Connector	4 x 7-16 DIN; 4 x 7/8" EIA Flange,2 x 7-16 DIN; 2 x 7/8" EIA Flange Note#2	2 x 7-16 DIN; 2 x 7/8" EIA Flange,1 x 7-16 DIN; 1 x 7/8" EIA Flange Note#3	2 x 7-16 DIN; 2 x 7/8" EIA Flange,1 x 7-16 DIN; 1 x 7/8" EIA Flange Note#3
Power Rating per Input, kW	2.7; 4 Note#1	2.7; 4 Note#1	2.7; 4 Note#1
Impedance, ohms	50 unbalanced	50 unbalanced	50 unbalanced
Weight, kg (lb)	50 (110)	50 (110)	50 (110)
Mounting (Standard), mm (in)	4 x 12mm (1/2) bolts	4 x 12mm (1/2) bolts	4 x 12mm (1/2) bolts
Effective Area Front (full antenna), sq m (sq ft)	0.75 (8.07)	0.6 (6.46)	0.6 (6.46)
Effective Area Side (full antenna), sq m (sq ft)	0.7 (7.53)	0.6 (6.46)	0.6 (6.46)
Design Wind Speed (max), km/h (mph)	240 (150)	240 (150)	240 (150)
Pressurization Operational, kPa (psi)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)
Pressurization Test, kPa (psi)	100 (15)	100 (15)	100 (15)
Material - Insulators	PTFE	PTFE	PTFE
Material - Radiators	Stainless Steel	Stainless Steel	Stainless Steel
Material - Reflecting Screen	Hot Dipped Galvanized steel	Hot Dipped Galvanized steel	Hot Dipped Galvanized steel

Note1
Power rating is limited by the input connector type. 2.7kW for 7-16 DIN, 4kW for 7/8" EIA
Note2
662CP Model is available with quad or dual inputs
Note3
662HP and 662VP models available with dual or single inputs



Radiation Patterns per Plane of Polarization HRPs



Radiation Patterns per Plane of Polarization VRPs

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663 Series

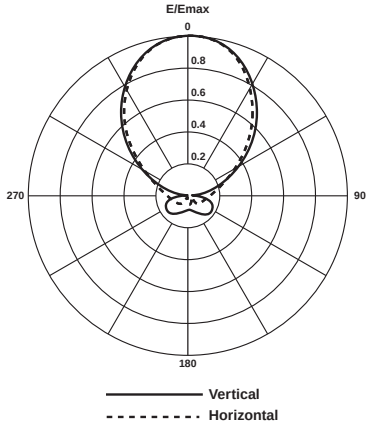
The 663 series has been designed for horizontally polarized VHF Band III TV applications.

- Digital TV compatible
- Horizontal polarization
- High power handling capacity
- Designed for high corrosion resistance and long life in harsh environments

Each panel consists of two dipoles mounted in front of a plane reflector. The baluns are mounted in front of the reflector, and support the dipoles. The panel is fully radomed with a fiberglass reinforced plastic radome. The radiator assemblies may be fitted onto the backscreen in an inverted format when assembled as an array element. The dipole and screen element are fabricated from 6000 series aluminum for maximum corrosion protection. Each panel is fed by a single 7/8" EIA flange connector.

663 Antenna

SPECIFICATIONS	663
Frequency Range, MHz	174 - 230
Polarization	Horizontal
Number of Channels	Multichannel
Nominal Gain (Mid-band), dBd	7.0
Half Power Beamwidth Azimuth, degrees	66
Return Loss, dB	> 26 array element,20 single element
Input Connector	7/8" EIA Flange
Power Rating, kW	4
Peak Voltage Rating, kV	2.7
Impedance, ohms	50 unbalanced
Weight, kg (lb)	50 (110)
Dimensions (Height or Length), cm (in)	120 (47-1/4)
Dimensions (Width), cm (in)	120 (47-1/4)
Dimensions (Depth), cm (in)	66 (26)
Mounting (Standard), mm (in)	8 x 10mm (3/8) bolts
Effective Area Front (full antenna), sq m (sq ft)	0.90 (9.70)
Effective Area Side (full antenna), sq m (sq ft)	1.10 (11.80)
Design Wind Speed (max), km/h (mph)	240 (150)
Wind Load @ 50 m/sec Front, kN (lb)	3.51 (790)
Wind Load @ 50 m/sec Side, kN (lb)	1.90 (427)
Wind Load @ 50 m/sec Rear, kN (lb)	4.75 (1067)
Pressurization Operational, kPa (psi)	10 - 35 (1.5 - 5)
Pressurization Test, kPa (psi)	100 (15)



Radiation Pattern

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Band III (VHF) TV/DAB Sidemount Antennas 174 - 240 MHz

618 Series

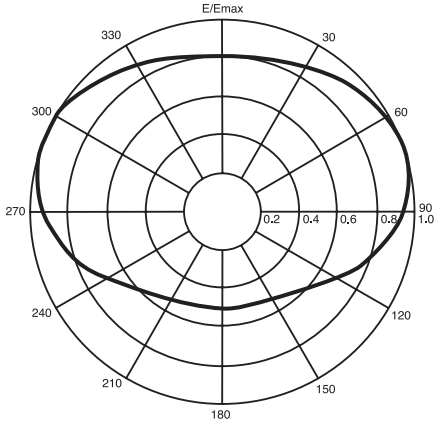
These vertically polarized antennas for TV and DAB broadcasting applications are intended for use where low wind loadings are required. They are designed to be sidemounted to a tower leg or pole and optional mounting brackets are available for this purpose.

- Rugged construction for maximum corrosion protection
- Broadband operation
- Multichannel use if required
- Optional pressurization
- Low windload to minimize tower or mast costs
- Vertical polarization
- Temperature range -40 to +60 degrees C available

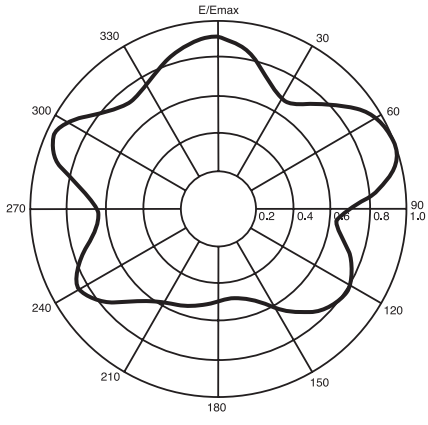
The 618 series are fabricated from stainless steel and will handle up to 4kW input power per bay for standard models. Beam tilt and null fill can be provided on request. Radomes are available for the 618 series if required.

Multiple element arrays are supplied as a complete package including power dividers and distribution cables. An optional input tuner ensures optimum VSWR performance after installation as it enables the effects of tower steelwork to be eliminated. The 618 series can be arrayed with up to 6 or more bays as required. Horizontal radiation patterns can be modified on the RFS antenna test range if required, by adjusting the spacing between the antenna and tower.

618 Antenna



Azimuth Pattern Support pole spaced 0.25 wavelength from tower.



Azimuth Pattern Support pole spaced 1.1 wavelength from tower (reduced bandwidth).

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Band III (VHF) TV/DAB Sidemount Antennas 174 - 240 MHz

618 Series

SPECIFICATIONS (ALL MODELS)	
Frequency Range, MHz	174 - 240
Polarization	Vertical
Azimuth Radiation Pattern	Omnidirectional + 3 dB (Note#1)
Return Loss, dB	Typically 20 over 50MHz, 30 single channel, field tunable
Impedance, ohms	50 unbalanced
Dimensions (Height or Length), cm (in)	69.5 (27-3/8) typical
Dimensions (Width), cm (in)	6 (2-3/8)
Dimensions (Depth), cm (in)	100.8 (39-11/16)
Mounting (Standard), mm (in)	Clamping Dia. 43 - 76mm (1-3/4 - 3)
Pressurization Operational, kPa (psi)	10 - 35 (1.5 - 5)
Pressurization Test, kPa (psi)	100 (15)

SPECIFICATIONS	618-1	618-2	618-3
Nominal Gain (Mid-band), dBd	0	3.0	4.7
Input Connector	7-16 DIN ; 7/8" EIA Flange	7/8"EIA Flange ; 1-5/8" EIA Flange	7/8"EIA Flange ; 1-5/8" EIA Flange
Power Rating, kW	4	8 Note#2	12 Note#2
Weight, kg (lb)	8 (18)	30 (66)	45 (99)
Effective Area Front (full antenna), sq m (sq ft)	Ant 0.11 (1.18) Note #3	Ant 0.22 (2.37) Note #3	Ant 0.33 (3.55) Note #3
Wind Load @ 50 m/sec Front, kN (lb)	0.13 (30) Note#5	0.26 (60) Note#4 #5	0.39 (90) Note#4 #5

SPECIFICATIONS	618-4	618-6
Nominal Gain (Mid-band), dBd	6.0	7.9
Input Connector	7/8"EIA Flange ; 1-5/8" EIA Flange	7/8"EIA Flange ; 1-5/8" EIA Flange
Power Rating, kW	16 Note #2	20
Weight, kg (lb)	65 (143)	105 (231)
Effective Area Front (full antenna), sq m (sq ft)	Ant 0.44 (4.74) Note #3	Ant 0.66 (7.10) Note #3
Wind Load @ 50 m/sec Front, kN (lb)	0.52 (120) Note#4 #5	0.78 (180) Note#4 #5

Note 1
When antenna is mounted on a mast/tower with a face width of less than 150mm.
Note 2
Input power is limited to 5 kW maximum if a 7/8" connector is used.
Note 3
Connecting cables are not included in calculations - 0.03 meters squared per metre length should be allowed.
Note 4
Power divider included and considered adjacent to antennas.
Note 5
Calculated in accordance with AS1170-1989, Part 2:" SAA Loading Code - Wind Forces".

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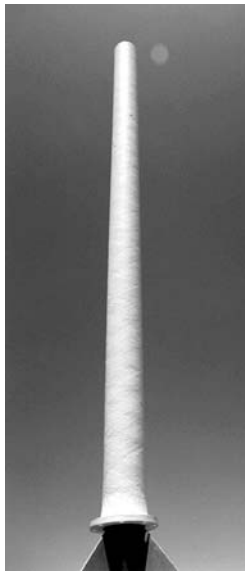
UD Series

The UD series are vertically polarized antennas which are complementary to the CBS series of slot antennas. They are ideal for low powered UHF TV transposer applications.

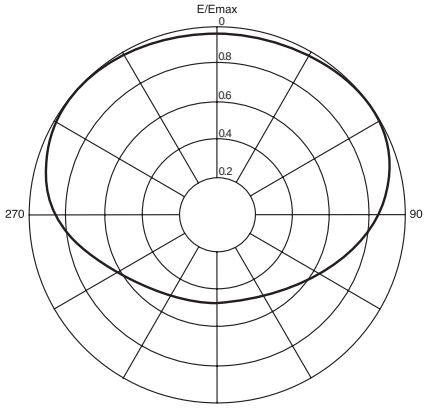
- Broadband design for Digital TV or multichannel use
- Band IV (470-650MHz) and Band V (620-860MHz) versions available
- Designed for maximum corrosion protection
- Vertically polarized
- Cyclone rated
- Can be pressurized if required
- Low wind loading

These dipole antennas are designed for broadband operation. Construction is of aluminum and the antenna is housed within a fiberglass radome which has been designed to survive wind speeds of 230 km/h (143mph).

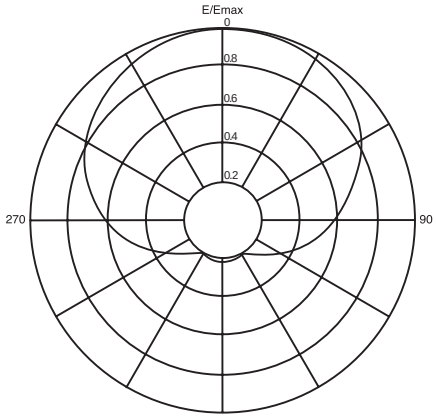
A range of dipole arrays (4 bay, 8 bay and 12 bay) are designed for various gain requirements. Dual inputs and custom VRPs are available as options. Custom azimuth patterns with a reduced backlobe are also available. Consult RFS for details.



8UD



Typical Azimuth Radiation Pattern Standard



Typical Azimuth Radiation Pattern Custom

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UD Series

SPECIFICATIONS	4UD	8UD	12UD
Frequency Range, MHz	470 - 860	470 - 860	470 - 860
Operating Frequency Ranges, MHz	470 - 650,620 - 860	470 - 650,620 - 860	470 - 650,620 - 860
Polarization	Vertical	Vertical	Vertical
Number of Channels	Multichannel	Multichannel	Multichannel
Nominal Gain (Mid-band), dBd	9	12	14
Return Loss, dB	20	20	20
Input Connector	7/8" EIA Flange	7/8" EIA Flange	7/8" EIA Flange
Power Rating, kW	0.6	1.2	1.8
Impedance, ohms	50 unbalanced	50 unbalanced	50 unbalanced
Weight, kg (lb)	23 (51)	35 (77) Band IV;33 (73) Band V	65 (143) Band IV;56 (123) Band V
Dimensions (Height or Length), cm (in)	240 (94)	460 (181) Band IV;360 (142) BandV	610 (240) Band IV;530 (209) Band V
Mounting (Standard), mm (in)	8 x 20mm (3/4) bolts on a 292mm (11-1/2) PCD	8 x 20mm (3/4) bolts on a 292mm (11-1/2) PCD	8 x 20mm (3/4) bolts on a 292mm (11-1/2) PCD
Effective Area Front (full antenna), sq m (sq ft)	0.40 (4.3)	0.94 (10.1)	1.34 (14.4)
Design Wind Speed (max), km/h (mph)	230 (144)	230 (144)	230 (144)
Wind Load @ 50 m/sec Front, kN (lb)	0.47 (110)	1.12 (250)	1.59 (360)
Pressurization Operational, kPa (psi)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)
Pressurization Test, kPa (psi)	100 (15)	100 (15)	100 (15)
Material - Radome	fiberglass	fiberglass	fiberglass
Material - Support Pole / Mounting	aluminum/Silver plated brass/stainless steel	aluminum/Silver plated brass/stainless steel	aluminum/Silver plated brass/stainless steel
Material - Radiators	aluminum/Silver plated brass/stainless steel	aluminum/Silver plated brass/stainless steel	aluminum/Silver plated brass/stainless steel

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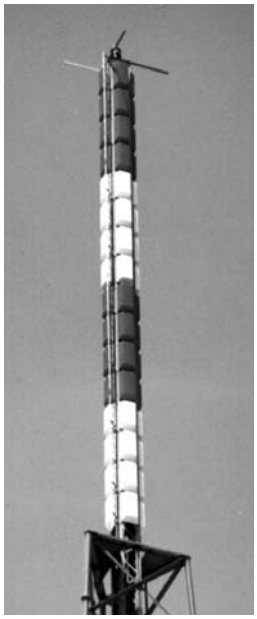
PHP, PVP Series

The PHP and PVP broadband panels are designed as building blocks for integration into complex antenna arrays or they can be used individually for simple antenna systems. Both models cover their associated transmitting bands without field adjustment.

- Fully re-engineered for Digital TV
- Corrosion resistant aluminum (optional stainless steel) construction with fiberglass radome
- PHP model - horizontal polarization
- PVP model - vertical polarization
- Low wind loading
- Cyclone rated
- Full band operation
- High power rating
- Array design allows a variety of horizontal radiation patterns with or without vertical beam tilt and null fill, contact RFS for details
- Temperature range -40 to +60 degrees C available

Standard antennas are pressurizable and have a 7/8" EIA input connector. The input connector is orientated vertically and a capacitive probe is supplied at the input. Panels can also be supplied with dual 7/8" EIA or single 1-5/8" EIA connectors to achieve the full 5kW power rating. 7-16 DIN input connectors are also available for low power, unpressurized operation. Radomes for individual panels are supplied in white and orange as standard and other Colors are available.

Array design can provide any of an almost infinite variety of horizontal patterns, with or without vertical beam tilt and null fill. Omnidirectional radiation characteristics can be achieved by mounting any number of panels around a suitably sized supporting structure. With a five panel configuration climbing access can be provided within the tower, a higher power rating for each level can be attained and, because of the larger cross section tower, higher gains can be achieved with less mechanical deflection due to windload.



PHP64 (Four sided) Array

PVP Antenna Panel

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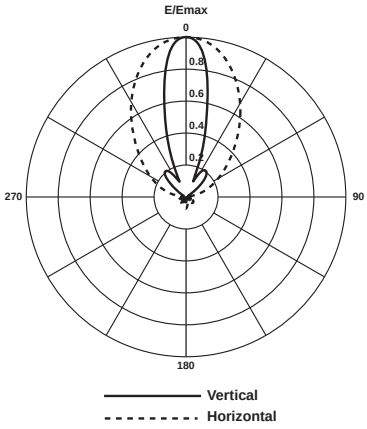
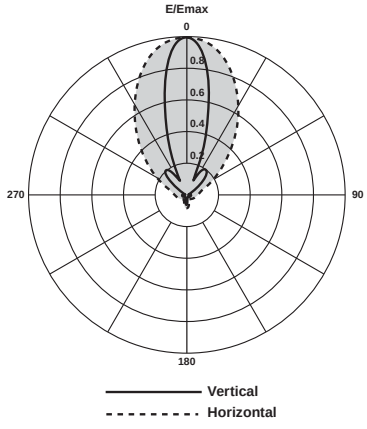
PHP, PVP Series

SPECIFICATIONS	PHP	PVP
Frequency Range, MHz	470 - 860	470 - 860
Polarization	Horizontal	Vertical
Number of Channels	Multichannel	Multichannel
Nominal Gain (Mid-band), dBd	11 - 13	11 - 13
Half Power Beamwidth Azimuth, degrees	60	60
Return Loss, dB	25	25
Input Connector	7-16 DIN; 7/8" EIA Flange; 1-5/8" EIA Flange	7-16 DIN; 7/8" EIA Flange; 1-5/8" EIA Flange
Power Rating, kW	2.5 Note # 1	2.5 Note # 1
Impedance, ohms	50 unbalanced	50 unbalanced
Weight, kg (lb)	11.5 (26)	12 (26)
Mounting (Standard), mm (in)	4 x 12mm (1/2) bolts	4 x 12mm (1/2) bolts
Effective Area Front (full antenna), sq m (sq ft)	0.35 (3.77)	0.45 (4.84)
Effective Area Side (full antenna), sq m (sq ft)	0.33 (3.55)	0.35 (3.76)
Design Wind Speed (max), km/h (mph)	240 (150)	240 (150)
Pressurization Operational, kPa (psi)	10 - 35 (1.5 - 5) 7/8" EIA Version	10 - 35 (1.5 - 5) 7/8" EIA Version
Pressurization Test, kPa (psi)	100 (15) 7/8" EIA Version	100 (15) 7/8" EIA Version
Material - Radome	fiberglass	fiberglass
Material - Insulators	PTFE	PTFE
Material - Radiators	Corrosion resistant aluminum (optional Stainless Steel)	Corrosion resistant aluminum (optional Stainless Steel)
Material - Reflecting Screen	Corrosion resistant aluminum	Corrosion resistant aluminum
Colour	White or Red radome standard, other upon request	White or Red radome standard, other upon request

Note 1
Power rating is limited by input connector.5kW version available with dual 7/8" EIA inputs or single 1-5/8" EIA input.



Radiation Pattern PHP



Radiation Pattern PVP

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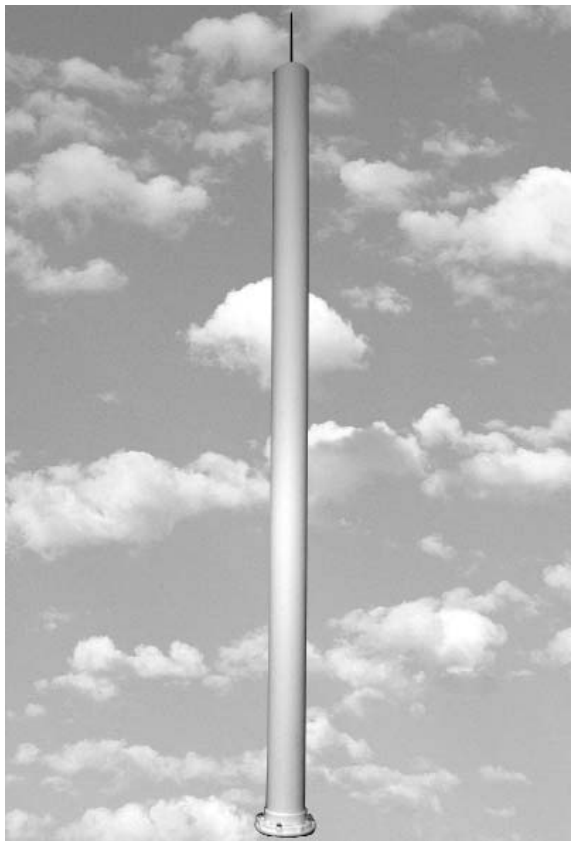
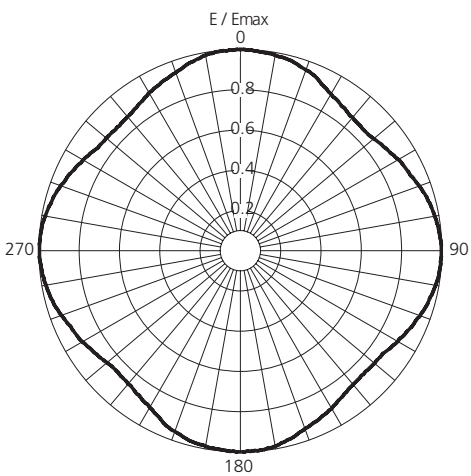
STA Series

A new ultra-slim and lightweight superturnstile UHF broadcast antenna supports the entire US and European UHF bands (470 to 862 MHz). This antenna exhibits pattern circularity that competing, higher priced, point antennas struggle to achieve. The profile of our new superturnstile is less than that of competing UHF broadband antennas. This has resulted in a significant reduction in wind loading and weight, providing broadcasters with enormous flexibility when considering installation on existing loaded towers.

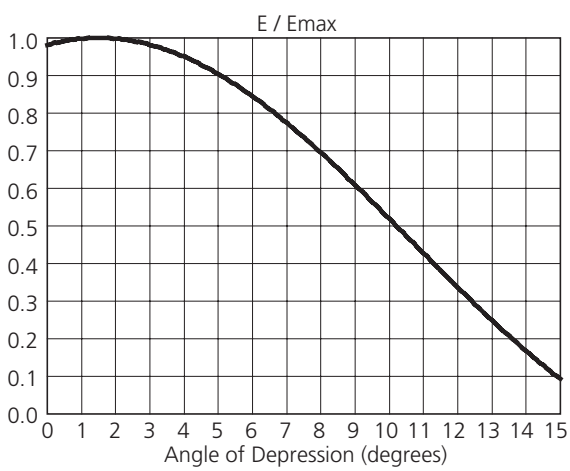
- Ideal low cost and wind load solution
- Ideal for many low, medium and high power broadcast applications.
- Exhibits pattern ripple of better than ±1.5 dB across the entire UHF band
- Low drag profile underpins the antenna's high wind speed rating and low wind load characteristics
- Uniquely cost-effective
- Single rod lightning protection, fully DC grounded



STA Antenna



Azimuth Radiation Pattern



Elevation Pattern STA40

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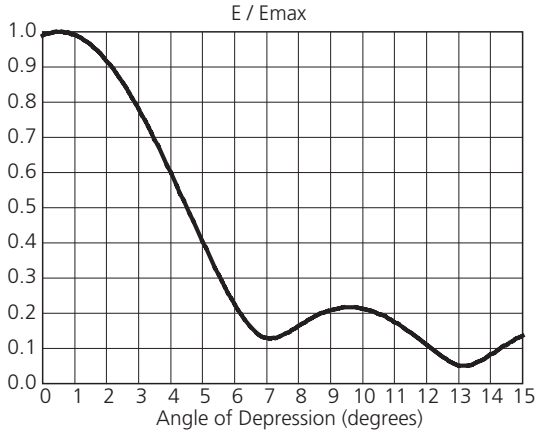
Band IV/V (UHF) Superturnstile Antennas 470 - 862 MHz

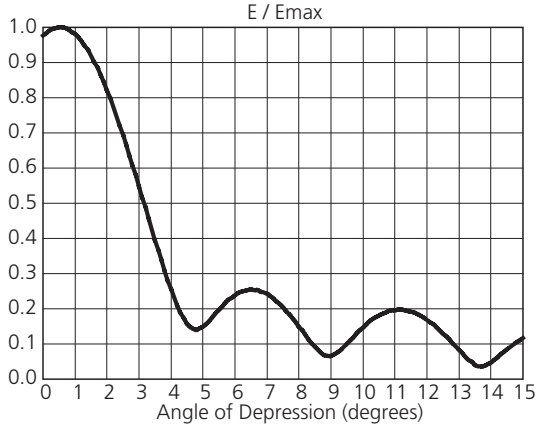
STA Series

SPECIFICATIONS	STA40	STA80	STA120	STA160
Frequency Range, MHz	470 - 862	470 - 862	470 - 862	470 - 862
Polarization	Horizontal	Horizontal	Horizontal	Horizontal
Number of Channels	Multichannel	Multichannel	Multichannel	Multichannel
Nominal Gain[1] (Mid-band), dBd	7.3	10.1	11.8	12.9
Azimuth Radiation Pattern	Omnidirectional	Omnidirectional	Omnidirectional	Omnidirectional
Return Loss[2], dB	>26 across frequency range	>26 across frequency range	>26 across frequency range	>26 across frequency range
Input Connector Options[3]	1-5/8" EIA	1-5/8" EIA	1-5/8" EIA	3-1/8" EIA
Impedance, ohms	50 unbalanced	50 unbalanced	50 unbalanced	50 unbalanced
Mounting (Standard)	Base Flange Mount	Base Flange Mount	Base Flange Mount	Base Flange Mount
Radome diameter, mm (in)	320 (12.6)	320 (12.6)	320 (12.6)	550 (21.7)
Length, m (ft)	2.84 (9.3)	4.80 (15.7)	6.90 (22.6)	9.00 (29.5)
Weight, kg (lb)	50 (110)	140 (309)	230 (507)	320 (705)
Wind Speed (max), km/h (mph)	240 (150)	240 (150)	240 (150)	240 (150)
Input Power Average (max), kw				
Low power version	5	5	5	20
Medium power version	10	20	30	40

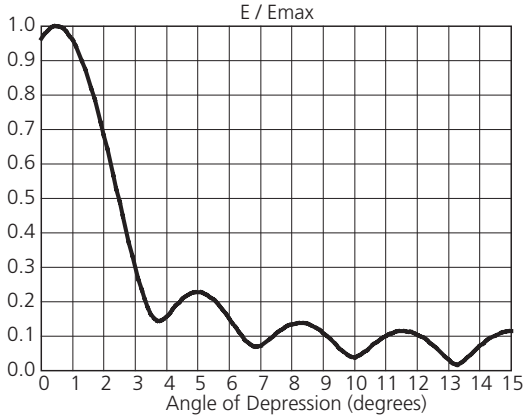
Note 1
Includes all internal losses, including internal cable attenuation and loss due to null fill.
Note 2
Can be optimized in in operating channels by tuning.
Note 2
Radome diameter, weight and connector options are specified for low power version.



Elevation Pattern STA80



Elevation Pattern STA120



Elevation Pattern STA160

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CBS Series

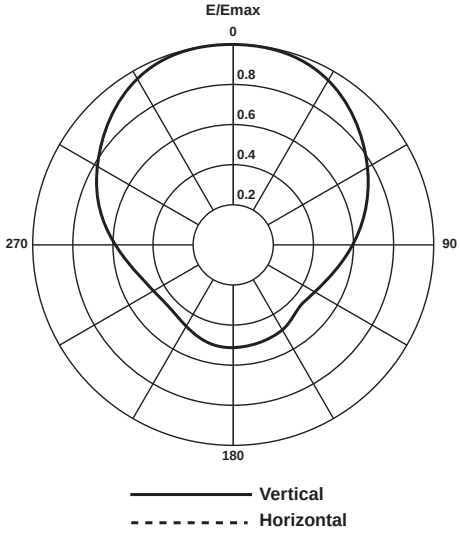
Slot antennas are a popular method of providing versatile antennas for UHF TV broadcasting applications. They offer extremely low wind loading characteristics and thus, low cost support structures. They are also aesthetically pleasing, having a low profile while maintaining great strength for the most severe weather conditions. The RFS CBS series of slot antennas were developed for Band IV and V antenna applications, offering bandwidths up to 110MHz for multichannel operation.

- Copper/brass construction - stainless steel mounting interface
- Horizontal polarization
- Low wind loading
- Fully pressurized
- Multichannel operation is possible
- Temperature range -40 to +60 degrees C available

These antennas offer many advantages over comparable panel arrays. Of compact cylindrical construction they are ideal for use in situations where low wind loadings are a primary concern. Mounting to a single leg of a tower structure is possible and on site assembly, erection and aligning are relatively simple. Minimal maintenance is required. Also available is a CBS7LP for low powered Band V repeater applications. The CBS7LP is of special lightweight construction with a simple 38mm stainless steel pole for mounting. It is rated to 200W maximum (type N input connector). An improved VSWR over one or two channels can be provided by an additional tuning unit that is connected to the input terminal of the antenna. Having a 7/8" EIA flange input (excepting the CBS7LP), plus the totally sealed fiberglass radome, these antennas are fully pressurizable and may be operated unpressurized by removal of a drain plug. They are base mounted, have considerable aesthetic appeal and have been designed to survive cyclonic conditions.

The standard CBS series is also available as a dual stack antenna (designated 2CBS series) with two CBS radiators stacked in a single fiberglass radome. Dual inputs are available on the 2CBS series as an option.

CBS7



Typical Azimuth Radiation Pattern

SPECIFICATIONS (ALL MODELS)	
Polarization	Horizontal
Return Loss, dB	20 Note #1
Null Fill (minimum), %	5
Beam Tilt, degrees	1
Impedance, ohms	50 unbalanced
Material - Radome	fiberglass
Material - Radiators	Brass
Colour	Radome colour white or grey

Note 1
Better than 26dB over limited bandwidth with optional extra tuning unit.

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CBS Series

SPECIFICATIONS	CBS4	CBS5	CBS6	CBS7
Frequency Range, MHz	470 - 550	520 - 620	610 - 720	710 - 820
Nominal Gain (Mid-band), dBd	9.5	9.5	9.5	9.5
Input Connector	7/8" EIA Flange	7/8" EIA Flange	7/8" EIA Flange	7/8" EIA Flange
Power Rating, kW	1.3	1.3	1.3	1.3
Weight, kg (lb)	38 (84)	35 (77)	25 (55)	19 (42)
Dimensions (Height or Length), cm (in)	260 (102)	240 (91)	200 (79)	180 (71)
Base Diameter, mm (in)	336 (13-1/4)	336 (13-1/4)	336 (13-1/4)	215 (8-1/2)
Mounting (Standard), mm (in)	8 x 22mm (7/8) holes on a 292mm (11-1/2) PCD	8 x 22mm (7/8) holes on a 292mm (11-1/2) PCD	8 x 22mm (7/8) holes on a 292mm (11-1/2) PCD	8 x 22mm (7/8) holes on a 178mm (7) PCD
Effective Area Front (full antenna), sq m (sq ft)	0.54 (5.8)	0.49 (5.3)	0.40 (4.3)	0.21 (2.3)
Wind Load @ 50 m/sec Front, kN (lb)	0.64 (140)	0.56 (130)	0.47 (110)	0.25 (60)
Pressurization Operational, kPa (psi)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)
Pressurization Test, kPa (psi)	100 (15)	100 (15)	100 (15)	100 (15)
Material - Support Pole / Mounting	Base Flange - Stainless steel	Base Flange - Stainless steel	Base Flange - Stainless steel	Base Flange - Stainless steel

SPECIFICATIONS	CBS7LP	CBS8	2CBS4	2CBS5
Frequency Range, MHz	710 - 820	740 - 860	470 - 550	520 - 620
Nominal Gain (Mid-band), dBd	9.5	9.5	12.5	12.5
Input Connector	N type	7/8" EIA Flange	7/8" EIA Flange	7/8" EIA Flange
Power Rating, kW	0.2	1.3	1.3	1.3
Weight, kg (lb)	14 (31)	16 (35)	114 (251)	105 (232)
Dimensions (Height or Length), cm (in)	180 (71)	180 (71)	540 (213)	490 (191)
Base Diameter, mm (in)	See Mounting (Standard)	215 (8-1/2)	336 (13-1/4)	336 (13-1/4)
Mounting (Standard), mm (in)	Mount to 48mm (1-13/16) nominal stainless steel pipe	8 x 22mm (7/8) holes on a 178mm (7) PCD	8 x 22mm (7/8) holes on a 292mm (11-1/2) PCD	8 x 22mm (7/8) holes on a 292mm (11-1/2) PCD
Effective Area Front (full antenna), sq m (sq ft)	0.21 (2.3)	0.22 (2.4)	1.1 (11.8)	0.89 (9.6)
Wind Load @ 50 m/sec Front, kN (lb)	0.25 (60)	0.26 (60)		
Pressurization Operational, kPa (psi)	Unpressurized	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)
Pressurization Test, kPa (psi)	N/A	100 (15)	100 (15)	100 (15)
Material - Support Pole / Mounting	Mounting pole - Stainless steel	Base Flange - Stainless steel	Base Flange - Stainless steel	Base Flange - Stainless steel

SPECIFICATIONS	2CBS6	2CBS7	2CBS8
Frequency Range, MHz	610 - 720	710 - 820	740 - 860
Nominal Gain (Mid-band), dBd	12.5	12.5	12.5
Input Connector	7/8" EIA Flange	7/8" EIA Flange	7/8" EIA Flange
Power Rating, kW	1.3	1.3	1.3
Weight, kg (lb)	75 (165)	60 (132)	51 112)
Dimensions (Height or Length), cm (in)	420 (165)	420 (165)	400 (158)
Base Diameter, mm (in)	336 (13-1/4)	336 (13-1/4)	336 (13-1/4)
Mounting (Standard), mm (in)	8 x 22mm (7/8) holes on a 292mm (11-1/2) PCD	8 x 22mm (7/8) holes on a 292mm (11-1/2) PCD	8 x 22mm (7/8) holes on a 292mm (11-1/2) PCD
Effective Area Front (full antenna), sq m (sq ft)	0.91 (9.7)	0.45 (4.8)	0.91 (9.7)
Wind Load @ 50 m/sec Front, kN (lb)			
Pressurization Operational, kPa (psi)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)	10 - 35 (1.5 - 5)
Pressurization Test, kPa (psi)	100 (15)	100 (15)	100 (15)
Material - Support Pole / Mounting	Base Flange - Stainless steel	Base Flange - Stainless steel	Base Flange - Stainless steel

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RD Series

The RD Series of wideband UHF antennas are lightweight in design, yet rugged in approach. They solve the critical question of using a single UHF antenna for multichannel Analog and DTV Broadcasting.

- Multichannel operation
- Wide bandwidth/ Low VSWR
- Power rating up to 160kW Average
- Top or Side mount
- Light weight/ Low wind load
- Single or Dual input
- Customized Vertical Pattern
- Multi pattern capacity

Utilizing slot cavity geometry, the RD series antenna is capable of wideband, low VSWR transmission for up to 120 MHz. This capability makes it possible for stations to utilize a single antenna for Analog and DTV channel allocation and relocation assignments which fall within 120 MHz of each other. Cavities are segmented into four groups. A unique one-piece aluminum extrusion integrates the antenna cavity and tower mounting backstructure, providing each four bay section with greater strength and power handling. Considering the requirements of tomorrow's broadcasting needs, the RD Series antenna combined with HELIFLEX transmission line, provides an alternative systems solution to heavy, stacked, slotted antennas and panel array antennas, minimizing tower load and maximizing tower space.

The RD antenna can also be used in various stacked arrangements especially in situations where adjacent channel combining may not be desired. By stacking an RD antenna either atop a panel antenna or another RD, increased channel capacity is obtained without pattern degradation as occurs in some other systems where an external feed is used to the top antenna.

SPECIFICATIONS (ALL MODELS)	
Polarization	Horizontal
Number of Channels	Multichannel
Azimuth Radiation Pattern	A, B, G, H, OM, SK, Other Patterns on request.
Impedance, ohms	50 unbalanced

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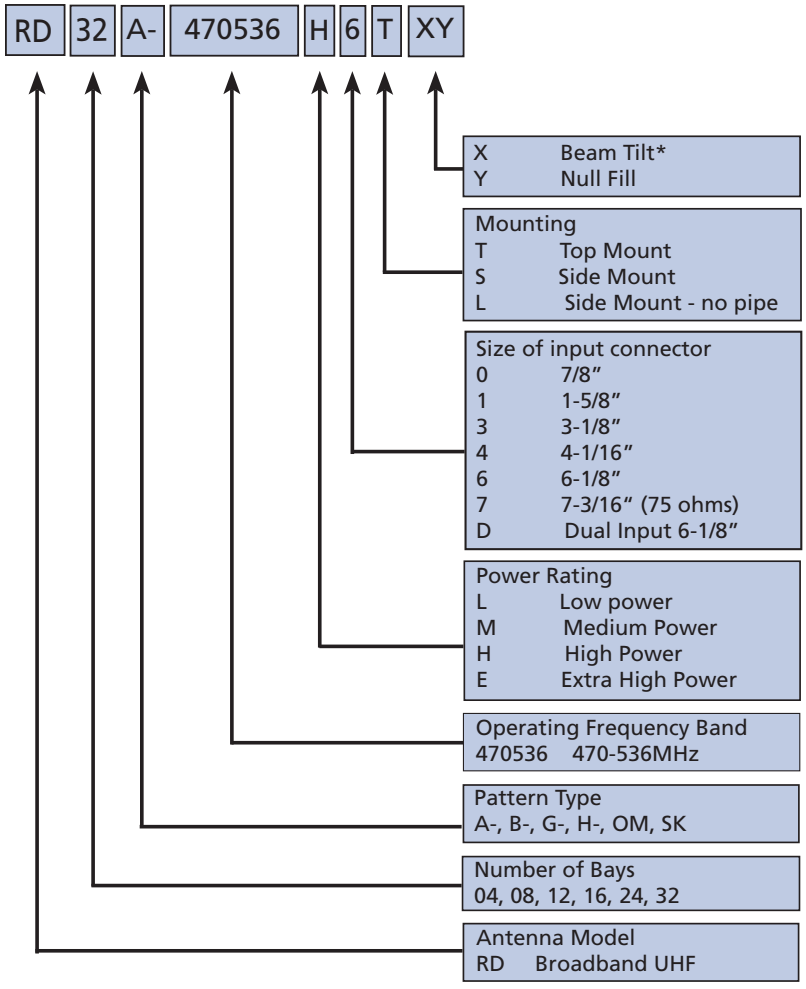
RD Series Ordering Information



RD Series Standard Power Rating

	Low Power			Medium Power			High Power		
	NTSC/PAL	Avg	Input	NTSC/PAL	Avg	Input	NTSC/PAL	Avg	Input
RD04	3 kW	2 kW	1-5/8" EIA, 50Ω	6 kW	4 kW	3-1/8" EIA, 50Ω	14 kW	10 kW	3-1/8" EIA, 50Ω
RD08	6 kW	4 kW	1-5/8" EIA, 50Ω	11 kW	8 kW	3-1/8" EIA, 50Ω	29 kW	20 kW	4-1/2" IEC, 50Ω [2]
RD12	9 kW	6 kW	3-1/8" EIA, 50Ω	17 kW	12 kW	3-1/8" EIA, 50Ω	43 kW	30 kW	6-1/8" EIA, 50Ω
RD16	11 kW	8 kW	3-1/8" EIA, 50Ω	23 kW	16 kW	3-1/8" EIA, 50Ω	57 kW	40 kW	6-1/8" EIA, 50Ω
RD24	17 kW	12 kW	3-1/8" EIA, 50Ω	34 kW	24 kW	6-1/8" EIA, 50Ω	86 kW	60 kW	6-1/8" EIA, 50Ω [1]
RD32	23 kW	16 kW	3-1/8" EIA, 50Ω	45 kW	32 kW	6-1/8" EIA, 50Ω	86 kW	60 kW	6-1/8" EIA, 50Ω [3]

Note 1
Power ratings are for single input models. Dual cavity versions can provide higher power ratings. Contact RFS for details.
Note 2
Connector types and impedance may be varied to suit customer requirements, contact RFS for details.
Note 3
80 kW ave power option available with 7-3/16, 75 ohm input connector.

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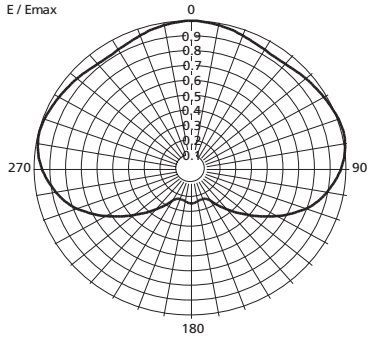
RD Antenna - A Pattern Data



Azimuth Pattern Gain 1.7 (2.3 dB)

RD Pattern & Cavity Group Specifications

Cavity Group	Frequency (MHz)
1	470 - 536
2	488 - 608
3	578 - 704
4	662 - 806

MECHANICAL SPECIFICATIONS

Cavity Group	Frequency Range	Height m (ft) Top Mount	Height m (ft) Side Mount	Weight Kg (lb) Top Mount	Weight Kg (lb) Side Mount	Effective Area (CaAc) sq m (sq ft) Top Mount	Effective Area (CaAc) sq m (sq ft) Side Mount
RD04 - Gain 9.5 dBd (x 8.9)							
1	470 - 536	2.65 (8.7)	2.50 (8.2)	234 (515)	100 (220)	1.50 (16.1)	1.15 (12.4)
2	488 - 608	2.65 (8.7)	2.23 (7.3)	227 (500)	91 (200)	1.36 (14.6)	0.09 (10.9)
3	578 - 704	2.07 (6.8)	1.95 (6.4)	200 (440)	82 (180)	1.07 (11.5)	0.8 (8.6)
4	662 - 806	2.07 (6.8)	1.71 (5.6)	196 (430)	76 (166)	0.97 (10.4)	0.7 (7.5)
RD08 - Gain 12.2 dBd (x 16.6)							
1	470 - 536	5.09 (16.7)	4.97 (16.3)	450 (990)	254 (559)	2.96 (31.9)	2.31 (24.9)
2	488 - 608	4.48 (14.7)	4.39 (14.4)	409 (900)	236 (518)	2.60 (28.0)	2.02 (21.7)
3	578 - 704	3.96 (13.0)	3.84 (12.6)	373 (820)	218 (479)	2.11 (22.7)	1.56 (17.2)
4	662 - 806	3.50 (11.5)	3.38 (11.1)	350 (770)	205 (451)	1.85 (19.9)	1.40 (15.1)
RD12 - Gain 13.6 dBd (x 22.9)							
1	470 - 536	7.56 (24.8)	7.44 (24.4)	818 (1800)	357 (786)	4.43 (47.7)	3.47 (37.3)
2	488 - 608	6.64 (21.8)	6.43 (21.1)	741 (1630)	330 (725)	3.88 (41.8)	3.03 (32.6)
3	578 - 704	5.85 (19.2)	5.73 (18.8)	523 (1150)	303 (666)	3.15 (33.9)	2.40 (25.8)
4	662 - 806	5.12 (16.8)	5.03 (16.5)	477 (1050)	283 (623)	3.70 (39.7)	2.10 (22.6)
RD16 - Gain 14.7 dBd (x 29.5)							
1	470 - 536	10 (32.8)	9.91 (32.5)	1409 (3100)	478 (1052)	6.22 (67.0)	4.62 (49.8)
2	488 - 608	8.78 (28.8)	7.77 (28.5)	905 (1990)	441 (970)	5.43 (58.5)	4.03 (43.4)
3	578 - 704	7.71 (25.3)	7.60 (25)	855 (1880)	406 (892)	4.18 (45.0)	3.20 (34.4)
4	662 - 806	6.80 (22.3)	6.71 (22)	605 (1330)	380 (835)	3.68 (39.6)	2.81 (30.2)
RD24 - Gain 16.3 dBd (x 42.7)							
1	470 - 536	15.24 (50.0)	14.81 (48.6)	2864 (6300)	803 (1767)	9.85 (106.0)	6.93 (74.6)
2	488 - 608	13.41 (44.0)	13.01 (42.7)	2318 (5100)	747 (1644)	8.20 (88.3)	6.06 (65.2)
3	578 - 704	11.80 (38.7)	11.43 (37.5)	1796 (3950)	694 (1526)	6.69 (72.0)	4.80 (51.7)
4	662 - 806	10.42 (34.2)	10.03 (32.9)	1409 (3100)	656 (1442)	5.86 (63.1)	4.20 (45.2)
RD32 - Gain 17.5 dBd (x 56.2)							
1	470 - 536	20.12 (66.0)	19.66 (64.5)	5409 (11900)	1076 (2368)	14.03 (151.0)	9.24 (99.5)
2	488 - 608	17.68 (58.0)	17.34 (56.9)	4000 (8800)	1002 (2204)	12.27 (132.1)	8.07 (86.9)
3	578 - 704	15.58 (51.1)	15.21 (49.9)	3046 (6700)	931 (2047)	9.36 (100.7)	6.40 (68.9)
4	662 - 806	13.69 (44.9)	13.35 (43.8)	2705 (5950)	879 (1934)	8.22 (88.5)	5.60 (60.2)

Note:
1. Expected Pattern variation for the RD Series is typically less than +/- 5% for a 60 MHz bandwidth.
2. Weights are based on the high power model (LP and MP will be lighter). Typical Effective Area (CaAc) values are with wind to front of antenna and no ice.

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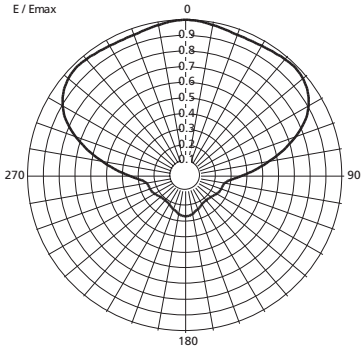
RD Antenna - B Pattern Data



Azimuth Pattern Gain 2.5 (4.0dB)

RD Pattern & Cavity Group Specifications

Cavity Group	Frequency (MHz)
1	470 - 536
2	488 - 548
2	518 - 578
2	548 - 608
3	578 - 638
3	614 - 674
3	644 - 704
4	662 - 722
4	704 - 764
4	746 - 806

MECHANICAL SPECIFICATIONS

Cavity Group	Frequency Range	Height m (ft) Top Mount	Height m (ft) Side Mount	Weight Kg (lb) Top Mount	Weight Kg (lb) Side Mount	Effective Area (CaAc) sq m (sq ft) Top Mount	Effective Area (CaAc) sq m (sq ft) Side Mount
RD4 - Gain 11.2 dBd (x 13.2)							
1	470 - 536	2.65 (8.7)	2.50 (8.2)	259.1 (570)	113.6 (250)	2.06 (22.2)	1.72 (18.5)
2	488 - 608	2.65 (8.7)	2.23 (7.3)	250.0 (550)	103.2 (227)	1.82 (19.6)	1.48 (15.9)
3	578 - 704	2.07 (6.8)	1.95 (6.4)	215.9 (475)	92.3 (203)	1.37 (14.8)	1.11 (11.9)
4	662 - 806	2.07 (6.8)	1.71 (5.6)	211.4 (465)	84.5 (186)	1.24 (13.3)	0.97 (10.4)
RD8 - Gain 13.9 dBd (x 24.5)							
1	470 - 536	5.09 (16.7)	4.97 (16.3)	509.1 (1120)	281.4 (619)	4.09 (44.0)	3.44 (37.0)
2	488 - 608	4.48 (14.7)	4.39 (14.4)	463.6 (1020)	260.0 (572)	3.53 (38.0)	2.95 (31.8)
3	578 - 704	3.96 (13.0)	3.84 (12.6)	418.2 (920)	238.6 (525)	2.72 (29.3)	2.21 (23.8)
4	662 - 806	3.50 (11.5)	3.38 (11.1)	390.9 (860)	223.2 (491)	2.39 (25.7)	1.94 (20.9)
RD12 - Gain 15.3 dBd (x 33.9)							
1	470 - 536	7.56 (24.8)	7.44 (24.4)	990.9 (2180)	398.2 (876)	6.11 (65.8)	5.15 (55.4)
2	488 - 608	6.64 (21.8)	6.43 (21.1)	809.1 (1780)	366.4 (806)	5.30 (57.0)	4.44 (47.8)
3	578 - 704	5.85 (19.2)	5.73 (18.8)	581.8 (1280)	334.1 (735)	4.07 (43.8)	3.32 (35.7)
4	662 - 806	5.12 (16.8)	5.03 (16.5)	527.3 (1160)	311.0 (684)	3.57 (38.4)	2.91 (31.3)
RD16 - Gain 16.4 dBd (x 43.7)							
1	470 - 536	10.00 (32.8)	9.91 (32.5)	1918.2 (4220)	532.7 (1172)	8.46 (91.1)	6.87 (73.9)
2	488 - 608	8.78 (28.8)	7.77 (28.5)	1345.5 (2960)	490.0 (1078)	7.32 (78.8)	5.92 (63.7)
3	578 - 704	7.71 (25.3)	7.60 (25)	922.7 (2030)	447.3 (984)	5.41 (58.2)	4.42 (47.6)
4	662 - 806	6.80 (22.3)	6.71 (22)	836.4 (1840)	416.0 (915)	4.74 (51.1)	3.87 (41.7)
RD24 - Gain 18.0 dBd (x 63.1)							
1	470 - 536	15.24 (50.0)	14.81 (48.6)	4222.7 (9290)	885.0 (1947)	13.93 (149.9)	10.30 (110.9)
2	488 - 608	13.41 (44.0)	13.01 (42.7)	2686.4 (5910)	821.0 (1806)	11.41 (122.8)	8.87 (95.5)
3	578 - 704	11.80 (38.7)	11.43 (37.5)	2163.6 (4760)	756.4 (1664)	8.52 (91.7)	6.63 (71.4)
4	662 - 806	10.42 (34.2)	10.03 (32.9)	1727.3 (3800)	710.0 (1562)	7.48 (80.5)	5.82 (62.6)
RD32 - Gain 19.2 dBd (x 83.2)							
1	470 - 536	20.12 (66.0)	19.66 (64.5)	6231.8 (13710)	1185.5 (2608)	19.11 (205.7)	13.73 (147.8)
2	488 - 608	17.68 (58.0)	17.34 (56.9)	4977.3 (10950)	1100.0 (2420)	16.03 (172.6)	11.84 (127.4)
3	578 - 704	15.58 (51.1)	15.21 (49.9)	3622.7 (7970)	1014.1 (2231)	1180 (127.0)	8.84 (95.2)
4	662 - 806	13.69 (44.9)	13.35 (43.8)	2840.9 (6250)	951.8 (2094)	10.34 (111.3)	7.75 (83.4)

Note:
1. Expected Pattern variation for the RD Series is typically less than +/- 5% for a 60 MHz bandwidth.
2. Weights are based on the high power model (LP and MP will be lighter). Typical Effective Area (CaAc) values are with wind to front of antenna and no ice.

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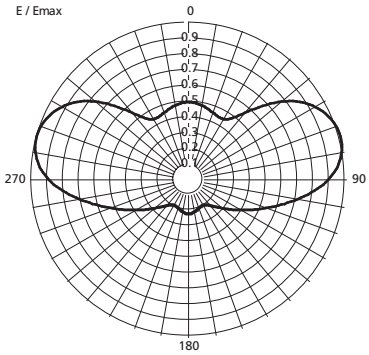
RD Antenna - G Pattern Data



Azimuth Pattern Gain 3.0 (4.8dB)

RD Pattern & Cavity Group Specifications

Cavity Group	Frequency (MHz)
1	470 - 536
2	488 - 578
2	500 - 590
2	518 - 608
3	578 - 668
3	596 - 686
3	614 - 704
4	662 - 752
4	686 - 776
4	716 - 806

MECHANICAL SPECIFICATIONS

Cavity Group	Frequency Range	Height m (ft) Top Mount	Height m (ft) Side Mount	Weight Kg (lb) Top Mount	Weight Kg (lb) Side Mount	Effective Area (CaAc) sq m (sq ft) Top Mount	Effective Area (CaAc) sq m (sq ft) Side Mount
RD04 - Gain 12.0 dBd (x 15.9)							
1	470 - 536	2.65 (8.7)	2.50 (8.2)	234 (515)	107 (235)	1.39 (15.0)	1.05 (11.3)
2	488 - 608	2.65 (8.7)	2.23 (7.3)	227 (500)	97 (214)	1.26 (13.6)	0.92 (9.9)
3	578 - 704	2.07 (6.8)	1.95 (6.4)	200 (440)	87 (192)	0.99 (10.7)	0.72 (7.8)
4	662 - 806	2.07 (6.8)	1.71 (5.6)	195 (430)	80 (176)	0.89 (9.6)	0.62 (6.7)
RD08 - Gain 14.7 dBd (x 29.5)							
1	470 - 536	5.09 (16.7)	4.97 (16.3)	450 (990)	268 (589)	2.76 (29.7)	2.11 (22.7)
2	488 - 608	4.48 (14.7)	4.39 (14.4)	409 (900)	248 (546)	2.42 (26.0)	1.84 (19.8)
3	578 - 704	3.96 (13.0)	3.84 (12.6)	373 (820)	229 (503)	1.96 (21.1)	1.45 (15.6)
4	662 - 806	3.50 (11.5)	3.38 (11.1)	350 (770)	215 (472)	1.69 (18.2)	1.24 (13.4)
RD12 - Gain 16.1 dBd (x 40.7)							
1	470 - 536	7.56 (24.8)	7.44 (24.4)	818 (1800)	378 (831)	4.12 (44.4)	3.16 (34.0)
2	488 - 608	6.64 (21.8)	6.43 (21.1)	741 (1630)	349 (767)	3.61 (38.9)	2.76 (29.7)
3	578 - 704	5.85 (19.2)	5.73 (18.8)	523 (1150)	319 (702)	2.92 (31.4)	2.16 (23.3)
4	662 - 806	5.12 (16.8)	5.03 (16.5)	477 (1050)	298 (655)	2.53 (27.2)	1.87 (20.1)
RD16 - Gain 17.3 dBd (x 53.7)							
1	470 - 536	10.00 (32.8)	9.91 (32.5)	1409 (3100)	506 (1112)	5.82 (62.6)	4.22 (45.4)
2	488 - 608	8.78 (28.8)	7.77 (28.5)	905 (1990)	466 (1026)	5.08 (54.7)	3.68 (39.6)
3	578 - 704	7.71 (25.3)	7.60 (25)	855 (1880)	427 (940)	3.87 (41.7)	2.89 (31.1)
4	662 - 806	6.80 (22.3)	6.71 (22)	605 (1330)	399 (877)	3.36 (36.2)	2.49 (26.8)
RD24 - Gain 18.8 dBd (x 75.9)							
1	470 - 536	15.24 (50.0)	14.81 (48.6)	2864 (6300)	844 (1857)	9.21 (99.1)	6.32 (68.0)
2	488 - 608	13.41 (44.0)	13.01 (42.7)	2318 (5100)	786 (1728)	7.67 (82.6)	5.50 (59.5)
3	578 - 704	11.80 (38.7)	11.43 (37.5)	1796 (3950)	726 (1598)	6.22 (67.0)	4.34 (46.7)
4	662 - 806	10.42 (34.2)	10.03 (32.9)	1409 (3100)	684 (1505)	5.41 (58.2)	3.74 (40.3)
RD32 - Gain 20.0 dBd (x 100.0)							
1	470 - 536	20.12 (66.0)	19.66 (64.5)	5409 (11900)	1131 (2488)	13.21 (142.2)	8.43 (90.7)
2	488 - 608	17.68 (58.0)	17.34 (56.9)	4000 (8800)	1053 (2316)	10.72 (115.4)	7.37 (79.3)
3	578 - 704	15.58 (51.1)	15.21 (49.9)	3046 (6700)	974 (2143)	8.73 (94.0)	5.78 (62.2)
4	662 - 806	13.69 (44.9)	13.35 (43.8)	2705 (5950)	917 (2018)	7.17 (77.2)	4.99 (53.7)

Note:
1. Expected Pattern variation for the RD Series is typically less than +/- 5% for a 60 MHz bandwidth.
2. Weights are based on the high power model (LP and MP will be lighter). Typical Effective Area (CaAc) values are with wind to front of antenna and no ice.

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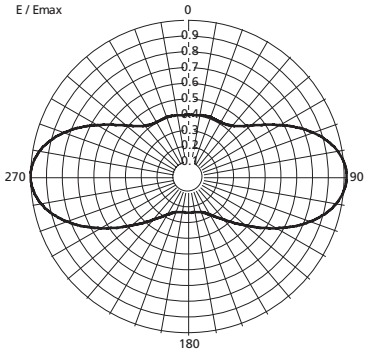
RD Antenna - H Pattern Data



Azimuth Pattern Gain 3.0 (4.8)

RD Pattern & Cavity Group Specifications

Cavity Group	Frequency (MHz)
1	470 - 536
2	488 - 548
2	518 - 578
2	548 - 608
3	578 - 638
3	614 - 674
3	644 - 704
4	662 - 722
4	704 - 764
4	746 - 806

MECHANICAL SPECIFICATIONS

Cavity Group	Frequency Range	Height m (ft) Top Mount	Height m (ft) Side Mount	Weight Kg (lb) Top Mount	Weight Kg (lb) Side Mount	Effective Area (CaAc) sq m (sq ft) Top Mount	Effective Area (CaAc) sq m (sq ft) Side Mount
RD4 - Gain 12.0 dBd (x 15.9)							
1	470 - 536	2.65 (8.7)	2.50 (8.2)	234.1 (515)	106.8 (235)	1.39 (15.0)	1.05 (11.3)
2	488 - 608	2.65 (8.7)	2.23 (7.3)	227.3 (500)	97.3 (214)	1.26 (13.6)	0.92 (9.9)
3	578 - 704	2.07 (6.8)	1.95 (6.4)	200.0 (440)	87.3 (192)	0.99 (10.7)	0.72 (7.8)
4	662 - 806	2.07 (6.8)	1.71 (5.6)	195.5 (430)	80 (176)	0.89 (9.6)	0.62 (6.7)
RD8 - Gain 14.7 dBd (x 29.5)							
1	470 - 536	5.09 (16.7)	4.97 (16.3)	450.0 (990)	267.7 (589)	2.76 (29.7)	2.11 (22.7)
2	488 - 608	4.48 (14.7)	4.39 (14.4)	409.1 (900)	248.2 (546)	2.42 (26.0)	1.84 (19.8)
3	578 - 704	3.96 (13.0)	3.84 (12.6)	372.7 (820)	228.6 (503)	1.96 (21.1)	1.45 (15.6)
4	662 - 806	3.50 (11.5)	3.38 (11.1)	350.0 (770)	214.5 (472)	1.69 (18.2)	1.24 (13.4)
RD12 - Gain 16.1 dBd (x 40.7)							
1	470 - 536	7.56 (24.8)	7.44 (24.4)	818.2 (1800)	377.7 (831)	4.12 (44.4)	3.16 (34.0)
2	488 - 608	6.64 (21.8)	6.43 (21.1)	741.0 (1630)	348.6 (767)	3.61 (38.9)	2.76 (29.7)
3	578 - 704	5.85 (19.2)	5.73 (18.8)	522.7 (1150)	319.1 (702)	2.92 (31.4)	2.16 (23.3)
4	662 - 806	5.12 (16.8)	5.03 (16.5)	477.3 (1050)	297.7 (655)	2.53 (27.2)	1.87 (20.1)
RD16 - Gain 17.3 dBd (x 53.7)							
1	470 - 536	10.00 (32.8)	9.91 (32.5)	1409.1 (3100)	505.5 (1112)	5.82 (62.6)	4.22 (45.4)
2	488 - 608	8.78 (28.8)	7.77 (28.5)	904.5 (1990)	466.4 (1026)	5.08 (54.7)	3.68 (39.6)
3	578 - 704	7.71 (25.3)	7.60 (25)	854.5 (1880)	427.3 (940)	3.87 (41.7)	2.89 (31.1)
4	662 - 806	6.80 (22.3)	6.71 (22)	604.5 (1330)	398.6 (877)	3.36 (36.2)	2.49 (26.8)
RD24 - Gain 18.8 dBd (x 75.9)							
1	470 - 536	15.24 (50.0)	14.81 (48.6)	2863.6 (6300)	844.1 (1857)	9.21 (99.1)	6.32 (68.0)
2	488 - 608	13.41 (44.0)	13.01 (42.7)	2318.2 (5100)	785.5 (1728)	7.67 (82.6)	5.50 (59.5)
3	578 - 704	11.80 (38.7)	11.43 (37.5)	1795.5 (3950)	726.4 (1598)	6.22 (67.0)	4.34 (46.7)
4	662 - 806	10.42 (34.2)	10.03 (32.9)	1409.1 (3100)	684.1 (1505)	5.41 (58.2)	3.74 (40.3)
RD32 - Gain 20.0 dBd (x 100.0)							
1	470 - 536	20.12 (66.0)	19.66 (64.5)	5409.1 (11900)	1131 (2488)	13.21 (142.2)	8.43 (90.7)
2	488 - 608	17.68 (58.0)	17.34 (56.9)	4000.0 (8800)	1052.7 (2316)	10.72 (115.4)	7.37 (79.3)
3	578 - 704	15.58 (51.1)	15.21 (49.9)	3045.5 (6700)	974.1 (2143)	8.73 (94.0)	5.78 (62.2)
4	662 - 806	13.69 (44.9)	13.35 (43.8)	2704.5 (5950)	917.3 (2018)	7.17 (77.2)	4.99 (53.7)

Note:
1. Expected Pattern variation for the RD Series is typically less than +/- 5% for a 60 MHz bandwidth.
2. Weights are based on the high power model (LP and MP will be lighter). Typical Effective Area (CaAc) values are with wind to front of antenna and no ice.

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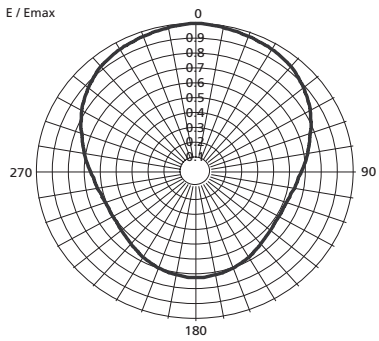
Band IV/V (UHF) TV Slot Antennas 470 - 806 MHz

RD Antenna - OM Pattern Data



Azimuth Pattern Gain 1.7 (2.3dB)

RD Pattern & Cavity Group Specifications

Cavity Group	Frequency (MHz)
1	470 - 536
2	488 - 548
2	518 - 578
2	548 - 608
3	578 - 638
3	614 - 674
3	644 - 704
4	662 - 722
4	704 - 764
4	746 - 806

MECHANICAL SPECIFICATIONS

Cavity Group	Frequency Range	Height m (ft) Top Mount	Height m (ft) Side Mount	Weight Kg (lb) Top Mount	Weight Kg (lb) Side Mount	Effective Area (CaAc) sq m (sq ft) Top Mount	Effective Area (CaAc) sq m (sq ft) Side Mount
RD4 - Gain 9.5 dBd (x 8.9)							
1	470 - 536	3.26 (10.7)	2.50 (8.2)	234.1 (515)	102.7 (226)	1.39 (15.0)	1.11 (12.0)
2	488 - 608	2.95 (9.7)	2.23 (7.3)	227.3 (500)	94.1 (207)	1.26 (13.6)	0.97 (10.4)
3	578 - 704	2.68 (8.8)	1.95 (6.4)	200.0 (440)	85.5 (188)	0.99 (10.7)	0.78 (8.4)
4	662 - 806	2.47 (8.1)	1.71 (5.6)	195.5 (430)	77.7 (171)	0.89 (9.6)	0.75 (8.1)
RD8 - Gain 12.2 dBd (x 16.6)							
1	470 - 536	5.70 (18.7)	4.97 (16.3)	450.0 (990)	260 (572)	2.76 (29.7)	2.23 (24.0)
2	488 - 608	5.09 (16.7)	4.39 (14.4)	409.1 (900)	242.3 (533)	2.42 (26.0)	1.93 (20.8)
3	578 - 704	4.57 (15)	3.84 (12.6)	372.7 (820)	225 (495)	1.96 (21.1)	1.56 (16.8)
4	662 - 806	4.12 (13.5)	3.38 (11.1)	350.0 (770)	209.6 (461)	1.69 (18.2)	1.51 (16.2)
RD12 - Gain 13.6 dBd (x 22.9)							
1	470 - 536	8.14 (26.7)	7.44 (24.4)	818.2 (1800)	366 (805)	4.12 (44.4)	3.35 (36.1)
2	488 - 608	7.25 (23.8)	6.43 (21.1)	741.0 (1630)	339.5 (747)	3.61 (38.9)	2.90 (31.2)
3	578 - 704	6.43 (21.1)	5.73 (18.8)	522.7 (1150)	313.6 (690)	2.92 (31.4)	2.35 (25.3)
4	662 - 806	5.76 (18.9)	5.03 (16.5)	477.3 (1050)	290.5 (639)	2.53 (27.2)	2.25 (24.2)
RD16 - Gain 14.8 dBd (x 30.2)							
1	470 - 536	10.58 (34.7)	9.91 (32.5)	1409.1 (3100)	489.6 (1077)	5.82 (62.6)	4.47 (48.1)
2	488 - 608	9.39 (30.8)	7.77 (28.5)	904.5 (1990)	454.5 (1000)	5.08 (54.7)	3.86 (41.6)
3	578 - 704	8.32 (27.3)	7.60 (25)	854.5 (1880)	420 (924)	3.87 (41.7)	3.13 (33.7)
4	662 - 806	7.41 (24.3)	6.71 (22)	604.5 (1330)	389.1 (856)	3.36 (36.2)	2.99 (32.2)
RD24 - Gain 16.3 dBd (x 42.7)							
1	470 - 536	15.67 (51.4)	14.81 (48.6)	2863.6 (6300)	820.5 (1805)	9.21 (99.1)	6.70 (72.1)
2	488 - 608	13.87 (45.5)	13.01 (42.7)	2318.2 (5100)	767.7 (1689)	7.67 (82.6)	5.79 (62.3)
3	578 - 704	12.28 (40.3)	11.43 (37.5)	1795.5 (3950)	715.5 (1574)	6.22 (67.0)	4.69 (50.5)
4	662 - 806	10.88 (35.7)	10.03 (32.9)	1409.1 (3100)	669.1 (1472)	5.41 (58.2)	4.51 (48.5)
RD32 - Gain 17.5 dBd (x 56.2)							
1	470 - 536	20.54 (67.4)	19.66 (64.5)	5409.1 (11900)	1099.1 (2418)	13.21 (142.2)	8.93 (96.2)
2	488 - 608	18.17 (59.6)	17.34 (56.9)	4000.0 (8800)	1029.1 (2264)	10.72 (115.4)	7.72 (83.1)
3	578 - 704	16.03 (52.6)	15.21 (49.9)	3045.5 (6700)	959.5 (2111)	8.73 (94.0)	6.26 (67.4)
4	662 - 806	14.17 (46.5)	13.35 (43.8)	2704.5 (5950)	897.7 (1975)	7.17 (77.2)	6.01 (64.7)

Note:
1. Expected Pattern variation for the RD Series is typically less than +/- 5% for a 60 MHz bandwidth.
2. Weights are based on the high power model (LP and MP will be lighter). Typical Effective Area (CaAc) values are with wind to front of antenna and no ice.

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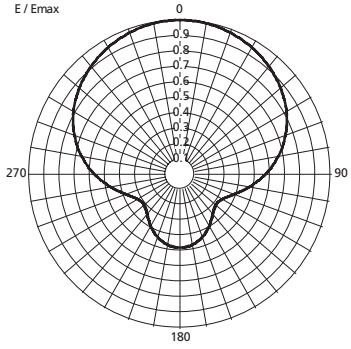
RD Antenna - SK Pattern Data



Azimuth Pattern Gain 2.2 (3.4dB)

RD Pattern & Cavity Group Specifications

Cavity Group	Frequency (MHz)
1	470 - 536
2	488 - 608
3	578 - 704
4	662 - 806

MECHANICAL SPECIFICATIONS

Cavity Group	Frequency Range	Height m (ft) Top Mount	Height m (ft) Side Mount	Weight Kg (lb) Top Mount	Weight Kg (lb) Side Mount	Effective Area (CaAc) sq m (sq ft) Top Mount	Effective Area (CaAc) sq m (sq ft) Side Mount
RD4 - Gain 10.6 dBd (x 11.5)							
1	470 - 536	2.65 (8.7)	2.50 (8.2)	231.8 (510)	78.6 (173)	1.50 (16.1)	0.65 (7.0)
2	488 - 608	2.65 (8.7)	2.23 (7.3)	225.0 (495)	70.9 (156)	1.36 (14.6)	0.57 (6.1)
3	578 - 704	2.07 (6.8)	1.95 (6.4)	197.7 (435)	62.7 (138)	1.07 (11.5)	0.42 (4.5)
4	662 - 806	2.07 (6.8)	1.71 (5.6)	193.2 (425)	57.3 (126)	0.97 (10.4)	0.36 (3.9)
RD8 - Gain 13.3 dBd (x 21.4)							
1	470 - 536	5.09 (16.7)	4.97 (16.3)	445.5 (980)	236.0 (519)	2.96 (31.9)	1.31 (14.1)
2	488 - 608	4.48 (14.7)	4.39 (14.4)	404.5 (890)	220.0 (484)	2.60 (28.0)	1.14 (12.3)
3	578 - 704	3.96 (13.0)	3.84 (12.6)	368.2 (810)	204.1 (449)	2.11 (22.7)	0.84 (9.0)
4	662 - 806	3.50 (11.5)	3.38 (11.1)	345.5 (760)	193.6 (426)	1.85 (19.9)	0.72 (7.8)
RD12 - Gain 14.7 dBd (x 29.5)							
1	470 - 536	7.56 (24.8)	7.44 (24.4)	811.4 (1785)	330.0 (726)	4.43 (47.7)	1.96 (21.1)
2	488 - 608	6.64 (21.8)	6.43 (21.1)	734.1 (1615)	306.4 (674)	3.88 (41.8)	1.71 (18.4)
3	578 - 704	5.85 (19.2)	5.73 (18.8)	515.9 (1135)	282.3 (621)	3.15 (33.9)	1.24 (13.4)
4	662 - 806	5.12 (16.8)	5.03 (16.5)	470.5 (1035)	266.4 (586)	3.70 (39.7)	1.10 (11.8)
RD16 - Gain 15.9 dBd (x 38.9)							
1	470 - 536	10.00 (32.8)	9.91 (32.5)	1400.0 (3080)	441.8 (972)	6.22 (67.0)	2.62 (28.2)
2	488 - 608	8.78 (28.8)	7.77 (28.5)	895.5 (1970)	410.0 (902)	5.43 (58.5)	2.28 (24.5)
3	578 - 704	7.71 (25.3)	7.60 (25)	845.5 (1860)	378.2 (832)	4.18 (45.0)	1.66 (17.9)
4	662 - 806	6.80 (22.3)	6.71 (22)	595.5 (1310)	356.8 (785)	3.68 (39.6)	1.46 (15.7)
RD24 - Gain 17.4 dBd (x 55.0)							
1	470 - 536	15.24 (50.0)	14.81 (48.6)	2850.0 (6270)	748.6 (1647)	9.85 (106.0)	3.92 (42.2)
2	488 - 608	13.41 (44.0)	13.01 (42.7)	2304.5 (5070)	701.0 (1542)	8.20 (88.3)	3.42 (36.8)
3	578 - 704	11.80 (38.7)	11.43 (37.5)	1781.8 (3920)	652.7 (1436)	6.69 (72.0)	2.50 (26.9)
4	662 - 806	10.42 (34.2)	10.03 (32.9)	1395.5 (3070)	621.4 (1367)	5.86 (63.1)	2.18 (23.5)
RD32 - Gain 18.6 dBd (x 72.4)							
1	470 - 536	20.12 (66.0)	19.66 (64.5)	5404.5 (11890)	1003.6 (2208)	14.03 (151.0)	5.23 (56.3)
2	488 - 608	17.68 (58.0)	17.34 (56.9)	3995.5 (8790)	940.0 (2068)	12.27 (132.1)	4.55 (49.0)
3	578 - 704	15.58 (51.1)	15.21 (49.9)	3040.9 (6690)	875.9 (1927)	9.36 (100.7)	3.33 (35.8)
4	662 - 806	13.69 (44.9)	13.35 (43.8)	2700.0 (5940)	833.6 (1834)	8.22 (88.5)	2.92 (31.4)

Note:
1. Expected Pattern variation for the RD Series is typically less than +/- 5% for a 60 MHz bandwidth.
2. Weights are based on the high power model (LP and MP will be lighter). Typical Effective Area (CaAc) values are with wind to front of antenna and no ice.

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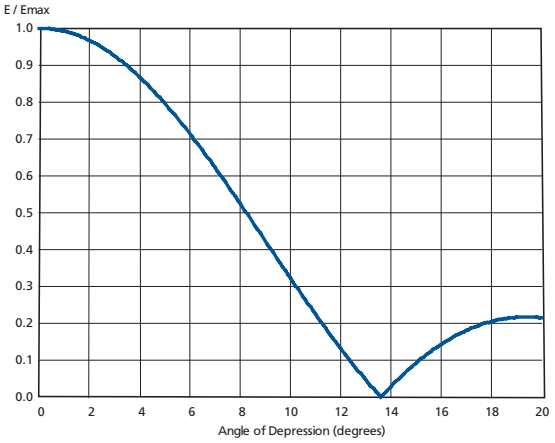
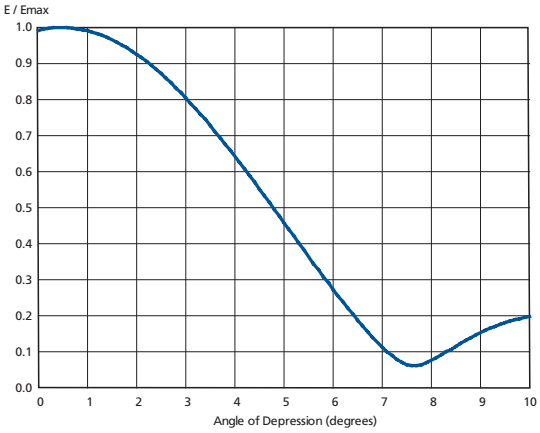
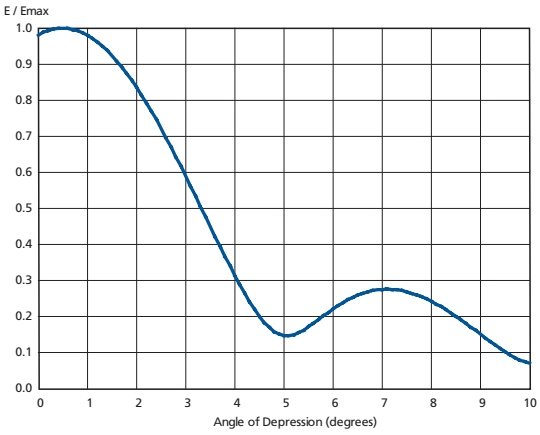
RD Series



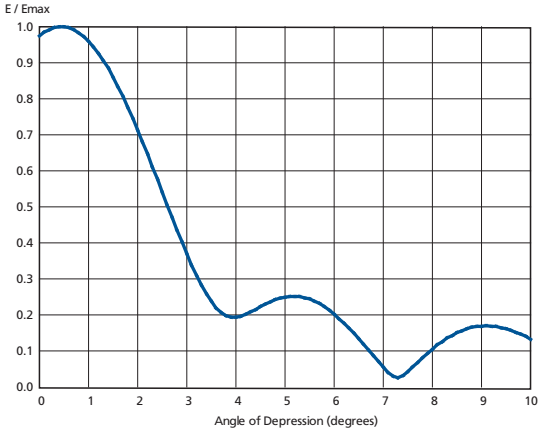
Elevation Pattern 4 Bay Vertical Directivity 5.21 (7.16 dBd) Beam Tilt (deg) 0



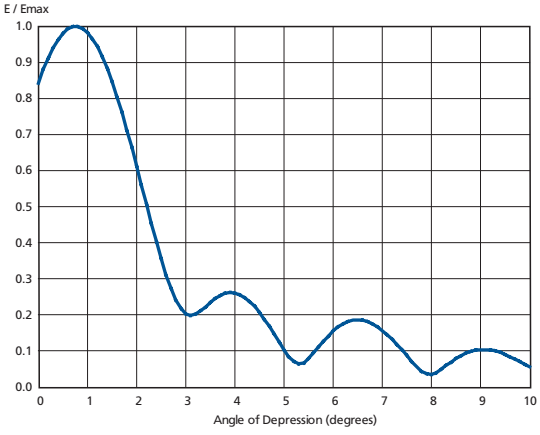
Elevation Pattern 8 Bay Vertical Directivity 9.77 (9.90 dBd) Beam Tilt (deg) 0.5 Note#1



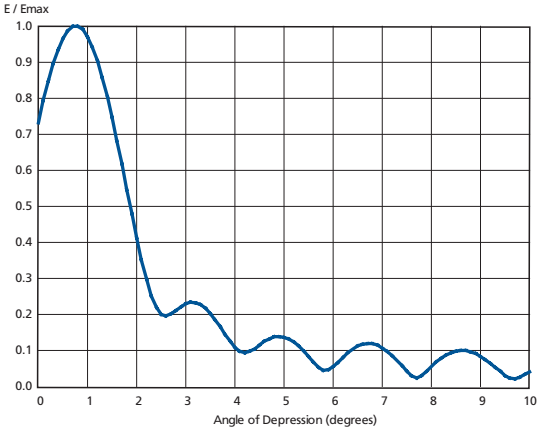
Elevation Pattern 12 Bay Vertical Directivity 13.38 (11.27 dBd) Beam Tilt (deg) 0.5 Note#1



Elevation Pattern 16 Bay Vertical Directivity 17.55 (12.44 dBd) Beam Tilt (deg) 0.5 Note#1



Elevation Pattern 24 Bay Vertical Directivity 25.36 (14.04 dBd) Beam Tilt (deg) 0.75 Note#1



Elevation Pattern 32 Bay Vertical Directivity 32.90 (15.17 dBd) Beam Tilt (deg) 0.75 Note#1

Note 1
Different Beam tilt and Null fill can be specified at time of order

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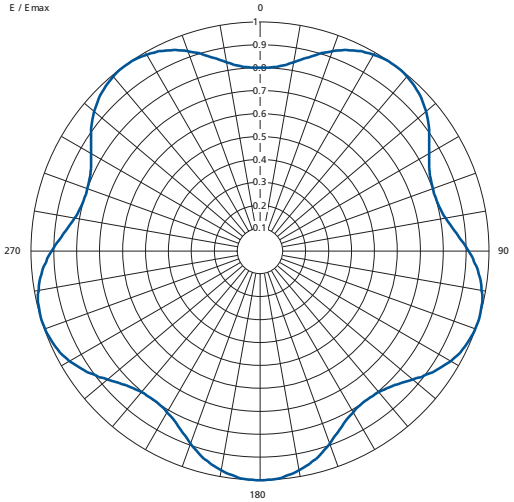
RO Series

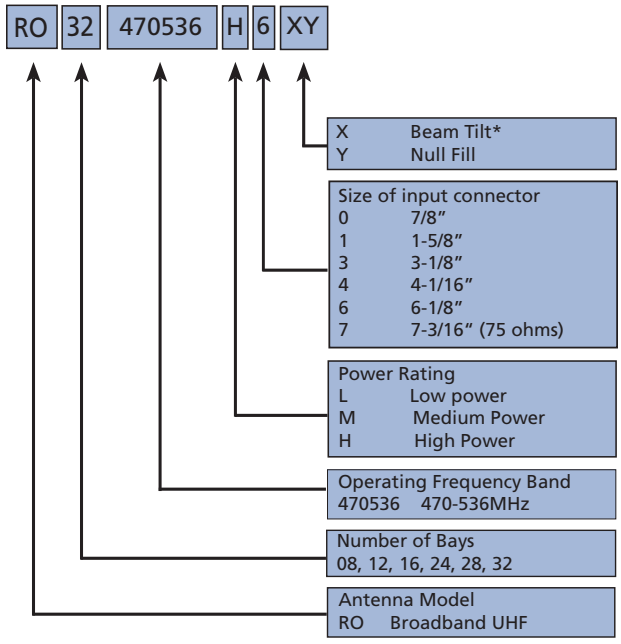
The RO series is typically supplied in a top mount configuration, with two service ladders and removable radome panels. The antenna is easily adapted to a variety of tower mounting requirements. A lifting lug is provided to lift the antenna into position. Lightning rods and beacon mounts are supplied. Typical beam tilts of 0 to 3 degrees are available in 0.25 degree increments with 0.5 degrees on the 8, 12 and 16 bay models and 0.75 degrees on the 24, 28 and 32 bay models as standard. Typical Null Fills of 0% to 30% are also available in 5% increments. Standard Null Fills are indicated in the Vertical Radiation Patterns.

- Very smooth omni-directional radiation pattern
- Multichannel operation
- Wide bandwidth/ Low VSWR
- Power rating up to 60kW Average
- Top mount
- Low wind load
- Fully enclosed in a cylindrical radome

The RO series is typically supplied in a top mount configuration, with two service ladders and removable radome panels. The antenna is easily adapted to a variety of tower mounting requirements. A lifting lug is provided to lift the antenna into position. Lightning rods and beacon mounts are supplied. Typical beam tilts of 0 to 3 degrees are available in 0.25 degree increments with 0.5 degrees on the 8, 12 and 16 bay models and 0.75 degrees on the 24, 28 and 32 bay models as standard. Typical Null Fills of 0% to 30% are also available in 5% increments. Standard Null Fills are indicated in the Vertical Radiation Patterns.



RO Series Azimuth Pattern Gain 1.2 (0.8 dB)



RO Series Ordering Information

SPECIFICATIONS (ALL MODELS)	
Polarization	Horizontal
Impedance, ohms	50 unbalanced

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RO Series Standard Power Ratings

Model	Low Power		Medium Power		High Power	
	Max Input Power (Avg)	Connector Size	Max Input Power (Avg)	Connector Size	Max Input Power (Avg)	Connector Size
RO08	4 kW	1 5/8" EIA	8 kW	3 1/8" EIA	20 kW	4 1/16"
RO12	6 kW	3 1/8" EIA	12 kW	3 1/8" EIA	30 kW	6 1/8" EIA
RO16	8 kW	3 1/8" EIA	16 kW	3 1/8" EIA	40 kW	6 1/8" EIA
RO24	12 kW	3 1/8" EIA	24 kW	6 1/8" EIA	60 kW	6 1/8" EIA
RO28	14 kW	3 1/8" EIA	28 kW	6 1/8" EIA	60 kW [1]	6 1/8" EIA
RO32	16 kW	3 1/8" EIA	32 kW	6 1/8" EIA	60 kW [1]	6 1/8" EIA

Note 1: Higher power option available with 7-3/16", 75 ohm input connector. Contact RFS for details.

Cavity Group Frequency Range Specifications

Cavity Group	Frequency Range (MHz)	Pattern Bandwidth (MHz)	Return Loss (dB)
1	470 - 536	66	>26
2	488 – 548, 518 – 578, 548 - 608	60	>26
3	578 – 584, 614 – 674, 644 - 704	60	>26
4	662 – 722, 704 – 764, 746 - 752	60	>26

Expected Pattern Variation for the RO Series is typically less than +/- 5% for a 60 MHz bandwidth

Cavity Group	Frequency Range	Height m (ft)	Weight Kg (lb)	Effective Area (CaAc) sq m (sq ft)	Radome Diameter cm (in)
RO8 - Gain 10.2 dBd (x 10.5)					
1	471.00 - 536.00	5.67 (18.6)	1636 (3600)	3.32 (35.7)	71.12 (28)
2	489.00 - 608.00	5.09 (16.7)	1591 (3500)	2.97 (32)	71.12 (28)
3	579.00 - 704.00	4.54 (14.9)	1455 (3200)	2.53 (27.2)	66.04 (26)
4	663.00 - 806.00	4.08 (13.4)	1410 (3100)	2.27 (24.4)	66.04 (26)
RO12 - Gain 11.8 dBd (x 15.1)					
1	471.00 - 536.00	8.26 (27.1)	2273 (5000)	4.83 (52)	71.12 (28)
2	489.00 - 608.00	7.38 (24.2)	2182 (4800)	4.31 (46.4)	71.12 (28)
3	579.00 - 704.00	6.58 (21.6)	1955 (4300)	3.64 (39.2)	66.04 (26)
4	663.00 - 806.00	5.88 (19.3)	1909 (4200)	3.26 (35.1)	66.04 (26)
RO16 - Gain 12.9 dBd (x 19.5)					
1	471.00 - 536.00	10.85 (35.6)	2909 (6400)	6.34 (68.3)	71.12 (28)
2	489.00 - 608.00	9.66 (31.7)	2773 (6100)	5.65 (60.8)	71.12 (28)
3	579.00 - 704.00	8.60 (28.2)	2500 (5500)	4.77 (51.3)	66.04 (26)
4	663.00 - 806.00	7.68 (25.2)	2409 (5300)	4.25 (45.8)	66.04 (26)
RO24 - Gain 14.5 dBd (x 28.2)					
1	471.00 - 536.00	16.03 (52.6)	5090 (11200)	9.36 (100.8)	71.12 (28)
2	489.00 - 608.00	14.23 (46.7)	4590 (10100)	8.32 (89.6)	71.12 (28)
3	579.00 - 704.00	12.65 (41.5)	4136 (9100)	7.00 (75.4)	66.04 (26)
4	663.00 - 806.00	11.25 (36.9)	3773 (8300)	6.23 (67.1)	66.04 (26)
RO28 - Gain 14.8 dBd (x 30.2)					
1	471.00 - 536.00	18.62 (61.1)	6636 (14600)	10.88 (117.1)	71.12 (28)
2	489.00 - 608.00	16.52 (54.2)	5773 (12700)	9.66 (104)	71.12 (28)
3	579.00 - 704.00	14.66 (48.1)	5182 (11400)	8.13 (87.5)	66.04 (26)
4	663.00 - 806.00	12.98 (42.6)	4546 (10000)	7.23 (77.8)	66.04 (26)
RO32 - Gain 15.7 dBd (x 37.2)					
1	471.00 - 536.00	21.21 (69.6)	7546 (16600)	12.39 (133.4)	71.12 (28)
2	489.00 - 608.00	18.83 (61.8)	7091 (15600)	11.00 (118.4)	71.12 (28)
3	579.00 - 704.00	16.70 (54.8)	5773 (12700)	9.25 (99.6)	66.04 (26)
4	663.00 - 806.00	14.84 (48.7)	5546 (12200)	8.22 (88.5)	66.04 (26)

Note: Weights are based on the high power model (LP and MP will be lighter). Typical Effective Area (CaAc) values are with wind to front of antenna and no ice. Two service ladders are included.

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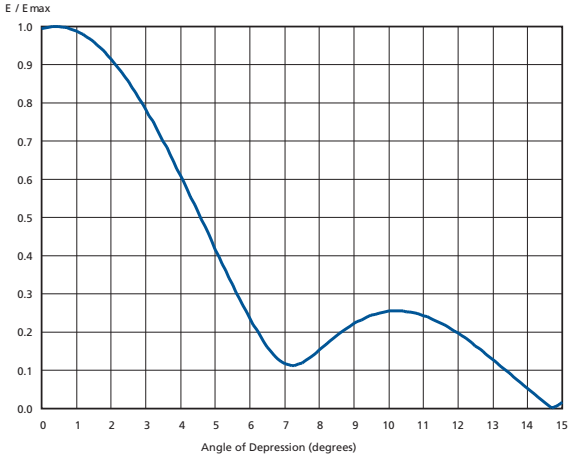
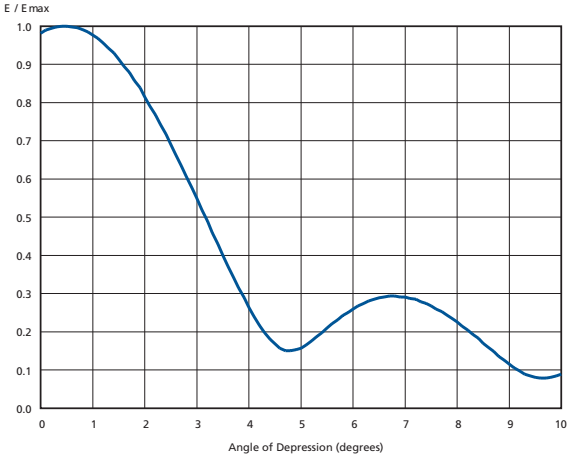
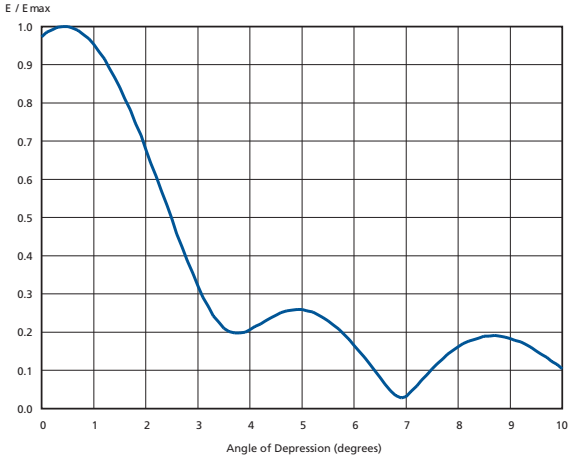
RO Series



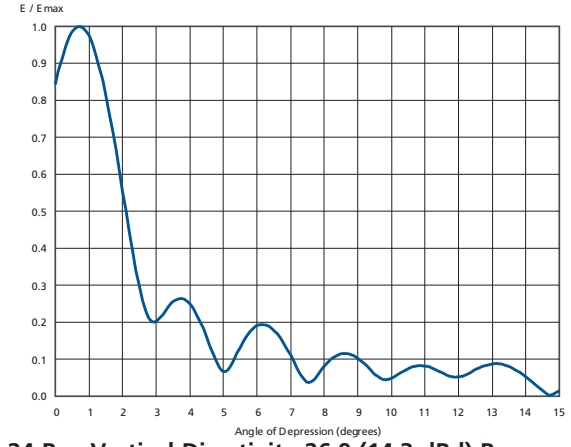
8 Bay Vertical Directivity 9.6 (9.8dBd) Beam Tilt (deg) 0.5 Note#1



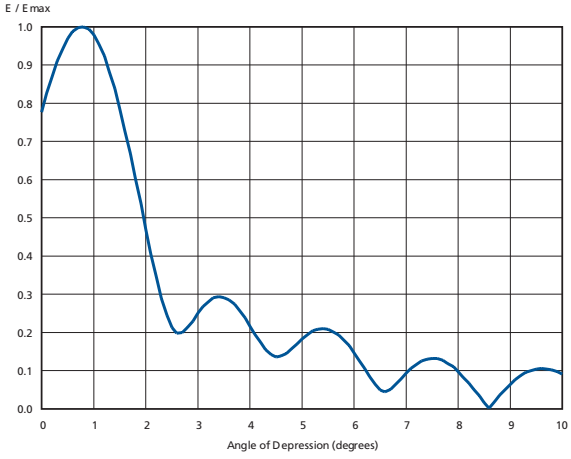
12 Bay Vertical Directivity 13.8 (11.4 dBd) Beam Tilt (deg) 0.75 Note#1



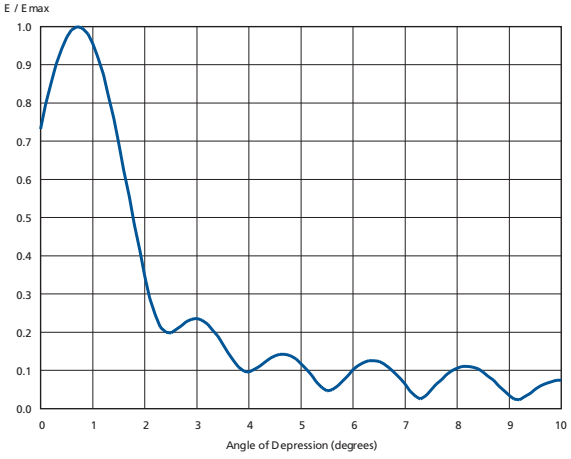
16 Bay Vertical Directivity 18.2 (12.6 dBd) Beam Tilt (deg) 0.5 Note#1



24 Bay Vertical Directivity 26.9 (14.3 dBd) Beam Tilt (deg) 0.75 Note#1



28 Bay Vertical Directivity 26.8 (14.6 dBd) Beam Tilt (deg) 0.75 Note#1



32 Bay Vertical Directivity 35.5 (15.5 dBd) Beam Tilt (deg) 0.75 Note#1

Note 1
Different Beam tilt and Null fill can be specified at time of order

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PHP10S Series

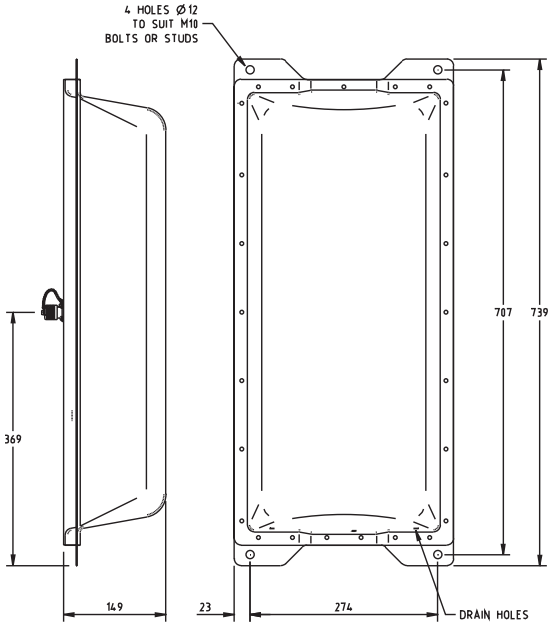
The PHP10S broadband panel is designed as a building block for integration into complex antenna arrays or can be used individually for simple antenna systems. This panel covers upper Band V frequency range without field adjustment.

- Engineered for digital or analogue TV
- Corrosion resistant aluminum construction with luran radome
- Horizontal polarization
- Low wind loading
- Cyclone rated
- High power rating
- Array design allows a variety of horizontal radiation patterns with or without beam tilt and null fill, contact RFS for details

Standard antennas are pressurizable and have a 7/8" EIA input connector. A capacitive probe is supplied at the input. Panels can also be supplied with dual 7/8" EIA connectors to achieve 4.4kW power rating. 7-16 DIN and N type input connectors are also available for low power situations without the capacitive probe. Radomes for individual panels are supplied in white luran as standard. Also available in orange.

Array design can provide any of an almost infinite variety of horizontal patterns, with or without vertical beam tilt and null fill. Omnidirectional radiation characteristics can be achieved by mounting any number of panels around a suitably sized supporting structure. Horizontal radiation patterns for four panels around a 400 mm square. These are plotted for 750MHz, 800MHz and 860MHz. Panels can also be mounted 10 around on an 800mm square column.

PHP10S Panel



PHP10S Panel

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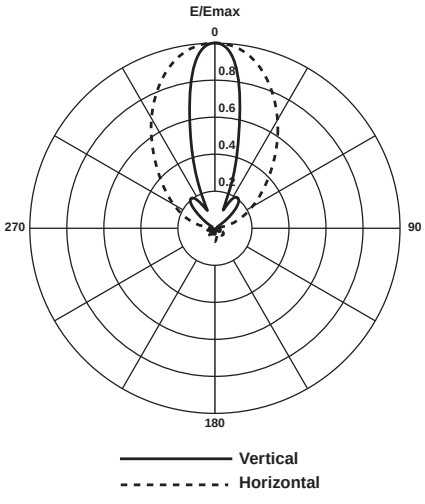
Band V (UHF) TV Panel Arrays 750 - 870 MHz

PHP10S Series

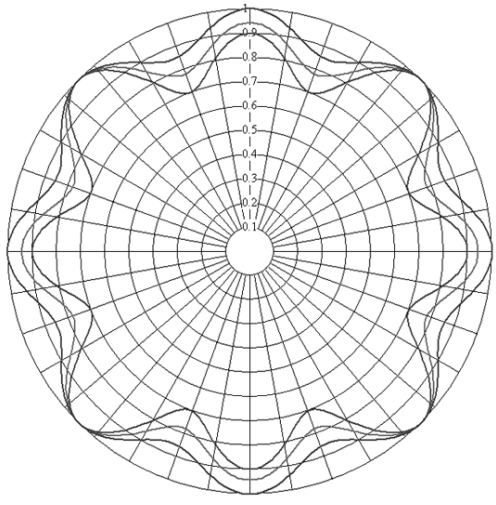
SPECIFICATIONS (ALL MODELS)	
Frequency Range, MHz	750 - 870
Polarization	Horizontal
Number of Channels	Multichannel
Nominal Gain (Mid-band), dBd	11
Half Power Beamwidth Azimuth, degrees	60
Return Loss, dB	> 26
Impedance, ohms	50
Mounting (Standard), mm (in)	4 x 10mm (3/8") bolts
Effective Area Front (full antenna), sq m (sq ft)	0.24 (2.58)
Effective Area Side (full antenna), sq m (sq ft)	0.16 (1.72)
Design Wind Speed (max), km/h (mph)	240 (150)
Pressurization Operational, kPa (psi)	10 - 35 (1.5 - 5) Note#2
Pressurization Test, kPa (psi)	100 (15)
Material - Radome	Luran
Material - Insulators	PTFE
Material - Radiators	Corrosion resistant aluminum
Material - Reflecting Screen	Corrosion resistant aluminum

SPECIFICATIONS	PHP10SN	PHP10S4	PHP10S
Input Connector	N socket	7-16 DIN	7/8" EIA
Power Rating, kW	0.25	1.4 Note#1	2.2 Note#1
Weight, kg (lb)	3.7 (8)	3.7 (8)	5.5 (12)

Note 1
Double power version available with dual 7/8" EIA inputs.
Note 2
7/8" EIA version only.



Radiation Pattern



Radiation Pattern - 4 panels on 400 mm column (750MHz, 800MHz, 860MHz)

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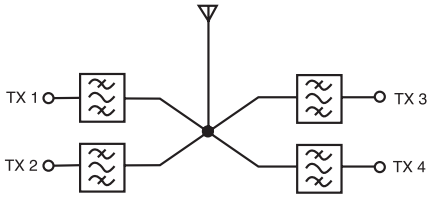
Band II (VHF) FM Branched Combiner 87.5 - 108 MHz

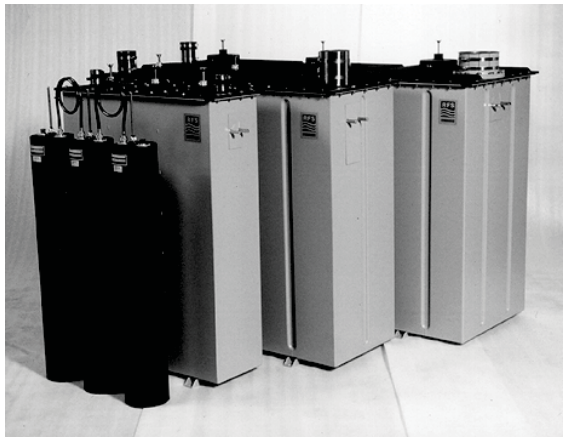
CS FM - 2 Pole, 3 Pole and Integrated Filters

The branched or star point combiner range utilizes bandpass filters connected to a common output. This arrangement provides a lower cost alternative to the balanced design while retaining the advantages of the RFS bandpass filter range.

- 2, 3 and 4 channel versions available as standard
- Additional channels can be added using balanced combiner modules
- Compact size for given power rating
- Fixed coupling aperture for maximum reliability and ease of tuning
- Vertical entry and exit without additional elbows
- 2 and 3 pole versions standard
- Natural convection cooling
- Invar temperature compensation
- 4 filter sizes for 500W, 1kW, 6kW and 15kW transmitter output powers
- Higher powers may be possible, please consult RFS for further information
- Shipped in “knock down” condition for ease of handling through standard doors and elevators
- Custom options such as patching facilities and power monitoring are available



Combiner Configuration



Bandpass Filters

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CS FM - 2 Pole Filters

SPECIFICATIONS (ALL MODELS)	
Frequency Range, MHz	87.5 - 108
Channel Spacing	2.4 MHz,1.6 MHz reduced spec
Impedance, ohms	50 unbalanced
Filter Type	4 x (2 Pole 400mm)
Narrowband Input Return Loss, dB	> 23 +/-150kHz
N'band Input Group Delay variation over Channel Bandwidth, nsec	< 25 to +/- 100 kHz
Intermod Spurs (10dB Tx Conversion Loss), dB	< -85 at min channel spacing
Narrowband to Narrowband Isolation, dB	> 35 at min channel spacing
Amplitude Variation, dB	< 0.2 to +/- 200kHz

SPECIFICATIONS	CS2P150B-2	CS2P150B-3	CS2P150B-4	CS2P200B-2
Narrowband Input Power (maximum), kW Average	0.5	0.5	0.5	1
Output Power (maximum), kW Average	0.5	0.5	0.5	2
Number of Channels	2	3	4	2
Narrowband Input Connector	N	N	N	7/8" EIA; 1-5/8" EIA
Narrowband Insertion Loss at Channel Center Frequency, dB	0.7	0.7	0.7	0.35
Output Connector	N	N	N	1-5/8" EIA
Weight, kg (lb)	10 (22) /Channel	10 (22) /Channel	10 (22) /Channel	35 (77) /Channel
Dimensions (Height or Length), cm (in)	120.0 (47) / Channel	120.0 (47) / Channel	120.0 (47) / Channel	140.0 (55) /channel
Dimensions (Width), cm (in)	40.0 (16) /Channel	40.0 (16) /Channel	40.0 (16) /Channel	60.0 (24) /channel
Dimensions (Depth), cm (in)	20.0 (8) /Channel	20.0 (8) /Channel	20.0 (8) /Channel	30.0 (12) /channel

SPECIFICATIONS	CS2P200B-3	CS2P200B-4	CS2P400B-2	CS2P400B-3
Narrowband Input Power (maximum), kW Average	1	1	6	6
Output Power (maximum), kW Average	3	4	12	18
Number of Channels	3	4	2	3
Narrowband Input Connector	7/8" EIA; 1-5/8" EIA	7/8" EIA; 1-5/8" EIA	3-1/8" EIA	3-1/8" EIA
Narrowband Insertion Loss at Channel Center Frequency, dB	0.35	0.35	0.25	0.25
Output Connector	1-5/8" EIA	1-5/8" EIA	3-1/8" EIA	3-1/8" EIA
Weight, kg (lb)	35 (77) /Channel	35 (77) /Channel	60 (132)/Channel	60 (132)/Channel
Dimensions (Height or Length), cm (in)	140.0 (55) /channel	140.0 (55) /channel	150.0 (59) /Channel	150.0 (59) /Channel
Dimensions (Width), cm (in)	60.0 (24) /channel	60.0 (24) /channel	90.0 (35) /Channel	90.0 (35) /Channel
Dimensions (Depth), cm (in)	30.0 (12) /channel	30.0 (12) /channel	50.0 (20) /Channel	50.0 (20) /Channel

SPECIFICATIONS	CS2P400B-4	CS2P600B-2	CS2P600B-3	CS2P600B-4
Narrowband Input Power (maximum), kW Average	6	15	15	15
Output Power (maximum), kW Average	24	30	40	40
Number of Channels	4	2	3	4
Narrowband Input Connector	3-1/8" EIA	3-1/8" EIA	3-1/8" EIA	3-1/8" EIA
Narrowband Insertion Loss at Channel Center Frequency, dB	0.25	0.2	0.2	0.2
Output Connector	3-1/8" EIA	3-1/8" EIA	3-1/8" EIA	3-1/8" EIA
Weight, kg (lb)	60 (132)/Channel	95 (209) /Channel	95 (209) /Channel	95 (209) /Channel
Dimensions (Height or Length), cm (in)	150.0 (59) /Channel	160.0 (63) /Channel	160.0 (63) /Channel	160.0 (63) /Channel
Dimensions (Width), cm (in)	90.0 (35) /Channel	130.0 (51) /Channel	130.0 (51) /Channel	130.0 (51) /Channel
Dimensions (Depth), cm (in)	50.0 (20) /Channel	70.0 (28) /Channel	70.0 (28) /Channel	70.0 (28) /Channel

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CS FM - 3 Pole Filters

SPECIFICATIONS (ALL MODELS)	
Frequency Range, MHz	87.5 - 108
Channel Spacing	1.6 MHz ,1.2 MHz reduced spec
Impedance, ohms	50 unbalanced
Filter Type	2 x (3 Pole 150mm)
Narrowband Input Return Loss, dB	> 23 +/-200kHz
N'band Input Group Delay variation over Channel Bandwidth, nsec	< 25 to +/- 100 kHz
Intermod Spurs (10dB Tx Conversion Loss), dB	< -85 at min channel spacing
Narrowband to Narrowband Isolation, dB	> 35 at min channel spacing
Amplitude Variation, dB	< 0.2 to +/- 200kHz

SPECIFICATIONS	CS3P150B-2	CS3P150B-3	CS3P150B-4	CS3P200B-2
Narrowband Input Power (maximum), kW Average	0.5	0.5	0.5	1
Output Power (maximum), kW Average	0.5	0.5	0.5	2
Number of Channels	2	3	4	2
Narrowband Input Connector	N	N	N	7/8" EIA; 1-5/8" EIA
Narrowband Insertion Loss at Channel Center Frequency, dB	1	1	1	0.5
Output Connector	N	N	N	1-5/8" EIA
Weight, kg (lb)	12 (26)/Channel	12 (26)/Channel	12 (26)/Channel	45 (99)/Channel
Dimensions (Height or Length), cm (in)	120.0 (47)/Channel	120.0 (47)/Channel	120.0 (47)/Channel	140.0 (55)/Channel
Dimensions (Width), cm (in)	60.0 (24)/Channel	60.0 (24) /Channel	60.0 (24) /Channel	80.0 (31)/Channel
Dimensions (Depth), cm (in)	20.0 (8)/Channel	20.0 (8)/Channel	20.0 (8)/Channel	30.0 (12)/channel

SPECIFICATIONS	CS3P200B-3	CS3P200B-4	CS3P400B-2	CS3P400B-3
Narrowband Input Power (maximum), kW Average	1	1	6	6
Output Power (maximum), kW Average	3	4	12	18
Number of Channels	3	4	2	3
Narrowband Input Connector	7/8" EIA; 1-5/8" EIA	7/8" EIA; 1-5/8" EIA	3-1/8" EIA	3-1/8" EIA
Narrowband Insertion Loss at Channel Center Frequency, dB	0.5	0.5	0.3	0.3
Output Connector	1-5/8" EIA	1-5/8" EIA	3-1/8" EIA	3-1/8" EIA
Weight, kg (lb)	45 (99)/Channel	45 (99)/Channel	80 (176)/Channel	80 (176)/Channel
Dimensions (Height or Length), cm (in)	140.0 (55)/Channel	140.0 (55)/Channel	150.0 (59)/Channel	150.0 (59)/Channel
Dimensions (Width), cm (in)	80.0 (31)/Channel	80.0 (31)/Channel	130.0 (51)/Channel	130.0 (51)/Channel
Dimensions (Depth), cm (in)	30.0 (12)/Channel	30.0 (12)/Channel	50.0 (20)/Channel	50.0 (20)/Channel

SPECIFICATIONS	CS3P400B-4	CS3P600B-2	CS3P600B-3	CS3P600B-4
Narrowband Input Power (maximum), kW Average	6	15	15	15
Output Power (maximum), kW Average	24	30	40	40
Number of Channels	4	2	3	4
Narrowband Input Connector	3-1/8" EIA	3-1/8" EIA	3-1/8" EIA	3-1/8" EIA
Narrowband Insertion Loss at Channel Center Frequency, dB	0.3	0.25	0.25	0.25
Output Connector	3-1/8" EIA	3-1/8" EIA	3-1/8" EIA	3-1/8" EIA
Weight, kg (lb)	80 (176)/Channel	125 (276)/Channel	125 (276)/Channel	125 (276)/Channel
Dimensions (Height or Length), cm (in)	150.0 (59)/Channel	160.0 (63)/Channel	160.0 (63)/Channel	160.0 (63)/Channel
Dimensions (Width), cm (in)	130.0 (51)/Channel	190.0 (75)/Channel	190.0 (75)/Channel	190.0 (75)/Channel
Dimensions (Depth), cm (in)	50.0 (20)/Channel	70.0 (28)/Channel	70.0 (28)/Channel	70.0 (28)/Channel

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CS FM - Integrated Filters

SPECIFICATIONS (ALL MODELS)	
Frequency Range, MHz	87.5 - 108
Channel Spacing	1.6 MHz
Number of Channels	2
Impedance, ohms	50 unbalanced
Filter Type	Integrated
Narrowband Insertion Loss at Channel Center Frequency, dB	< 0.5
Narrowband Input Return Loss, dB	> 23 +/-200kHz
Narrowband to Narrowband Isolation, dB	> 40 at min channel spacing
Amplitude Variation, dB	< 0.2 to +/- 200kHz

SPECIFICATIONS	CS2P400IB-2	CS3P200IB-2	CS3P400IB-2
Narrowband Input Power (maximum), kW Average	N/A	1	N/A
Output Power (maximum), kW Average	N/A	4	N/A
Narrowband Input Connector	3-1/8" EIA	7/8" EIA	3-1/8" EIA
Output Connector	3-1/8" EIA	7/8" EIA	3-1/8" EIA
Weight, kg (lb)		95 (209)	
Dimensions (Height or Length), cm (in)		160.0 (63)	
Dimensions (Width), cm (in)		70.0 (28)	
Dimensions (Depth), cm (in)		50.0 (20)	

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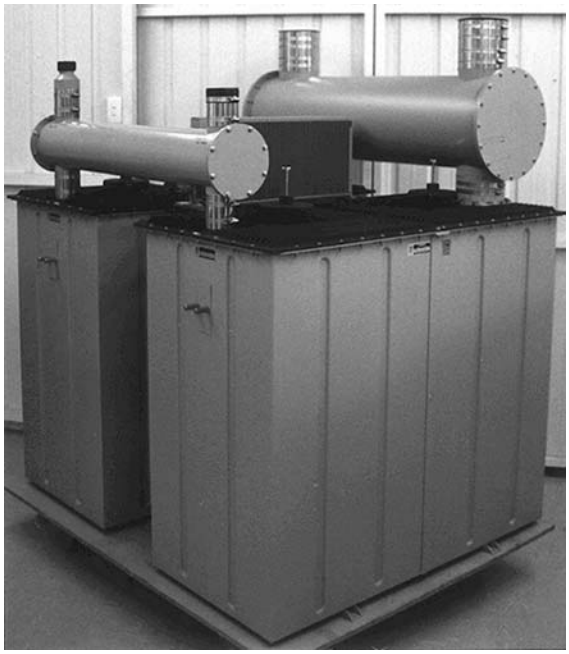
Band II (VHF) FM Balanced Combiner 87.5 - 108 MHz

CA FM - 2 Pole, 3 Pole and Integrated Filters

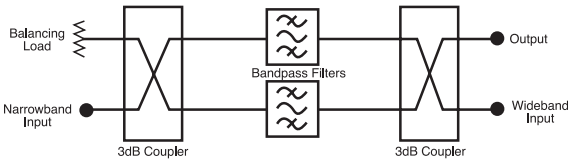
RFS offers a comprehensive product line of FM combiners to suit a wide range of applications. The balanced (or constant impedance) bandpass design offers an expandable system which is built in a modular form enabling extra stations to be added at a future date. This configuration provides state of the art performance with the best frequency response and isolation attainable.

- Compact size for given power rating
- Vertical entry and exit without additional elbows
- Can be field retuned to any frequency in the 87.5 - 108MHz band
- 2 and 3 pole bandpass filter versions standard
- Natural convection cooling for all power levels
- Suitable for channel spacings as close as 800kHz
- Group delay corrector modules available for complex multichannel systems
- Larger units shipped in “knock-down” condition for ease of handling through standard doors and elevators
- Custom options such as patching facilities and power monitoring are available
- Input/output line sizes can be varied to suit using RFS developed R series adaptors

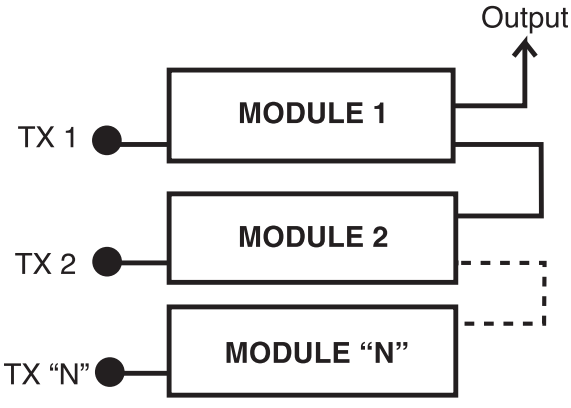
A module consists of a balanced pair of bandpass filters, two 3dB couplers and a balancing load. The narrowband input corresponds to the filter resonant frequency, whereas the wideband input can be any other frequency across the FM band. Modules can therefore be cascaded to form a multichannel combiner. A balancing load absorbs narrowband reflections within the module and any wideband signal which passes through the filter network. This property of redirecting signals between the output and balancing loads results in the transmitter working into a 50 ohm system across the full operating bandwidth of the antenna. The narrowband signal is split by the input coupler, passes through the bandpass filters and is recombined in the output coupler to add at the output port. Wideband signals are split by the output coupler, then reflect from the bandpass filters and, as the path lengths are identical, recombine in the output coupler to add at the output port. Isolation between the inputs is provided by the output coupler directivity and the filter selectivity.



CA3P150-618



Combiner Module Configuration



Multi-station Combiner Arrangement

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CA FM - 2 Pole Filters

SPECIFICATIONS (ALL MODELS)	
Frequency Range, MHz	87.5 - 108 Field tunable
Channel Spacing	1.6 MHz
Impedance, ohms	50
Input Return Loss, dB	> 30 to +/- 200kHz
Input Group Delay variation over Channel Bandwidth, nsec	< 25 to +/- 100kHz
Intermod Spurs (10dB Tx Conversion Loss), dB	< -85 at minimum ch spacing
Narrowband to Narrowband Isolation, dB	> 50 at min ch spacing

SPECIFICATIONS	CA2P150B-00N	CA2P400IB-318	CA2P400B-318	CA2P400B-412
Dimensions (Depth), cm (in)	50.0 (20)	90.0 (35)	90.0 (35)	90.0 (35)
Narrowband Input Power (maximum), kW Average	0.5	5	12	12
Output Power (maximum), kW Average	0.5	40	40	80
Filter Type	2 Pole (150mm)	2 Pole (Integrated)	2 Pole (400mm)	2 Pole (400mm)
Narrowband Input Connector	N	1-5/8" EIA	3-1/8" EIA	3-1/8" EIA
Narrowband Insertion Loss at Channel Center Frequency, dB	0.7	0.25	0.25	0.2
Wideband Input Connector	N	3-1/8" EIA	3-1/8" EIA	4-1/2" IEC
Wideband Input Insertion Loss, dB	<0.2	0.1	0.1	0.1
Amplitude Variation, dB	< 0.2 to +/- 200kHz	< 0.1 to +/- 200kHz	< 0.1 to +/- 200kHz	< 0.1 to +/- 200kHz
Output Connector	N	3-1/8" EIA	3-1/8" EIA	4-1/2" IEC
Weight, kg (lb)	25 (55)	100 (220)	170 (375)	190 (419)
Dimensions (Height or Length), cm (in)	120.0 (47)	140.0 (55)	150.0 (59)	160.0 (63)
Dimensions (Width), cm (in)	50.0 (20)	90.0 (35)	120.0 (47)	120.0 (47)

SPECIFICATIONS	CA2P600B-318	CA2P600B-412	CA2P600B-618
Dimensions (Depth), cm (in)	130.0 (51)	130.0 (51)	130.0 (51)
Narrowband Input Power (maximum), kW Average	25	25	25
Output Power (maximum), kW Average	40	80	160
Filter Type	2 Pole (600mm)	2 Pole (600mm)	2 Pole (600mm)
Narrowband Input Connector	3-1/8" EIA	3-1/8" EIA	3-1/8" EIA
Narrowband Insertion Loss at Channel Center Frequency, dB	0.2	0.2	0.2
Wideband Input Connector	3-1/8" EIA	4-1/2" IEC	6-1/8" EIA
Wideband Input Insertion Loss, dB	0.1	0.1	0.1
Amplitude Variation, dB	< 0.1 to +/- 200kHz	< 0.1 to +/- 200kHz	< 0.1 to +/- 200kHz
Output Connector	3-1/8" EIA	4-1/2" IEC	6-1/8" EIA
Weight, kg (lb)	230 (507)	245 (540)	270 (595)
Dimensions (Height or Length), cm (in)	150.0 (59)	160.0 (63)	160.0 (63)
Dimensions (Width), cm (in)	150.0 (59)	150.0 (59)	150.0 (59)

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CA FM - 3 Pole Filters

SPECIFICATIONS (ALL MODELS)	
Frequency Range, MHz	87.5 - 108 Field tunable
Channel Spacing	0.8 MHz
Impedance, ohms	50
Input Return Loss, dB	> 30 to +/- 200kHz
Input Group Delay variation over Channel Bandwidth, nsec	< 25 to +/- 100kHz
Intermod Spurs (10dB Tx Conversion Loss), dB	< -85 at minimum ch spacing
Wideband Input Insertion Loss, dB	0.1
Narrowband to Narrowband Isolation, dB	> 50 at min ch spacing
Amplitude Variation, dB	< 0.1 to +/- 200kHz

SPECIFICATIONS	CA3P150B-00N	CA3P200IB-158	CA3P400IB-318	CA3P400B-318
Narrowband Input Power (maximum), kW Average	0.5	2	5	12
Output Power (maximum), kW Average	0.5	10	40	40
Filter Type	3 Pole (150mm)	3 Pole (Integrated)	3 Pole (Integrated)	3 Pole (400mm)
Narrowband Input Connector	N	7/8" EIA	1-5/8" EIA	3-1/8" EIA
Narrowband Insertion Loss at Channel Center Frequency, dB	1	0.5	0.35	0.35
Wideband Input Connector	N	1-5/8" EIA	3-1/8" EIA	3-1/8" EIA
Output Connector	N	1-5/8" EIA	3-1/8" EIA	3-1/8" EIA
Weight, kg (lb)	32 (71)	61 (135)	145 (320)	210 (463)
Dimensions (Height or Length), cm (in)	120.0 (47)	140.0 (55)	140.0 (55)	150.0 (59)
Dimensions (Width), cm (in)	50.0 (20)	50.0 (20)	90.0 (35)	120.0 (47)
Dimensions (Depth), cm (in)	60.0 (24)	70.0 (28)	120.0 (47)	130.0 (51)

SPECIFICATIONS	CA3P400B-412	CA3P600B-318	CA3P600B-412	CA3P600B-618
Narrowband Input Power (maximum), kW Average	12	25	25	25
Output Power (maximum), kW Average	80	40	80	160
Filter Type	3 Pole (400mm)	3 Pole (600mm)	3 Pole (600mm)	3 Pole (600mm)
Narrowband Input Connector	3-1/8" EIA	3-1/8" EIA	3-1/8" EIA	3-1/8" EIA
Narrowband Insertion Loss at Channel Center Frequency, dB	0.35	0.25	0.25	0.25
Wideband Input Connector	4-1/2" IEC	3-1/8" EIA	4-1/2" IEC	6-1/8" EIA
Output Connector	4-1/2" IEC	3-1/8" EIA	4-1/2" IEC	6-1/8" EIA
Weight, kg (lb)	230 (507)	310 (683)	325 (717)	350 (772)
Dimensions (Height or Length), cm (in)	160.0 (63)	150.0 (59)	160.0 (63)	160.0 (63)
Dimensions (Width), cm (in)	120.0 (47)	150.0 (59)	150.0 (59)	150.0 (59)
Dimensions (Depth), cm (in)	130.0 (51)	190.0 (75)	190.0 (75)	190.0 (75)

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Band III (VHF) TV Commutating Line Combiner 174 - 222 MHz

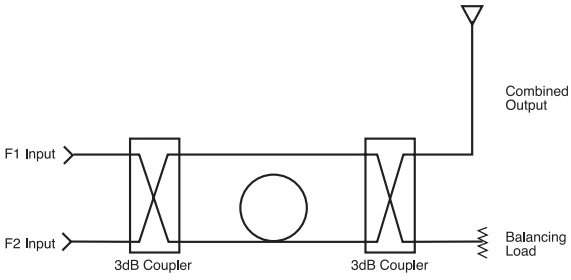
CC VHF Series

This style of circuit provides a relatively low cost combiner which is ideal, provided the frequency spacing is not too close.

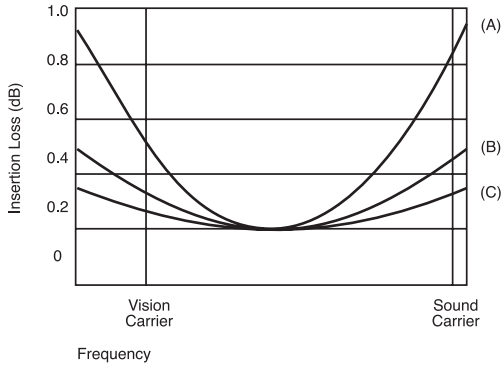
- Compact, economical design
- Constant impedance inputs
- Zero group delay
- Custom designs, including switching are available

The principle of operation is due to the length difference of the interconnecting cables between the 3dB couplers. This difference is approximately a half wavelength at the channel separation frequency. As resonators are not used, high Q voltage and current multiplications are avoided, as are group delay considerations. The characteristics of the 3dB coupler make the operation of this combiner possible. Isolation between inputs is determined by the 3dB coupler. As the frequency spacing becomes closer, the isolation does not reduce but the insertion loss slope across each channel increases.

CC318C (Mounted in enclosed cabinet)



Circuit Diagram



Typical Frequency Response (A) = Two channel spacing (14MHz) (B) = Three channel spacing (21MHz) (C) = Four channel spacing (28MHz)

SPECIFICATIONS (ALL MODELS)	
Frequency Range, MHz	174 - 222
Insertion Loss at Channel Center Frequency, dB	Less than 1 depending on channel spacing
Input Return Loss, dB	> 26
Narrowband to Narrowband Isolation, dB	> 30

SPECIFICATIONS	CC14C	CC12C	CC78C	CC158C
Narrowband Input Power (maximum), kW Average	0.25	0.5	1	5
Output Power (maximum), kW Average	0.5	1	2	10
Input Connector	N socket	N socket	7/8" EIA	1-5/8" EIA
Output Connector	N socket	7/8" EIA	7/8" EIA	1-5/8" EIA

SPECIFICATIONS	CC318C	CC412C
Narrowband Input Power (maximum), kW Average	15	30
Output Power (maximum), kW Average	30	60
Input Connector	3-1/8" EIA	4-1/2" IEC
Output Connector	3-1/8" EIA	4-1/2" IEC

Note 1
Unflanged connectors are standard for unpressurized applications.

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Band III (VHF) TV Commutating Line Combiner 470 - 860 MHz

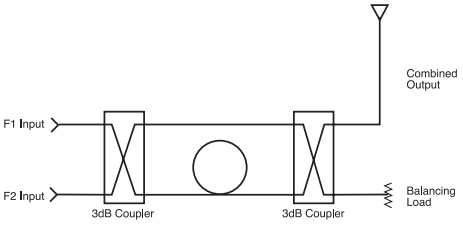
CC UHF Series

This style of circuit provides a relatively low cost combiner which is ideal, provided the frequency spacing is not too close.

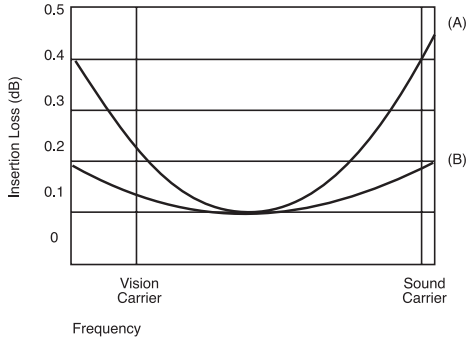
- Compact, economical design
- Constant impedance inputs
- Zero group delay
- Suitable for up to 8 equally spaced channels
- Custom designs, including switching are available

The principle of operation is due to the length difference of the interconnecting cables between the 3dB couplers. This difference is approximately a half wavelength at the channel separation frequency. As resonators are not used, high Q voltage and current multiplications are avoided, as are group delay considerations. The characteristics of the 3dB coupler make the operation of this combiner possible. Isolation between inputs is determined by the 3dB coupler. As the frequency spacing becomes closer, the isolation does not reduce but the insertion loss slope across each channel increases.

CC14E



Circuit Diagram



Typical Frequency Response (A) = Three channel spacing (21MHz) (B) = Six channel spacing (42MHz)

SPECIFICATIONS (ALL MODELS)	
Frequency Range, MHz	470 - 860
Insertion Loss at Channel Center Frequency, dB	Less than 1 depending on channel spacing
Input Return Loss, dB	> 26
Narrowband to Narrowband Isolation, dB	> 30

SPECIFICATIONS	CC14E	CC78E	CC158E	CC318E
Narrowband Input Power (maximum), kW Average	0.125	1	3	10
Output Power (maximum), kW Average	0.25	2	6	20
Input Connector	N socket	7/8"EIA	1-5/8" EIA	3-1/8" EIA
Output Connector	N socket	7/8" EIA	1-5/8" EIA	3-1/8" EIA

SPECIFICATIONS	CC412E	CC478E
Narrowband Input Power (maximum), kW Average	15	25
Output Power (maximum), kW Average	30	50
Input Connector	4-1/2" IEC	4-1/2" IEC
Output Connector	4-1/2" IEC	6-1/8" EIA

Note 1
Unflanged connectors are standard for unpressurized applications.

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Band III (High VHF) TV Balanced Combiner 174 - 230 MHz

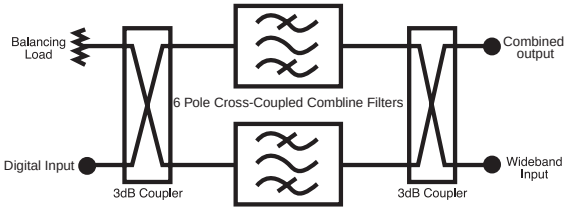
CA VHF Series

This series of constant impedance VHF combiner modules are designed for multichannel digital and/or analogue TV combining applications. The adjacent channel models enable a contiguous spectrum of analogue and digital transmitters to be transmitted from a shared site. This arrangement provides optimum tracking between channels and the economies associated with shared antenna and tower costs.

- Compact design
- Adjustable channel bandwidth
- Tunable across full band
- Low Insertion Loss
- Available with patch panel
- Expandable for future services
- Cascade modules for multichannel operation
- Temperature stable

Each balanced combiner module consists of two 3dB couplers that are connected to a pair of 5 or 6 Pole coaxial, interdigital, or quasi-combline bandpass filters. The narrowband input corresponds to the bandpass resonant frequency, whereas the wideband input can be any other channels in the applicable TV band. Modules can be connected together to provide a multichannel combiner.

CA6PX180C with patch panel



Combiner Module Configuration

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Band III (High VHF) TV Balanced Combiner 174 - 230 MHz

CA VHF Series

SPECIFICATIONS (ALL MODELS)	
Frequency Range, MHz	174 - 230
Impedance, ohms	50
Narrowband Input Channel Bandwidth, MHz	6;7;8
Wideband Input Insertion Loss, dB	<0.1
Wideband Input Return Loss, dB	>26
Narrowband to Wideband Isolation, dB	>32
Wideband to Narrowband Isolation, dB	50
Operating Temperature Range, degrees C	0 to 40

SPECIFICATIONS	CA4PX270C	CA5P100C-078	CA5P100C-158	CA5P180C
Channel Spacing	2 or greater	2 or greater	2 or greater	2 or greater
Narrowband Input Power (maximum), kW Average	30	2	5	15
Output Power (maximum), kW Average	70	3	10	30
Filter Type	4 pole cross coupled	5 pole coaxial	5 pole coaxial	5 pole coaxial
Narrowband Input Connector	3-1/8" EIA	7/8" EIA	1-5/8" EIA	3-1/8" EIA
Narrowband Insertion Loss at Channel Center Frequency, dB	0.2	0.4	0.3	0.2
Narrowband Input Return Loss, dB	30	30	30	30
N'band Input Group Delay variation over Channel Bandwidth, nsec	+/-20	+/-20	+/-20	+/-20
Wideband Input Connector	4-7/8" EIA	7/8" EIA	1-5/8" EIA	3-1/8" EIA
Output Peak Voltage (maximum), kV				
Rack Included, Yes/No	Frame	No	Yes	Yes
Weight, kg (lb)	220 (484)	33 (73)	105 (231)	180 (396)
Dimensions (Height or Length), cm (in)	124.2 (49)	83.3 (33)	185.7 (74)	185.7 (74)
Dimensions (Width), cm (in)	67.5 (26)	56.6 (23)	72.5 (29)	72.5 (29)
Dimensions (Depth), cm (in)	129 (51)	67.0 (27)	85.5 (34)	85.5 (34)

SPECIFICATIONS	CA6PX180C	CA6PX270C	CA7P60C
Channel Spacing	adjacent	adjacent	adjacent
Narrowband Input Power (maximum), kW Average	15	25	0.75
Output Power (maximum), kW Average	70	70	2
Filter Type	6 pole cross coupled	6 pole cross coupled	7 pole coaxial
Narrowband Input Connector	1-5/8" EIA	3-1/8" EIA	7-16 DIN
Narrowband Insertion Loss at Channel Center Frequency, dB	0.1 - 0.3	0.1 - 0.2	0.7 - 0.8
Narrowband Input Return Loss, dB	26	26	26
N'band Input Group Delay variation over Channel Bandwidth, nsec	< 400	< 400	< 400
Wideband Input Connector	4-7/8" EIA	4-7/8" EIA	7-16 DIN
Output Peak Voltage (maximum), kV	14	14	2
Rack Included, Yes/No	Frame	Frame	No
Weight, kg (lb)	240 (528)	270 (594)	21 (46)
Dimensions (Height or Length), cm (in)	119 (47)	124 (49)	60 (23-5/8)
Dimensions (Width), cm (in)	103 (41)	129 (51)	12.9 (5)
Dimensions (Depth), cm (in)	78 (31)	100 (40)	67.4 (26-1/2)

Note 1
Narrowband insertion losses are typical and dependent on channel bandwidth and operating frequency.
Note 2
Input and output power ratings are dependent on system used (PAL, NTSC, 8VSB, COFDM etc.), TX powers and number of digital/analogue systems. Advise RFS of system details to determine optimum multi-channel combiner configuration.
Note 3
All input and output connector sizes can be varied to suit customer requirements.
Note 4
Dimensions and weights are approximate and dependent on operating frequency.
Note 5
The power rating in an adjacent channel combiner depends not only on the power in the filter passband but must also include the power that the filter reflects due to adjacent channels. For further details contact RFS.

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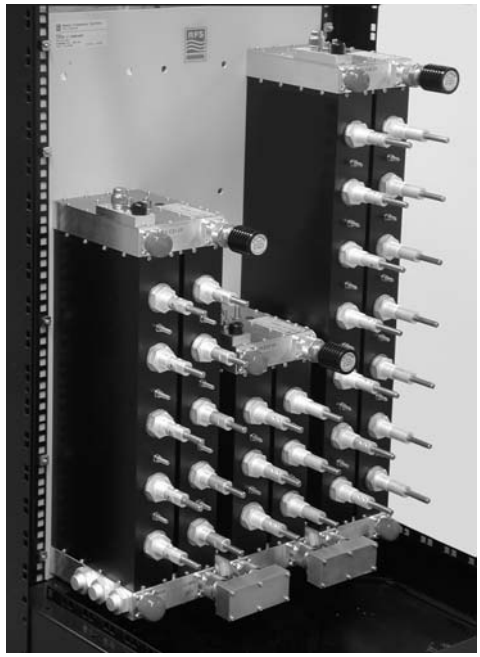
Band IV/V (UHF) TV Balanced Combiner 470 - 860 MHz

CA UHF Series

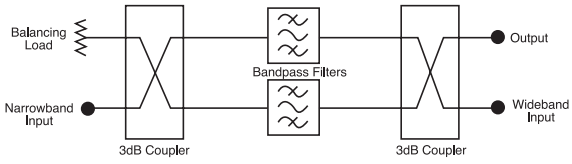
This series of constant impedance UHF combiner modules is designed for multichannel digital and/or analog TV combining applications. These modules are designed in sizes including 50E, 100E, 150E and 200E. They are available with 3 pole, 5 pole, 6 pole cross-coupled, 7 pole and 8 pole filters making them suitable for all low to medium power applications.

- Compact design
- Adjustable channel bandwidth
- Tunable across full band
- Built-in fine tuner to optimize wideband return loss on 50E models
- Expandable for future services
- Temperature stabilized
- Optional wall mount for 50E models
- Directional probe for forward/reflected power monitoring on 50E models

These balanced UHF TV combiners are ideal when optimum performance specifications are required. They are extremely compact, as well as being temperature stable and suitable for a wide range of applications. Each balanced combiner module consists of two 3dB couplers, separated by two coaxial or bandpass filters. The filters are designed according to channel spacing and power rating. The narrowband input corresponds to the bandpass resonant frequency, whereas the wideband input can be any other channels in the applicable TV band. Modules can be connected together to provide a multi-channel combiner with eight or more channels possible. Bandpass coaxial filters are designed as 3, 5, 6, 7 or 8 pole to suit the following channel separations: • 3 pole: 3 channels or greater. For example channels 31 and 34 • 5 pole: 2 channels or greater. For example channels 31 and 33 • 6, 7 or 8 pole: adjacent channels. For example channels 31 and 32



3 Channel combiner mounted in rack (Type 50E)



Combiner Module Configuration

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Band IV/V (UHF) TV Balanced Combiner 470 - 860 MHz

CA UHF Series

SPECIFICATIONS (ALL MODELS)	
Frequency Range, MHz	470 - 860
Impedance, ohms	50
Narrowband Input Channel Bandwidth, MHz	6;7;8

SPECIFICATIONS	CA3P50E	CA5P50E	CA7P50E	CA8PX50E
Channel Spacing	3 or greater	semi adjacent	adjacent	adjacent
Narrowband Input Power (maximum), kW Average	0.75	0.6	0.4	0.4
Output Power (maximum), kW Average	1.4	1.4	1.4	1.4
Filter Type	3 pole coaxial	5 pole coaxial	7 pole coaxial	8 pole coaxial
Narrowband Input Connector	7-16 DIN socket	7-16 DIN socket	7-16 DIN socket	7-16 DIN socket
Narrowband Insertion Loss at Channel Center Frequency, dB	0.3 - 0.4	0.6 - 0.8	1.0 - 1.3	1.1 - 1.4
Narrowband Input Return Loss, dB	30	30	>26	>26
N'band Input Group Delay variation over Channel Bandwidth, nsec	<20	+/-20	<400	<550
Wideband Input Connector	7-16 DIN socket	7-16 DIN socket	7-16 DIN socket	7-16 DIN socket
Wideband Input Insertion Loss, dB	<0.15 Note#5	<0.15	<0.15	<0.15
Wideband Input Return Loss, dB	>26	>26	>26	>26
Narrowband to Wideband Isolation, dB	32	32	32	32
Wideband to Narrowband Isolation, dB	50	50	50	50
Narrowband to Narrowband Isolation, dB	>50	>50	>50	>50
Filter Selectivity, dB	Note#7	Note#7	Note#7	
Rack Included, Yes/No	No	No	No	No
Operating Temperature Range, degrees C	0 to 40	0 to 40	0 to 40	0 to 40
Weight, kg (lb)	9 (20)	12 (27)	15 (33)	16 (35)
Dimensions (Height or Length), cm (in)	33.1 (13-1/32)	51.8 (20-25/64)	68.5 (26-31/32)	77 (30-5/16)
Dimensions (Width), cm (in)	13.1 (5-5/32)	13.1 (5-5/32)	13.1 (5-5/32)	13.1 (5-5/32)
Dimensions (Depth), cm (in)	30 (11-13/16)	30 (11-13/16)	30 (11-13/16)	30 (11-13/16)

SPECIFICATIONS	CA3P100E	CA5P100E	CA6PX100E	CA8PX100E
Channel Spacing	3 or greater	semi adjacent	adjacent	adjacent
Narrowband Input Power (maximum), kW Average	3	2	1.5	1.5
Output Power (maximum), kW Average	2,6	2,6	2,6	2,6
Filter Type	3 pole coaxial	5 pole coaxial	6 pole coaxial	8 pole coaxial
Narrowband Input Connector	7/8" EIA;1-5/8" EIA	7/8" EIA;1-5/8" EIA	7/8" EIA;1-5/8" EIA	7/8" EIA;1-5/8" EIA
Narrowband Insertion Loss at Channel Center Frequency, dB	0.3 - 0.4	0.4 - 0.7	0.6 - 0.9	0.8 - 1.2
Narrowband Input Return Loss, dB	>30	30	>26	>26
N'band Input Group Delay variation over Channel Bandwidth, nsec	<20	+/-20	<400	<550
Wideband Input Connector	7/8" EIA;1-5/8" EIA	7/8" EIA;1-5/8" EIA	7/8" EIA;1-5/8" EIA	7/8" EIA;1-5/8" EIA
Wideband Input Insertion Loss, dB	<0.1	0.1	0.1	0.1
Wideband Input Return Loss, dB	26	26	26	26
Narrowband to Wideband Isolation, dB	32	32	32	32
Wideband to Narrowband Isolation, dB	50	50	50	50
Rack Included, Yes/No	No	No	No	No
Operating Temperature Range, degrees C	0 to 40	0 to 40	0 to 40	0 to 40
Weight, kg (lb)	25 (55)	28 (61.6)	55 (121)	50 (110)
Dimensions (Height or Length), cm (in)	66.7 (27)	120 (47-1/4)	136 (53-1/2)	185.7 (74)
Dimensions (Width), cm (in)	53.9 (21)	27.5 (10-13/16)	27.5 (10-13/16)	56.5 (22)
Dimensions (Depth), cm (in)	47.3 (19)	46 (18-7/64)	46 (18-7/64)	85.5 (34)

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Band IV/V (UHF) TV Balanced Combiner 470 - 860 MHz

CA UHF Series

SPECIFICATIONS	CA3P150E	CA5P150E	CA6PX150E	CA3P200E
Channel Spacing	3 or greater	semi adjacent	adjacent	3 or greater
Narrowband Input Power (maximum), kW Average	7	5	3	12
Output Power (maximum), kW Average	19,30	19,30	30	19, 30
Filter Type	3 pole coaxial	5 pole coaxial	6 pole coaxial	3 pole coaxial
Narrowband Input Connector	3-1/8" EIA	3-1/8" EIA;4-1/2" IEC	R Series Note#6	3-1/8" EIA
Narrowband Insertion Loss at Channel Center Frequency, dB	0.2 - 0.3	0.3 - 0.5	0.4 - 0.6	0.2 - 0.25
Narrowband Input Return Loss, dB	30	30	>26	30
N'band Input Group Delay variation over Channel Bandwidth, nsec	<20	+/-20	<400	<20
Wideband Input Connector	3-1/8" EIA;4-1/2" IEC	3-1/8" EIA;4-1/2" IEC	R Series Note#6	3-1/8" EIA: 4-1/2" IEC
Wideband Input Insertion Loss, dB	0.1	0.1	0.1	0.1
Wideband Input Return Loss, dB	26	26	26	26
Narrowband to Wideband Isolation, dB	32	32	32	32
Wideband to Narrowband Isolation, dB	50	50	50	50
Rack Included, Yes/No	No	No	No	No
Operating Temperature Range, degrees C	0 to 40	0 to 40	0 to 40	0 to 40
Weight, kg (lb)	55 (121)	65 (143)	70 (150)	
Dimensions (Height or Length), cm (in)	114 (44-7/8)	154 (60-1/2)	174 (68-1/2)	123 (48-27/64)
Dimensions (Width), cm (in)	32 (12-1/2)	32 (12-1/2)	32 (12-1/2)	48.4 (19)
Dimensions (Depth), cm (in)	58 (22-7/8)	58 (22-7/8)	58 (22-7/8)	42.9 (16-19/32)

SPECIFICATIONS	CA4PX200E	CA5P200E	CA6PX200E	CA8PX200E
Channel Spacing	semi adjacent	semi adjacent	adjacent	adjacent
Narrowband Input Power (maximum), kW Average	7	9	5	5
Output Power (maximum), kW Average	19, 30	19, 30	19, 30	19, 30
Filter Type	4 pole cross coupled	5 pole coaxial	6 pole coaxial	8 pole coaxial
Narrowband Input Connector	3-1/8" EIA	3-1/8" EIA	3-1/8" EIA	3-1/8" EIA
Narrowband Insertion Loss at Channel Center Frequency, dB	0.2 - 0.3	0.3 - 0.4	0.4 - 0.5	0.5 - 0.7
Narrowband Input Return Loss, dB	>26	30	>26	>26
N'band Input Group Delay variation over Channel Bandwidth, nsec	<80	+/-20	<400	<550
Wideband Input Connector	3-1/8" EIA; 4-1/2" IEC	3-1/8" EIA: 4-1/2" IEC	3-1/8" EIA; 4-1/2" IEC	3-1/8" EIA; 4-1/2" IEC
Wideband Input Insertion Loss, dB	0.1	0.1	0.1	0.1
Wideband Input Return Loss, dB	26	26	26	26
Narrowband to Wideband Isolation, dB	32	32	32	32
Wideband to Narrowband Isolation, dB	50	50	50	50
Rack Included, Yes/No	No	No	No	No
Operating Temperature Range, degrees C	0 to 40	0 to 40	0 to 40	0 to 40
Weight, kg (lb)				
Dimensions (Height or Length), cm (in)	71 (28)	160 (63)	180 (70-5/8) or 91 (35-13/16) folded	111 (43-11/16)
Dimensions (Width), cm (in)	41 (16-9/64)	48.4 (19)	48.4 (19) or 41 (16-9/64) folded	41 (16-9/64)
Dimensions (Depth), cm (in)	90 (35-27/64)	42.9 (16-19/32)	42.9 (16-19/32) or 90 (35-27/64) folded	90 (35-27/64)

Note 1 Narrowband insertion losses are typical and dependent on channel bandwidth and operating frequency.
Note 2 Input and output power ratings are dependent on system used (PAL, NTSC, 8VSB, COFDM etc.), TX powers and number of digital/ analog systems.. Advise RFS of system details to determine optimum multi-channel combiner configuration.
Note 3 All input and output connector sizes can be varied to suit customer requirements.
Note 4 Dimensions and weights are approximate and dependent on operating frequency.
Note 5 Wideband Input Insertion Loss quoted is for mid band next channel.
Note 6 The RFS R series provides a "mix and match" interface to 50 ohm EIA/IEC standard connectors.
Note 7 Filter selectivity (dB) is as follows: CA3P50E - <0.1@+/-3.8MHz, <0.1@+/-4.2MHz, <0.2@+/ 5 MHz, <1@+/-6MHz, >10@+/-12MHz, >23@+/-20MHz. CA5P50E - <1@+/-3.8MHz, >3@+/-4.2MHz, >7@+/ 5 MHz, >16@+/-6MHz, >46@+/-12MHz. CA7P50E - <2@+/-3.8MHz, >7@+/-4.2MHz, >19@+/ 5 MHz, >32@+/-6MHz, >75@+/-12MHz.

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Band IV/V (UHF) Low Power Manifold Combiner 470 - 860 MHz

CM UHF Series

This product range utilizing RFS 50E filter components has been designed for combining applications in the transmitter power range up to 250 W per channel and a combined maximum power of 750 W output. The primary application is a lower cost, more compact alternative to the balanced combiner. The 7 pole and 8 pole filter variants can simultaneously provide DTV mask filtering as well as combining a number of channels into a common antenna. For some applications a hybrid system comprised of both manifold and balanced modules can provide a very economical, compact combiner solution.. Adjacent channels can be added, for example, by routing the manifold combiner output through suitable RFS balanced combiner modules. This arrangement can also extend the number of channels with only marginally higher reflections than a balanced combiner system.

- Very compact, with low losses for given filter sizes
- Up to 4 manifold channels and 1 balanced channel can be accommodated in a single 19" rack panel (or optional wall mounting)
- Built in mask filtering when 7 pole or 8 pole modules are selected
- Semi adjacent channel or wider bandwidths with 3 filter options
- Adjacent channel operation possible when used in conjunction with model CA7P50E
- Filters are tuneable over full UHF band, variable bandwidth for 6, 7 or 8 MHz channels
- Double Temperature compensation

4 channel manifold combiner featuring 4 x 5 pole filters. Mounted on 19" rack panel.

SPECIFICATIONS	CM3P50E	CM5P50E	CM7P50E	CM8PX50E
Frequency Range, MHz	470 - 860	470 - 860	470 - 860	470 - 860
Channel Spacing	4 or greater	semi adjacent	semi adjacent	semi adjacent
Narrowband Input Power (maximum), kW Average	0.25 Note#1	0.2 Note#1	0.15 Note#1	0.15 Note#1
Input Connector	7-16 DIN socket	7-16 DIN socket	7-16 DIN socket	7-16 DIN socket
Impedance, ohms	50	50	50	50
Filter Type	3 pole coaxial	5 pole coaxial	7 pole coaxial	8 pole coaxial
Insertion Loss at Channel Center Frequency, dB	0.3 at 470MHz, 0.4 at 860MHz Note#1,#2	0.6 at 470MHz, 0.8 at 860MHz Note#1,#2	0.9 at 470MHz, 1.3 at 860MHz Note#1,#2	1.0 at 470MHz, 1.4 at 860MHz
Input Return Loss, dB	>23 (typically >26)	>23 (typically >26)	>23 (typically >26)	>20
Filter Selectivity, dB	<0.1 +/- 3.8MHz Note#1	<0.5 +/- 3.8MHz, >8 +/- 6MHz, >40 +/- 12MHz Note#1	<2 +/- 3.8MHz, >7 +/- 4.2MHz, >14 +/- 5MHz, >27 +/- 6MHz, >70 +/- 12MHz Note#1	<2+/- 3.8MHz, >8 +/- 4.2 MHz, >40 +/- 6.0 MHz, >60 +/- 12 MHz
Rack Included, Yes/No	No	No	No	No
Isolation, dB	30	40	>50	>50
Weight, kg (lb)	3 (7)	4.5 (10)	6 (14)	8.3 (18)
Dimensions (Height or Length), cm (in)	33.1 (13-1/32)	51.8 (20-25/64)	68.5 (26-31/32)	79 (31-7/64)
Dimensions (Width), cm (in)	6.5 (2-39/64)	6.5 (2-39/64)	6.5 (2-39/64)	6.5 (2-39/64)
Dimensions (Depth), cm (in)	30 (11-13/16)	30 (11-13/16)	30 (11-13/16)	30 (11-13/16)

Note 1
Data shown is for 8 MHz channel bandwidth, filters can be tuned to 6 or 7 MHz bandwidth.
Note 2
Insertion loss increases by approximately 0.1dB through each successive filter up to the max. of 4 channels.

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Band IV/V (UHF) TV Waveguide Combiner 470 - 860 MHz

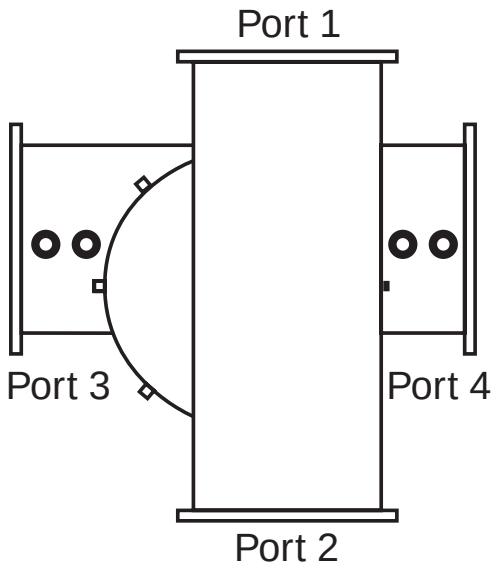
CW UHF Series

Constant impedance combiner modules for high power multichannel UHF television combining applications. The directional filter arrangement is considerably more compact than other waveguide designs using discrete hybrids and filter components. A number of Patents have been applied for.

- High power rating - suitable for transmitters from 10kW to 100kW
- Compact dimensions
- Computer aided design
- Simple construction with no inner conductors provides high reliability
- Low losses as there are no inner conductors or dielectric supports
- Large cross-sectional surface areas provide significantly more peak and average power handling capacity than coaxial lines
- Metering and U link switching options are available
- Large range of connectors, splitters and waveguide accessories are available.

Standard designs use three or four pole filter designs for semi-adjacent or larger channel spacings. Six pole filters are used for adjacent channel combiners. Each balanced combiner module consists of a pair of waveguide couplers and a waveguide directional filter to provide a module which is functionally identical to a balanced TV combiner module. Modules can therefore be connected together in the same way to provide a multichannel combiner. The directional filter is a four-port device. Power incident at Port 1 emerges from Port 4 with the frequency response of a bandpass filter while the remaining power emerges from Port 2 with the complementary frequency response of a band reject filter. Port 3 is isolated and no power is reflected from Port 1, if all ports are terminated in their characteristic impedances. This type of performance is obtained in an analogous way, no matter which port is used as the input port. In the waveguide version the device is realized by two rectangular waveguides operating in the TE10 mode connected by means of cylindrical direct coupled cavity resonators operating in the circularly polarized TE11 mode.

Waveguide Directional Combiner for Ch 28 29, 31 and 35 featuring 3-pole, 4-pole and 6-pole modules



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Band IV/V (UHF) TV Waveguide Combiner 470 - 860 MHz

CW UHF Series

SPECIFICATIONS	CW3P	CW4P	CW6P
Frequency Range, MHz	470 - 750, 550 - 860	470 - 750, 550 - 860	470 - 750, 550 - 860
Channel Spacing	3 or greater	2 or greater	adjacent
Narrowband Input Power (maximum), kW Average	35 Note#2	35 Note#2	25 Note#2
Output Power (maximum), kW Average	240 Note#2,5	240 Note#2,5	240 Note#2,5
Impedance, ohms	50	50	50
Filter Type	Directional waveguide	Directional waveguide	Directional cross coupled waveguide
Narrowband Input Connector	Up to 6-1/8" EIA Note#3	Up to 6-1/8" EIA Note#3	Up to 6-1/8" EIA Note#3
Narrowband Input Channel Bandwidth, MHz	6;7;8	6;7;8	6;7;8
Narrowband Insertion Loss at Channel Center Frequency, dB	0.2 Note#1	0.3 Note#1	0.2 - 0.3 Note#1
Narrowband Input Return Loss, dB	30	30	30
N'band Input Group Delay variation over Channel Bandwidth, nsec	+/-20	+/-20	< 400
Transmitter Spur Attenuation, dB			> 30
Wideband Input Connector	Note#3	Note#3	Note#3
Wideband Input Insertion Loss, dB	0.05	0.05	0.1
Wideband Input Return Loss, dB	26	26	26
Narrowband to Wideband Isolation, dB	32	32	32
Wideband to Narrowband Isolation, dB	50	50	50
Rack Included, Yes/No	Support Frame	Support Frame	Support Frame
Operating Temperature Range, degrees C	0 to 40	0 to 40	0 to 40
Weight, kg (lb)	175 (385)	200 (440)	250 (550)
Dimensions (Height or Length), cm (in)	150.0 (60)	180.0 (71)	300.0 (120)
Dimensions (Width), cm (in)	120.0 (48)	120.0 (48)	120.0 (48)
Dimensions (Depth), cm (in)	70.0 (28)	70.0 (28)	70.0 (28)

Note 1
Narrowband insertion losses are typical and dependent on channel bandwidth and operating frequency.
Note 2
Input and output power ratings are dependent on system used (PAL, NTSC, 8VSB, COFDM etc.), TX powers and number of digital/ analogue systems. Advise RFS of system details to determine optimum multi - channel combiner configuration.
Note 3
All input and output connector sizes can be varied to suit customer requirements.
Note 4
Dimensions and weights are approximate and dependent on operating frequency.
Note 5
Maximum output power may be less depending on channel allocation.

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Band II (VHF) FM Bandpass Filter 87.5 - 108 MHz

2P, 3P Series

RFS bandpass filters are primarily used as part of multi-channel combiner facilities but can also be used to eliminate spurious emissions and increase isolation between co-sited services.

- Natural convection cooling for all power levels
- Fixed aperture coupling for high reliability and easy re-tuning
- Vertical entry and exit
- Invar temperature compensation
- 2 and 3 pole versions standard

The filters are designed with all bolted connections and any sliding contacts are at low current density points to ensure maximum reliability and ideal power ratings for a given physical size. Each filter comprises several 2 or 3 coaxial resonators which are aperture coupled. The fixed aperture coupling design is engineered for a constant passband wherever the pass band is tuned in the 87.5 - 108MHz band. This design ensures standard insertion loss and rejection for each filter model, although custom filter performance (modified aperture coupling) is available on request.

Bandpass Filters

SPECIFICATIONS (ALL MODELS)	
Frequency Range, MHz	87.5 - 108
Impedance, ohms	50 unbalanced
Input Return Loss, dB	> 26 to +/- 200kHz
Input Group Delay variation over Channel Bandwidth, nsec	< 25 to +/- 100kHz
Amplitude Variation, dB	< 0.2 to +/- 200kHz

SPECIFICATIONS	2P150B	2P200B	2P400B	2P600B
Input Connector	N type	7/8" EIA	3-1/8" EIA	3-1/8" EIA
Insertion Loss at Channel Center Frequency, dB	0.7	0.35	0.25	0.2
Filter Rejection, dB	14 at 0.8MHz, 26 at 1.6MHz	14 at 0.8MHz, 26 at 1.6MHz	14 at 0.8MHz, 26 at 1.6MHz	14 at 0.8MHz, 26 at 1.6MHz
Weight, kg (lb)	10 (22)	35 (77)	60 (132)	95 (209)
Dimensions (Height or Length), cm (in)	120.0 (47-1/4)	140.0 (5- 1/8)	150.0 (59)	160.0 (63)
Dimensions (Width), cm (in)	20.0 (7-7/8)	30.0 (11-3/4)	50.0 (19-5/8)	70.0 (27-1/2)
Dimensions (Depth), cm (in)	40.0 (15-3/4)	60.0 (23-5/8)	90.0 (35-3/8)	130.0 (51-1/8)

SPECIFICATIONS	3P150B	3P200B	3P400B	3P600B
Input Connector	N type	7/8" EIA	3-1/8" EIA	3-1/8" EIA
Insertion Loss at Channel Center Frequency, dB	1	0.5	0.3	0.25
Filter Rejection, dB	20 at 0.8MHz, 38 at 1.6MHz	20 at 0.8MHz, 38 at 1.6MHz	20 at 0.8MHz, 38 at 1.6MHz	20 at 0.8MHz, 38 at 1.6MHz
Weight, kg (lb)	12 (26)	45 (99)	80 (176)	125 (276)
Dimensions (Height or Length), cm (in)	120.0 (47-1/4)	140.0 (55-1/8)	150.0 (59)	160.0 (63)
Dimensions (Width), cm (in)	20.0 (7-7/8)	30.0 (11-3/4)	50.0 (19-5/8)	70.0 (27-1/2)
Dimensions (Depth), cm (in)	60.0 (23-5/8)	80.0 (31-1/2)	130.0 (51-1/8)	190.0 (74-3/4)

Note 1
Alternative connectors available on request.

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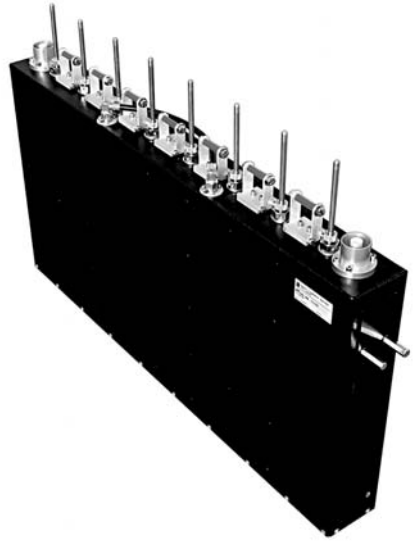
Band III (VHF) DAB Coaxial Filter 174 - 240 MHz

PX Series

This series of DAB filters are tuneable over the entire VHF Band III. The filters offer a compact and flexible solution for both transmitter mask filtering and digital RF channel combining. The DAB filter range is founded on RFS' world-leading RF combining technology and utilizes a similar platform of components to the company's VHF Band III digital television combiners.

- Compact design
- 6 and 8 pole versions are available
- Available in 3 cavity sizes 100 mm, 180 mm and 270 mm
- Can be used for transmitter powers of 500 W, 1500 W and 2500 W
- Natural convection cooling for all power levels
- Low loss for all cavity sizes
- RFS R series connectors provide "mix and match" interface to common standards

The eight-pole DAB filters can be incorporated within transmitters to provide critical mask filtering of the digital RF signal, in keeping with global DAB standards. When used as the key components of a balanced DAB combiner, the eight-pole filters can achieve both critical transmitter masking and adjacent channel combining simultaneously, eliminating the need for additional filters within the transmitter. The 100-mm models can be installed within a standard 19-inch rack. The nominal bandwidth of all models is 1.54 MHz, as specified by the global "Eureka 147" DAB standard.



8PX100DAB filter

SPECIFICATIONS	6PX100DAB	6PX180DAB	6PX270DAB	8PX100DAB
Frequency Range, MHz	174 - 240	174 - 240	174 - 240	174 - 240
Input Connector	16R Note#1	31R Note#1	31R Note#1	16R Note#1
Filter Type	6 Pole	6 Pole	6 Pole	8 Pole
Input Power (maximum), kW Average	0.5	1.5	2.5	0.5
Input Return Loss, dB	>23	>23	>23	>23
Filter Selectivity, dB	<1.0 +/- 768kHz, >15 +/- 970kHz, >30 +/- 1.7MHz, >50 +/- 3MHz	<1.0 +/- 768kHz, >15 +/- 970kHz, >30 +/- 1.7MHz, >50 +/- 3MHz	<1.0 +/- 768kHz, >15 +/- 970kHz, >30 +/- 1.7MHz, >50 +/- 3MHz	<0.8 +/- 768kHz, >20 +/- 970kHz, >50 +/- 1.7MHz, >75 +/- 3MHz
Operating Temperature Range, degrees C	0 to 45	0 to 45	0 to 45	0 to 45
Weight, kg (lb)		46 (101)		21.5 (47)
Dimensions (Height or Length), cm (in)	65 (25-39/64)	65 (25-39/64)	65 (25-39/64)	65 (25-39/64)
Dimensions (Width), cm (in)	110 (43-19/64)	375 (147-39/64)	560 (220-15/32)	110 (43-19/64)
Dimensions (Depth), cm (in)	740 (291-21/64)	775 (305-7/64)	980 (385-53/64)	1055 (415-11/32)

SPECIFICATIONS	8PX180DAB	8PX270DAB
Frequency Range, MHz	174 - 240	174 - 240
Input Connector	31R Note#1	31R Note#1
Filter Type	8 Pole	8 Pole
Input Power (maximum), kW Average	1.5	2.5
Input Return Loss, dB	>23	>23
Filter Selectivity, dB	<0.8 +/- 768kHz, >20 +/- 970kHz, >50 +/- 1.7MHz, >75 +/- 3MHz	<0.8 +/- 768kHz, >20 +/- 970kHz, >50 +/- 1.7MHz, >75 +/- 3MHz
Operating Temperature Range, degrees C	0 to 45	0 to 45
Dimensions (Height or Length), cm (in)	65 (25-39/64)	65 (25-39/64)
Dimensions (Width), cm (in)	375 (147-39/64)	560 (220-15/32)
Dimensions (Depth), cm (in)	1015 (399-39/64)	1270 (500)

Note 1
The RFS R series provides a "mix and match" interface to 50 ohm EIA/IEC standard connectors.

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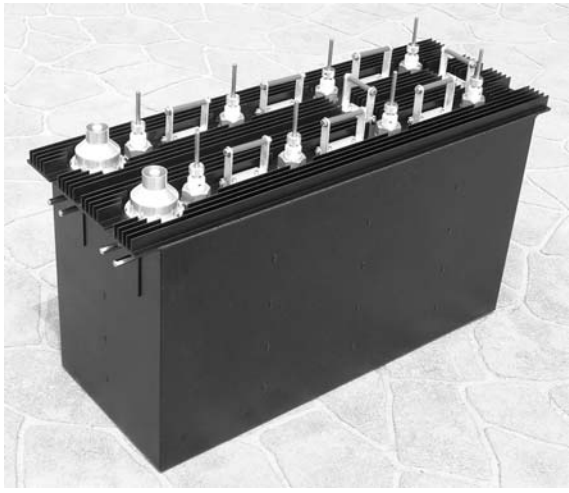
Band III (High VHF) TV Bandpass Filter 174 - 230 MHz

C Series

RFS bandpass filters are primarily used as part of multi-channel combiner facilities but can also be used to eliminate spurious emissions and increase isolation between co-sited services.

- Natural convection cooling for all power levels
- Can be retuned to any channel
- Vertical entry and exit
- Invar temperature compensation
- 4 and 6 pole versions standard



SPECIFICATIONS	4PX270C	6PX180C	6PX270C
Frequency Range, MHz	174 - 230	174 - 230	174 - 230
Input Connector	31R Note#2	31R Note#2	31R Note#2
Impedance, ohms	50 unbalanced	50 unbalanced	50 unbalanced
Input Power (maximum), kW Average	15	6	12
Input Channel Bandwidth, MHz	6 to 8 adjustable. Note#1	6 to 8 adjustable. Note#1	6 to 8 adjustable. Note#1
Insertion Loss at Channel Center Frequency, dB	0.1	0.2	0.15
Input Return Loss, dB	> 30 Note#1	> 25 Note#1	> 25 Note#1
Filter Selectivity, dB	< 0.1 at +/- 3.8 MHz, > 33 at +/- 12 MHz	< 1.0 at +/- 3.8 MHz, > 25 at +/- 5 MHz, > 49 at +/- 12 MHz	< 1.0 at +/- 3.8 MHz, > 25 at +/- 5 MHz, > 49 at +/- 12 MHz
Operating Temperature Range, degrees C	0 to 40	0 to 40	0 to 40

Note 1
8MHz wide channel data shown, can be adjusted for other bandwidths.
Note 2
The RFS R series provides a "mix and match" interface to 50 ohm EIA/IEC standard connectors.

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Band IV/V (UHF) TV Bandpass Filter 470 - 860 MHz

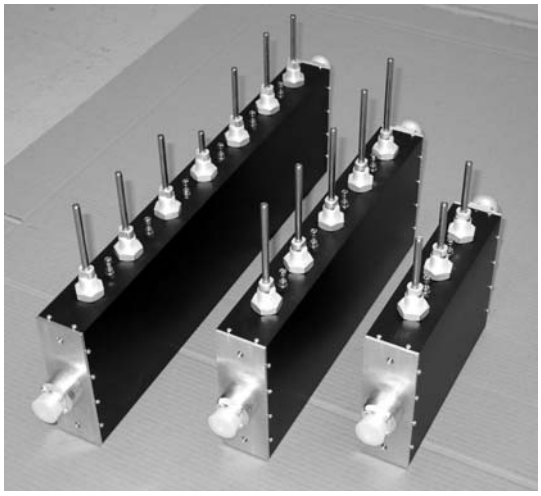
E Series

The UHF coaxial filter range utilizes four different cavity sizes and has been designed for bandpass filtering in transmitter power ranges up to 6 kW. For higher powers the RFS waveguide filters are available. Primary applications include filtering of transmitter outputs, filtering translator input signals and as building blocks for the RFS range of channel combiners. An alternative to a single filter is use a pair of filters and 3 dB couplers together with loads to form a balanced filter. This arrangement doubles the power rating and also provides a constant input impedance, both within and outside the filter passband. The constant impedance property means that signals outside the passband are dissipated into the loads rather than reflected back into the transmitter. (see the CA UHF series balanced modules).

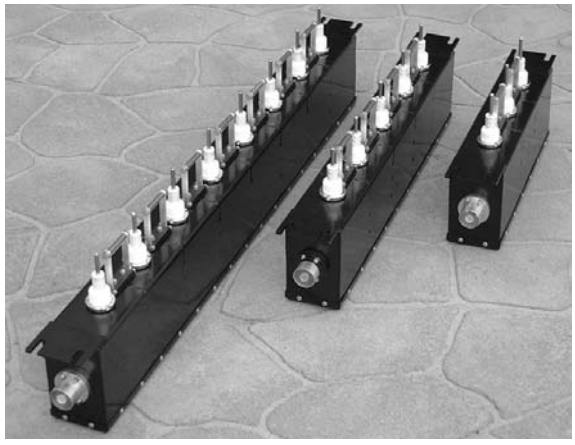
The design, construction and materials used ensure that benchmark performance is achieved for the given cavity sizes. Low loss, variable bandwidth and full band tuneability are the primary electrical features while vertical mounting and operation over a wide ambient temperature range detail the mechanical characteristics.

RFS R series connectors are a mix and match interface to various standards and sizes. For example, EIA/IEC flanged/ unflanged connections of line sizes larger and smaller are widely available, this makes interfacing to other equipment simple.

- Four cavity sizes available
- 3, 5 and 6 pole versions available for wide channel, semi adjacent and adjacent channel applications
- Designed for vertical mounting to minimize floor space requirements
- Very compact, with low losses for given filter sizes
- Tuneable over full UHF band 470 to 860 MHz
- Adjustable bandwidth for 6, 7 or 8 MHz channels
- Can be used for DTV critical and non-critical masking applications
- RFS R series connectors provide “mix and match” interface to common standards
- Double Temperature compensation for stability



3, 5 and 7 pole versions of 50E size filters.



3, 5 and 8 pole versions of 100E size filters.

3 pole filters showing some of the available R series connectors.

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Band IV/V (UHF) TV Bandpass Filter 470 - 860 MHz

E Series

SPECIFICATIONS (ALL MODELS)	
Frequency Range, MHz	470 - 860
Impedance, ohms	50 unbalanced
Input Channel Bandwidth, MHz	6 to 8 adjustable. Note#1
Operating Temperature Range, degrees C	0 to 40

SPECIFICATIONS	3P50E	5P50E	7P50E	8PX50E
Input Connector	7-16 DIN Note#2	7-16 DIN Note#2	7-16 DIN Note#2	7-16 DIN Note#2
Input Power (maximum), kW Average	0.4 Note#1	0.3 Note#1	0.2 Note#1	0.2 Note#1
Insertion Loss at Channel Center Frequency, dB	0.25 @ 470MHz, 0.35 @ 860MHz Note#1	0.50 @ 470MHz, 0.65 @ 860MHz Note#1	0.85 @ 470MHz, 1.15 @ 860MHz Note#1	1.0 @ 470MHz, 1.3 @ 860MHz Note#1
Input Return Loss, dB	> 25 Note#1	> 25 Note#1	> 25 Note#1	> 20 Note#1
Filter Selectivity, dB	< 0.1 at +/- 3.8 MHz, > 23 at +/- 20 MHz	< 0.2 at +/- 3.8 MHz, > 40 at +/- 12 MHz	< 2.0 at +/- 3.8 MHz, > 14 at +/- 5 MHz, > 70 at +/- 12 MHz	< 2.0 at +/- 3.8 MHz, > 8 at +/- 4.2 MHz, > 40 at +/- 6 MHz, > 60 at +/- 12 MHz
Weight, kg (lb)	3.0 (6.6)	4.2 (9.2)	5.5 (12.1)	6.1 (13.4)
Dimensions (Height or Length), cm (in)	35.4 (14)	53.2 (21)	70.8 (28)	79.5 (31-5/16)
Dimensions (Width), cm (in)	6.0 (2-3/8)	6.0 (2-3/8)	6.0 (2-3/8)	6.0 (2-3/8)
Dimensions (Depth), cm (in)	30.0 (11-13/16)	30.0 (11-13/16)	30.0 (11-13/16)	30.0 (11-13/16)

SPECIFICATIONS	3P100E	5P100E	6PX100E	8PX100E
Input Connector	16R Note#2	16R Note#2	16R Note#2	16R Note#2
Input Power (maximum), kW Average	1.5 Note#1	1 Note#1	0.75 Note#1	0.75 Note#1
Insertion Loss at Channel Center Frequency, dB	0.15 @ 470MHz, 0.20 @ 860MHz Note#1	0.25 @ 470MHz, 0.35 @ 860MHz Note#1	0.50 @ 470MHz, 0.60 @ 860MHz Note#1	0.60 @ 470MHz, 0.80 @ 860MHz Note#1
Input Return Loss, dB	> 25 Note#1	> 25 Note#1	> 25 Note#1	> 20 Note#1
Filter Selectivity, dB	< 0.1 at +/- 3.8 MHz, > 23 at +/- 20 MHz	< 0.2 at +/- 3.8 MHz, > 40 at +/- 12 MHz	< 1.0 at +/- 3.8 MHz, > 20 at +/- 5 MHz, > 45 at +/- 12 MHz	< 1.3 at +/- 3.8 MHz, > 8 at +/- 4.2 MHz, > 40 at +/- 6 MHz, > 60 at +/- 12 MHz
Weight, kg (lb)	5.4 (12)	8.4 (18.5)	10.6 (23.4)	12.9 (28.5)
Dimensions (Height or Length), cm (in)	57.3 (22-5/8)	87.3 (34-3/8)	102.3 (40-9/32)	132.3 (52-5/64)
Dimensions (Width), cm (in)	11.0 (4-11/32)	11.0 (4-11/32)	11.0 (4-11/32)	11.0 (4 11/32)
Dimensions (Depth), cm (in)	30.0 (11-13/16)	30.0 (11-13/16)	35.0 (13-13/16)	30.0 (11-13/16)

Note 1
8MHz wide channel data shown, can be adjusted for other bandwidths.
Note 2
The RFS R series provides a "mix and match" interface to 50 ohm EIA/IEC standard connectors.

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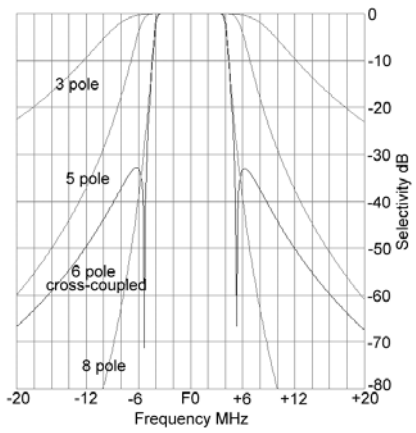
Band IV/V (UHF) TV Bandpass Filter 470 - 860 MHz

E Series

SPECIFICATIONS	3P150E	5P150E	6PX150E	3P200E
Input Connector	31R Note#2	31R Note#2	31R Note#2	31R Note#2
Input Power (maximum), kW Average	3.5 Note#1	2.5 Note#1	1.5 Note#1	6.0 Note#1
Insertion Loss at Channel Center Frequency, dB	0.10 @ 470MHz, 0.15 @ 860MHz Note#1	0.20 @ 470MHz, 0.25 @ 860MHz Note#1	0.20 @ 470MHz, 0.40 @ 860MHz Note#1	0.10 @ 470MHz, 0.15 @ 860MHz Note#1
Input Return Loss, dB	> 25 Note#1	> 25 Note#1	> 25 Note#1	> 25 Note#1
Filter Selectivity, dB	< 0.1 at +/- 3.8 MHz, > 23 at +/- 20 MHz	< 0.2 at +/- 3.8 MHz, > 40 at +/- 12 MHz	< 1.0 at +/- 3.8 MHz, > 20 at +/- 5 MHz, > 45 at +/- 12 MHz	< 0.1 at +/- 3.8 MHz, > 23 at +/- 20 MHz
Weight, kg (lb)	9.8 (21.5)	14.7 (32.5)	19.5 (43)	23 (50.7)
Dimensions (Height or Length), cm (in)	68.4 (27)	108.4 (42-11/16)	128.4 (50-1/2)	70.4 (27-3/4)
Dimensions (Width), cm (in)	16.0 (6-5/16)	16.0 (6-5/16)	16.0 (6-5/16)	21.0 (8-1/4)
Dimensions (Depth), cm (in)	30.0 (11-13/16)	30.0 (11-13/16)	35.0 (13-13/16)	30.0 (11-13/16)

SPECIFICATIONS	4PX200E	5P200E	6PX200E	8PX200E
Input Connector	31R Note#2	31R Note#2	31R Note#2	31R Note#2
Input Power (maximum), kW Average	3.5 Note#1	4.5 Note#1	2.5 Note#1	2.5 Note#1
Insertion Loss at Channel Center Frequency, dB	0.15 @470MHz, 0.2 @ 860MHz	0.20 @ 470MHz, 0.25 @ 860MHz Note#1	0.30 @ 470MHz, 0 .40 @ 860MHz Note#1	0.40 @ 470MHz, 0 .60 @ 860MHz Note#1
Input Return Loss, dB	> 25 Note#1	> 25 Note#1	> 25 Note#1	> 20 Note#1
Filter Selectivity, dB	>30 at +/- 12MHz	< 0.2 at +/- 3.8 MHz, > 40 at +/- 12 MHz	< 1.0 at +/- 3.8 MHz, > 20 at +/- 5 MHz, > 45 at +/- 12 MHz	< 1.0 at +/- 3.8 MHz, > 9 at +/- 4.2 MHz, > 40 at +/- 6 MHz, > 60 at +/- 12 MHz
Weight, kg (lb)		35 (77.2)	40 (88.2)	45 (99)
Dimensions (Height or Length), cm (in)	54 (21-5/16)	108.4 (42-5/8)	128.4 (50-9/16)	90 (35-7/16)
Dimensions (Width), cm (in)	40.9 (16-7/64)	21.0 (8-1/4)	21.0 (8-1/4)	40.9 (16-7/64)
Dimensions (Depth), cm (in)	42.9 (16-57/64)	30.0 (11-13/16)	35 (13-13/16)	42.9 (16-57/64)

Note 1
8MHz wide channel data shown, can be adjusted for other bandwidths.
Note 2
The RFS R series provides a "mix and match" interface to 50 ohm EIA/IEC standard connectors.



Typical Filter Response

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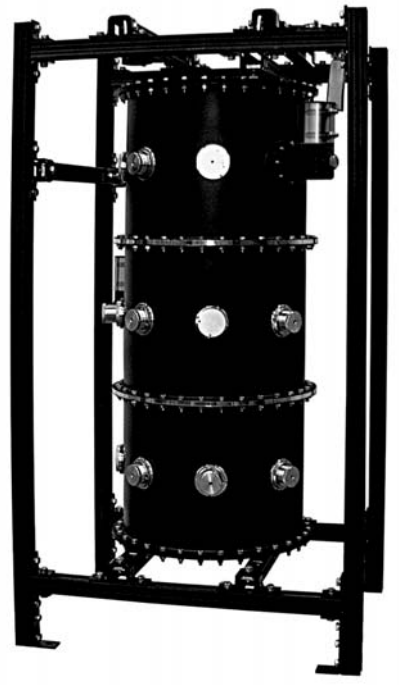
Band IV/V (UHF) TV Waveguide Filter 470 - 860 MHz

EW Series

This range of UHF filters are now 3rd generation products designed for global combining and filtering applications associated with DTV and analog television transmissions.

- 4, 6 and 8 pole versions for wide channel, semi adjacent and adjacent channel applications
- Designed for vertical mounting to minimize footprint
- Adjustable 6 to 8MHz bandwidth for global applications
- Designed for high peak voltage DTV signals
- Advanced design and manufacturing techniques for optimum performance



Waveguide Filter 6PXW

SPECIFICATIONS (ALL MODELS)	
Frequency Range, MHz	470 - 860
Filter Type	Dual Mode Waveguide with Cross Coupling
Input Channel Bandwidth, MHz	6;7;8
Insertion Loss at Channel Center Frequency, dB	0.2
Input Return Loss, dB	> 26 (typically 30)
Operating Temperature Range, degrees C	10 to 40

SPECIFICATIONS	6PXW	4PXW
Channel Spacing	1	>1
Input Group Delay variation over Channel Bandwidth, nsec	360	25
Narrowband Input Connector	31R Note#1	31R Note#1
Filter Selectivity, dB	> 30 adjacent vision carrier	> 30 semi adjacent channel
Weight, kg (lb)	95 (209)	70 (154)
Dimensions (Height or Length), cm (in)	148.0 (58-5/16)	110.0 (43-5/16)
Dimensions (Width), cm (in)	65 (25-5/8)	65 (25-5/8)
Dimensions (Depth), cm (in)	82 (32-5/16)	82 (32-5/16)

Note 1
The RFS R series provides a "mix and match" interface to 50 ohm EIA/IEC standard connectors.

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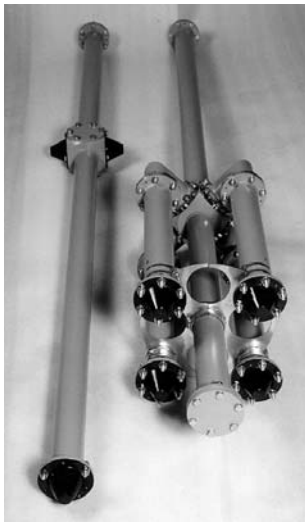
LPD, MPD, PD, SPD Series

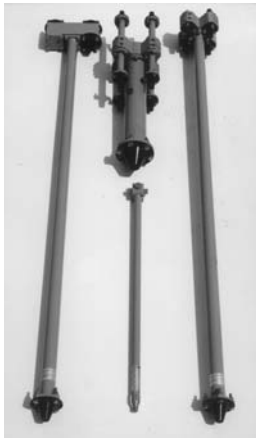
Power dividers are manufactured in a broad range of styles and types for varied applications. Generally a power divider consists of a junction block with a multi-stage quarter wave transforming section. Unequal power division may be achieved by adding quarter wave transforming sections between the junction block and the outputs.

- Low VSWR
- Wide bandwidth
- Fully welded outer construction
- Connectors are DIN, EIA or IEC standards
- Temperature range -40 to +60 degrees C available
- EIA connectors have fixed male output spigots
- Available in four basic series – LPD, MPD, PD and SPD
- Unequal power dividers with a wide range of power division ratios available and engineered to customer requirements. Contact RFS for details.

Power dividers are available in four basic series: LPD series – Low cost , low power equal split dividers using N type connectors. MPD series – Low cost, low power equal split dividers (up to 4 way) using 7/8" EIA input connectors and N type output connector. PD series – Used for most common applications with up to 8 way division with ratios of up to 7dB in almost any combination. Wideband performance with multistage transforming sections, 7/8" EIA flanged input and EIA or DIN output connectors. Connectors are in-line to conserve space. SPD series – Similar to PD series but with up to 4 way split. EIA or IEC connectors, short circuit stub across the junction provides tuning and DC grounding. Additional low power arms are available where unequal power splits are required.



SPD power dividers.



PD and LPD power dividers.

SPECIFICATIONS	LPD	MPD	PD	SPD
Frequency Range, MHz	All Bands I, II, III, IV/V	All Bands I, II, III, IV/V	All Bands I, II, III, IV/V	All Bands I, II, III, IV/V
Input Return Loss, dB	26	30	34 Note#1	34
Input Impedance, ohm	50 unbalanced	50 unbalanced	50 unbalanced	50 unbalanced
Output Impedance, ohm	50 unbalanced	50 unbalanced	50 unbalanced	50 unbalanced
Number of Outputs	2 to 6	2 to 6	2 to 8	2 to 4
Power Division Ratio, dB	< 6	< 6	< 6	< 6
Power Division Variation, dB	within 0.5 of specified ratio	within 0.5 of specified ratio	within 0.5 of specified ratio	within 0.5 of specified ratio
Output Phase Variation, degrees	< +/-10	< +/-10	< +/-10	< +/-10

Note 1
Equal power divider with less than 4 way split will achieve 36dB

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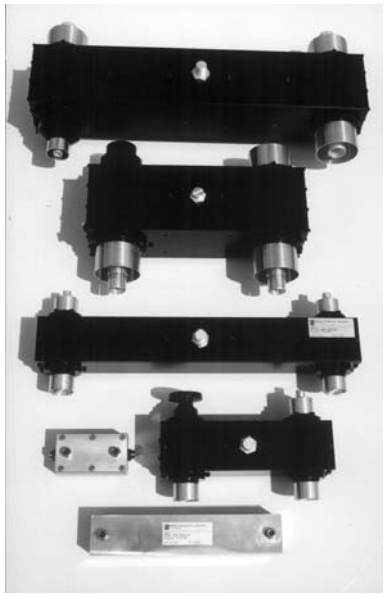
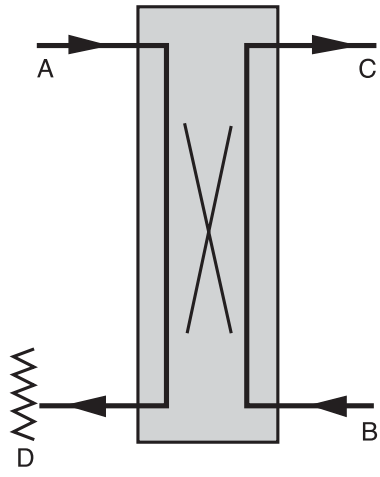
DC Series

This product range is most commonly used within combiners, diplexers and switchframes, but can be used as stand alone combiners and splitters. The flanged versions are fully pressurized to 70kPa and are of gas through construction via the connectors.

Crossed outputs (i.e. on same side of coupler) are standard in order to simplify equipment layout (not available in 'N' type versions). Each coupler size is defined by its "standard" connector size. For example: an FM 3dB coupler rated for 50kW usually has 3-1/8" connectors, so this coupler is defined as a model DC31BU. Using RFS developed R series adaptors for connector sizes 7/8" to 6-1/8", all coupler ports can be adapted to any size flanged or unflanged EIA or IEC standard. A coupler consists of a pair of strip lines approximately a quarter wavelength long configured in such a way to provide the required couplings. If two signals of similar amplitude in phase quadrature are applied to ports A and B (with B leading) the sum will appear at port C. The arrangement provides good isolation between inputs with low VSWR over a wide bandwidth without adjustment. If the inputs do not have the correct amplitude and/or phase relationship, an out of balance signal is dissipated in a load connected to port D. Conversely a signal applied to port C will split to give two outputs of equal amplitude in quadrature of port A and B.



Various power rating and frequency range 3dB couplers.



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DC Series

SPECIFICATIONS (ALL MODELS)	
Input Return Loss, dB	35
Isolation, dB	32
Output Phase, degrees	90 +/- 1 Note#2

SPECIFICATIONS	DCNB	DC78B	DC158B	DC318B
Frequency Range, MHz	88 - 108	88 - 108	88 - 108	88 - 108
Power Rating, kW	0.5 Note#1	5 Note#1	15 Note#1	50 Note#1
Standard Connector Size	N	7/8" EIA	1-5/8" EIA	3-1/8" EIA
Output Power Split, dB	3 +/- 0.15 Note#2	3 +/- 0.15 Note#2	3 +/- 0.15 Note#2	3 +/- 0.15 Note#2

SPECIFICATIONS	DC412B	DC478B	DC618B	DCNC
Frequency Range, MHz	88 - 108	88 - 108	88 - 108	174 - 230
Power Rating, kW	90 Note#1	100 Note#1	150 Note#1	0.5 Note#1
Standard Connector Size	4-1/2" IEC	4-7/8" EIA	6-1/8" EIA	N
Output Power Split, dB	3 +/- 0.15 Note#2	3 +/- 0.15 Note#2	3 +/- 0.15 Note#2	3 +/- 0.15 Note#2

SPECIFICATIONS	DC78C	DC158C	DC318C	DC412C
Frequency Range, MHz	174 - 230	174 - 230	174 - 230	174 - 230
Power Rating, kW	4 Note#1	10 Note#1	35 Note#1	60 Note#1
Standard Connector Size	7/8" EIA	1-5/8" EIA	3-1/8" EIA	4-1/2" IEC
Output Power Split, dB	3 +/- 0.15 Note#2	3 +/- 0.15 Note#2	3 +/- 0.15 Note#2	3 +/- 0.15 Note#2

SPECIFICATIONS	DC478C	DCNE	DC78E	DC158E
Frequency Range, MHz	174 - 230	526 - 820	526 - 820	526 - 820
Power Rating, kW	70 Note#1	0.25 Note#1	2.5 Note#1	5 Note#1
Standard Connector Size	4-7/8" EIA	N	7/8" EIA	1-5/8" EIA
Output Power Split, dB	3 +/- 0.15 Note#2	3 +/- 0.35 Note#2	3 +/- 0.35 Note#2	3 +/- 0.35 Note#2

SPECIFICATIONS	DC318E	DC412E
Frequency Range, MHz	526 - 820	526 - 820
Power Rating, kW	19 Note#1	30 Note#1
Standard Connector Size	3-1/8" EIA	4-1/2" IEC
Output Power Split, dB	3 +/- 0.35 Note#2	3 +/- 0.35 Note#2

Note 1
Power ratings are based on an ambient temperature of 40 degrees C and represent the maximum average power at any ports, at the highest operating frequency in each band.
Note 2
Across full band.

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RF Monitor System

MS Series

This system provides a complete range of monitoring functions for output coaxial equipment, allowing broadcasters to display forward/reflected transmitter power and active mimic display of U link/motorized switch and multi-channel combiner configurations. The unit uses a single chip controller providing programmable functions and alarm outputs. Its power supply is used to power the external detectors.

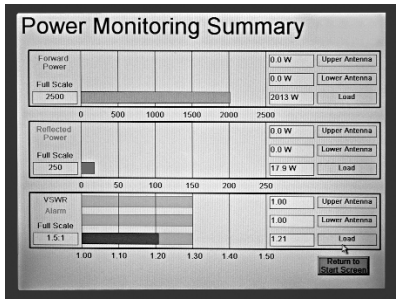
Dual RS485 inputs will accept up to 50 RFS detectors measuring RF power or temperature as required.

The RF monitoring system is expandable for alarming systems with up to 16 transmitters. Alarms can be reset from the PC touchscreen display. 24 opto-isolated inputs are available which are used to provide detailed status on equipment such as coaxial switches, U link panels or over-temperature switches on loads or dehydrator operation. (12 inputs standard, additional 12 inputs on optional daughter board).

Display is a bright 8.4" TFT colour touch screen PC with 800 x 600 pixel resolution and using Windows XP embedded operating system.

Ethernet output is available as an option to enable the system to be remotely viewed or integrated into a network.

Operated with a watchdog fail-safe timer to ensure the processor is operational and providing transmitter protection.



Typical Power Monitoring Screen

Typical Multichannel Power Monitoring Display Unit

- Accepts input from up to 50 detectors via RS485 ports
- High accuracy detectors available for measurement of power and temperature
- Custom detectors developed for rigid line inner conductor temperatures
- Can alarm up to 16 transmitters (8 transmitters standard, additional 8 on optional daughter board)
- U link & motorized switch inputs (12 standard, additional 12 on optional daughter board)
- Extensive display and setting of alarms options via PC
- PC based display can be extended to full networking capabilities

SPECIFICATIONS	MS1208	MS1216	MS2408	MS2416
Inputs Opto-isolated switch inputs	12	12	24	24
RS485 inputs (Suitable for up to 50 detectors)	2	2	2	2
Outputs Relay	8	16	8	16
Relay ratings	NO and NC contacts rated at 100Vdc at 0.5A)			
LCD Display	TFT Colour, 8.4" resistive touch screen 800 x 600, 16 bit Colors 230 nit brightness			
Other Connectors	2 x USB type A sockets, 1 x RJ-45 socket			
DC Output for external detectors	12V at 5A (current limited via resettable fuse)			
AC Input IEC Inlet Mains Fused (2A)	Universal power supply 90-264V, 47-63Hz			
Housing	Std 19" rack 4RU high approx 220 mm deep			
Weight, Kg	7			
Operating temperature	0 to +50 deg C			
Storage temperature	-20 to +80 deg C			

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High Dynamic Range RMS RF Power Detectors

Power Detector Series

This product range potentially can measure true root-mean-square (RMS) RF power over a dynamic range of 60dB in a single carrier or complex multi channel digital waveform environment at frequencies up to 2.7 GHz.

The peak voltages of multiple transmitters statistically add. In a system of digital transmitters with individually high crest factors this can result in a system with peak to average voltages in excess of 20dB. Traditional power detectors using diode detection or log amps do not accurately measure power when the peak-to-average ratio of the transmitted signal is not fixed.

Designed for use with RFS directional couplers and the output polled by a master unit, multiple RF sensors and other RS485 devices can be simply paralleled on the one pair of wires. The RFS Monitor System display unit supplies DC power to the detectors and has a 8.4" TFT colour screen to provide multiple views of detector and RF switch arrays.

Alternatively the detector can be used without the control unit featuring a linear or log analogue output (0.05 to 4.75V, 100 ohms), requiring an external 8 to 30V dc power source at 60mA.

Wideband RF detector module.

- True RMS power detector
- Input dynamic range in excess of 50 dB
- RF power measurement is independent of signal peak-to-average ratio (crest factor).
- Measurement of power of multiple digital channels with crest factors approaching 20dB
- Standard frequency range of 30 MHz to 1 GHz
- Output is via a half duplex RS485 two - wire interface

SPECIFICATIONS	ASD
Application	High accuracy
Uncertainty*	<+/- 4%
Frequency Range**	30 to 1000 MHz
Impedance	50 ohms
RF Connector Type	N plug
Input Dynamic Range	>50 dB
Max no Damage Input power	+36 dBm
Max Continuous Input power	+24 dBm
Max DTV (10dB crest factor)	+13 dBm
Min Input Power	-27 dBm
Operating Temperature	0 to +50 deg C
Storage Temperature	-20 to +80 deg C

Notes:
*Applies to waveform and temperature effects over a 25 +/- 15 degree C range at the customer specified channel and rated power, excluding the accuracy of calibration standards.
**Standard models are available to cover the FM, VHF and UHF frequency bands, with extended bandwidth and frequency variations to order.
Suffix B for 45 to 250 MHz
Suffix E for 470 to 860 MHz
Suffix A for analogue output.

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Rapid Release U Links

Rapid release U links provide manual switching for high power RF circuits. Typical applications include transmitter, antenna and test load patching.

Manufactured in custom built configurations ranging from simple patch panels to fully integrated multichannel switching.

Features

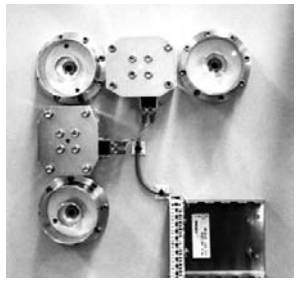
- Fast, simple lever action
- Slimline - low profile design
- Interlock circuits operate before the RF circuit is disturbed
- Available in five sizes to match RFS rigid line sizes/power ratings
- Standard EIA or IEC test adapters can be used
- Input/output line sizes can be varied to suit using RFS developed R series adapters

Available Options

- Integrated with other components (combiners, etc)
- Housed in rack cabinet
- Blanking panels, side panels and locking rear doors
- Metering
- Mimic panel with/without LED display
- Interlock circuits wired to terminal blocks

1 5/8" 6 port patch panel integrated with combiner in a 19" rack complete with metering and mimic panel

3 1/8" 3 port patch panel housed in a 19" rack including mimic panel



Rear view of the unit above showing interlock switches wired to KRONE block.

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Rapid Release U Links

Ordering Information

- U Link size
- Number of ports integrated with other components
  eg power dividers, loads, combiners etc.
- Please provide schematic
- Rigid line and elbows for vertical entry and exit
- Adapters to change line size

Housed in rack cabinet

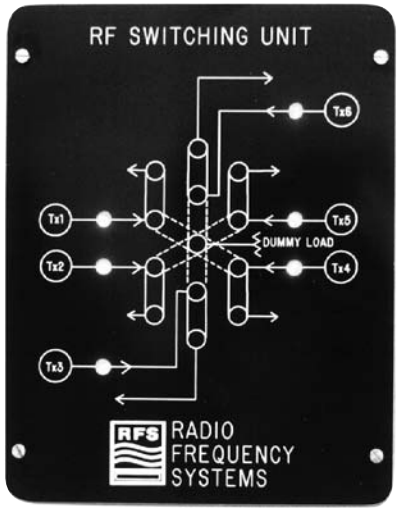
- 565 (19'') x 545D x 27RU
- 725 x 855D x 39RU
- 565 (19") x 545D x 39RU
- 1100 x 855D x 39RU
- 565 (19") x 855D x 39RU
- 1100 x 1000 x 39RU
- Blanking panels
- Other rack size
- Side panels
- Rear doors

Metering

- Specify quantity and scale details
- Mimic Panel
- LED display available

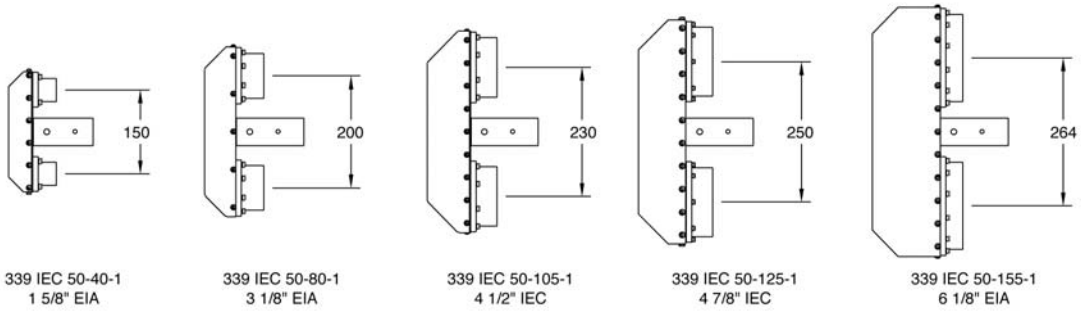
Microswitches

- Specify No. of circuits per U link position
  1-4 standard (up to 8 are generally possible)
- Microswitches wired to KRONE terminal block



Mimic panel with LED display from a 13 port patch panel

U Link Sizes



339 IEC 50-40-1 1 5/8" EIA | 339 IEC 50-80-1 3 1/8" EIA | 339 IEC 50-105-1 4 1/2" IEC | 339 IEC 50-125-1 4 7/8" IEC | 339 IEC 50-155-1 6 1/8" EIA

GENERAL DATA	
Frequency Range (MHz)	DC to 860 (6 1/8" max frequency is 650MHz)
Impedance (ohms)	50
U Link Return Loss (dB)	36
Power Rating (kW)	As for rigid line
Connector Diameters (mm)	As for rigid line

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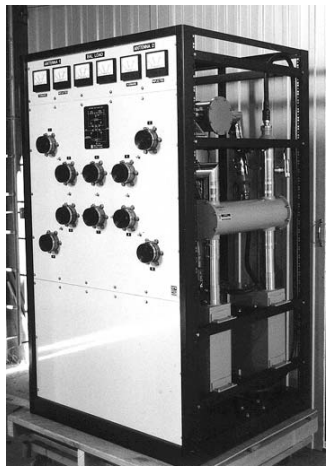
Rigid Line Components

RFS produces a range of 50 ohm rigid line components. Items for both unpressurized (indoor) systems and pressurized, flanged (outdoor) systems are available
in 7/8", 1 5/8", 3 1/8", 4 1/2", 4 7/8" and 6 1/8" sizes. All components are manufactured to the most exacting tolerances.

Features

- High Conductivity Copper Lines:
  Line inner and outer tubing is of high conductivity, hard-drawn, copper, milled to exact dimensions. Unflanged components for indoor use are polished and sprayed with a clear lacquer to maintain a high luster finish
- Welded Construction:
  Flanges and mitered elbow joints are TIG welded for maximum strength
- Low Loss PTFE Dielectric:
  Captive PTFE dielectric insulators are used exclusively in lines and elbows to ensure precision mating and stability of components after assembly
- Silver Plated Contacts:
  All inner conductor connectors are silver plated
- Standard Sizes:
  All components conform to the relevant EIA or IEC standards



Switch frame without U-Links

Commutating line combiner

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Rigid Line Components

RIGID LINE COMPONENTRY	7/8"	1 5/8"	3 1/8"	4 1/2"	4 7/8"	6 1/8"
Rigid Line 6m Lengths ,Unflanged	(3m length)	•	•	•	•	•
Flanged	-	•	•	•	•	•
90° Elbows Plug with Coupling Sleeves & Inner Connectors	•	•	•	•	•	•
90° Elbow Socket, Swivel Flanges	•	•	•	•	•	•
Flange Adapters with Hose Clamps	•	•	•	•	•	•
Flange Adapters, Hard Solder	-	•	•	•	•	•
Straight Coupling Complete	•	•	•	•	•	•
Rapid Release U-Links	(manual)	•	•	•	•	•
Tee, Plug with Couplings	•	•	•	•	•	•
Inner Joining Kits with Insulator, Bullet O Ring Bolts, etc.	•	•	•	•	•	•
End Seals/Witches Hats	•	•	•	•	•	•
Rigid Line Power divider hanger	-	•	•	•	•	•
1m Allthread Susp. hangers	-	•	•	•	•	•

Notes:
1. Rigid lines are available in standard lengths of 6 meters. Shorter lengths are also available - exact length must be specified.
2.Unflanged elbows, tees, etc., can be converted to socket (female) outputs, upon request.
• = available

ADAPTERS	6 1/8"	4 7/8"	4 1/2"	3 1/8"	1 5/8"	6 1/8"	4 7/8"	4 1/2"	3 1/8"	1 5/8"	7/8"
	UNFLANGED					FLANGED					
'N' Socket	•	•	•	•	•	•	•	•	•	•	•
7/8" flanged	•	•	•	•	•	•	•	•	•	•	
1 5/8" flanged	•	•	•	•	•	•	•	•	•		
3 1/8" flanged	•	•	•	•	•	•	•	•			
4 1/2" flanged	•	•	•	•	•	•	•				
4 7/8" flanged	•	•	•	•	•	•					
6 1/8" flanged	•	•	•	•	•						
1 5/8" unflanged	•	•	•	•							
3 1/8" unflanged	•	•	•								
4 1/2" unflanged	•	•									
4 7/8" flanged	•										

•For special adapters (4 1/16", AWA/Marconi, NEC, etc) please enquire.
•Premium VSWR adapters (typically 1.02:1) available on request.

LINE DIMENSIONS (METRIC)	1 5/8"	3 1/8"	4 1/2"	4 7/8"	6 1/8"
Outer conductor (OD)	41.3	79.4	106	123.2	155.6
(ID)	38.8	76.8	103	120	151.9
Inner conductor (OD)	16.9	33.4	44.8	52.1	66
(ID)	15	31.3	42.8	50.1	64
Flange weight (2 required)(kg)	0.3	1	1.5	1.5	1.7
Weight (kg/m)	1.75	3.6	5.5	7.1	10
Flange (OD)	*70	132	160	177	205
Bolt circle Ø	71.4	111.1	140	156	187.3
Bolt quantity	4	6	8	8	12
Bolt diameter	8	10	10	10	10
MAXIMUM SUPPORT DISTANCE BETWEEN CLAMPS					
In free air ie. open to high winds (m)	1	1.1	1.2	1.2	1.3
In protected space ie. where high winds are not present (m)	1.2	1.5	2	2	2

Notes:
1. All dimensions in mm.
* Square flange standard.

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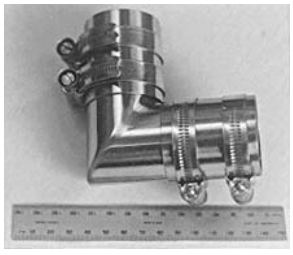
Rigid Line Components

Straight Coupling

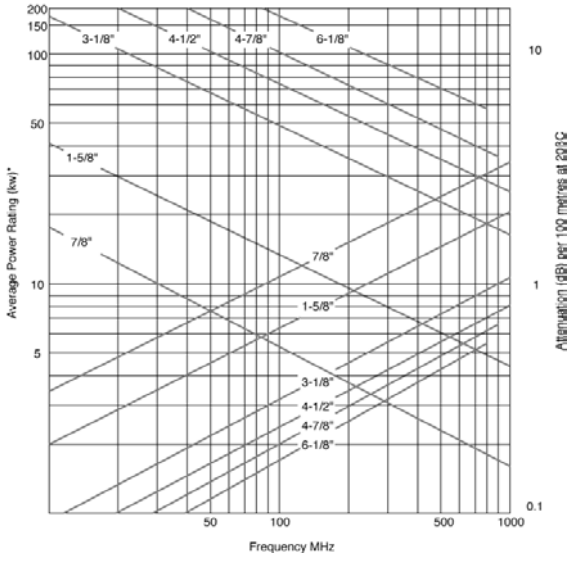
Inner and outer and hose clamps.

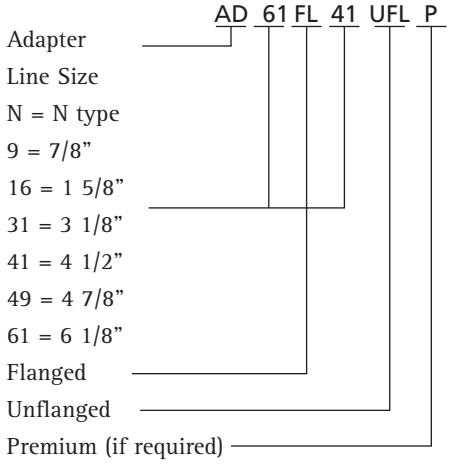
90° Elbow



Male with coupling sleeves.

EIA Flange Adapter, Hard Solder





Adapter Identification

Rigid Line Ratings*

*Average power ratings are based upon an ambient temperature
of 40°C, unity VSWR termination, and free air circulation.

Inner conductor temperature rise 62°C.

Outer conductor temperature rise 23°C

Linearly derate to 0.5 for 80°C ambient temperature.

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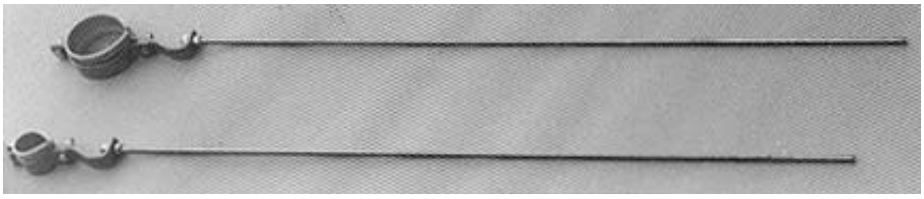
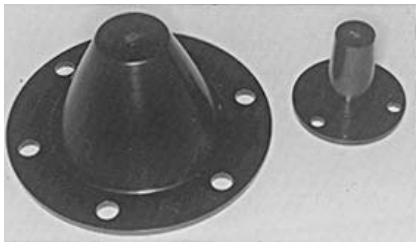
1 5/8" EIA to 'N' Type Socket Adapter

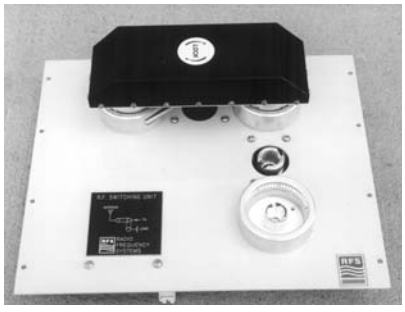
EIA Flange Adapter, Hose Clamp



Rigid Line Suspension Hangers:Complete with "all thread" 1 metre rod



End Cap Seals (Witch's Hats) .
Inner bullet, PTFE insulator
'O' Ring, stainless hardware



Three Port 'U' Link Panel

EIA Inner Joining Kit

7/8" 'U' Link Panel

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Waveguide Components

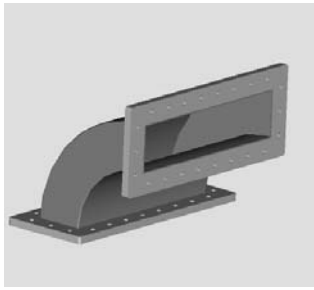
This product range is most commonly used with RFS waveguide directional combiners, to connect the output port into an antenna feed system. The combiner spine uses a nominal 4:1 aspect ratio waveguide operating in the TE10 mode.

RFS directional waveguide combiners utilize two different waveguide sizes to cover the entire UHF broadcasting band:

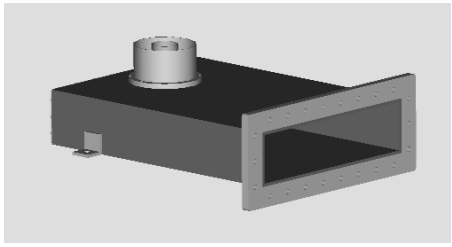
W381 covers 470 to 752 MHz and
W332 covers 548 to 860 MHz.

The accessories consist of sweeps and straight sections, adapters to other waveguide and coax sizes, and 2 and
4 way waveguide to coax splitters

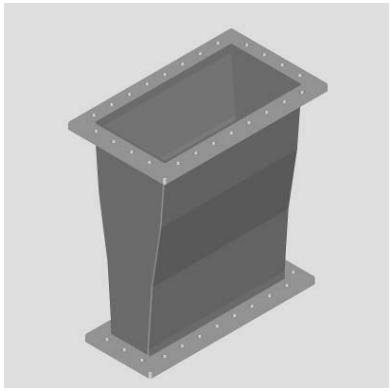
These components are characterized by full band operation with very low reflections to compliment the wideband performance that the combiners are capable of. Within this wide bandwidth capability considerable emphasis has been placed on component designs to ensure minimum sizes and high average and peak power rating.



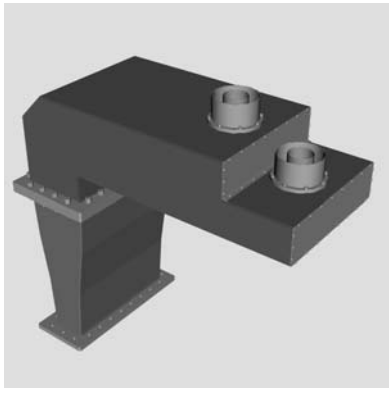
W381 900 E-Plane sweep



W381 4 7/8" Unflanged Adapter



W381 / WR1500 Adapter



W381 4 7/8" 2-way Splitter

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WAVEGUIDE SWEEPS RETURN LOSS >36DB

	Frequency Range MHz	Power Rating kW** LO MHz	Power Rating kW** HI MHz	Centerline Radius (mm)
W381 90° E plane	470 to 752	200	270	200
W381 90° H plane	470 to 752	200	270	600
W332 90° E plane	548 to 860	150	195	175
W332 90° H plane	548 to 860	150	195	525

WAVEGUIDE ADAPTERS RETURN LOSS >36DB

	Frequency Range MHz	Power Rating kW** LO MHz	Power Rating kW** HI MHz	Length (mm)
W381 / WR1800	470 to 630	200	230	427
W381 / WR1500	470 to 752	200	270	512
W332 / WR1150	638 to 752	160	190	488
W381 Blanking plate	N/A	N/A	N/A	10
W332 Blanking plate	N/A	N/A	N/A	10

COAXIAL ADAPTERS RETURN LOSS >32DB
(FLANGED AND UNFLANGED VERSIONS AVAILABLE)

	Frequency Range MHz	Power Rating kW** LO MHz	Power Rating kW** HI MHz	Flange to Coax center Length (mm)
W381 / 6 1/8" EIA	470 to 752	73	60	435
W381 / 4 7/8"	470 to 752	47	39	435
W381 / 4 1/2"	470 to 752	37	30	435
W381 / 3 1/8" EIA	470 to 752	24	20	435
W381 / 1 5/8" EIA	470 to 752	7	5	435
W332 / 6 1/8" EIA	548 to 860	70	56	362
W332 / 4 7/8"	548 to 860	44	36	362
W332 / 4 1/2"	548 to 860	35	28	362
W332 / 3 1/8" EIA	548 to 860	22	18	362
W332 / 1 5/8" EIA	548 to 860	6	5	362

POWER SPLITTERS RETURN LOSS >32DB

	Frequency Range MHz	Power Rating kW** LO MHz	Power Rating kW** HI MHz	Height (mm)	Width (mm)
W381 2 way	470 to 752	146	120	915	894
W381 4 way	470 to 752	200	240	1645	1300
W332 2 way	548 to 860	140	112	790	820

**Power Ratings are average and based on an ambient temperature of 40ºC.
Coaxial components are 50 ohms characteristic impedance.
Power Splitter Ratings are quoted with 6 1/8" EIA outputs. Derate for smaller connectors.
W381 Splitters are constructed from a W381/WR1500 adapter and WR1500/coax splitter.

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Product Overview

RFS HF and tactical antennas provide economical and innovative solutions that can be fully tailored to suit particular system requirements and applications.

In addition, RFS provides a comprehensive antenna field service, with field staff available to support all antenna site activities – site planning and clearing, through installation to final system testing and commissioning.

• **Tactical antennas**
RFS's wide range of tactical manpack and transportable antennas are available in standard designs, or can be customized to meet specific customer requirements.

• **Broadband monopoles**
Designed for medium to long distance omnidirectional operation, these antennas exhibit low angle radiation patterns - an economical solution for general HF communication applications.

• **Horizontal and vertical log periodics**
Suitable for short to long distance applications, RFS's horizontal log periodic antenna performance is virtually ground independent, with take-off angle able to be tailored to suit particular requirements. Alternatively, RFS vertical log periodic antenna series provides ground-dependent vertical beamwidths and is characterized by a low angle radiation that is essentially constant at all frequencies.

• **Rotatable log periodics**
High performance directional antennas designed to provide short, medium and long range coverage. These units exhibit high gain characteristics coupled with excellent rotational speed and accuracy, making these multipurpose antennas the ideal solution for multi-link applications.

• **Biconical dipoles**
This omnidirectional broadband series is designed for short and medium range coverage. As neither terminating resistors nor antenna tuning hardware is required, essentially all input power is radiated.

• **Standard and tandem deltas**
Omnidirectional high angle radiators designed for ionospheric propagation over short to medium distances. Radiation results from a wave travelling upward to a resistive termination at the antenna's apex. Similar in form to the standard delta, the tandem delta does not have a terminating resistor as a result, all input power is radiated, achieving gains of 3-4dB over the standard delta.

• **Surface wave radar**
RFS has developed a comprehensive range of transmit and receive antennas for surface wave systems. Surface wave radar antennas are available in various configurations optimized to suit customer requirements.

• **HF Short wave broadcast antennas**

High performance omni- and directional antennas are available to suit shortwave HF broadcasting applications.

These antennas are capable of handling input powers up to approximately 50kWand have a wide frequency bandwidth.

Engineering Capability

In the creation of both standard and custom HF and tactical antennas, RFS's design capabilities are among the most advanced in the world.

With its strong focus on improving system performance through innovative product design, RFS serves major defense groups, government organizations and system integrators the world over.

Our highly-qualified team of scientists, engineers, technical officers and technicians work to a continuous program of research and design, developing and adapting HF and tactical products at the cutting edge of modern technology.

World-first from RFS include the complex antenna networks developed for the Jindalee 'Over the horizon' radar project.

System Integration and Commissioning

• **RFS is able to offer complete HF and tactical turnkey project services, with specific resources and skills in the key areas of:**
Installation
Field supervision
Commissioning
Sub-system design
Training
Project management

It has proven global expertise in the total project management of cost-effective, end-to-end radio frequency sub-system solutions.

For more information on the selection and use of HF antennas, see the applications overview in the technical section of this catalog.

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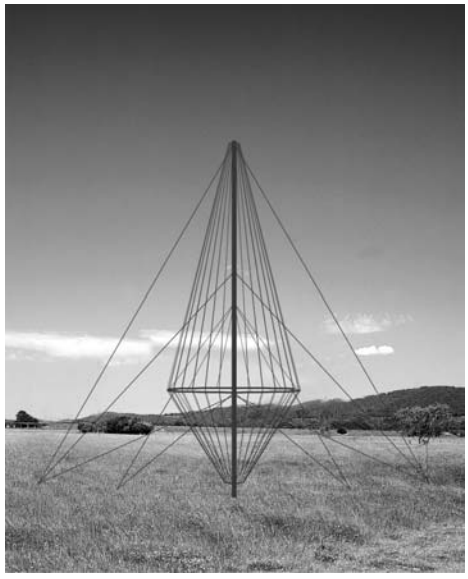
WM Series

Designed for medium to long distance omnidirectional operation, RFS monopoles are vertically polarized and are characterized by low angle radiation patterns and a wide selection of frequency ranges and bandwidths.

For detailed model specifications and ordering information please contact RFS.

- These antennas provide an economical solution for high power applications for general HF communications with their long term reliability and stability of electrical characteristics. Particular attention has been paid to the matching of dissimilar metals to minimize electro-chemical corrosion as well as noise and intermodulation components.
- Monopole antennas require a radial ground mat system for specified performance. Ground mat kits are supplied with each antenna. The radiator is comprised of a biconical cage of stranded marine grade stainless steel wire.
- The standard, optional, support structure is a guyed triangular galvanized steel mast supported on a heavy duty ceramic insulator. The insulated tower base is fitted with a horn gap for lightning protection. For very severe environments an option is available with the WM series for a wind rating of 305km/hr.

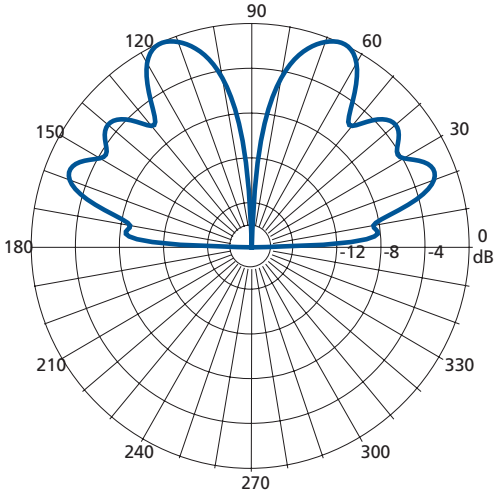


Model WM330

Ordering Information

WM230	•	3	1	0
Model		Always 3	Input Connection	Always 0

1	N Type
2	7/8" EIA
3	1-5/8" EIA
4	3-1/8" EIA



WM230 Elevation Cut
30MHz

WM230 Elevation Pattern

HF & TACTICAL ANTENNA SYSTEMS
7

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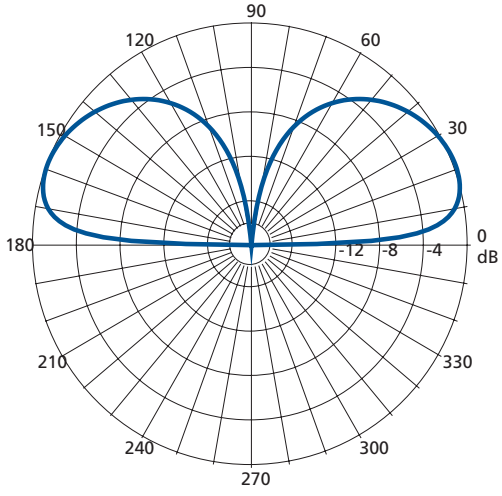
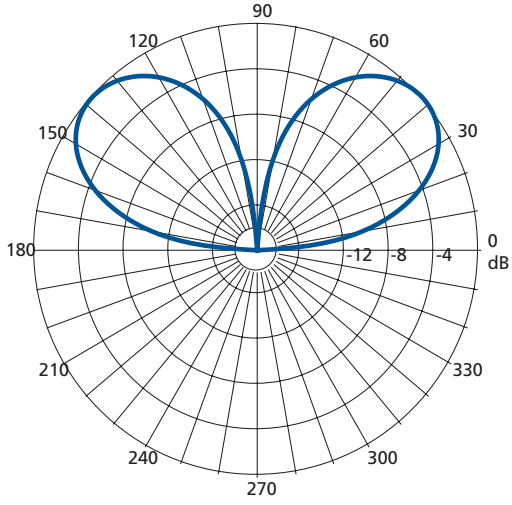
WM Series

ELECTRICAL SPECIFICATIONS			
Model Number	WM230.xxx	WM330.xxx	WM430.xxx
Frequency Range, MHz	2 - 30	3 - 30	4 - 30
Power Rating, kW	1 Average - 40 Average Note#1	1 Average - 40 Average Note#1	1 Average - 40 Average Note#1
Impedance, ohms	50 unbalanced	50 unbalanced	50 unbalanced
Azimuth Radiation Pattern	Omnidirectional	Omnidirectional	Omnidirectional
Polarization	Vertical	Vertical	Vertical
Isotropic Gain, dBi	4	4	4
VSWR	<2.5:1 2.0 to 2.15MHz, 2.0:1 2.15MHz up	<2.5:1 2.0 to 2.15MHz, 2.0:1 2.15MHz up	<2.5:1 2.0 to 2.15MHz, 2.0:1 2.15MHz up
Elevation Radiation Pattern	refer diagrams	refer diagrams	refer diagrams
Input Connector	N type;7/8"EIA; 1-5/8"EIA; 3-1/8" EIA	N type;7/8"EIA; 1-5/8"EIA; 3-1/8" EIA	N type;7/8"EIA; 1-5/8"EIA; 3-1/8" EIA
MECHANICAL SPECIFICATIONS			
Mast Type	MS3 (steel) sections,3m (9.8ft) length,30cm(11.8in) side	MS3 (steel) sections,3m (9.8ft) length,30cm(11.8in) side	MS3 (steel) sections,3m (9.8ft) length,30cm(11.8in) side
Mast/Antenna Height, m (ft)	34 (111.55)	25 (82)	19 (62.34)
Mast Guy Radius, m (ft)	23 (75.50)	17 (55.78)	12 (39.37)
Earth Mat Radius, m (ft)	38 (124.70)	26 (85.31)	20 (65.62)
Wind Survival Rating, km/h (mph)	250 (155);305 (190) Optional. Note#2	250 (155);305 (190) Optional. Note#2	250 (155);305 (190) Optional. Note#2
Material - Support Mast	Heavy duty welded galvanized steel	Heavy duty welded galvanized steel	Heavy duty welded galvanized steel
Material - Radiators	Marine grade stainless steel	Marine grade stainless steel	Marine grade stainless steel
Material - Guy Assemblies	Galvanized steel and heavy duty fail-safe insulators	Galvanized steel and heavy duty fail-safe insulators	Galvanized steel and heavy duty fail-safe insulators
Material - Earth Mat	64 radials of 16 SWG (1.6mm) copper wire	64 radials of 16 SWG (1.6mm) copper wire	64 radials of 16 SWG (1.6mm) copper wire
Packed Weight, Kg (lb)	1320 (2904)	1090 (2398)	820 (1804)
Packed Volume, cu m (cu ft)	9 (317.80)	7.5 (264.83)	5.6 (197.74)



WM230 Elevation Cut
2MHz

WM230 Elevation Pattern



WM230 Elevation Cut
7MHz

WM230 Elevation Pattern

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TDG Series

A high angle radiating antenna designed for ionospheric propagation over short to medium distances. Specifically designed for ground to air systems utilizing high performance and reliability.

For detailed model specifications and ordering information please contact RFS.

- The Tandem Delta is a derivation of the RFS series of delta antennas.
- Unlike the standard delta or other traveling wave antennas, where radiation results from a wave traveling upward to a resistive termination at the apex, the new Tandem Delta does not incorporate a terminating resistor. All input power is therefore radiated and, in consequence, these new antennas have a 2 to 4dB higher gain than the standard delta. Furthermore, removal of the terminating resistor means that higher power ratings are more readily achieved.
- Due to it's high radiation angle characteristics, the Tandem delta antenna is less prone to long distance interference and local electrical noise. It is strongly recommended for high grade communication networks.
- Tandem Delta antennas operate completely independently of ground conditions. Their polarization is elliptical.
- RFS masts and stubmasts for this antenna, are available as options.

Model TDG230

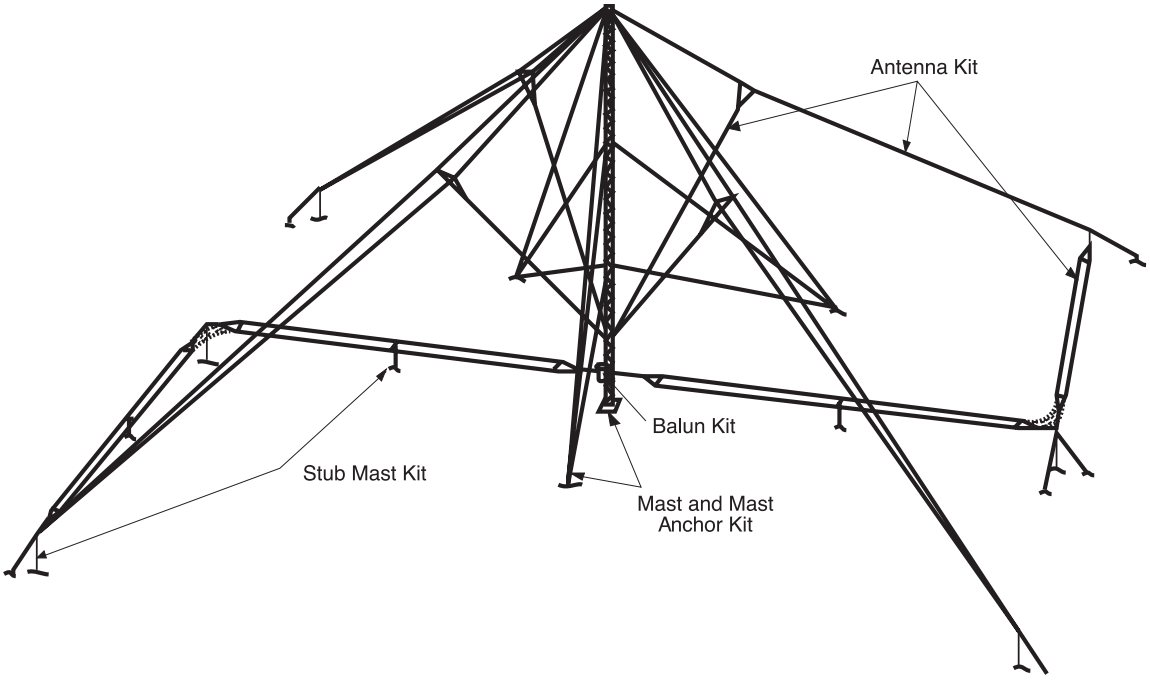
Ordering Information

1. Specify Model
2. Specify Input Impedance/Power
3. Specify Mast Requirements

TDG230	•	0	1	0
Model		Input Impedance/ Power	Always 1.	Mast Requirements

0	600Ω/20kW (no balun)
1	50Ω/250kW
2	50Ω/1kW
3	50Ω/10kW

0	None
3	Mast, Anchor & Stub Mast kits



TDG Antenna

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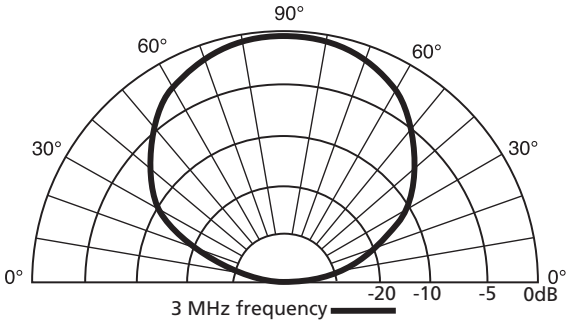
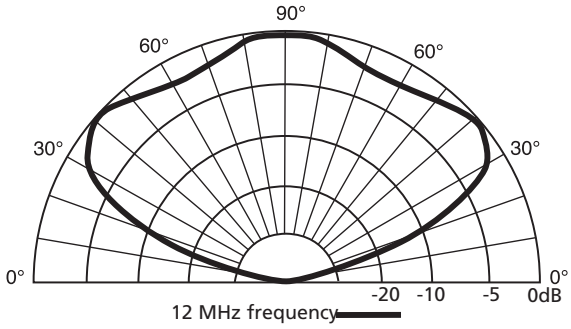
TDG Series

ELECTRICAL SPECIFICATIONS		
Model Number	TDG230.xxx	TDG330.xxx
Frequency Range, MHz	2 - 30	3 - 30
Power Rating, kW	0.25 - 20	0.25 - 20
Impedance, ohms	600 balanced; 50 (balun)	600 balanced; 50 (balun)
Azimuth Radiation Pattern	Omnidirectional	Omnidirectional
Polarization	Elliptical	Elliptical
Isotropic Gain, dBi	5 - 7	5 - 7
VSWR	<2.5:1	<2.5:1
Elevation Radiation Pattern	refer diagrams	refer diagrams
MECHANICAL SPECIFICATIONS		
Mast/Antenna Height, m (ft)	30 (98.43)	20 (65.62)
Ground Dimensions, m (ft)	92 (301.85) x 92 (301.85)	60 (196.86) x 60 (196.86)
Wind Rating (no ice), km/h (mph)	250 (155) Note#1	250 (155) Note#1
Material - Radiators	Marine grade stainless steel	Marine grade stainless steel
Packed Weight, Kg (lb)	1300 (2860)	860 (1892)
Packed Volume, cu m (cu ft)	8 (282.48)	6 (211.86)

Note 1
Wind ratings calculated in accordance with AS1170-1981: Part 2, "SAA Loading Codes, Wind Forces".



TDG330 Azimuth Radiation Pattern - perfect ground



TDG330 Elevation Radiation Pattern

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D Series

Delta antennas are designed for coverage over short to medium distances and exhibit essentially a omni-directional, high angle radiation pattern. Radiation results from a wave traveling upwards to a resistive termination at the apex of the antenna.

For detailed model specifications and ordering information please contact RFS.

- Each antenna is available with or without a support mast and is supplied complete with the appropriate balun and termination. When masts are supplied they include all installation hardware.
- Within the range of delta antennas are models where the oblique elements are fed by open wire, as well as others which are fed by a coaxial cable that can be ducted over or underground. When ordering coaxial cable models the type of cable should be specified: standard RG213 cable or optional half inch foam dielectric cable. The input connector can either be N type (balun) or open wire feed.

Models D230 and D330

- With these omni-directional models, antenna elements are in a single plane with the feed distributed from a central balun transformer, through horizontal feed “wings”, to the bottom of the oblique elements. Each element is fed anti-phase to the other. Ground anchors secure wings and oblique elements in position.
- Two of these omni-directional deltas can be attached to a single mast and operated as separate transmit antennas. Isolation between the two is 30dB. A dual antenna variant, for circular polarization, can also be supplied.

Models DC230 and DC330

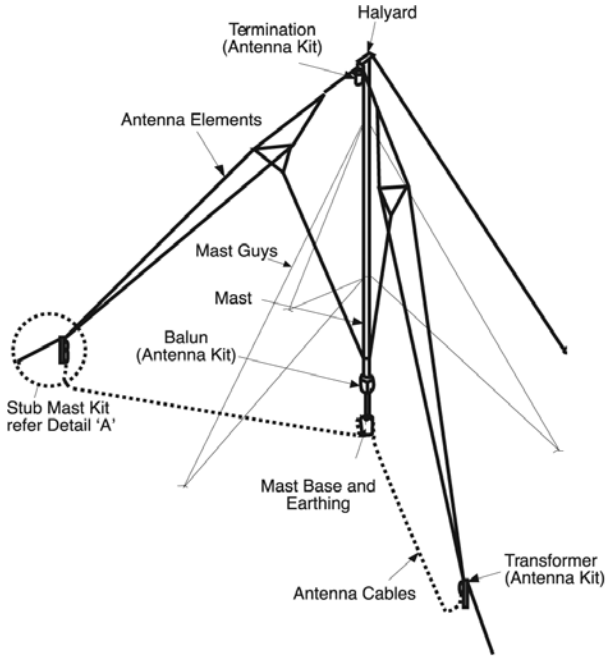
- Although these omni-directional deltas are more expensive than Model D antennas, the lack of over ground wings offer advantages where personnel safety and peculiar site features are an issue. With these a different form of wing is used. Again a central balun supplies anti-phase signals to the bottom of the oblique elements, but in this case via underground interconnect coaxial cable lines and secondary balun transformers.
- Two of these antennas can be attached to one mast and operated as separate transmit antennas. Isolation between the two is 30dB.

Models DDC230 and DDC330

- These semi-directional models have two oblique elements set at an angle to each other supported by a common mast. Arrangement of the feed is similar to that used with the DC Series.

Model D330

Model DC330



Model DDC230

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D Series

ELECTRICAL SPECIFICATIONS				
Model Number	D230.xxx	D330.xxx	DC230.xxx	DC330.xxx
Frequency Range, MHz	2 - 30	3 - 30	2 - 30	3 - 30
Power Rating, kW	0.25 Average - 1 Average	0.25 Average - 1 Average	0.25 Average - 1 Average	0.25 Average - 1 Average
Impedance, ohms	600 balanced; 50 (balun)	600 balanced; 50 (balun)	50	50
Isotropic Gain, dBi	4 - 7	4 - 7	4 - 7	4 - 7
VSWR	2.0:1	2.0:1	2.0:1	2.0:1
MECHANICAL SPECIFICATIONS				
Mast/Antenna Height, m (ft)	22 (72.18)	16.5 (54.14)	22 (72.18)	16.5 (54.14)
Antenna Width, m (ft)	58 (190.29)	46 (151)	44 (144.36)	32 (105)
Mast Guy Radius, m (ft)	14.5 (47.57)	12.5 (41)	14.5 (47.57)	12.5 (41)
Mast/Antenna Height, m (ft)	22 (72.18)	16.5 (54.14)	22 (72.18)	16.5 (54.14)
Wind Rating (no ice), km/h (mph)	230 (143) Note#1	230 (143) Note#1	230 (143) Note#1	230 (143) Note#1
Material - Radiators	Marine grade stainless steel	Marine grade stainless steel	Marine grade stainless steel	Marine grade stainless steel
Packed Weight, Kg (lb)	35 (77) excludes mast and balun	30 (66) excludes mast and balun	40 (88) excludes mast and balun	35 (77) excludes mast and balun
Packed Dimensions, cm (in)	90 x 65 x 30 (35-7/16 x 25-19/32 x 11-13/16) excludes mast and balun	90 x 65 x 30 (35-7/16 x 25-19/32 x 11-13/16) excludes mast and balun	90 x 65 x 30 (35-7/16 x 25-19/32 x 11-13/16) excludes mast and balun	100 x 70 x 30 (39-3/8 x 27-1/2 x 11-13/16) excludes mast and balun

ELECTRICAL SPECIFICATIONS		
Model Number	DDC230.xxx	DDC330.xxx
Frequency Range, MHz	2 - 30	3 - 30
Power Rating, kW	0.25 Average - 1 Average	0.25 Average - 1 Average
Impedance, ohms	50	50
Isotropic Gain, dBi	4 - 7	4 - 7
VSWR	2.0:1	2.0:1
MECHANICAL SPECIFICATIONS		
Mast/Antenna Height, m (ft)	19 (62.34)	14 (46)
Antenna Width, m (ft)	41 (134.52)	29 (95)
Mast Guy Radius, m (ft)	14.5 (47.57)	12.5 (41)
Mast/Antenna Height, m (ft)	19 (62.34)	14 (46)
Wind Rating (no ice), km/h (mph)	230 (143) Note#1	230 (143) Note#1
Material - Radiators	Marine grade stainless steel	Marine grade stainless steel
Packed Weight, Kg (lb)	40 (88) excludes mast and balun	35 (77) excludes mast and balun
Packed Dimensions, cm (in)	100 x 70 x 30 (39-3/8 x 27-1/2 x 11-13/16) excludes mast and balun	100 x 70 x 30 (39-3/8 x 27-1/2 x 11-13/16) excludes mast and balun

Note 1
Wind ratings are calculated to the following Australian standards:
1. AS1664-1975 - SAA Aluminum Structures Code (which gives a safety factor of 65% to material yield)
2. AS1250-1981 - SAA Steel Structures Code (which gives a safety factor of 65% to material yield)
3. AS1170-1981 - Part 2 - SAA Loading Code, Wind Forces

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D Series

Ordering Information D Series

1. Specify Model
2. Specify Power Rating (Av.)
3. Specify Input Impedance
4. Specify Mast Requirements

D230	•	2	0	0
Model		Power Rating	Input Impedance	Mast Requirements

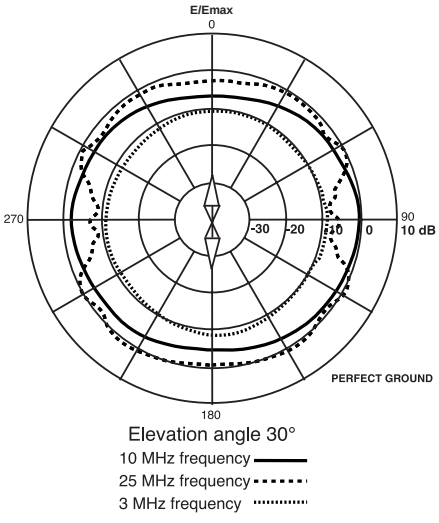
Power Rating		Input Impedance		Mast Requirements	
2	250W A	0	600 ohm (no balun)	0	None
3	1000W A	1	50 ohm (balun)	1	Mast Kit & Halyard
				2	Mast Kit, Jury Mast & Halyard

Ordering Information DC & DDC Series

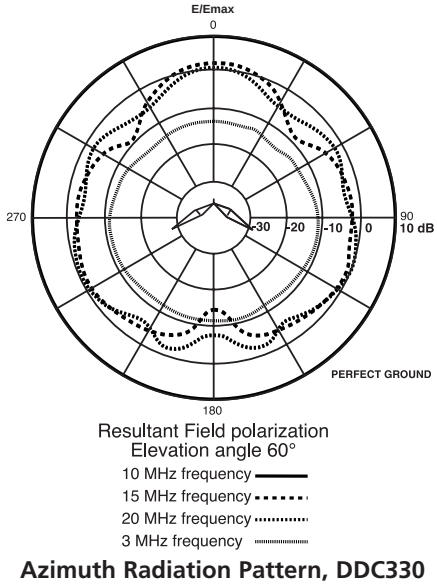
1. Specify Model
2. Specify Power Rating (Av.)
3. Specify Antenna Cable required
4. Specify Mast Requirements

DC230	•	2	1	0
Model		Power Rating	Interconnect Cable Supplied	Mast Requirements

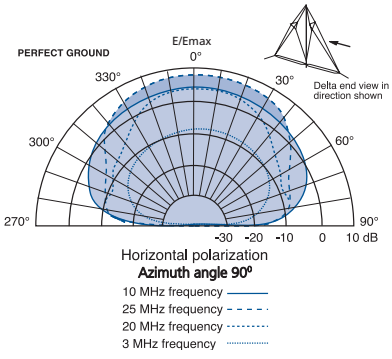
Power Rating		Interconnect Cable Supplied		Mast Requirements	
2	250W A	0	RG213	0	None
3	1000W A	1	LCF12	1	Mast Kit & Halyard
				2	Mast Kit, Halyard & Stub Mast Kit



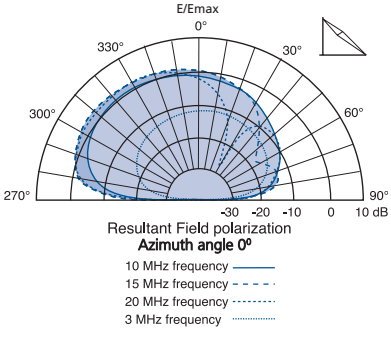
Azimuth Radiation Pattern, D330



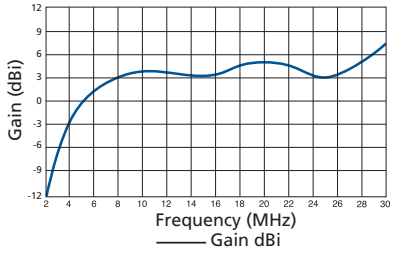
Azimuth Radiation Pattern, DDC330



Elevation Pattern, D330



Elevation Pattern, DDC330



Typical Gain Curve

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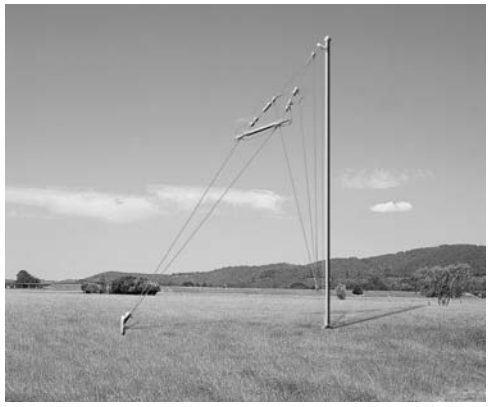
SD Series

An economical, broadband, omni-directional traveling wave antenna, the Model SD214 is designed for coverage over short to medium distances and exhibits essentially an omni-directional high angle radiation pattern. Two versions are available, one rated at 100W average, the other, 250W average.

For detailed model specifications and ordering information please contact RFS.

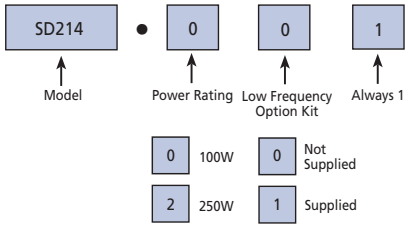
- The SD214 is simple to install and erection can be carried out by unskilled personnel within 30 minutes.
- A halyard is incorporated for ease of erection and enables the antenna to be deployed from a wide range of support structures.
- A simple metal stake or pipe is required to secure the lower end of the antenna and attach the supplied input balun.
- Where soil conditions are poor, antenna performance below approximately 3MHz can be affected. This problem can be overcome by using an optional low frequency kit.



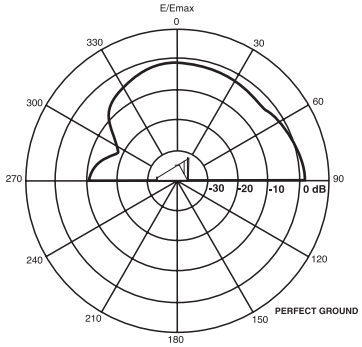
Model SD214

Ordering Information

1. Specify Model
2. Specify Power Rating (Av.)
3. Specify Low Freq. Option Kit

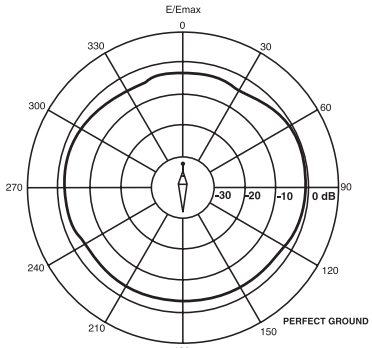


ELECTRICAL SPECIFICATIONS		
Model Number	SD214.0xx	SD214.2xx
Frequency Range, MHz	2 - 14	2 - 14
Power Rating, kW	0.1 Average, 0.4 PEP	0.25 Average, 1 PEP
Impedance, ohms	50 unbalanced	50 unbalanced
Azimuth Radiation Pattern	Omnidirectional	Omnidirectional
VSWR	2.5:1 max, 2.0:1 typical	2.5:1 max, 2.0:1 typical
Elevation Radiation Pattern	refer diagrams	refer diagrams
Input Connector	N type socket	N type socket
MECHANICAL SPECIFICATIONS		
Material - Radiators	Marine grade stainless steel	Marine grade stainless steel
Packed Weight, Kg (lb)	7 (15.4)	8 (17.6)
Packed Dimensions, cm (in)	88 x 34 x 10 (34-21/32 x 13-3/8 x 3-15/16)	100 x 35 x 12 (39-3/8 x 13-25/32 x 4-23/32)
Assembly Time, minutes	<30 for 1 person	<30 for 1 person



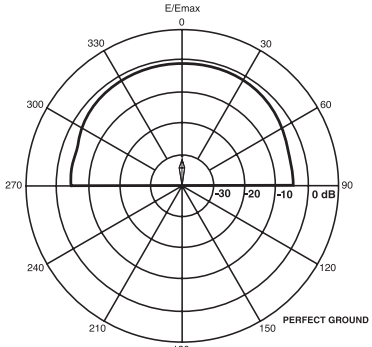
Elevation pattern
Azimuth angle 0°
8 MHz frequency

Radiation Pattern



Elevation pattern
Azimuth angle 60°
8 MHz frequency

Radiation Pattern



Elevation pattern
Azimuth angle 90°
8 MHz frequency

Radiation Pattern

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Broadband Biconical Dipole Antennas 2 - 30 MHz

BDH Series

This broadband series of antennas is designed for short to long (depending on frequency) range transmitting or receiving applications. Polarization is horizontal and the radiation pattern is essentially omnidirectional.

For detailed model specifications and ordering information please contact RFS.

- These broadband antennas do not require tuning eliminating the need for any form of antenna tuning unit (ATU) with its associated losses. No terminating resistors are employed so full power is available for radiation.
- The broadband feature is ideal for multi-channel or frequency agile synthesized HF radio equipment.
- The antenna is comprised of two horizontal conical sections, the elements of which are connected in the center to a common feed line. Either a 300 ohm balanced line, or a 50 ohm coaxial feeder with a balun option may be used to feed the antenna.
- The Average power rating of the standard antenna is 10kW with higher ratings available on special order. The BDH-SW50 is a 50kW broadcast antenna version.
- Baluns are available with average power ratings of 1kW and 10kW. Higher ratings are also available.

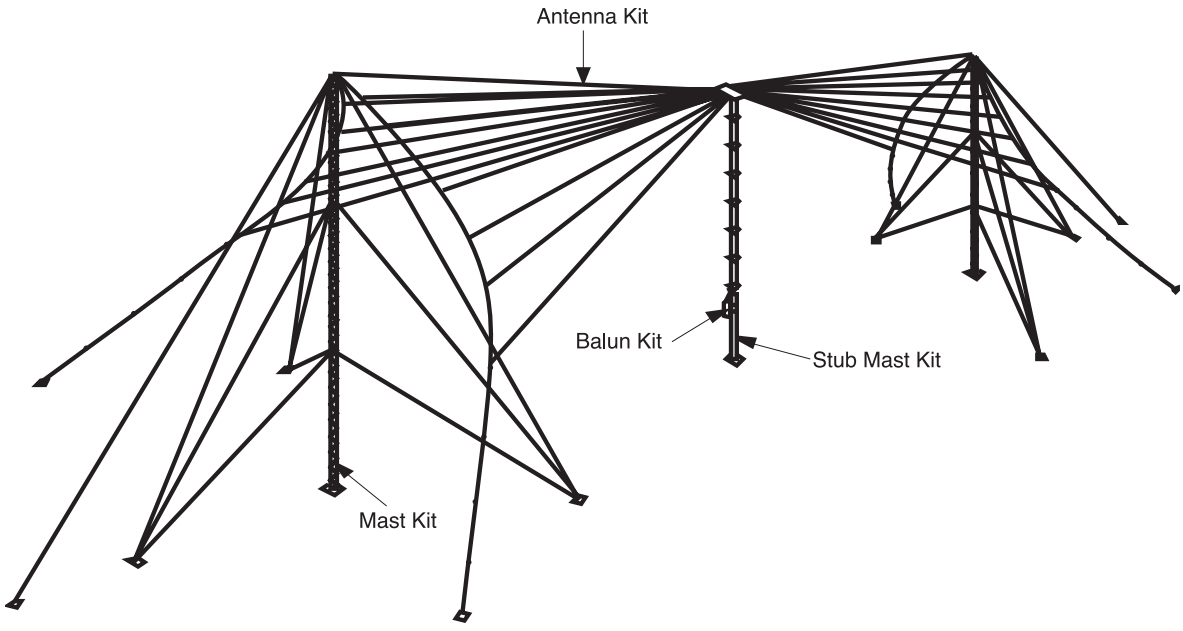
Model BDH230

Ordering Information

1. Specify Model
2. Specify Input Impedance/Power

BDH230	•	0	1	3
Model		Input Impedance & Power	Always 1	Always 3

0	300Ω/10kW (no balun)
2	50Ω/1kW
3	50Ω/10kW



BDH Series

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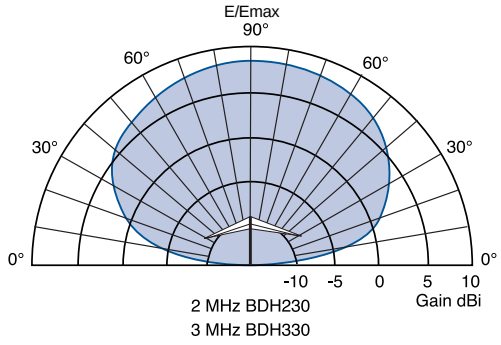
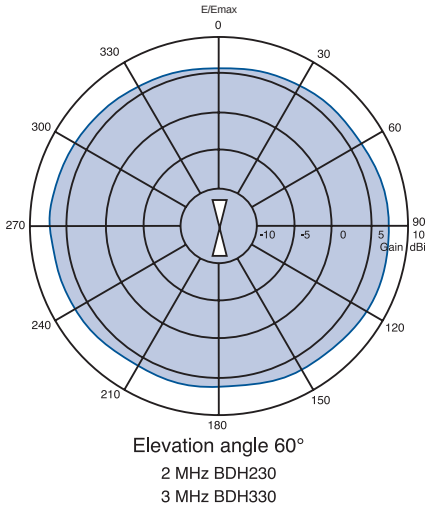
BDH Series

ELECTRICAL SPECIFICATIONS			
Model Number	BDH230.xxx	BDH330.xxx	BDH-SW50
Frequency Range, MHz	2 - 30	3 - 30	3 - 16
Power Rating, kW	1 Average, 4 PEP,10 Average, 40 PEP	1 Average, 4 PEP,10 Average, 40 PEP	50 Average, 200 PEP
Impedance, ohms	300 balanced; 50 (balun)	300 balanced; 50 (balun)	300 balanced; 50 unbalanced
Polarization	Horizontal	Horizontal	Horizontal
Isotropic Gain, dBi	8	8	8
VSWR	2.5:1 max, 2.0:1 typical	2.5:1 max, 2.0:1 typical	2.5:1 max, 2.1:1 typical
MECHANICAL SPECIFICATIONS			
Mast/Antenna Height, m (ft)	21 (69)	15 (49.22)	15 (49.22)
Ground Dimensions, m (ft)	45 (147.65) x 105 (344.5)	35 (114.8) x 75 (246)	35 (114.8) x 75 (246)
Wind Rating (no ice), km/h (mph)	300 (186.5) Note#1	200 (124) Note#1	200 (124) Note#1

Note 1
Wind ratings are calculated to the following Australian Standards:
1. AS1250 SAA Steel Structure Code (which gives a safety factor of 1.5 to material yield).
2. AS1170.2 SAA Loading Code, Wind Forces.
Options
MS3-30/21 mast, 21m(68.9ft), packed weight 550Kg(1210lb), Packed size, cm, 60x170x304(23.6x67x119.7in)
MS3-30/15 mast, 15m(49.2ft), packed weight 400Kg(880lb), Packed size, cm, 60x120x304(23.6x47.2x119.7in)
SMBDH Stubmast, packed weight 18Kg(39.6lb), Packed size, cm, 280x10x12(110.2x3.9x4.7in)



Elevation Radiation Pattern



Azimuth Radiation Pattern

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TWD Series

These horizontally polarized antennas are suitable for short to medium distance coverage and provide an economical option to the full Biconical dipole where cost and ground area may be an issue.

For detailed model specifications and ordering information please contact RFS.

- The radiation pattern is essentially omnidirectional, however for long distance links the dipole should be orientated broadside to the required direction of communication.
- Three models are available:
  frequency range 2 - 30MHz: Model TWD230
  frequency range 3 - 30MHz: Model TWD330
  frequency range 5 - 30MHz: Model TWD530
- All models are available in 250W and 1000W power rating.
- Although not part of the basic package, support masts are available with all necessary hardware for installation.

TWD Antenna

Ordering Information

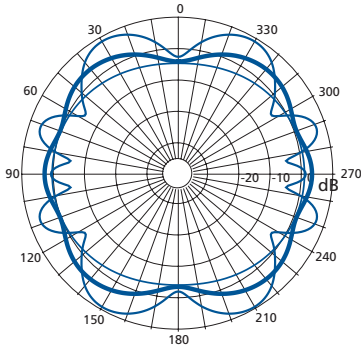
1. Specify Model
2. Specify Mast Requirements
3. Specify Power Rating (Avg.)

TWD230	•	0	0	0
Model		Mast Requirements	Always 0	Power Rating

1	None	0	250W avg.
2	Mast Kit Only	2	1000W avg.
3	Mast & Jury Kits		

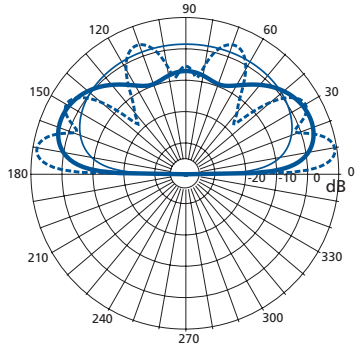
ELECTRICAL SPECIFICATIONS			
Model Number	TWD230.xxx	TWD330.xxx	TWD530.xxx
Frequency Range, MHz	2 - 30	3 - 30	5 - 30
Power Rating, kW	0.25 Average,1 Average	0.25 Average,1 Average	0.25 Average,1 Average
Impedance, ohms	50	50	50
Polarization	Horizontal	Horizontal	Horizontal
VSWR	2.5:1	2.5:1	2.5:1
Input Connector	N type socket	N type socket	N type socket
MECHANICAL SPECIFICATIONS			
Mast/Antenna Height, m (ft)	18 (59.10)	10 - 15 (32.81 - 49.22)	7 (22.97)
Distance Between Masts, m (ft)	53 (173.90)	40 (131.24)	29 (95)
Wind Survival Rating, km/h (mph)	160 (100) Note#1	200 (124.3) Note#1	200 (124.3) Note#1
Material - Radiators	Marine grade stainless steel	Marine grade stainless steel	Marine grade stainless steel

Note 1
Wind ratings calculated in accordance with AS1170-1981: Part 2, "SAA Loading Codes, Wind Forces".



TWD330 Azimuth Cut
Maximum Gain Curves
5MHz
12MHz
30MHz

Azimuth Pattern



TWD330 Elevation Cut
Maximum Gain Curves
5Mhz
12MHz
30MHz

Elevation Pattern

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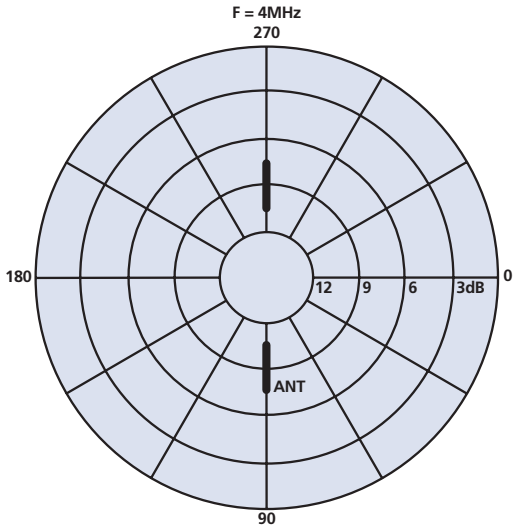
ADH Ground Version Series

The ADH antenna is a horizontally polarized antenna fitted with an adaptive tuning mechanism.

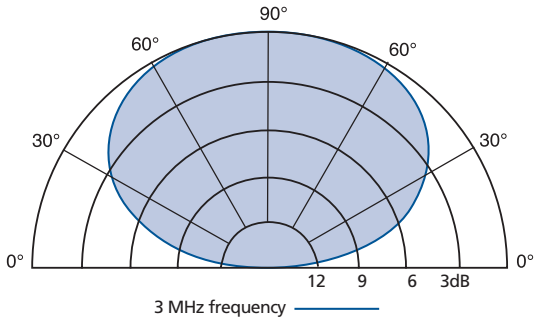
- Available in two frequency bands (2-30MHz and 3-30MHz), the antenna is mounted on a 9 meter high tubular mast.
- A hinged mast base is incorporated enabling ease of installation and access to the adaptive tuning mechanism.
- Up to 8MHz the antenna is predominantly omnidirectional becoming bidirectional when operated between 8-30MHz.
- The ADH series operates in conjunction with a fully automatic remote control unit.

ADH Ground Version Antenna

ELECTRICAL SPECIFICATIONS		
Model Number	ADH230G	ADH330G
Frequency Range, MHz	2 - 30	3 - 30
Power Rating, kW	1	1
Impedance, ohms	50	50
Azimuth Radiation Pattern	Omnidirectional +/- 2dB < 8MHz, Bidirectional > 8MHz	Omnidirectional +/- 2dB < 8MHz, Bidirectional > 8MHz
Polarization	Horizontal	Horizontal
VSWR	<1.5:1	<1.5:1
Elevation Radiation Pattern	refer diagrams	refer diagrams
Switching Time, mS	20	20
Remote Control Cable	28 pair, armored	28 pair, armored
Remote Control Location, m (ft)	500 (1640.5)	500 (1640.5)
MECHANICAL SPECIFICATIONS		
Antenna Width, m (ft)	16 (52.50)	12 (39.40)
Wind Survival Rating, km/h (mph)	160 (100)	200 (124.3)



Azimuth Radiation Pattern



Elevation Radiation Pattern

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Tunable Horizontal Dipole Antennas 2 - 30 MHz

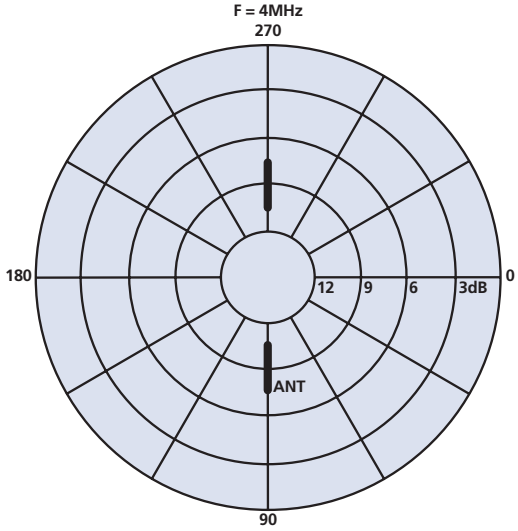
ADH Roof Version Series

The ADH antenna is a horizontally polarized dipole antenna fitted with an adaptive tuning mechanism.

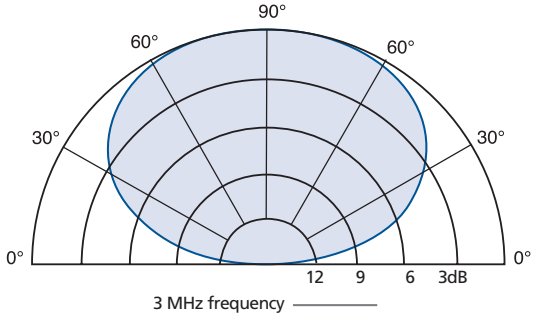
- Available in two frequency bands (2-30MHz and 3-30MHz), the roof mounted version of this antenna is mounted on a 6 meter high tubular mast.
- A hinged mast base is incorporated enabling ease of installation and access to the adaptive tuning mechanism.
- The antenna radiation pattern will vary dependent on the area of roof and height above the ground that it is deployed.
- On smaller buildings (5-7 meters in height) the antenna is predominantly omnidirectional up to 8MHz, becoming bidirectional when operated between 8-30MHz.
- On taller buildings (15-20 meters) the antenna is bidirectional across the full band of operation.

ADH Roof Version Antenna

ELECTRICAL SPECIFICATIONS		
Model Number	ADH230R	ADH330R
Frequency Range, MHz	2 - 30	3 - 30
Power Rating, kW	1	1
Impedance, ohms	50	50
Azimuth Radiation Pattern	Omnidirectional or Bidirectional depending on frequency and installation height	Omnidirectional or Bidirectional depending on frequency and installation height
Polarization	Horizontal	Horizontal
VSWR	<1.5:1	<1.5:1
Elevation Radiation Pattern	refer diagrams	refer diagrams
Switching Time, mS	20	20
Remote Control Cable	28 pair, armored	28 pair, armored
Remote Control Location, m (ft)	500 (1640.5)	500 (1640.5)
MECHANICAL SPECIFICATIONS		
Antenna Width, m (ft)	16 (52.50)	12 (39.40)
Wind Survival Rating, km/h (mph)	160 (100)	200 (124.3)



Azimuth Radiation Pattern



Elevation Radiation Pattern

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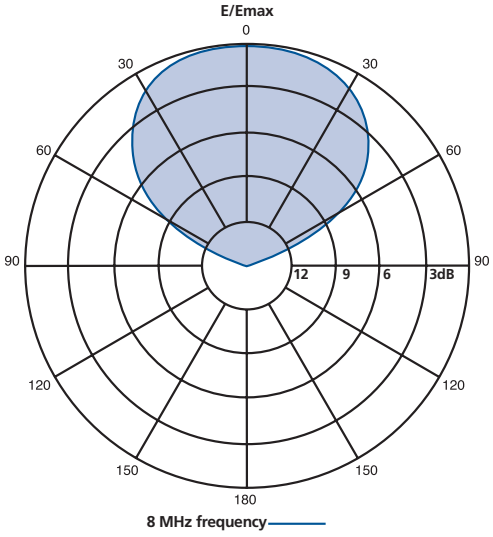
HLO Series

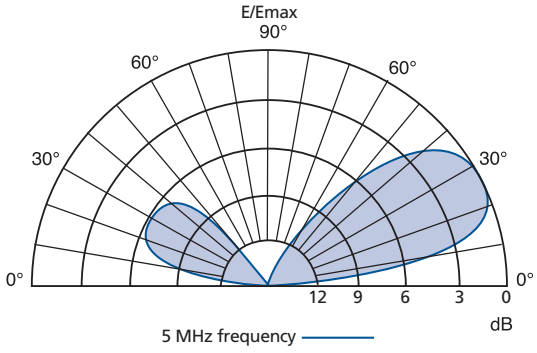
The HLO series are high performance, rotatable log periodic antennas designed to provide reliable link establishment over short, medium and long distances with mobile stations.

- Characterized by high gain performance while maintaining excellent front to back ratio, the HLO antennas are capable of providing coverage in excess of 5000kms
- The broadband feature enables transmission over 4-30MHz (HLO430) and 6-30MHz (HLO630) band. A high performance rotary joint enables continuous rotation with a complete 360° turn achieved in two minutes.
- A unique design feature of the HLO antenna series is the ability to raise and lower the antenna without the use of cranes or special erection towers.

HLO430 Antenna



Typical Azimuth Radiation Pattern



Elevation Radiation Pattern HLO430

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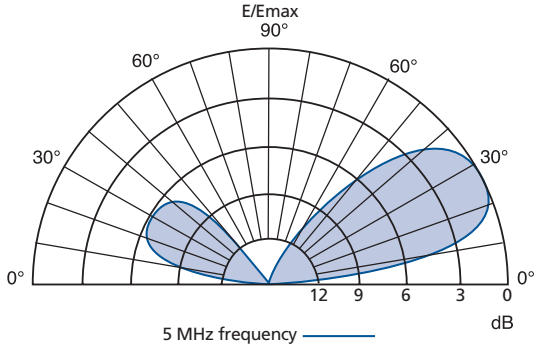
Rotatable Log Periodic Antennas 2 - 30 MHz

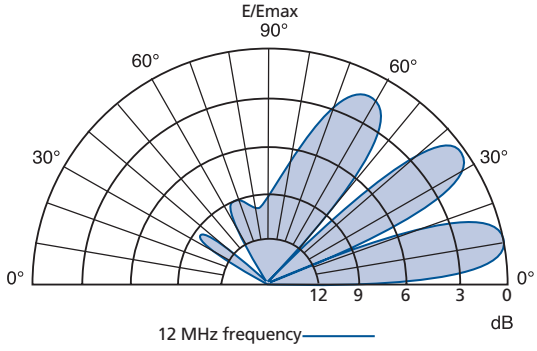
HLO Series

ELECTRICAL SPECIFICATIONS		
Model Number	HLO430	HLO630
Frequency Range, MHz	4 - 30	6 - 30
Power Rating, kW	10 Average, 20 PEP	10 Average, 20 PEP
Impedance, ohms	50 nominal	50 nominal
Polarization	Horizontal	Horizontal
Isotropic Gain, dBi	12 nominal	11 nominal
VSWR	2.0:1	2.05:1
Azimuth 3dB Beamwidth, degrees	72 nominal	72 nominal
Elevation Radiation Pattern	refer diagrams	refer diagrams
MECHANICAL SPECIFICATIONS		
Mast/Antenna Height, m (ft)	34.5 (113.2)	16.5 (54.1)
Ground Dimensions, m (ft)	58 (190.3) diameter	25 (82) diameter
Boom Length, m (ft)	28 (91.87)	18 (59)
Dipole Span, m (ft)	36 (118.1)	24 (78.7)
Number of Dipoles	14	12
Rotation	continuous, 1/2 turn per minute	continuous, 1/2 turn per minute
Wind Rating (no ice), km/h (mph)	200 (125) Note#1	200 (125) Note#1
Packed Weight, Kg (lb)	7880 (17336)	7000 (15400)

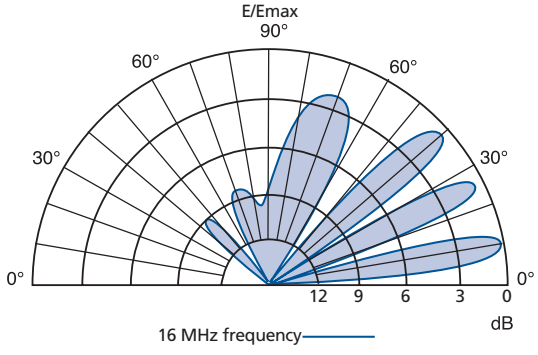
Note 1
Wind ratings calculated in accordance with AS1170-1981: Part 2,"SAA Loading Codes, Wind Forces".



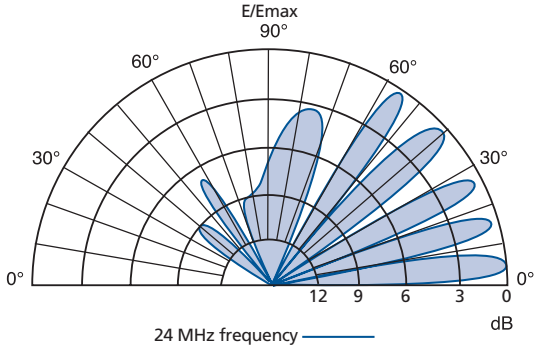
Elevation Pattern



Elevation Pattern



Elevation Pattern



Elevation Pattern

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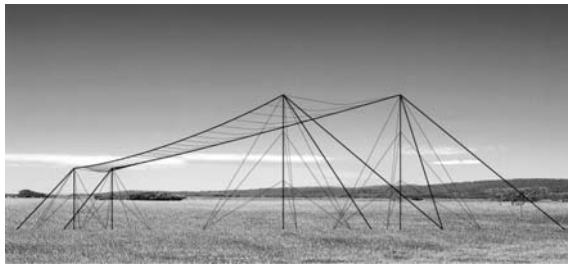
HLPR Series

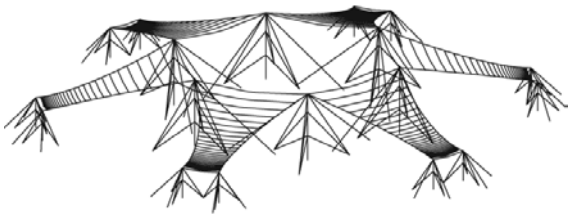
The HLPR series Log Periodic Antennas are high performance, directional, horizontally polarized antennas designed for long range communication circuits.

For detailed model specifications and ordering information please contact RFS.

- Designed specifically to meet customer requirements for very low VSWR and high gain system characteristics, the HLPR is the leading edge in log periodic designs.
- Although virtually ground independent and exhibiting radiation patterns consistent over the entire frequency band, take off angles can be tailored to suit various systems applications.
- Side lobes are extremely small over the entire frequency band providing good discrimination against interfering signals.
- The HLPR has been designed for incorporation within multi-element array and rosette configurations.
- The HLPR range is available for Receive or Transmit applications up to 10kW power rating.



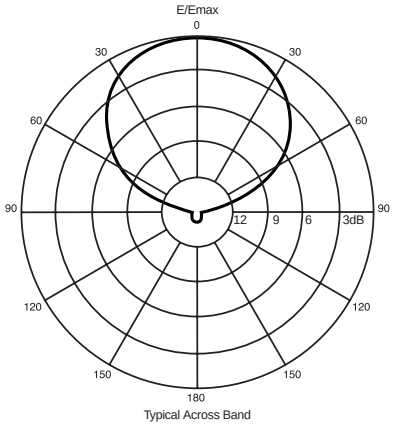
HLPR Antenna



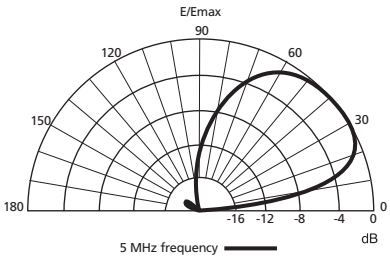
HLPR Rosette Array

ELECTRICAL SPECIFICATIONS	
Model Number	HLPR
Frequency Range, MHz	3 - 33
Power Rating, kW	1 Average - 10 Average
Impedance, ohms	50
Polarization	Horizontal
Isotropic Gain, dBi	12 nominal
VSWR	1.8:1 max, 1.5:1 typical
Elevation Radiation Pattern	refer diagrams
MECHANICAL SPECIFICATIONS	
Mast/Antenna Height, m (ft)	33 (108.3) rear, 15 (49.2) front
Ground Dimensions, m (ft)	94 (308.4) width rear, 48 (157.5) width front, 120 (393.7) length
Wind Survival Rating, km/h (mph)	310 (193) Note#1

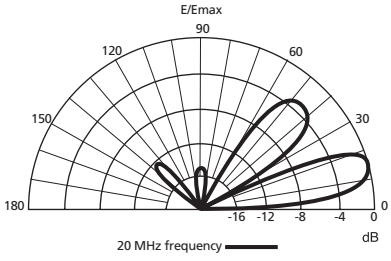
Note 1
Wind ratings calculated in accordance with AS1170-1981: Part 2, "SAA Loading Codes, Wind Forces".



Azimuth Radiation Pattern



Elevation Radiation Pattern



Elevation Radiation Pattern

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Sloping Triangle Antennas 3 - 30 MHz

ST Series

These simple, low cost, broadband horizontally polarized antennas are designed for medium to long range point to point or sectorized transmission or receiving applications.

For detailed model specifications and ordering information please contact RFS.

- Characterized by an increase in gain and directivity when operated within the higher frequency band, the ST series provides an economical option to a full horizontal Log Periodic Dipole design.
- The antenna is comprised of two sloping wires resistively terminated at the center point of the vee near ground level. The apex of the vee is supported by a suitable mast while the antenna is fed via a balun transformer at the mast head.
- The ST330 model is available as a ST330S version which has a much reduced footprint for applications where ground area may be an issue.
- The ST series is available with or without mast systems of which two versions are available: Tubular aluminum (MA): Triangular galvanized steel (for high wind loading) (MS)

Sloping Triangle Antenna

Ordering Information

1. Specify Model
2. Specify Power Rating (Av.)
3. Specify Mast Requirements

ST330	•	2	1	0
Model		Power/Impedance	Wind Rating	Mast Requirements

		2	250W Av/50Ω	1	160km/h
		3	1kW A	2	230km/h

0	None
1	Mast & Stub Mast kit (MA)
2	Mast & Stub Mast kit (MS)
3	Mast, Stub Mast and Jury Mast kit (MA)

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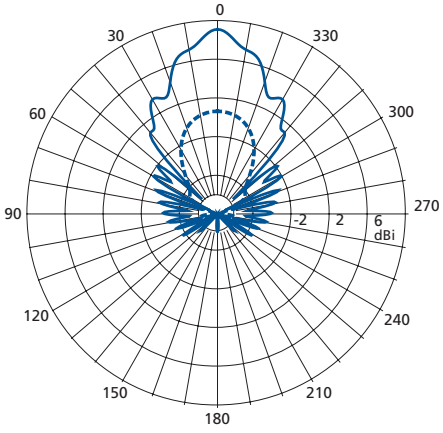
ST Series

ELECTRICAL SPECIFICATIONS			
Model Number	ST330.xxx	ST330S.xxx	ST530.xxx
Frequency Range, MHz	3 - 30	3 - 30	5 - 30
Power Rating, kW	0.25 Average, 1 PEP,1 Average, 4 PEP	0.25 Average, 1 PEP,1 Average, 4 PEP	0.25 Average, 1 PEP,1 Average, 4 PEP
Impedance, ohms	50	50	50
Azimuth Radiation Pattern	Directional	Directional	Directional
Polarization	Horizontal	Horizontal	Horizontal
VSWR	2.5:1 max, <2:1 typical	2.5:1 max, <2:1 typical	2.5:1 max, <2:1 typical
Elevation Radiation Pattern	refer diagrams	refer diagrams	refer diagrams
Input Connector	N type socket	N type socket	N type socket
MECHANICAL SPECIFICATIONS			
Mast/Antenna Height, m (ft)	19 (62.3)	15 (49.2)	15.5 (50.8)
Mast Guy Radius, m (ft)	14 (45.9)	11 (36.1)	11 (36.1)
Ground Dimensions, m (ft)	100 (328.1) Vee length, 80 (262.5) Vee width Note#1	50 (164.05) Vee length, 50 (164.05) Vee width Note#1	80 (262.5) Vee length, 63 (206.7) Vee width Note#1
Wind Survival Rating, km/h (mph)	160 (100) with RFS MA1 mast; 230 (143) with RFS MS3 mast Note#2	160 (100) with RFS MA1 mast; 230 (143) with RFS MS3 mast Note#2	160 (100) with RFS MA1 mast; 230 (143) with RFS MS3 mast Note#2

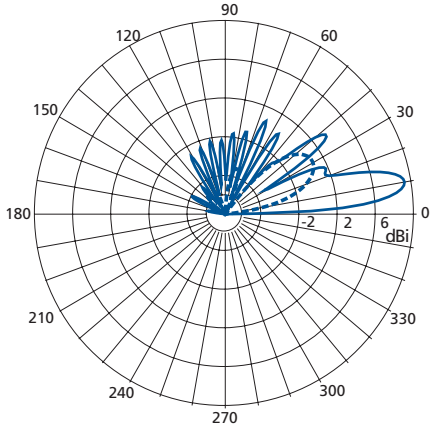
Note 1
Additional space must be allowed for main mast guys
Note 2
Calculated in accordance with AS1170-1981, Part 2, "SAA Loading Code Wind Forces" and AS1664-1975, "SAA Aluminum Structures Code" and AS1250-1981 "SAA Steel Structure Code"



ST330 Azimuth Cut
Maximum Gain Curves
20MHz ——————
5MHz ----------

Azimuth Radiation Pattern

Azimuth Pattern ST330



ST330 Elevation Cut
Maximum Gain Curves
20MHz ——————
5MHz ----------

Elevation Radiation Pattern

Elevation Pattern ST330

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VLP Series

The VLP series can be customized or tailored to suit lower frequency operation and specific customer requirements or applications. The VLP series is available for Receive or Transmit applications from 1kW to 10kW power rating.

For detailed model specifications and ordering information please contact RFS.

- They are characterized by a radiation pattern that is essentially constant at all frequencies.
- The rugged design of the VLP series ensures its suitability for wind velocities up to 230km/hr.
- Electrically steerable arrays, comprising of a number of antennas radiating from a common support mast can be supplied to suit customer specifications.

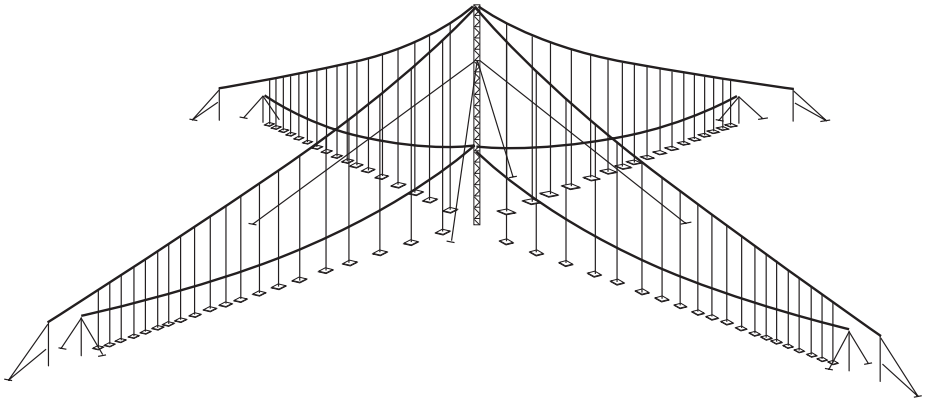
VLP Antenna

Ordering Information

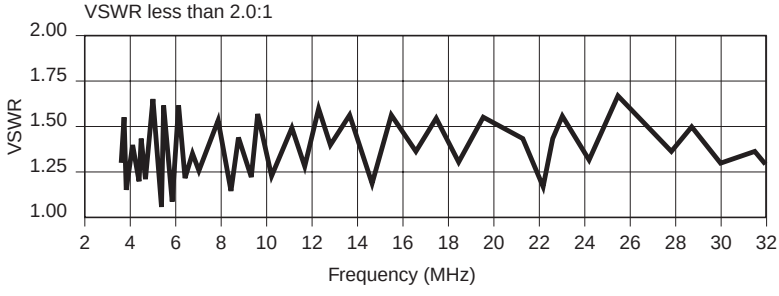
1. Specify Model
2. Specify Power Rating (Avg.)

VLP3.5	•	1	0	0
Model		Power Rating	Always 0	Always 0

1	1KW
2	10KW



VLP Switchable array



VSWR VLP Series

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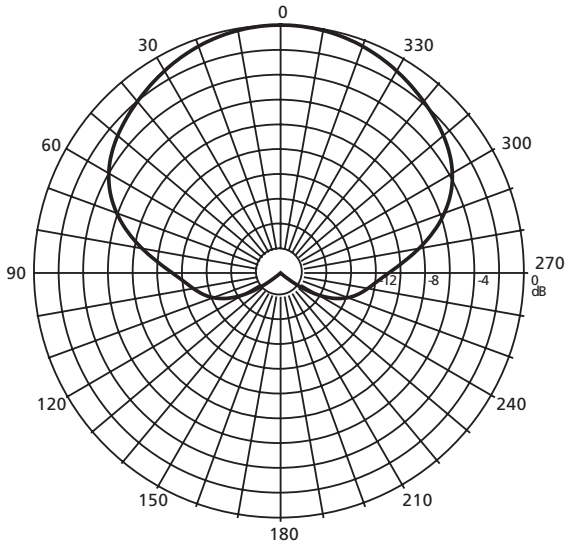
Vertical Log Periodic Dipole Arrays 3.5 - 30 MHz

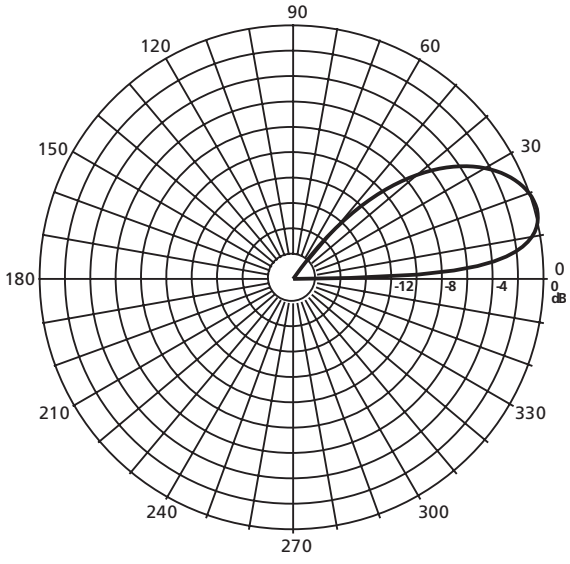
VLP Series

ELECTRICAL SPECIFICATIONS	
Model Number	VLP3.5.xxx
Frequency Range, MHz	3.5 - 30
Power Rating, kW	1 Average, 4 PEP,10 Average, 20 PEP
Impedance, ohms	300 balanced; 50 unbalanced
Polarization	Vertical
Isotropic Gain, dBi	10 for 3.5 to 8MHz, 14 for 8 to 30MHz
VSWR	<2.0:1
Azimuth 3dB Beamwidth, degrees	90 typical
MECHANICAL SPECIFICATIONS	
Mast/Antenna Height, m (ft)	48 (157.5) rear, 10 (32.8) front
Earth Mat Area, m (ft)	80 (262.5) x 50 (164.1)
Ground Dimensions, m (ft)	35 (114.8) width rear, 12 (39.4) width front, 98 (321.5) length
Wind Survival Rating, km/h (mph)	230 (143) Note#1

Note 1
Wind ratings calculated in accordance with AS1170-1981: Part 2, "SAA Loading Codes, Wind Forces".



Azimuth Radiation Pattern



Elevation Radiation Pattern

HF & TACTICAL ANTENNA SYSTEMS 7

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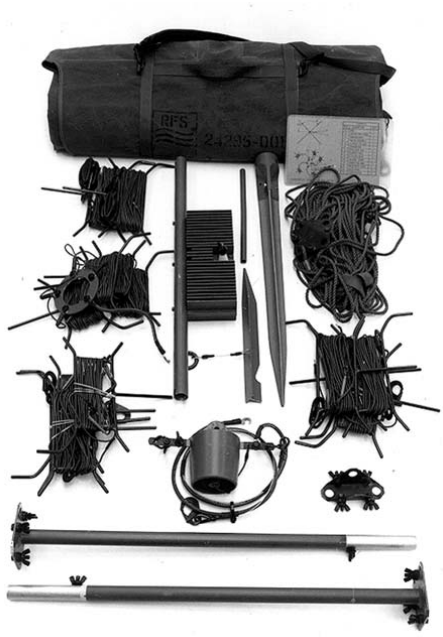
SD-T Series

The RFS Model SD230T antenna is a transportable, broadband, lightweight, traveling wave antenna for short to medium range ionospheric communications.

For detailed model specifications and ordering information please contact RFS.

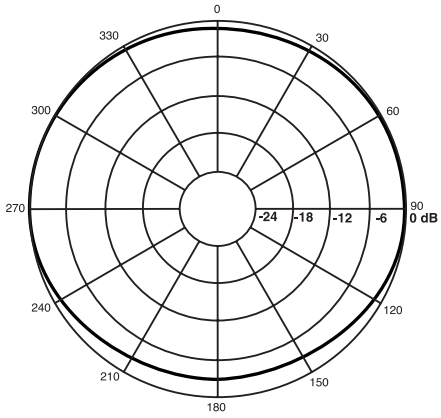
- Designed specifically for use by the defense forces or emergency services, this antenna can be erected within 20 minutes on an existing mast.
- Supplied in a canvas carry bag, the SD230T antenna comes complete with wire elements, balun transformer, terminations, halyard and pulley assembly, stub mast and counterpoise earth system. Normally a user supplied item, the main mast is available as an option if required. A counterpoise earth system is provided for use when the antenna is erected over soil with poor conductivity or over concrete.
- To aid in the rapid deployment of the SD230T antenna, the wire elements are made of a plastic coated, highly flexible copper braid reinforced with synthetic fibers. These wire elements are wound on formers for ease of storage. The balun transformer and terminations are sealed to prevent the ingress of moisture and to reduce the possibility of damage to these components during normal usage.



SD230T

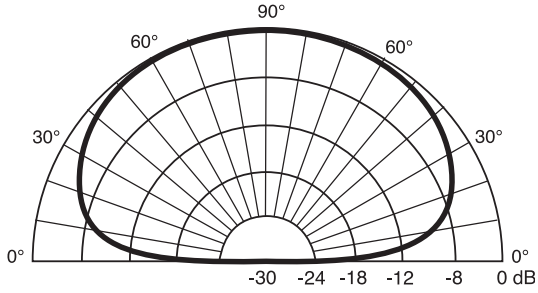
ELECTRICAL SPECIFICATIONS	
Model Number	SD230T.xxx
Frequency Range, MHz	2 - 30
Power Rating, kW	0.2 Average, 0.6 PEP,1 Average, 3 PEP
Impedance, ohms	50 unbalanced
Azimuth Radiation Pattern	Non-directional
VSWR	<2.0:1 for 3 to 20MHz, <2.5:1 for 2 to 30MHz
Input Connector	N type socket
MECHANICAL SPECIFICATIONS	
Mast/Antenna Height, m (ft)	12 (39.4) +/- 1.5 (4.9)
Ground Dimensions, m (ft)	22.5 (73.8) x 2 (6.6) Note#1

Note 1
Listed ground area excludes mast guys and counterpoise.



Elevation angle 60°
8 MHz frequency

Azimuth Radiation Pattern



Azimuth angle 90°
8 MHz frequency

Elevation Radiation Pattern

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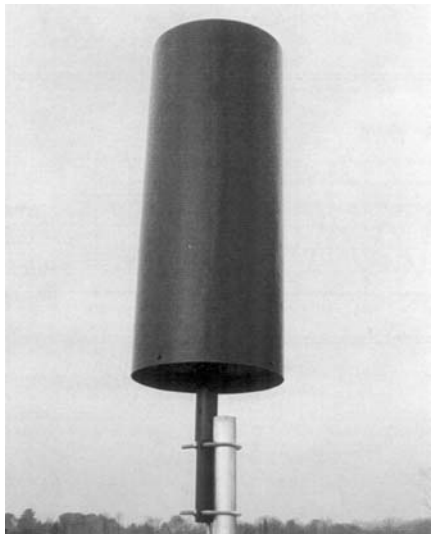
DTLB Series

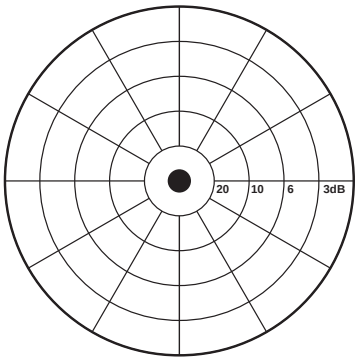
The DTLB115 is a crossband antenna covering the VHF and UHF aeroband from 115 to 500MHz. This antenna is used extensively for ground-to-air communications from control towers or shelters as well as for counter-measures operations.

- The DTLB115 antenna is made of aluminum alloy (AG3) and protected with a polyester radome, providing excellent protection against the hardest conditions: rain, icing, sand storms, marine corrosion and industrial pollution.
- The coaxial output is made on a cable which exits from the lower mounting tube: Length - 1.00m, Connector - N socket



DTLB115 Antenna

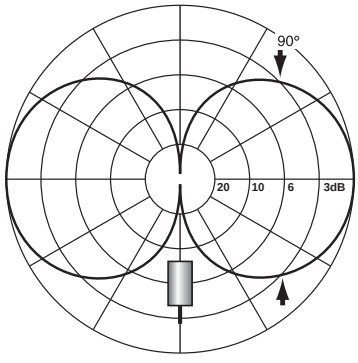
ELECTRICAL SPECIFICATIONS	
Model Number	DTLB115
Frequency Range, MHz	115 - 500
Power Rating, kW	0.4 cw
Impedance, ohms	50
Polarization	Vertical
Isotropic Gain, dBi	2.5
VSWR	<2:1
Half Power Beamwidth E-Plane, degrees	90
Half Power Beamwidth H-Plane, degrees	Omnidirectional
Input Connector	N type socket
Coaxial Tail Length, cm (in)	100 (39-1/4) length of RG213U
MECHANICAL SPECIFICATIONS	
Operating Temperature Range, °C (°F)	-30 to +70 (-22 to 158)
Weight, kg (lb)	11.5 (25.3)
Dimensions (Height/Length), cm (in)	135 (53-1/8)
Radome Height, cm (in)	95 (37-3/8)
Radome Diameter, cm (in)	36 (14-11/64)
Mounting (Standard), mm (in)	Fastening by 2 rings for mast 60 - 95 (2-3/8 - 3-3/4)
Effective Area Front (full antenna), sq m (sq ft)	0.4 (4.30)
Wind Rating (no ice), km/h (mph)	220 (137)
Wind Rating (2cm Ice), km/h (mph)	140 (87)
Material	Aluminum alloy
Material - Radome	Polyester
Color	Army green (IR NATO 24X5); White; Grey



Horizontal pattern
(H plane)

140MHz Frequency

Azimuth Radiation Pattern



Vertical pattern
(E plane)

140MHz Frequency

Elevation Radiation Pattern

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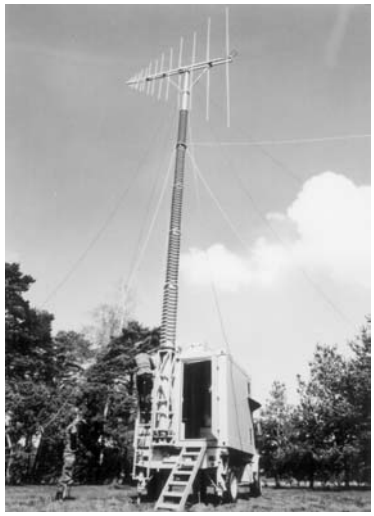
LLB20T Series

The LLB 20T is a 1kW Transmit and wideband receive antenna.

Characteristics of this rugged tactical antenna are:

- Time required to assemble is less than 15min
- Folding girder/beam
- Folding elements fitted with bayonet connections
- No specific tools required for assembly
- All components are self contained - cannot be misplaced
- Packed into a small transit case
- Highly resistant TAN X - 24X5 IR coating
- Can be fitted on various telescopic masts and mounted either in horizontal or vertical polarization - 2 or 3m of insulated mast is required for correct operation in vertical polarization
- Outstanding radio-electrical performances.

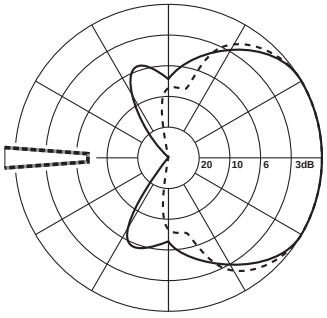


LLB20T antenna

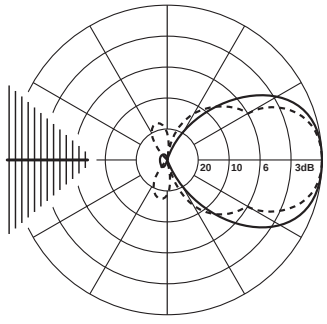
ELECTRICAL SPECIFICATIONS	
Model Number	LLB20T
Frequency Range, MHz	20 - 500
Power Rating, kW	1 cw
Impedance, ohms	50
Polarization	Horizontal; Vertical
Isotropic Gain, dBi	7
VSWR	<2.5:1
Half Power Beamwidth E-Plane, degrees	70
Half Power Beamwidth H-Plane, degrees	130
Input Connector	HN type
Front to Back Ratio, dB	15 typical
MECHANICAL SPECIFICATIONS	
Weight, kg (lb)	45 (99)
Dimensions (Height/Length), cm (in)	460 (181-7/64)
Dimensions (Width), cm (in)	820 (322-53/64)
Effective Area Front (full antenna), sq m (sq ft)	0.8 (8.61)
Wind Rating (no ice), km/h (mph)	130 (81)
Wind Rating (1cm Ice), km/h (mph)	100 (62)
Material	Aluminum alloy
Coating	TAN X
Color	Army green (IR NATO 24X5)
Packed Weight, Kg (lb)	55 (121)
Packed Dimensions, cm (in)	260 x 45 x 45 (102-23/64 x 17-23/32 x 17-23/32)

Note 1 This antenna can be used in receive mode but with reduced performances between 20 and 30 MHz

Options Insulating mast Ø118mm, Protective cover for insulating mast, Protective antenna cover, Antenna color, Down coaxial cable, Telescopic mast



LLB20T Elevation Radiation Pattern



LLB20T Azimuth Radiation Pattern

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LLB22TR Series

The LLB 22TR is a 1kW transmit and very wideband receive antenna.

Characteristics of this rugged tactical antenna are:

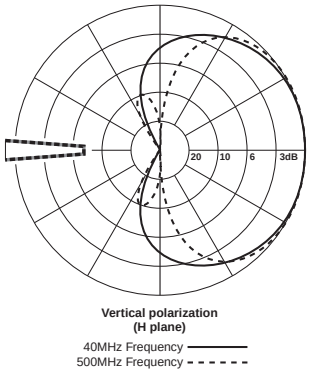
- Time required to assemble is less than 15min
- Folding girder/beam
- Folding elements fitted with bayonet connections
- No specific tools required for assembly
- All components are self contained – cannot be misplaced
- Packed into a small transit case
- Highly resistant TAN X – 24X5 IR coating
- Can be fitted on various telescopic masts and mounted either in horizontal or vertical polarization – 2 or 3m of insulated mast is required for correct operation in vertical polarization
- Outstanding radio-electrical performances.

LLB22TR antenna

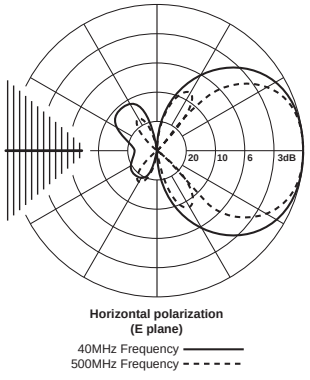
ELECTRICAL SPECIFICATIONS	
Model Number	LLB22TR
Frequency Range, MHz	30 - 1350 Note#1
Power Rating, kW	1 cw
Impedance, ohms	50
Polarization	Horizontal; Vertical
Isotropic Gain, dBi	7
VSWR	<3:1
Half Power Beamwidth E-Plane, degrees	40 to 70 depending on frequency
Half Power Beamwidth H-Plane, degrees	100 to 130 depending on frequency
Input Connector	HN type
Front to Back Ratio, dB	7 to 15 from 30 to 100MHz, >15 above 100 MHz
MECHANICAL SPECIFICATIONS	
Weight, kg (lb)	30 (66)
Dimensions (Height/Length), cm (in)	302 (118-29/32)
Dimensions (Width), cm (in)	590 (232-9/32)
Effective Area Front (full antenna), sq m (sq ft)	0.7 (7.53)
Wind Rating (no ice), km/h (mph)	120 (75)
Wind Rating (1cm Ice), km/h (mph)	90 (56)
Material	Aluminum alloy
Coating	TAN X
Color	Army green (IR NATO 24X5)
Packed Weight, Kg (lb)	39 (85.8)
Packed Dimensions, cm (in)	165 x 45 x 43 (65 x 17-23/32 x 17)
Assembly Time, minutes	5 for 2 people

Note 1 This antenna can be used in receive mode but a reduction of some performances within 20 and 30 MHz

Options Insulating mast Ø118mm, Protective cover for insulating mast, Protective antenna cover, Antenna color, Down coaxial cable, Telescopic mast



LLB22TR Elevation Radiation Pattern



LLB22TR Azimuth Radiation Pattern

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APL-3T Series

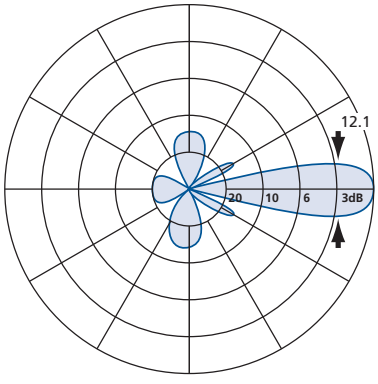
The tactical microwave antenna APL-3T operates in the 1350-1850MHz frequency band and can be installed at the top of a vertically erected mast.

In addition to its radio-electrical performances, its main features are:

- Light weight and rugged design
- Ease of deployment and reduced drag
- Installation is quick and requires one operator only
- The aerial covers the full Band III, and operates in linear polarization. The choice between horizontal and vertical polarization is achieved by the proper choice of orthogonal fittings at the rear of the antenna.
- The parabolic reflector is illuminated by a primary feed which is fitted to the center of the assembly with a quick fastener system.
- The antenna assembly is protected by an extremely resistant coating of TAN X army green IR NATO 24X5.

APL-3TB-III antenna

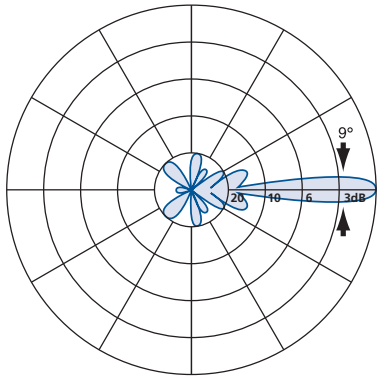
ELECTRICAL SPECIFICATIONS	
Model Number	APL-3T
Frequency Range, MHz	1350 - 1850
Power Rating, kW	0.15
Impedance, ohms	50
Polarization	Horizontal; Vertical
Isotropic Gain, dBi	22
VSWR	<1.8:1
Half Power Beamwidth E-Plane, degrees	10.5
Half Power Beamwidth H-Plane, degrees	10.5
Input Connector	4/11 socket, N type socket
Front to Back Ratio, dB	>20
Side Lobe (max), dB	>12 for 0 to 90 degrees, >30 for 90 to 180 degrees
Cross Polarization, dB	>30
MECHANICAL SPECIFICATIONS	
Weight, kg (lb)	8.1 (17.8)
Mounting (Standard), mm (in)	on 40mm spigot (H or V)
Effective Area Front (full antenna), sq m (sq ft)	0.39 (4.20)
Material	Aluminum alloy
Coating	TAN X
Color	Army green (IR NATO 24X5)



Vertical or Horizontal polarization
(H or E plane)

1350MHz Frequency

Azimuth Radiation Pattern



Vertical or Horizontal polarization
(H or E plane)

1850MHz Frequency

Azimuth Radiation Pattern

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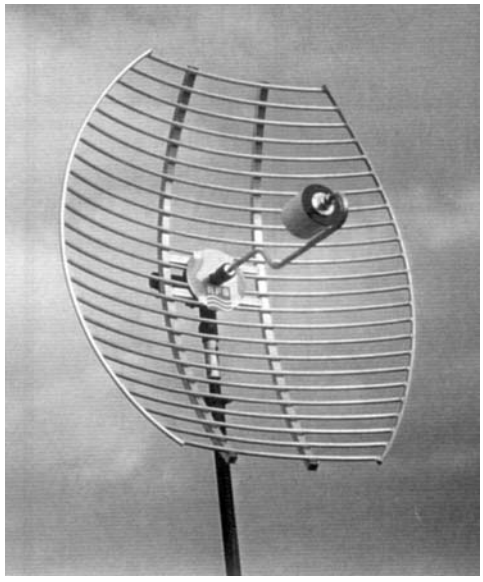
APL-4T Series

The tactical microwave antenna APL-4T operates in the 1350-2700MHz frequency band and can be installed at the top of a vertically erected mast.

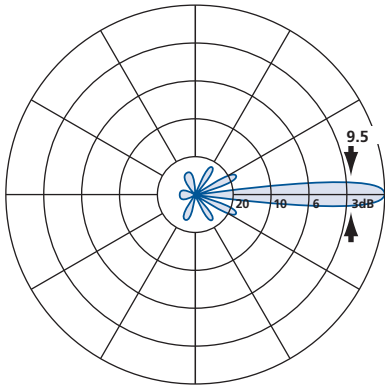
In addition to its radio-electrical performances, its main features are:

- Light weight and rugged design
- Ease of deployment and reduced drag
- Installation is quick and requires one operator only
- The aerial covers the full frequency range 1350-2700MHz and operates in linear polarization. The choice between horizontal and vertical polarization is achieved by the choice of orthogonal fittings at the rear of the antenna.
- The parabolic reflector is illuminated by a primary feed which is fitted to the center of the assembly with a quick fastener system.
- The antenna assembly is protected by an extremely resistant coating of TAN X army green IR NATO 24X5



APL-4T antenna

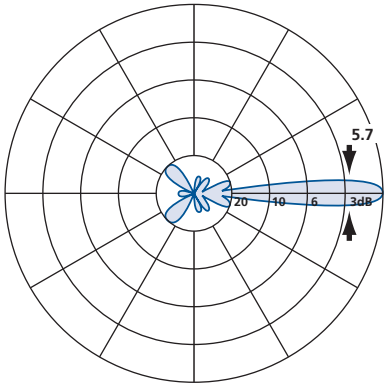
ELECTRICAL SPECIFICATIONS	
Model Number	APL-4T
Frequency Range, MHz	1350 - 2700
Power Rating, kW	0.15
Impedance, ohms	50
Polarization	Horizontal; Vertical
Isotropic Gain, dBi	28
VSWR	<2:1
Half Power Beamwidth E-Plane, degrees	7
Half Power Beamwidth H-Plane, degrees	7
Input Connector	N type socket
Front to Back Ratio, dB	>30
Side Lobe (max), dB	>15 for 0 to 20 degrees, >25 for 20 to 115 degrees, >30 for 115 to 180 degrees
Cross Polarization, dB	>30
MECHANICAL SPECIFICATIONS	
Weight, kg (lb)	14 (30.8)
Mounting (Standard), mm (in)	on 40mm spigot (H or V)
Effective Area Front (full antenna), sq m (sq ft)	1.04 (11.20)
Material	Duralinox
Coating	TAN X
Color	Army green (IR NATO 24X5)



Vertical or Horizontal polarization
(H or E plane)

1350MHz Frequency

Azimuth Radiation Pattern



Vertical or Horizontal polarization
(H or E plane)

2600MHz Frequency

Azimuth Radiation Pattern

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T Series

RFS wideband radio frequency transformers are designed to match a variety of transmission line impedances over a frequency range from 2 to 30 MHz.

For detailed model specifications and ordering information please contact RFS.

- Conservatively rated and field proven in many antenna systems, these high quality transformers offer superior performance and long term reliability.
- Wideband RF transformers are the most efficient means of transferring power from a balanced feeder to an unbalanced feeder system, or vice versa. They can be used to connect coaxial feeder systems to balanced antenna inputs, or to connect coaxial outputs of transmitters to more efficient balanced open wire feeders, with significant economies on long runs.
- Series TB250, T250, T1000 and T10K balun transformers are available with 300 ohm or 600 ohm balanced impedance. Please specify when ordering.

TB250 Series
- Designed for installation at the center of a wire antenna. This transformer will stand continuous wire tensions up to 136kg maximum. Coaxial connector load is limited to 4.5kg.

T250 Series
- For internal or external installation, these transformers are supplied in an aluminum housing for wall, or pole mounting. Gaseous Discharge Tubes are fitted for lightning protection.

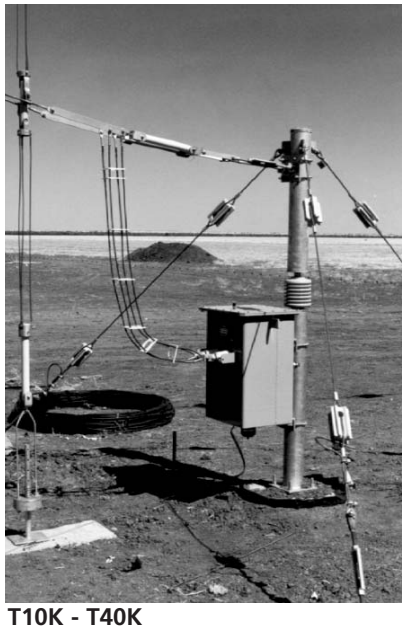
T1000 Series
- For internal or external installation, these transformers are supplied in an aluminum housing for wall, or pole mounting. Adjustable spark gaps are fitted for lightning protection.

T1000T Series
- Designed for rugged external environments, ideal for inclusion in tactical and transportable antenna systems. The transformers are housed in extremely strong fiberglass bodies, hermetically sealed with low loss resin. The input connector is protected within the specially formed body and the transformer is grounded as an added protection against static and lightning induced EMF.

T10K - T40K Series
- The transformer housing is a sealed weatherproof aluminum tank which may be mounted on a pole or vertical surface. The transformer core and winding is cooled by immersion in transformer oil, which transfers heat to the case by convection and then to the external air. A pressure relief valve is provided to prevent excessive internal oil pressures at high temperatures. Heavy duty ceramic (alumina for Model T40K) bushes are provided for the balanced terminals. Spark gaps are provided for lightning protection.

TB250

T1000


T10K - T40K

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Towers

Overview

Premium-quality towers and antenna support systems are essential factors in ensuring optimal RF coverage over a broad range of environments and terrains. RFS's comprehensive CGTI tower range provides just that--a rich selection of towers, antenna mounting systems and associated equipment that facilitates analog and digital RF transmission in the most demanding applications. These include applications requiring coverage over long distances, high-trafficked areas and hard-to-reach locations.

Expertly constructed from galvanized steel (and painted to specification), CGTI towers and antenna mounting products are globally renowned for their robustness, strength and performance. For many decades and in every corner of the globe, CGTI systems have successfully withstood the most demanding environmental conditions, including tropical cyclones, blizzards, sand storms, ice, earthquakes, and corrosive environments.

Capabilities

For over half a century, CGTI has been a proven global leader in tower and associated infrastructure for the telecommunications, radio and television services, and microwave sectors. CGTI has supplied and installed more than 17,000 towers for leading wireless communications providers, and has delivered in excess of 3,000 turnkey tower projects in more than 70 countries. The leading-edge structural design and civil engineering expertise provided by the CGTI team makes it the number one choice.

Range

The CGTI range includes:

- Self-supporting towers – up to 220 meters (720 feet) in height
- Guyed mast – up to 600 meters (1968 feet) in height
- Monopoles – for the broadcast, cellular and microwave industries

Tower accessories, such as antenna supports and passive reflectors up to 90 square meters (970 square feet), are also offered in the comprehensive CGTI range.

Standards

CGTI products comply with all major tower and structural standards, including those of:

- Electrical Industries Association/Telecommunications Industry Association(EIA/TIA North America)
- Neige et Vents (France)
- British Standard (BS, United Kingdom)
- Deutsches Institut für Normung (DIN, Germany)

In addition, CGTI is fully accredited to the exacting ISO 9001-2000 quality management standard.

CGTI products are designed and rated to support heavy loads under wind conditions up to 200 km/hr. (124 miles/hr). By combining the company's standard range with special tailored options, CGTI can also offers towers and masts that are designed to meet specific customer needs.

Safety

CGTI products are designed to provide optimal site safety with minimal exposure to hazards, from manufacture through to site installation and maintenance. The inclusion of anti-falling devices, internal ladders and indicative safety markings ensure safe and efficient tower installation. In addition, CGTI offers a comprehensive range of services to ensure the safest installation. These range from tower installation and assembly supervision, through to site maintenance and logistic and export advice.

Product range

1. Self-supporting towers

The six self-supporting tower models in the CGTI range are either triangular-tubular or square-angle profiled in construction, manufactured from galvanized steel and designed to satisfy the ever-changing requirements of the wireless communications industry. The range is available in a broad selection of height, antenna load-rating and deflection combinations. This, coupled with the option to custom design, ensures that there is a CGTI self-supporting tower suitable for almost any application.

ORYX: With small base dimensions and external ladder, the CGTI ORYX tower has been especially designed for mobile telephone applications. It is available in heights of 12 to 50 meters (39 to 164 feet) and can support antenna loading up to six square meters (65 square feet).

ORION-R: The CGTI ORION-R tower has been designed for dual-carrier applications and comes with an internal ladder. It is available in heights of 8 to 60 meters (26 to 197 feet) and can support antenna loading up to 10 square meters (108 square feet).

OMEGA: Designed specifically for heavy antenna loading and small deflection at medium altitudes, the CGTI OMEGA tower is ideal for multiple-carrier applications. It is available in heights of 8 to 90 meters (26 to 295 feet) and can support antenna loading up to 10 square meters (108 square feet).

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PAT-91: Designed specifically for heavy antenna loading and small deflection at higher altitudes, the CGTI PAT-91 tower is suitable for the most demanding of wireless applications. The largest in the CGTI self supporting tower range, it is available in heights of 20 to 120 meters (66 to 394 feet) and can support antenna loading in excess of 20 square meters (215 square feet).

ALPHA: The CGTI ALPHA tower has been designed for multiple-operator use and comes complete with an internal ladder. It is available in heights of 8 to 60 meters (26 to 197 feet) and can support antenna loading up to 15 square meters (161 square feet).

HELIX: Designed specifically for heavy antenna loading and small deflection at lower altitudes, the CGTI HELIX tower is suitable for areas with high wireless communication activity. It is available in heights of 15 to 60 meters (49 to 197 feet) and can support antenna loading up to 25 square meters (269 square feet).

2. Guyed masts

The CGTI range of guyed masts consists of three models, each boasting strong slender construction from galvanized steel to suit the widest range of applications.

CGTI's masts are specifically designed to support wireless communication equipment at heights of up to 600 meters (1968 feet). Triangular or square in section, the masts are supplied in standard sections with special guy support frames inserted at appropriate intervals. The masts are fitted with built-in climbing rungs in one face as a minimum, and can accommodate extremely high antenna loading.

CG-350: The CGTI CG-350 guyed mast has been designed with a reduced side section and comes complete with an external climbing rung assembly on one face. It is available in heights of 12 to 40 meters (39 to 131 feet) and can support antenna loading up to three square meters (32 square feet).

CG-600: The big brother of the CG-350, the CGTI CG-600 guyed mast system is available in heights of 18 to 90 meters (59 to 295 feet) and can support antenna loading up to eight square meters (86 square feet).

CG-1200: Designed specifically for heavy antenna loading at higher altitudes, the CGTI CG-1200 guyed mast is suitable for the most demanding of wireless installations. The largest in the CGTI guyed mast range, it is available in heights of 30 to 121 meters (98 to 397 feet) and can support antenna loading up to 20 square meters (215 square feet).

CG2200: This tower is designed for specifically for the broadcast industry. It can reach heights up to 400m (1,312 ft).

3. Monopoles

The CGTI monopole range is constructed from galvanized steel and is supplied complete with an external ladder and working platform. The lightweight monopoles are designed to support wireless communication equipment at heights of 12 to 35 meters (39 to 115 feet) and can accommodate antenna loading capacities of up to five square meters (54 square feet).

Inclusions and options

All CGTI self-supporting towers, guyed masts and monopoles incorporate all necessary support steel work, and access infrastructure. These include:

- Galvanized steel structure
- Working platform (with the exception of the CG350 and CG600 guyed masts and the ORYX tower)
- Internal ladder (with the exception of the CG350 and CG600 guyed masts and the ORYX tower)
- Vertical cable tray
- Anchoring system

In addition, a wide range of options are available, enhancing and extending the range. Available for CGTI self-supporting towers, guyed masts and monopoles, these options include:

- Lightning arrestors
- Rest platforms
- Anti-climbing systems
- Fall arrestor slides
- Grounding systems
- Customized painting
- Night beacon systems
- Horizontal cable trays
- Antenna supports

4. Antenna supports

CGTI offers a broad array of galvanized steel antenna supports, enabling the tailoring of self-supporting towers, guyed masts and monopoles to meet the needs of almost any wireless communications application.

The comprehensive CGTI antenna support range

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includes a selection of low-profile, low visual-impact mounting systems. These provide wireless communication carriers practical and easy-to-deploy options for dense urban applications where larger communication towers are impractical.

Cluster-mount: CGTI offers a unique and attractive mechanical 'cluster-mount' system for rooftop sites. The CGTI cluster-mount assembly is specifically designed to accommodate the low visual impact RFS integrated cluster antenna configuration. The one-piece mechanical cluster-mount system is lightweight and can be carried by hand. It has been specially designed to operate without physical fastening – no drilling is required – meaning that it does not impact permanently on the site. In addition, the mounting system is height-adjustable for achieving optimum coverage and ease of servicing.

Adjustable antenna supports: CGTI adjustable antenna supports allow azimuth and tilt adjustment, along with tower slope compensation. These are available in a range of sizes and maneuverability. Cross-beam kits are also available for sway-bar installation, along with standard antenna-mounting kits – all offer optimal reliability and allow for speedy installation.

Wall supports: CGTI offers a range of antenna wall support systems, both with and without platforms. The wall supports permit convenient placement of both microwave and cellular antennas in built-up locations.

Rooftop supports: A range of both permanent-bolted and moveable rooftop supports is offered by CGTI. Available in monopod and 'easel' design, the CGTI rooftop supports allow both microwave and cellular antenna mounting at heights where self-supporting towers and masts would normally be used, but at a fraction of the price.

Antenna support system accessories: CGTI's comprehensive selection of antenna support system accessories includes half-rung, rung and ladder kits (all available in multiple variations), along with securing components that are designed with safety in mind. All accessories are manufactured from corrosion-resistant galvanized steel.

5. Passive reflectors/repeaters

Passive reflectors (or repeaters) are an essential element in any microwave transmission system. They provide the crucial link where – due to one or more obstacles – a direct line-of-sight within the microwave 'hop' is not easily achievable. CGTI is a leading provider of such crucial reflector systems.

CGTI passive reflectors are designed and built to withstand wind loads of up to 240km/h (149 miles/hr), while achieving maximum signal reflection and compliance with all relevant flatness standards at frequencies up to 40 GHz. The reflecting face of each passive reflector is manufactured from solid aluminum, while the rigid-steel framework is based on CGTI's unique triangular design.

CGTI passive repeaters are available in seven sizes and two distinct types – 'back-to-back' or 'mirror'. Custom-made repeaters with surface areas up to 18 square meters (194 square feet) are also available.

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ORYX

SPECIFICATIONS	
Type:	self supporting tower
Design:	lattice
Section:	triangular
Leg member	pipe
Top section size in m	0,60 or 0,90
Height up to in m	50
Access ladder	external
Possible antenna load in m²	from 4 to 6
Possible wind speed in km/h	from 120 to 200
Tilt and sway in degree	+/- 1°
Design rules	American, Eurocodes, French

This tower is especially designed for mobile telephony. It fulfills operator needs requiring tower with light loads.

Top and bottom sections have been reduced in order to optimize landscape integration.

This tower can be fitted with every kind of anti falling systems (cable or rail).

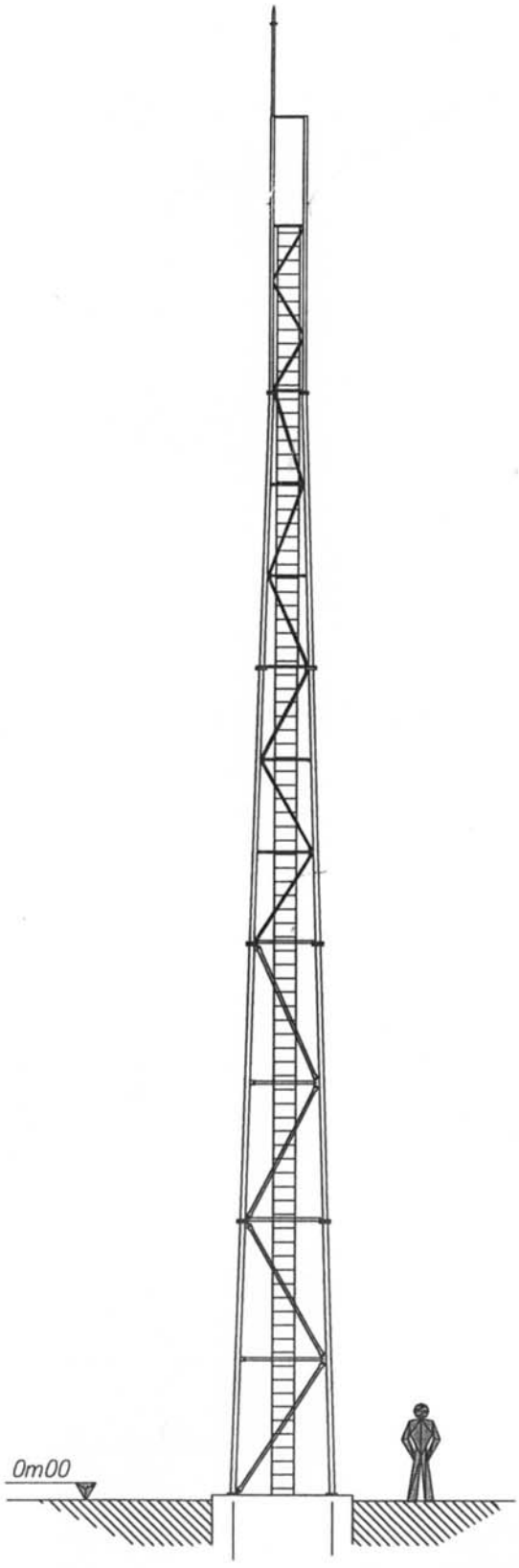
All elements of towers are hot dip galvanized according to international Norms ISO 1461 and ISO 14713. Towers are made out of S355-JO and/or S235-JR steel according to stresses to be endured.

The steel quality is suited for galvanization and compliant with norms NF A35-503.

Tubes are compliant with norms EN10210 or EN10219.

All these fixing parts are compliant with European norms EN 20898-1, EN 24014, EN 24017 and EN 24032.

Anchors are hot dip galvanized threaded rods with flanges and bolts, provided with lost templates.



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ORION-R

SPECIFICATIONS	
Type:	self supporting tower
Design:	lattice
Section:	triangular
Leg member	pipe
Top section size in m	1.20
Height up to in m	70
Access ladder	internal
Possible antenna load in m²	from 6 to 10
Possible wind speed in km/h	from 120 to 200
Tilt and sway in degree	from +/-0,60 to +/- 1
Design rules	American, Eurocodes, French

This tower is especially designed for mobile telephony. It can accept several telecom operators with light antenna load each.

Top section is reduced to 1m20 with an internal access ladder.

This tower can be fitted with every kind of anti falling systems (cable or rail).

All elements of towers are hot dip galvanized according to international Norms ISO 1461 and ISO 14713. Towers are made out of S355-JO and/or S235-JR steel according to stresses to be endured.

The steel quality is suited for galvanization and compliant with norms NF A35-503.

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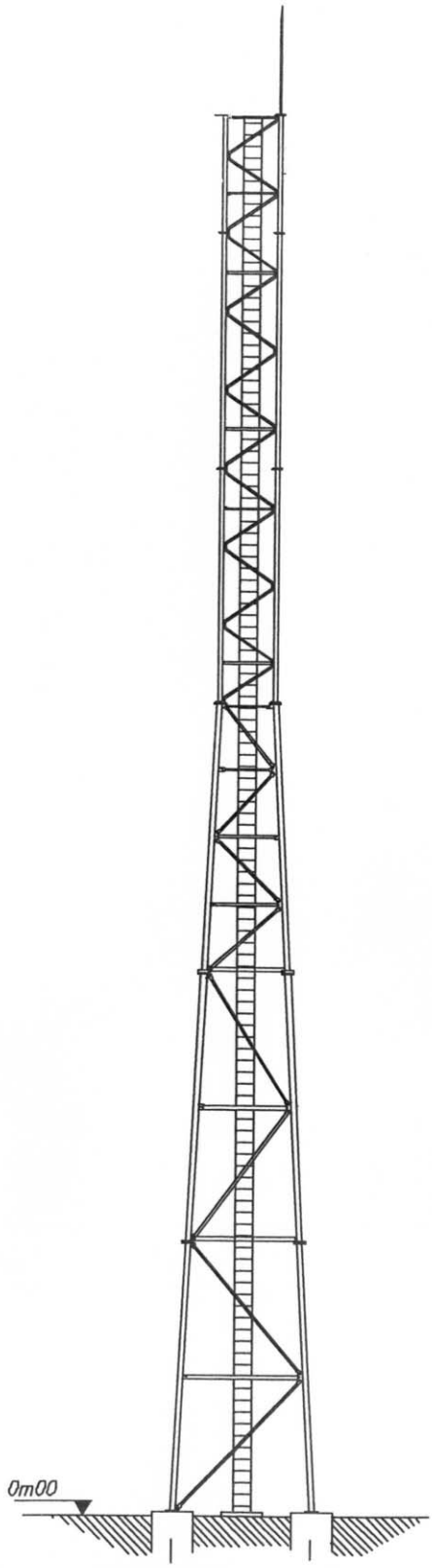
Anchors are hot dip galvanized threaded rods with flanges and bolts, provided with lost templates.



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OMEGA

SPECIFICATIONS	
Type:	self supporting tower
Design:	lattice
Section:	triangular
Leg member	pipe
Top section size in m	1.80
Height up to in m	100
Access ladder	internal
Possible antenna load in m²	from 8 to 20
Possible wind speed in km/h	from 120 to 200
Tilt and sway in degree	from +/-0,30 to +/- 1
Design rules	American, Eurocodes, French

This tower is designed for mobile telephony and backbone networks. It can be used as a multi operator tower.

Its design allows small "tilt and sway" value. The tower can be fitted with several dish antennae in addition to usual panel antennas.

In some case, it can also be used for broadcast issues.

This tower can be fitted with every kind of anti falling systems (cable or rail).

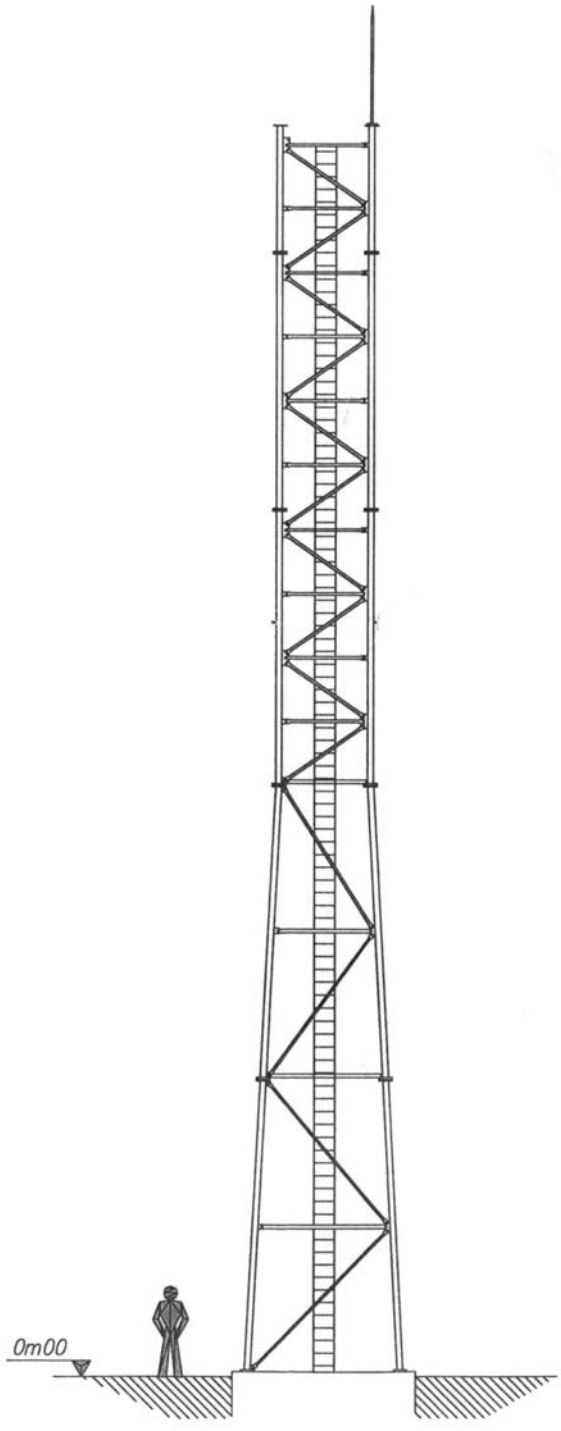
All elements of towers are hot dip galvanized according to international Norms ISO 1461 and ISO 14713. Towers are made out of S355-JO and/or S235-JR steel according to stresses to be endured.

The steel quality is suited for galvanization and compliant with norms NF A35-503.

Tubes are compliant with norms EN10210 or EN10219.

All these fixing parts are compliant with European norms EN 20898-1, EN 24014, EN 24017 and EN 24032.

Anchors are hot dip galvanized threaded rods with flanges and bolts, provided with lost templates or an anchorage section partly galvanized (part above ground) provided with lost templates.



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HELIX

SPECIFICATIONS	
Type:	self supporting tower
Design:	lattice
Section:	triangular
Leg member	pipe
Top section size in m	2.50
Height up to in m	60
Access ladder	internal
Possible antenna load in m²	from 15 to 25
Possible wind speed in km/h	from 120 to 200
Tilt and sway in degree	from +/-0,30 to +/- 1
Design rules	American, Eurocodes, French

This tower is meant for heavy duty site with a small “tilt and sway” value. It can be used as a multi operator tower.

It perfectly fits to backbone networks and SDH.

The large number of straight sections allows an easy fitting of equipment on different levels.

This tower can be fitted with every kind of anti falling systems (cable or rail).

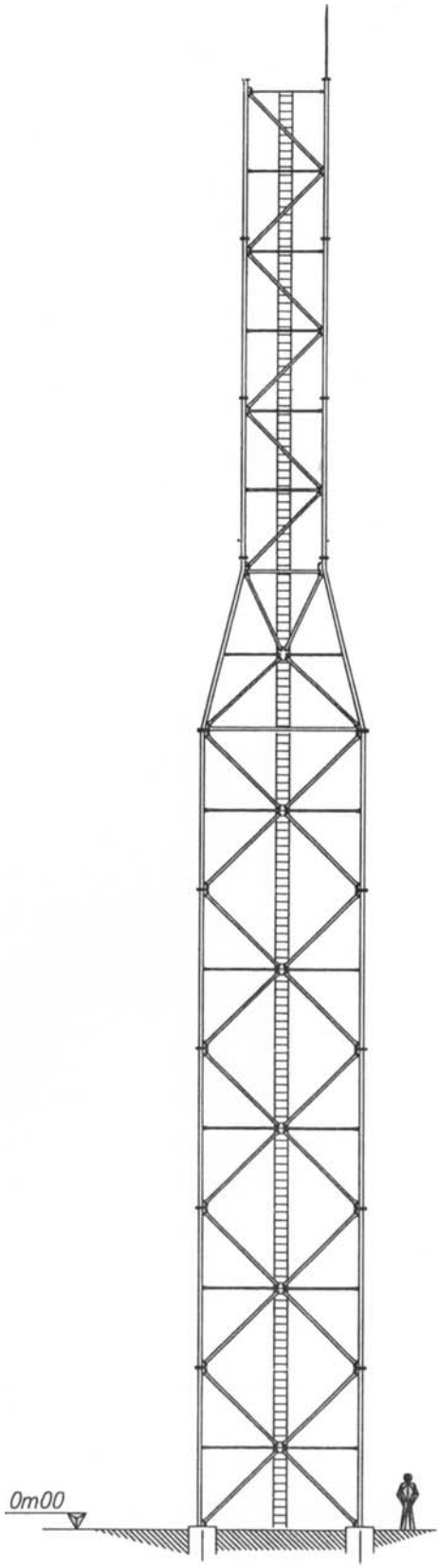
All elements of towers are hot dip galvanized according to international Norms ISO 1461 and ISO 14713. Towers are made out of S355-JO and/or S235-JR steel according to stresses to be endured.

The steel quality is suited for galvanization and compliant with norms NF A35-503.

Tubes are compliant with norms EN10210 or EN10219.

All these fixing parts are compliant with European norms EN 20898-1, EN 24014, EN 24017 and EN 24032.

Anchors are hot dip galvanized threaded rods with flanges and bolts, provided with lost templates.



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PCC12

SPECIFICATIONS	
Type:	self supporting tower
Design:	lattice
Section:	square
Leg member	angle profile
Top section size in m	1m20
Height up to in m	70
Access ladder	internal
Possible antenna load in m²	from 4 to 10
Possible wind speed in km/h	from 120 to 200
Tilt and sway in degree	from +/-0,60 to +/- 1
Design rules	American, Eurocodes, French

This tower is designed for mobile telephony. It can accept several telecom operators with light antenna load each.

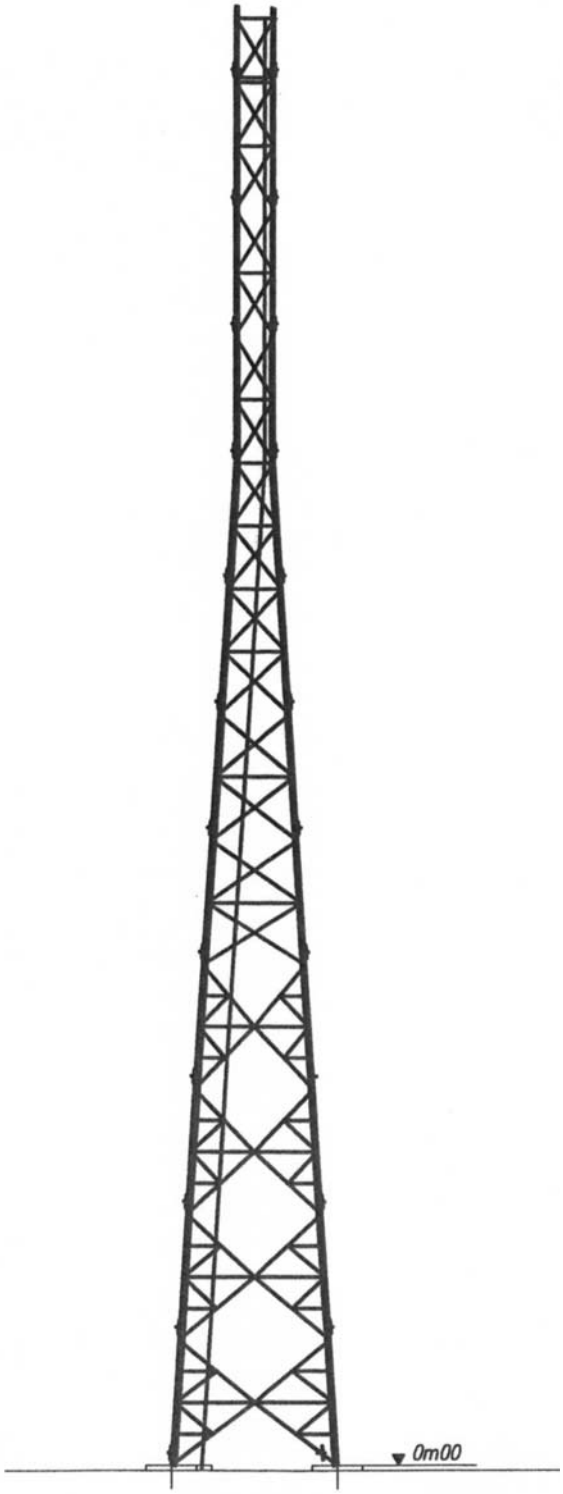
Top section is reduced to 1m20 with an internal access ladder.

This tower can be fitted with every kind of anti falling systems (cable or rail).

All elements of towers are hot dip galvanized according to international Norms ISO 1461 and ISO 14713. Towers are made out of S355-JO and/or S235-JR steel according to stresses to be endured.

The steel quality is suited for galvanization and compliant with norms NF A35-503.

Anchors are an anchorage section partly galvanized (part above ground) provided with lost templates.



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PCC17

SPECIFICATIONS	
Type:	self supporting tower
Design:	lattice
Section:	square
Leg member	angle profile
Top section size in m	1m70
Height up to in m	100
Access ladder	internal
Possible antenna load in m²	from 8 to 20
Possible wind speed in km/h	from 120 to 200
Tilt and sway in degree	from +/-0,30 to +/- 1
Design rules	American, Eurocodes, French

This tower is designed for mobile telephony and backbone networks. It can be used as a multi operator tower.

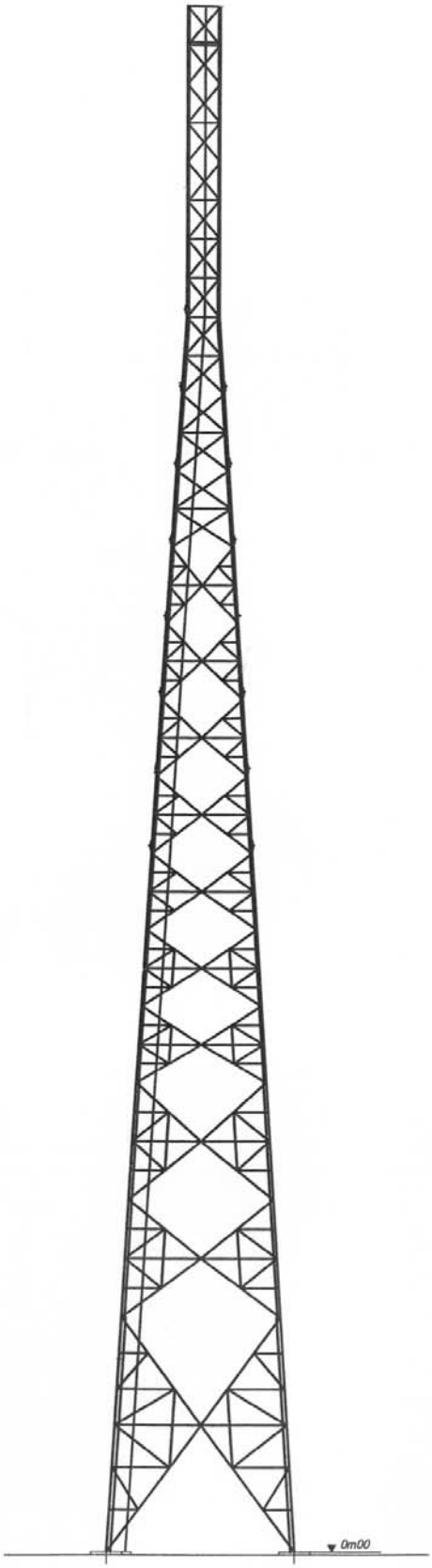
Its design allows small "tilt and sway" value. The tower can be fitted with several dish antennae in addition to usual panel antennas.

This tower can be fitted with every kind of anti falling systems (cable or rail).

All elements of towers are hot dip galvanized according to international Norms ISO 1461 and ISO 14713. Towers are made out of S355-JO and/or S235-JR steel according to stresses to be endured.

The steel quality is suited for galvanization and compliant with norms NF A35-503.

Anchors are an anchorage section partly galvanized (part above ground) provided with lost templates.



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CG350

SPECIFICATIONS	
Type:	guyed mast
Design:	lattice
Section:	triangular
Leg member	angle profile
Top section size in m	0.35
Height up to, in m	40
Access ladder	none: climbing on 1 face
Possible antenna load in m²	from 1 to 3
Possible wind speed in km/h	from 120 to 200
Tilt and sway in degree	+/- 1°
Design rules	American, Eurocodes, French

This tower is designed for light loads. It can be fitted on a roof top site with special design for anchor system.

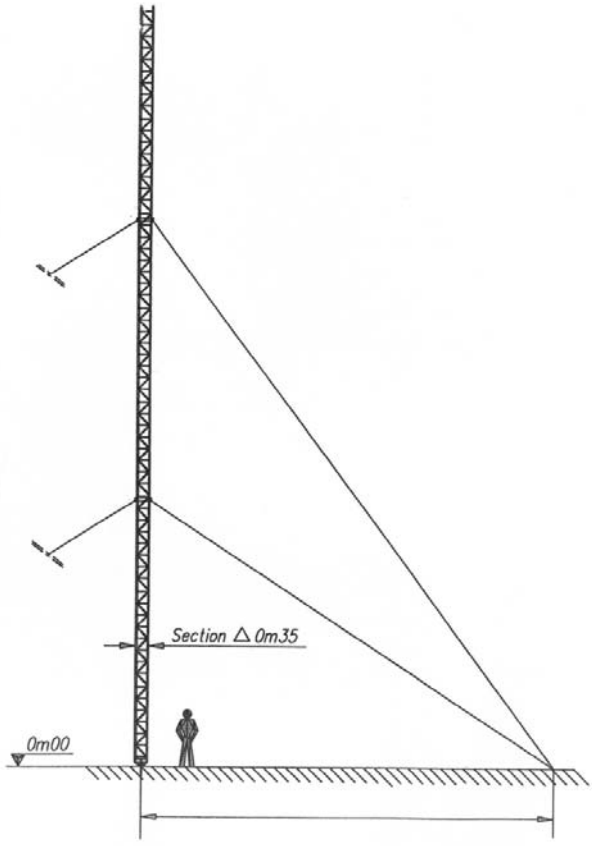
This tower allows a minimum of equipment (no ladder and no working platform).

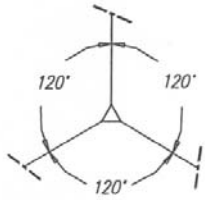
This tower can be fitted with every kind of anti falling systems (cable or rail).

All elements of towers are hot dip galvanized according to international Norms ISO 1461 and ISO 14713. Towers are made out of S355-JO and/or S235-JR steel according to stresses to be endured.

The steel quality is suited for galvanization and compliant with norms NF A35-503.

All these fixing parts are compliant with European norms EN 20898-1, EN 24014, EN 24017 and EN 24032.





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CG600

SPECIFICATIONS	
Type:	guyed mast
Design:	lattice
Section:	triangular
Leg member	angle profile or pipe
Top section size in m	0.60
Height up to, in m	90
Access	on face of tower
Possible antenna load in m²	from 1 to 8
Possible wind speed in km/h	from 120 to 200
Tilt and sway in degree	from +/-0,5 to +/- 1
Design rules	American, Eurocodes, French

It fulfills operator needs requiring tower with light loads. It can be used for mobile telephony.

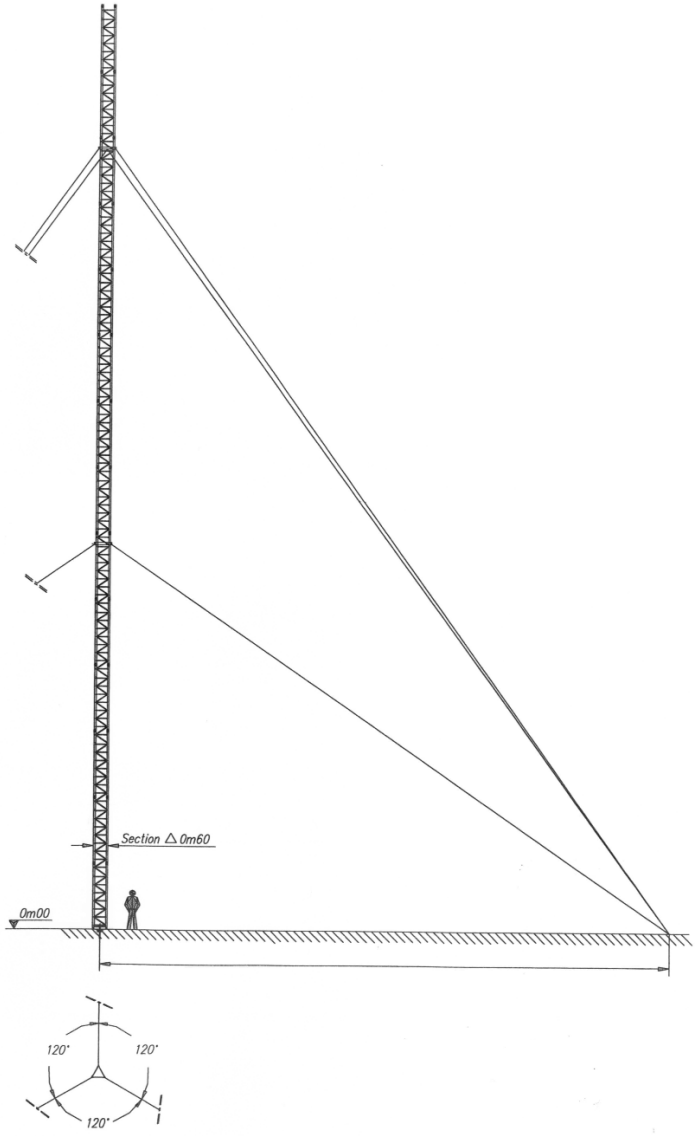
Tower section is reduced in order to optimize landscape integration.

This tower can be fitted with every kind of anti falling systems (cable or rail).

All elements of towers are hot dip galvanized according to international Norms ISO 1461 and ISO 14713. Towers are made out of S355-JO and/or S235-JR steel according to stresses to be endured.

The steel quality is suited for galvanization and compliant with norms NF A35-503.

All these fixing parts are compliant with European norms EN 20898-1, EN 24014, EN 24017 and EN 24032.



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CG1200

SPECIFICATIONS	
Type:	guyed mast
Design:	lattice
Section:	triangular
Leg member	angle profile or pipe
Top section size in m	1m20
Height up to, in m	120
Access ladder	internal
Possible antenna load in m²	from 1 to 20
Possible wind speed in km/h	from 120 to 200
Tilt and sway in degree	from +/-0,30 to +/- 1
Design rules	American, Eurocodes, French

This tower can reach important heights up to 120m. It can be used for mobile telephony (several operators) as well as broadcast.

Top section is reduced to 1m20 with an internal access ladder.

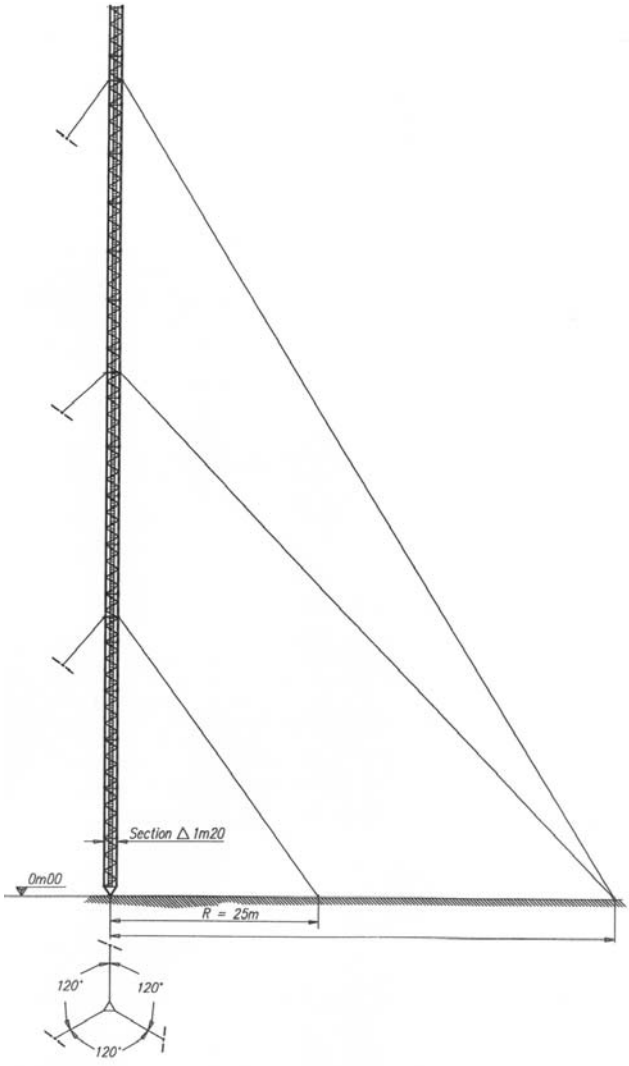
This tower can be fitted with every kind of anti falling systems (cable or rail).

All elements of towers are hot dip galvanized according to international Norms ISO 1461 and ISO 14713. Towers are made out of S355-JO and/or S235-JR steel according to stresses to be endured.

The steel quality is suited for galvanization and compliant with norms NF A35-503.

Tubes are compliant with norms EN10210 or EN10219.

All these fixing parts are compliant with European norms EN 20898-1, EN 24014, EN 24017 and EN 24032.



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CG2200

SPECIFICATIONS	
Type:	guyed mast
Design:	lattice
Section:	triangular or square
Leg member	pipe or round bars
Top section size in m	2.20
Height up to, in m	400
Access ladder	internal
Possible antenna load in m²	from 20 to 50
Possible wind speed in km/h	from 120 to 200
Tilt and sway in degree	from +/-0,30 to +/- 1
Design rules	American, Eurocodes, French

This tower is designed for broadcast. It can reach very important heights up to 400m.

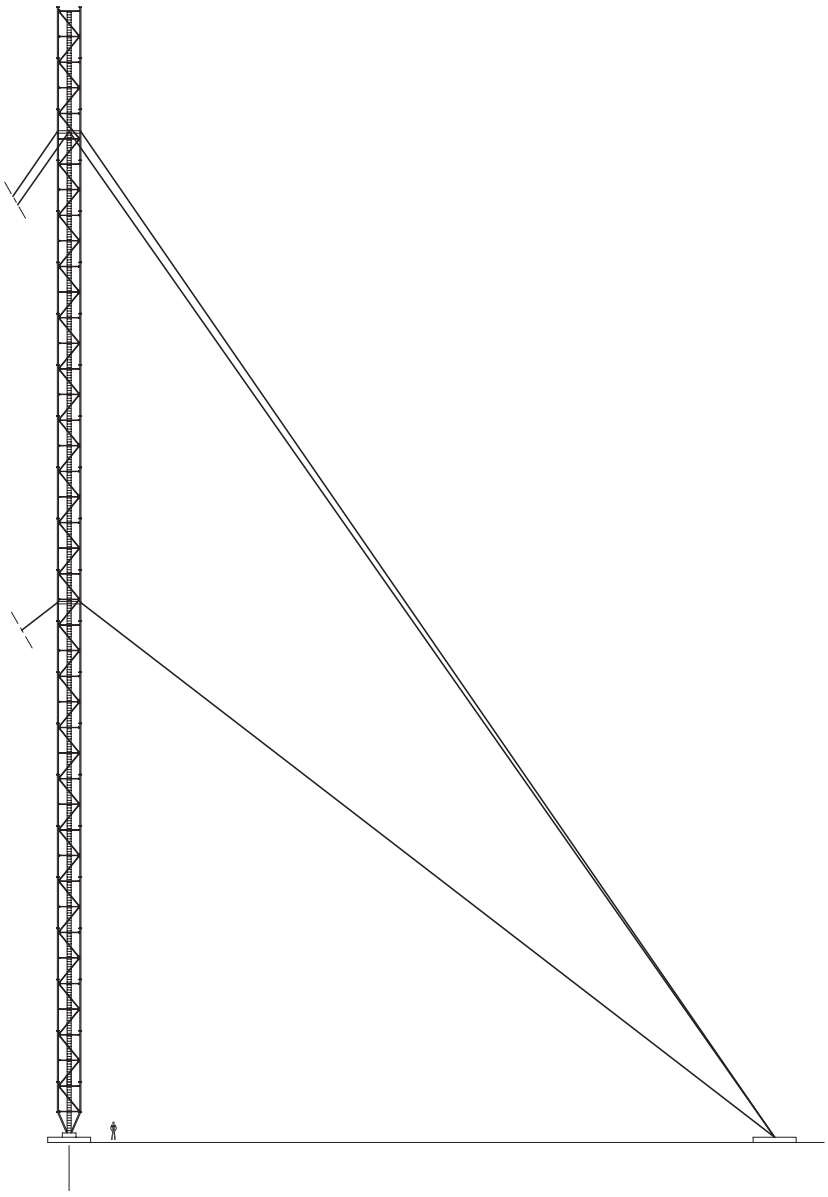
This tower can be fitted with every kind of anti-falling systems (cable or rail).

All elements of towers are hot dip galvanized according to international Norms ISO 1461 and ISO 14713. Towers are made out of S355-JO and/or S235-JR steel according to stresses to be endured.

The steel quality is suited for galvanization and compliant with norms NF A35-503.

Tubes are compliant with norms EN10210 or EN10219.

All these fixing parts are compliant with European norms EN 20898-1, EN 24014, EN 24017 and EN 24032.



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Definitions

Mechanical Characteristics

Cable weight

Weight per unit (meter or foot) of the complete cable.

Bending properties

A particular advantage of RF cables with corrugated conductors is their flexibility, as expressed in the data for minimum bending radii.

Minimum bending radius, single bending

After the cable has been bent to these minimum values it should not be bent back, as this could result in damage to the cable.

Minimum bending radius, repeated bending

This bending radius allows for several operations and indicates the minimum bending radius during the installation procedure of the cable. It also gives an indication of the minimum reel core radius.

Bending moment

A particular advantage of RF cables with corrugated conductors is their flexibility, as expressed in the bending moment. The cable under test is fixed in a straight support and a perpendicular force is introduced at a certain distance (50 times the cable diameter for LCF, 25 times for SCF and UCF) away from the support. The necessary force to deflect the cable by half this distance multiplied by the distance gives the bending moment.

Flat plate crush strength

Another advantage of the outer conductor corrugation is the fact that it gives the cable a very high crush resistance. If the given values are not exceeded the local impedance change is less than 0.5 Ω. For instance: In order to compress a 90 mm length section of CELLFLEX® LCF158-50 to reduce the local impedance by 0.5 Ω, it is necessary to apply a force of more than 2790 N.

Tensile strength

The tensile strength of RF cables is determined by a typical installation situation when pulling the cable with hoisting grips. In the case of corrugated conductors, tensile strength is naturally less than in the case of smooth conductors. To prevent damage to the cable, when hoisting it into masts or pulling it through ducts, the maximum admissible tensile force stated for the particular cable must not be exceeded. The values are based on a maximum cable elongation by 0.2%. Refer to the installation instructions for further details.

Electrical Properties

Characteristic impedance

The mean value of characteristic impedance is measured at around 200 MHz. The admissible deviation from the nominal value is ± 1% to ± 4%, depending on the cable type.

Relative propagation velocity

This ratio (in percent) is the propagation velocity of the electromagnetic wave inside the cable in relation to propagation velocity in free space. It determines the electrical length of the cable.

Capacitance

The capacitance of RF cables is independent of frequency and is determined by the relative dielectric constant, the effective outer conductor diameter and the effective inner conductor diameter.

Inductance

The inductance of RF cables is slightly frequency dependent and is determined by the effective outer and inner conductor diameter and the equivalent conducting layer due to the skin effect.

Maximum operating frequency

Up to this frequency, the properties of the cable are within the specifications given unless otherwise stated.

Peak power rating

Peak power rating is the input power for which the peak RF voltage rating is reached, when the cable is operating in its matched condition. Peak power rating is independent of frequency.

RF peak voltage

The RF Peak voltage is limited by the air gap between inner and outer conductor of a coaxial line and the voltage withstand of air. Air is also considered a dielectric for foam cables since there will always be a short section of air line at the interface between foam cable and connector. Depending on the connector used, a smaller connector mating interface can be the limiting factor.

Spark test

Within the production process, the cable jacket is tested by applying a pulsed high voltage to the jacket against the outer conductor. This is to ensure the integrity of the jacket regarding holes, inclusions and thickness.

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DC-resistance inner conductor

This value is the DC-resistance of the inner conductor in ohms per length (ohms/km or ohms/1000ft).

DC-resistance outer conductor

This value is the DC-resistance of the outer conductor in ohms per length (ohms/km or ohms/1000ft).

Storage temperature

During storage the given temperature range must not be exceeded. Otherwise the cable can be damaged.

Operation temperature

During operation the given temperature range must not be exceeded. Otherwise the cable can be damaged.

Installation temperature

During installation the given temperature range must not be exceeded. Otherwise the cable can be damaged.

Foundations

Transmission line parameters

Primary & secondary transmission line parameters

The relation between the primary parameters:

series resistance	R′ in Ω/km
inductance	L′ in H/km
parallel capacitance	C′ in F/km
parallel resistance	G′ in S/km

and the secondary parameters:

characteristic impedance	Z_c in Ω
propagation constant	γ
phase constant	β in rad/km
attenuation constant	α in N/km

is given by the following transmission line equations:

$$\gamma = \alpha + j\beta$$

$$\gamma = \sqrt{(R' + j\omega L') \cdot (G' + j\omega C')} \qquad (1)$$

$$Z_c = \sqrt{(R' + j\omega L') / (G' + j\omega C')} \qquad (2)$$

$$\omega = 2\pi f$$

These equations are valid for the entire frequency range of RF cables up to their cut-off frequency.

At radio frequencies where $R' \ll \omega L'$ and $G' \ll \omega C'$, the transmission line equations take the following form:

$$Z_c = \sqrt{\frac{L'}{C'}} \quad \text{in } \Omega \qquad (3)$$

$$\beta = \omega \cdot \sqrt{L' \cdot C'} \quad \text{in rad/km} \qquad (4)$$

$$\alpha = (R' / 2) / Z_c + (G' / 2) \cdot Z_c$$

$$= \alpha_R + \alpha_G \quad \text{in nepers/km} \qquad (5)$$

$$v_\varphi = 1 / \sqrt{L' \cdot C'} \quad \text{in km/s} \qquad (6)$$

α_R -conductor attenuation

α_G -dielectric attenuation

v_φ -propagation attenuation

The deviations between equations (3) to (6) as compared to equations (1) and (2) is below 0.1%, as long as

$$D_e \quad f \geq 140 \qquad (7)$$

D_e -dielectric attenuation

f -propagation attenuation

Skin effect

At DC, current in a conductor flows with uniform density over the cross section of the conductor. At high frequencies, the current tends to flow only in the conductor surface; the effective conductor cross section decreases and the conductor resistance increases.

At radio frequencies, current flows only in a very thin "skin". Everywhere else the conductors are free from electromagnetic fields. Even very thin walled metal envelopes will, therefore, entirely screen the electro-magnetic field within coaxial RF cables at radio frequencies.

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The depth of penetration illustrates the skin effect. It is defined as the thickness of a thin surface layer (assumed to have an even distribution of current flow), having the same resistance as an actual conductor, which is undergoing to the skin effect.

For non-magnetic materials the equivalent conducting layer is

$$\delta = 15,9 / \sqrt{\sigma \cdot f} \quad \text{in mm} \qquad (8)$$

σ - conductivity in m/Ω mm²

f - frequency in kHz

Other than resistance, the skin effect also influences inductance and thereby characteristic impedance and propagation velocity.

Electrical characteristics

Capacitance

The capacitance of RF cables is independent of frequency:

$$C' = \frac{10^{-6} \cdot \varepsilon_r}{18 \cdot In\,(D_c / d_c)} \quad \text{in F/km} \qquad (9)$$

ε_r - relative dielectric constant

D_c - effective outer conductor diameter (capacitive)

d_c - effective inner conductor diameter (capacitive)

Inductance

The inductance of a RF cable is:

$$L' = 2 \cdot 10^{-4} \cdot In \frac{D_i + \delta}{d_i - \delta} \quad \text{in H/km} \qquad (10)$$

D_i - effective inner conductor diameter (inductive)

d_i - effective inner conductor diameter (inductive)

δ - equivalent conducting layer

At very high frequencies, inductance approaches: in H/km

$$L' = 2 \cdot 10^{-4} \cdot In(D_i / d_i) \quad \text{in H/km} \qquad (11)$$

Characteristic impedance

The characteristic impedance of an RF cable is determined by its inductance and capacity according to equation 3. Because of the influence of the skin effect upon inductance, it also is frequency-dependent.

Characteristic impedance of RF cables is, therefore, understood as the value it approaches for very high frequencies. If we say $D_c \approx D_i = D_e$, $d_c \approx d_i = d_e$ and $\delta \ll d_i$ then

$$Z_c = \frac{60}{\sqrt{\varepsilon_r}} \cdot In(D_e / d_e) \quad \text{in } \Omega \qquad (12)$$

D_e - electrically effective outer conductor diameter

d_e - electrically effective inner conductor diameter

ε_r - relative dielectric constant

As frequency falls, the characteristic impedance rises. The relative deviation from the value at very high frequency is approx.

$$\frac{\Delta Z}{Z_c} = \frac{4}{D_e \cdot \sqrt{f}}$$

D_e - electrically effective outer conductor in mm

f - frequency in kHz

Certain electrical properties of an RF cable can be optimized by proper choice of characteristic impedance. For coaxial cables with cylindrical conductors (of the same material) the following optimizations are possible:

	AIR DIELECTRIC CABLES	SOLID PE DIELECTRIC CABLES
minimum attenuation	77 ohms	51 ohms
max. operating voltage	60 ohms	40 ohms
max. peak power rating	30 ohms	20 ohms
max. mean power rating	=50 ohms*	

*approx. valid for HELIFLEX® transmission lines of larger diameter

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Today, RF coaxial cables are produced mainly with characteristic impedance of 50 ohms and to some extend in 75 ohms.

As the material properties and dimensions of RF cables are not constant along their length, the characteristic impedance will vary with length and deviate from the mean value of characteristic impedance of the particular cable; similarly the mean value will deviate from the nominal value (50 or 75 ohms).

The mean value of characteristic impedance of a cable is defined as follows:

$$Z_m = \frac{I_e}{c_o \cdot C} \quad \text{in ohms} \qquad (14)$$

I_e - electrical length in m

c_o - propagation velocity in free space in m/sec

C - capacitance in F

The mean value of characteristic impedance is measured at around 200 MHz. The admissible deviation from the nominal value is ±¾ 1% to ±¾ 4%, depending on the product group.

Uniformity of characteristic impedance

As mentioned, the material properties of RF cables are not uniform along their length and result in small deviations of the characteristic impedance. The impedance step ΔZ at position x of the cable results in reflection factor at the position as follows:

$$r_x = \frac{\Delta Z}{2Z_c} \qquad (15)$$

The magnitude and distribution of the various reflections determine their effect upon transmission properties. Two ways are commonly used to judge the effect of impedance variation.

Time domain reflectometry (TDR)

A defined voltage step is fed into the cable and partially reflected at each impedance variation. The display of the reflected energy versus time gives a view upon the local distribution of the inner reflections. The pulse reflection factor at a certain position is the ratio between the voltage of the reflected and the incident pulse. Instead of reflection factor, one can also use the term pulse return loss:

$$A_p = 20 \cdot \log \frac{100}{r_p} \quad \text{in dB} \qquad (16)$$

r_p - pulse reflection factor in %

The magnitude and nature of the pulse reflection factor depend very much upon the form of incident pulse.

Return loss/reflection factor (steady state condition)

The reflection factor sums up the effects of all the impedance variations within the cable and its ends, at a certain frequency. It is the ratio between the vectorial) addition of all reflections and the incident signal, measured at the near end of the cable.

As well as reflection factor, the term return loss is also used.

$$A_z = 20 \cdot \log \frac{100}{r} \quad \text{in dB} \qquad (17)$$

r - reflection factor in %

The reflection factor versus frequency may be plotted continuously. The reference impedance of test equipment and the load at cable end are equal to the nominal value of cable impedance.

It is also customary to use the term voltage standing wave ratio (VSWR), based upon the standing wave, which the cable under test would produce in a homogeneous transmission line connected to its near end and having its nominal characteristic impedance.

$$s = \frac{1 + r/100}{1 - r/100} \qquad (18)$$

$$r = \frac{s - 1}{s + 1} \cdot 100 \quad \text{in \%} \qquad (19)$$

s - standing wave ratio

Relative propagation velocity and delay

The relative propagation velocity is defined as follows.

$$v_r = \frac{\upsilon_\varphi}{c_o} \cdot 100 = \frac{l}{l_e} \cdot 100 \quad \text{in \%} \qquad (20)$$

υ_φ - propagation velocity in cable

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c_o- propagation velocity in free space ($300 \bullet 10^3$ km/s)

l - geometrical length in m

l_e - electrical length in m

Delay is defined as follows:

$$t_\varphi = \frac{336.6}{v_r} = \frac{10^8}{v_r \cdot c_o} \quad \text{in ns/m} \qquad (21)$$

v_r - relative propagation velocity in %

Due to the skin effect, propagation velocity is frequency dependent. Velocity decreases with falling frequency, delay increases. The relative deviation can be calculated according to equation 13.

As in the case of characteristic impedance, relative propagation velocity of RF cables is understood as the value it approaches for very high frequencies. If $D_c = D_i$ and $d_c = d_i$ it is dependent solely upon the dielectric constant and is defined as follows:

$$v_r = \frac{100}{\sqrt{\varepsilon_r}} \quad \text{in \%} \qquad (22)$$

Propagation velocity is measured at frequencies around 200 MHz as standard. Propagation velocity is also subject to variations. These variations have no direct influence upon transmission characteristics; they do, however, come to light, if cables have to be adjusted to equal electrical length, because after adjustment the cables of equal electrical length may show differences in geometrical length. If cables are to be used in applications where consistency of electrical length is important, we recommend that this is stated at the time of order placement, in order to allow us to select the cables from one manufacturing batch, whenever possible.

Electrical length and adjustment of length

The electrical length is defined as follows:

$$l_e = \frac{100 \cdot l}{v_r} \quad \text{in m} \qquad (23)$$

l - geometrical length in m

v_r - relative propagation velocity in %

Between electrical length and phase angle the following relation applies:

$$\varphi = 2 \cdot \frac{1_e}{300} \cdot f \quad \text{in rad} \qquad (24)$$

l_e - electrical length in m

f - frequency in MHz

In many cases, cables with equal or defined differential electrical length are required. Typical examples are feeder cables for TV transmitters and cabling of antenna groups or antenna arrays. Such length adjustments can be made with precision. A typical value for the achievable accuracy is a phase angle tolerance of ± 5° in the 470 to 860 MHz frequency band. In order to eliminate length variations through handling after adjustment, we recommend to have long lengths of cables length adjusted after installation; short cable lengths may, however, be supplied factory-adjusted.

The electrical length of RF cables is dependent upon temperature, and in case of air dielectric cables also upon the pressure and humidity of contained air. The influences are quite small, but must, however, be taken into account in case where the cables are very long as compared to the operating wavelength.

It is advisable to install length-adjusted cables so that they are all subject to the same ambient conditions such as temperature, solar radiation etc. Length-adjusted HELIFLEX® cables should be operated under a slight overpressure (the same for all cables) of approx. 0.2 bar of dry air or nitrogen.

For less critical applications, phase-stabilized cables can be supplied. These are cables that are aged in order to reduce hysteresis effects.

The variation of electrical length with temperature is also influenced by the kind of cable attachment to the support structure. Cables that can expand freely with temperature have different values than cables which are rigidly clamped down.

In the following diagrams typical figures of the electrical length change are shown for several cable types.

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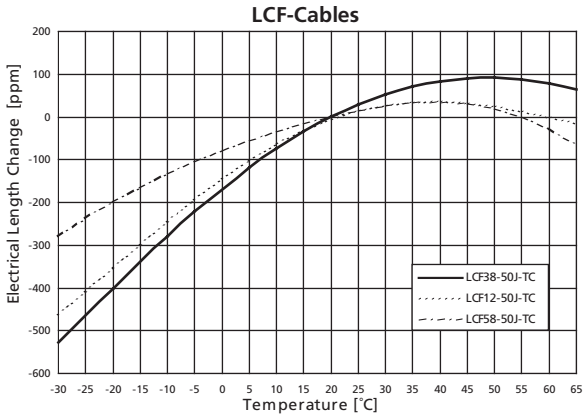

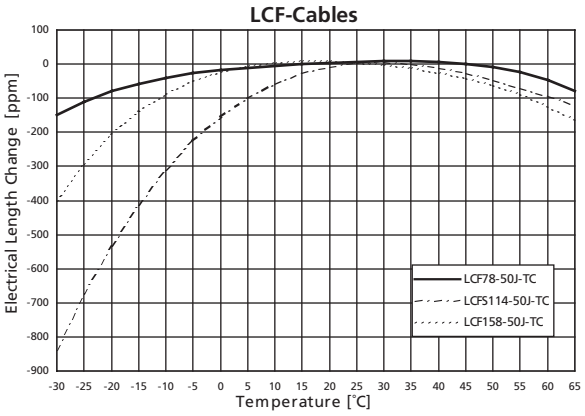

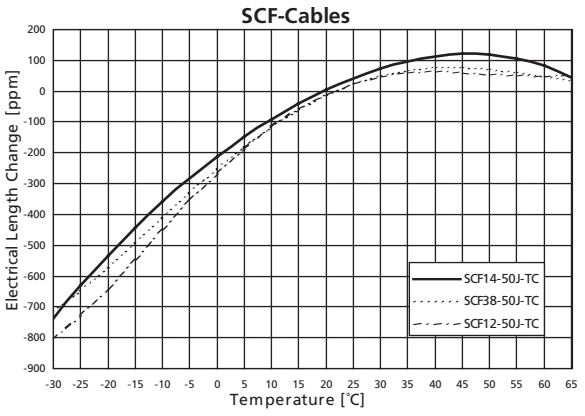

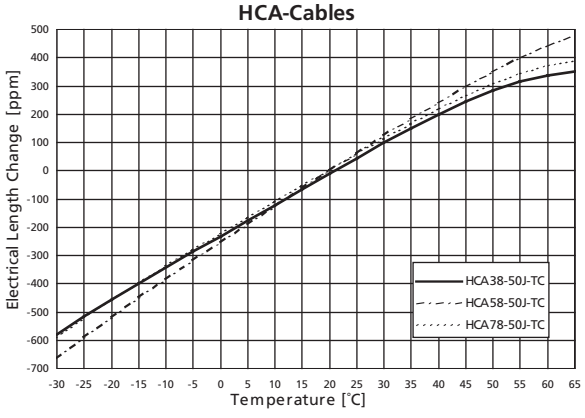

The phase change for a given cable length and temperature range can be calculated with equation(25).

$$\Delta\varphi = 120 \cdot 10^{-6} \cdot \frac{1}{v_r} \cdot \Delta ppm \cdot f \quad \text{in Deg} \qquad (25)$$

l - cable length in m

v_r - relative propagation velocity in %

Δppm - electrical length change in m

f - frequency in MHz

Example:
A 10 m run of LCF12-50 is used in the temperature range from -10°C to 40°C (14°F to 104°F) at 1 GHz.

In the above diagram the Δppm of approximately 280 can be read. The maximum phase change is

$$\Delta\varphi = 120 \cdot 10^{-6} \cdot \frac{10}{88} \cdot 280 \cdot 1000 = 3.8°$$

Attenuation

The attenuation of RF cables is defined as follows:

$$\alpha = 10 \cdot \log(P_1 / P_2) \quad \text{in dB/100 m} \qquad (26)$$

P_1 - input power into a 100 m long cable terminated with the nominal value of its characteristic impedance

P_2 - power at the far end of this cable

The construction of a cable influences the attenuation (in the case of copper conductors and at 20°C [68°F]) in accordance with the following equation:

$$\alpha_{20} = \frac{36,1}{Z_c} \left(\frac{k_i}{d_e} + \frac{k_a}{D_e}\right) \cdot \sqrt{f} + 9,1 \cdot \sqrt{\varepsilon_r} \cdot tg\delta \cdot f$$
$$= \alpha_R + \alpha_G \quad \text{in dB/100 m} \qquad (27)$$

Z_c characteristic impedance in ohm

f frequency in MHz

D_e electrically equivalent outer conductor diameter in mm

d_e electrically equivalent inner conductor diameter in mm

ε_r relative permittivity of dielectric

$tg\delta$ loss factor of dielectric

k_i shape factor of inner conductor

k_a shape factor of outer conductor

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The attenuation values are stated for 20 °C (68°F). The stated figures are typical. With rising ambient temperature the attenuation also rises, by 0.2% K. The attenuation also rises if the cable is heated up by the transmitted power. The maximum rise is as follows:

HELIFLEX® cable with PE dielectric $\alpha_t/\alpha_{20} = 1.14$

HELIFLEX® cable with PTFE dielectric $\alpha_t/\alpha_{20} = 1.20$

CELLFLEX® cable $\alpha_t/\alpha_{20} = 1.12$

α_t - attenuation of the cable at full mean power rating

Finally, attenuation rises in case of considerable mismatches at the cable end. The effect is illustrated in Fig. 1. The cable is assumed to be matched at the transmitter. The curve parameter is the total cable loss in dB.

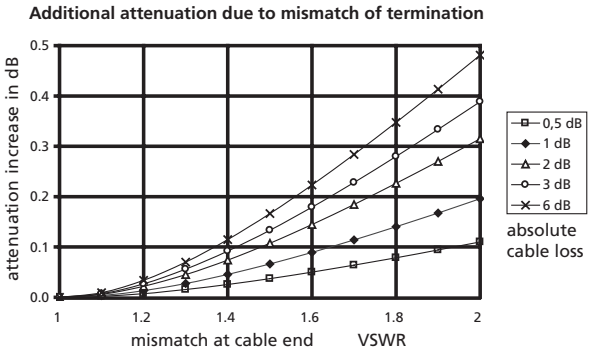

Fig. 1 Attenuation increase due to mismatch at cable end (with cable matched at transmitter end)

The attenuation of RF cables is mainly resistive attenuation α_r, which rises with the square root of frequency. For a given cable size and impedance, the resistive attenuation reaches a minimum for a dielectric constant of 1 (air dielectric) as the inner conductor size reaches a maximum. Resistive attenuation also decreases with increasing cable size.

Dielectric attenuation rises proportionally with frequency. It is independent of cable size and determined only by quantity and quality of the dielectric material. Its share in total attenuation rises with frequency and cable size. Therefore, in particular the larger HELIFLEX® cable sizes have a very low material content dielectric. The same fact also prompted the introduction of loss foam CELLFLEX® cables (LCF).

Efficiency

The efficiency of a cable is the ratio between the power available to a load at the far end of the cable and the power put into it at the near end and is therefore an important parameter to compare several feeder cables.

$$\eta = \frac{P_2}{P_1} = 10^{-\left(\frac{\alpha_t \cdot \frac{l}{100} + A_r}{10}\right)} \qquad (28)$$

P_2 - power at load

P_1 - input power

α_t - attenuation of cable (taking into account additional attenuation due to the power being used) in dB/100 m

A_r - additional attenuation through mismatch at cable end (see Fig.1)

l - cable length in m

Power Rating

Power rating is the lower of the following two values: peak power rating and mean power rating.

Peak power rating

Peak power rating is the input power for which the peak RF voltage rating is reached, when the cable is operating in its matched condition. It is defined as:

$$\hat{P} = 500 \cdot \frac{\hat{U}}{Z_c} \quad \text{in kW} \qquad (29)$$

$\hat{U}$ - RF voltage rating (peak value) in kV

Z_c - characteristic impedance in Ω

Peak power rating is independent of frequency. The stated values for peak RF voltage rating and peak power rating of HELIFLEX® cables are valid for dry air or dry nitrogen under normal atmospheric pressure. RF voltage rating and peak power rating of HELIFLEX® cables are valid for dry air or dry nitrogen under normal atmospheric pressure.

As production testing of RF cables is done with DC voltage of twice the peak RF voltage rating, there is a safety factor of 2 in voltage and a safety factor of 4 in peak power rating.

Peak power rating of HELIFLEX® cables can be increased considerably by operating them under inner overpressure (suitable connectors for this operation are available for cable, sizes 3¨ and larger). Peak power rating decreases with altitude, if the cable inner is allowed to assume the pressure of the environment, see. Fig. 2.

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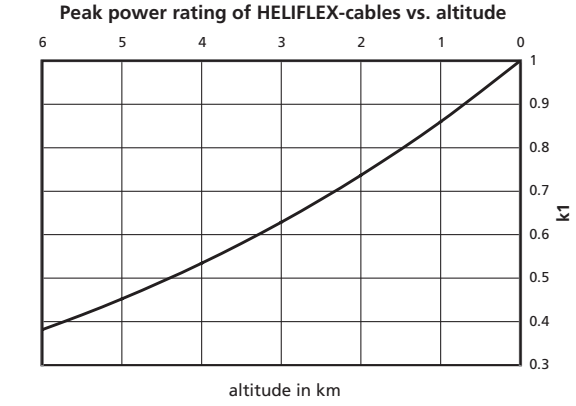
Although CELLFLEX® cables due to their dielectric type have a higher voltage strength than air dielectric cables, in practice the short sections of air line present at the cable ends when terminated with commonly used connector types limit the peak voltage ratings of CELLFLEX® cables to those of equivalent size air dielectric cables.



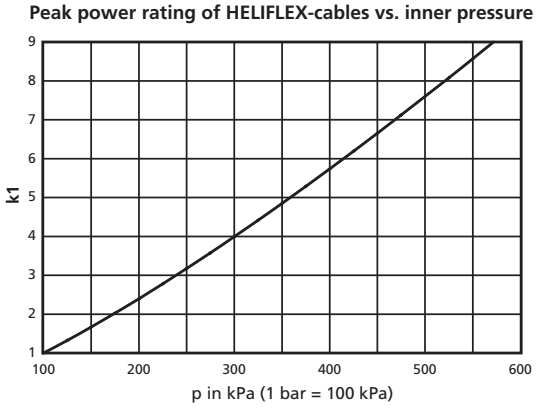


Fig. 2 Peak power rating of HELIFLEX® cables Factor k1 versus inner pressure and altitude

Mean power rating

Mean power rating is defined as:

$$P_{max} = \frac{0,8686 \cdot P_v}{2 \cdot \alpha_t} \quad \text{in kW} \qquad (30)$$

P_v - maximum admissible power dissipation in W/m

α_t - attenuation under operation condition in dB/100 m

Mean power rating is the input power at which the inner conductor reaches a temperature agreed for a certain dielectric material. For most of the RFS cables these are:

HELIFLEX® (PTFE) 150°C (302°F)
HELIFLEX® (PE) 115°C (239° F)
CELLFLEX® 100°C (212°F)

Mean power rating decreases as frequency rises.

Mean power rating values are given for the following conditions:

- installed in still air of 40°C (104°F)
- in case of HELIFLEX® cables, filled with air or nitrogen, under normal atmospheric pressure.

The variation of mean power rating with ambient temperature is given in Fig. 3.

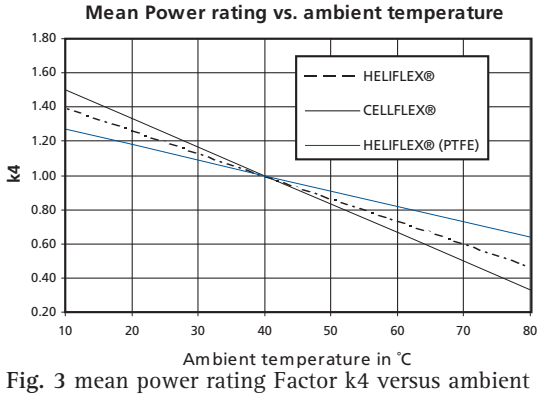


Fig. 3 mean power rating Factor k4 versus ambient temperature

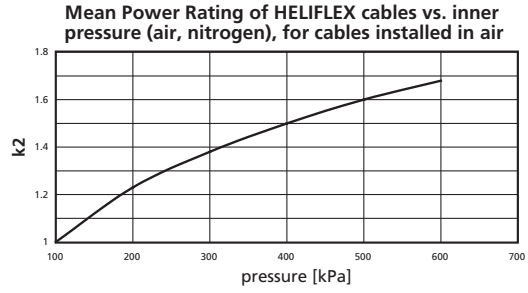


Fig. 4 Mean power rating of HELIFLEX®cables Factor k2 versus inner pressure (air, nitrogen) for cables installed in air

If RF cables are subjected to direct solar radiation, mean power rating will decrease. The derating factor is given in Fig. 5.

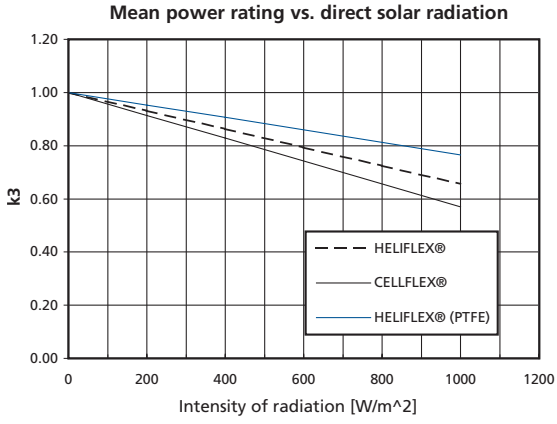


Fig. 5 Influence of direct solar radiation on mean power rating Factor k3. Worst case: cable fully exposed and perpendicular to sun rays

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For mean power calculation of cables to be buried in the ground, the heat resistance of the cable jacket to air combination is replaced by the heat resistance of the soil, and the ambient temperature is replaced by the average soil temperature at the proposed cable laying depth.

As the heat resistivity of the soil is very dependent upon local conditions such as humidity and type of soil, and since the soil in the vicinity of RF cables which dissipate large heat power tends to dry out, it is necessary to have the correspondent information from the list given below.

Generally, it can be said for normal kinds of soil in moderate climates, that mean power rating of smaller cable sizes (if buried) increases whereas in the case of larger cable sizes it decreases.

If a buried, large cable is operating under inner overpressure, mean power rating doesn't increase as much as if this cable would be installed above ground.

When planning an RF cable system the following Data should be known:

Installation location details:

- height above sea level
- ambient temperature and intensity of solar radiation
- ground temperature, soil type and ground water level

Installation details:

- cable to be laid in masts, above-ground, in-ground or in ducts
- pressurization permissible
- heat dissipated by parallel cables
- connector types

Operating conditions:

- number and length of cables
- frequencies and permissible attenuation
- transmitter peak and average output power ($\hat{P}$ and $\bar{P}$)
- or the information to calculate these data, as given in Fig.6 antenna VSWR (s)

Power considerations summary

If the cable end is not terminated in its characteristic impedance, standing waves along the cable will result in higher power being dissipated at current and voltage maximums. Input power must, therefore, be reduced accordingly. In summary, therefore, the following conditions must be fulfilled when selecting a cable size for a certain power configuration.

$$\hat{P}_{max} \geq \frac{\hat{P} \cdot s}{k_1} \quad (31)$$

$$\bar{P}_{max} \geq \bar{P} \frac{s}{k_2 k_3 k_4} \quad (32)$$

$\hat{P}, \bar{P}$ - peak power and mean power of transmitter

$\hat{P}_{max}, \bar{P}_{max}$ - peak power rating and mean power rating of cable

s - VSWR

k_1 - peak power rating factor for inner pressure (Fig. 2)

k_2 - mean power rating factor for inner pressure (Fig. 4)

k_3 - mean power rating factor for direct solar radiation (Fig. 5)

k_4 - mean power rating factor for ambient temperature (Fig. 3)

For cables operated above half their cut-off frequency in a non-matched condition, heat compensation between the extreme values of temperature along the cable can be expected. In this case, the VSWR in equation 32 may be replaced by the term:

$(s^2 + 1) / 2\,s$

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If peak and average transmitter output power are known only in terms like carrier power, modulation depth etc., then these data can be computed as follows:

$$\hat{P} = P_R \cdot \hat{q} \qquad (33)$$

$$\overline{P} = P_R \cdot \overline{q} \qquad (34)$$

P_R - reference power of transmitter

$\hat{q}$ - factor according to Fig.6

$\overline{q}$ - factor according to Fig. 6

If several programs with peak power values P_1 , P_2 , etc., are transmitted simultaneously, then the resulting peak power is as follows:

$$\hat{P}_{res} = (\sqrt{\hat{P}_1} + \sqrt{\hat{P}_2} + ...)^2 \qquad (35)$$

Maximum operating frequency and cut-off frequency

Energy transmission in a coaxial RF cable takes place in the normal coaxial wave mode. Above cut-off frequency, which is a function of cables dimensions, other wave modes can also exist and the transmission properties are no longer defined. It is, therefore, generally not possible to operate RF cables above their cut-off frequency. An approximate value of cut-off frequency and the cut-off wavelength for RF cables can be computed as follows:

$$f_c = \frac{1,91 \cdot v_r}{D_i + d_a} \text{ in GHz} \qquad (36)$$

$$\lambda_c = \pi \frac{D_i + d_a}{2} \cdot \frac{10}{1 \cdot v_r} \text{ in m} \qquad (37)$$

v_r - relative propagation velocity in %

D_i - inner diameter of outer conductor in mm

d_a - outer diameter of inner conductor in mm

In addition to cut-off frequencies, maximum operating frequencies of RF cables are stated. These give a certain safety margin from cut-off frequency. For some cables the maximum operating frequency is determined by other construction criteria and may then significantly deviate from cut-off frequency.

Measurements

If no alternative arrangements have been made, then measurements of the electrical properties of RF cables are made in accordance with IEC 61196-1: Radio-Frequency-Cables; Generic specification - General definitions, requirements and test methods.

MODULATION	REFERENCE POWER P_R	$\hat{q}$	$\overline{q}$
amplitude modulation	carrier power	$(1+\hat{m})^2$	$1+\frac{\overline{m}^2}{2}$
frequency modulation	transmitter power	1	1
pulse modulation	pulse power	1	$t_p \cdot f_p$
television (CCIR Standard)	peak sync. Power	1.73 [1]	0.71 [1]
		1.50 [2]	0.66 [2]
DAB OFDM	sum power	10 [3]	1
DVB OFDM	sum power	10 [3]	1

Fig. 6

[1] audio to video power ratio 1:10
[2] audio to video power ratio 1:20
[3] Depending on the number of carriers, the theoretical value of can be very high. In practice, it is limited to about 10 by saturation effects of the transmitter output amplifier.

$\hat{m}$ - peak modulation depth
$\overline{m}$ - mean modulation depth
t_p - pulse length in µs
f_p - pulse repetition frequency in MHz

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Definitions

Propagation

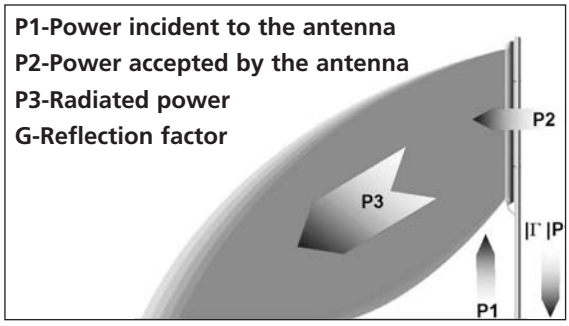
Need: The aim of telecommunications is to transmit, from one point to another, a signal carrier of an information.

Medium: Propagation of electromagnetic energy between a transmitter and a receiver.

Modes: Propagation in free space (without physical medium).

Antenna

Interface permitting to convert an electrical current into an electromagnetic field defined by its frequency, amplitude, and polarization. The antenna allows (in a reciprocal way) either to radiate, or to collect the energy, in a given direction. The radiation is optimal for radiating element dimensions comparable to the wavelength what is determining the antenna dimension regarding to a certain set of specifications.



Dipole

Radiating element.

Network of Dipole

Allow to reduce the vertical opening angle, as a consequence focalizing the energy and increasing the gain.

Butterfly Dipole

2 slants (+/- 45°)

- 2 polarization in one element

Perfect symmetry

- No squint

Full modularity 900/1800/UMTS

Extreme compactness

Simplified cabling for Intermodulation reliability

Dipole Head

To bring energy in the height of the radiating element.

Power Splitter

Associated to cables permit to share out the energy on dipoles and to build the vertical radiating diagram.

Connectors

Designed to ensure the more efficient energy transmission between the feeders and the antenna.

Chassis

Acting like a reflector, allows to design the horizontal aperture, to have an effect on the directivity, the F/B ratio, and also on the mechanical strength of the antenna.

Isotropic Radiation

Ideal case of an isolated transmitting source in space, which radiate an equal amplitude wave in an omnidirectional way.

Coupling

Express the reciprocal influence of a radiating disruptive element on its environment.

Polarization

Describe the propagation mode of electromagnetic waves, and more precisely the plane of the electro-magnetic vector. (vertical, horizontal, double, circular, elliptic...)

Double Polarization

To integrate two RX antennas in one, reduce the necessary number of antennas on site (gain of space and esthetic). With the use of duplexer, permit the integration of a TX channel.

Radiation Pattern

A diagram relating power flux density at a constant distance from an antenna to direction relative to the antenna main beam axis.

Radiation Pattern Envelope (RPE)

The envelope represent the worst values of measurements taken on the pattern test range at bottom, mid, top of the band, in both co & cross polarization, horizontal & vertical plan, over the full 360° of azimuth.

RPE Type

Omnidirectional: All directions are to be covered equally well. The horizontal radiation pattern is generally circular. The vertical radiation pattern may have some directivity in order to enhance the gain. Shaped: One of the principle plane is designed in order to have a specified type of coverage.

Bandwidth

All frequencies for which the antenna meets a given set of specifications, concerning both TX & RX band according to the standard.

RX: part of the bandwidth dedicated to the reception (Uplink).

TX: part of the bandwidth dedicated to the transmission (Downlink).

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Definitions

Uplink

Transmitting direction from the mobile to the BTS.

Downlink

Transmitting direction from the BTS to the mobile.

Fading

The existence of various type of obstacles, generate reflections and diffraction of the transmitted wave. The uplink suffer generally of wide amplitude variations: Shadowing / path loss / multi-path propagation. The received signal is summation of several rays, sometimes leading to cancellation (regarding to the phase), which causes a drop call.

Multipath propagation

The mobile and environment moving induce a discrepancy on received signal frequencies.

Analog signal: intermodulation noise.

Digital noise: increase of the bit error rate.

Diversity Definitions

Solution designed in view of improving the drop call

Space diversity

Horizontal separation of 2 antennas for receive path.

Drawbacks:

Visual impact, heavy and expensive platform, large space requirement.

Benefits:

- Optimum gain for wide area.
- Normal spacing = l
- 6 m (20 ft) spacing in 800-900 MHz
- 3 m (10 ft) spacing in 1800-1900 MHz

Polarization diversity

Reception on perpendicular radiating elements (cross pol antenna): physical spacing no longer needed. May be associated to the cross polarization discrimination.

Horizontal/Vertical slants –

Drawbacks:

Problem to achieve good isolation between each ports. Unbalanced RX signal reduce polarization diversity. No possible Horizontal transmit.

Benefits:

- Optimal Vertical transmit
- +/- 45° slants –

Drawbacks:

Worse propagation in free space.

Benefits:

- Full RX TX equivalent propagation.
- Equivalent mean signal.
- H /V polarized coverage equivalent

Signal's Selection –

Selection diversity (Best SNR)
Maximum ratio (Amplitude or phase, or both)

Downtilt Definitions

Control of the signal such as the focus is below the horizon. Downtilt can be potentially achieved mechanically, electrically or with a combination of the two. Associated to the RET system, Downtilt could be done remotely. Downtilt improves coverage close to the site, reduce the cell site radius & interferences.

Mechanical downtilt / uptilt

Achieved by the mounting hardware.

Drawbacks:

Weaker mechanically, non-regular coverage reduction, notch effect in main direction, interference reduction in main direction only, not good for visual impact.

Benefits:

- Adjustment on site.

Electrical downtilt

Fixed electrical tilt –

Drawbacks:

Total freedom on site only with tuneable tilt.

Benefits:

- All lobes equally tilted
- Equal reduction of all interferences
- Regular reduction of coverage
- Best solution for visual impact
- Good mechanical withstanding

Variable electrical tilt –

Benefits:

- Easy cell size tuning according to capacity evolution
- Full network planning freedom.
- Keep low interferences
- Prevent change of antenna
- IMP free antenna providing no additional galvanic contact thanks to the dielectric built in VET system.

Remote electrical tilt –

Benefits:

- RET will provide interference mastering.
- Reduction of cells overlapping.
- Coverage versus Capacity easy adaptation.
- Fine Cell's tuning without sending crew on the site.
- Control of non accessible sites.
- Reduction of Network Optimization's cost.
- No limitation on frequency of tuning.
- Compatible with future dynamic capacity allocation

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Definitions

Side by Side Configuration

Dual band application

2 single band antennas placed closed together in a single radome.

Benefits:

- Reaches the better performance on each band.
- Efficient interband isolation performance.
- Manages the external aspect.

Air combining application

Allows 3 dB saving in power budget.
2 identical antennas in view of having a thinner horizontal beamwidth. (Generally 2 times thinner than the HPBW obtained with a single band one).

Concentric cell application

2 antennas with the same gain, but different tilts (for different coverage policy).

Side sharing application

Different range of GSM1800/1800, PCC1900/1900, GSM1800/UMTS, UMTS/UMTS solution in order to manage site reuse between various operators, without site extra-negotiation.

Tower Mounted Amplifier (TMA)

Benefits:

- Fewer cell sites by increasing cell size.
- Improved coverage.
- Reduction of drop call.
- Improve uplink power budget – leads to a longer handset battery life size
- Compatible to all BTS providers.
- High reliability.

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Antenna Types

Single band

Antenna developed for the coverage of one particular standard.
Optimized for the narrow band requirement.

Broad band

Antenna developed for the coverage of at least two different standards. Approached as a compromise due to the larger band aspect.

Multi band

Several dipole networks cohabiting in the same chassis: Dual band / Triple band antennas.

Network Planning

Cellular systems

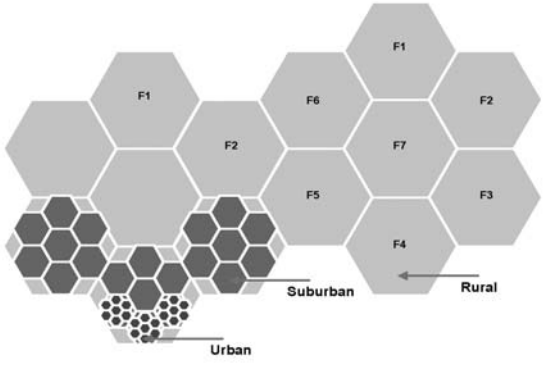
The approximation of each cell represents a hexagon.

Low Power of transmitters induce:

- A limited range.
- Space split in elementary cells.

Reducing interferences induce:

- Space between frequencies.
- (limited spectrum/frequency reuse/large number of cells).



Deployment

Depends on:

- The number of simultaneous communications to sell.
- The relief of the covered area.

Omnidirectional site

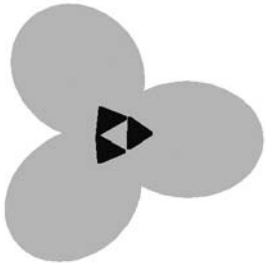
1 dipole radiating isotopically, 360° beamwidth.

Bidirectional Site

1 helicoidal, or 2 panel antennas placed in opposite directions (with shaped horizontal beamwidth).

Trisectorial Site

3 Panel antennas separated by 120°



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Technical Notes

Horizontal Radiation Pattern Parameters

Half power beam width (HPBW) [°]:

The angle, relative to the main axis, between the two directions at which the co-polar pattern is 3dB below the value on the main axis. The values are nominal and stated as the minimum for the frequency range.

1. Horizontal opening angle [°]:

HPBW in the horizontal plan. Gives the coverage geometry. Tolerance about +/- 5°.

2. Squint [°]:

Natural distortion of the horizontal pattern outcoming in a dissymetry compared with the main axis.

3. Horizontal tracking [dB]:

Natural horizontal pattern dispersion versus a frequency sweep. Specified at 3dB below the value on the main axis.

4. Co-polarization:

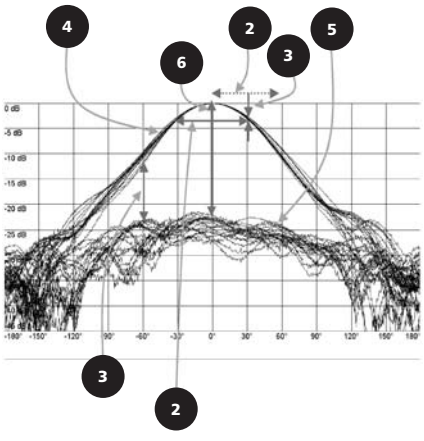
Horizontal diagram of the considered polarization. The co-polarization measurement correspond to the signal received by one dipole slant with the same polarization than the transmitter.

5. Cross-polarization:

Orthogonal diagram to the considered co-polarization. Unwanted radiated energy in a polarization which is different from the polarization in which the antenna was intended to radiate. For linearly polarized antennas, the cross-polarization is perpendicular to the intended polarization.

6. Cross-polarization discrimination [dB]:

The difference between the co-polarized main beam gain and the cross-polarized signal measured within an angular area in azimuth of twice the maximum HPBW of the frequency band. Better is the cross polarized discrimination, lower is the level of disturbing signal (coming from the opposite slant), in order to insure a safer reception. Measured both in the main axis and at 60° opening angle.



Vertical Radiation Pattern Parameters

Vertical opening angle [°]:

HPBW in the vertical plan. Gives coverage quality. Tolerance about +/- 0.5°.

Directivity:

D (dBi) = 10 log [27000/(Ov x Oh)]
Ov: Vertical opening angle
Oh: Horizontal opening angle

Effectiveness in focusing energy in a given direction.

Gain [dBi]:

G (dBi) = D (dBi) – estimated loss (dB)
The ratio of the radiation intensity in the main beam axis to the radiation intensity that would be obtained if the power accepted by the antenna were radiated in all directions. Gain is reciprocal, either transmitting or receiving. Practical value integrating internal losses and efficiency, specified as maximum in the main axis.

G (dBi) = G (dBd) + 2.15
dBi: expresses the gain as compared to radiating point.
dBd: expresses the gain as compared to radiating dipole.

1. Lobes suppression [dB]:

Secondary lobes are undesirable because of the direct relation with energy losses.

2. Upper side lobe suppression [dB]:

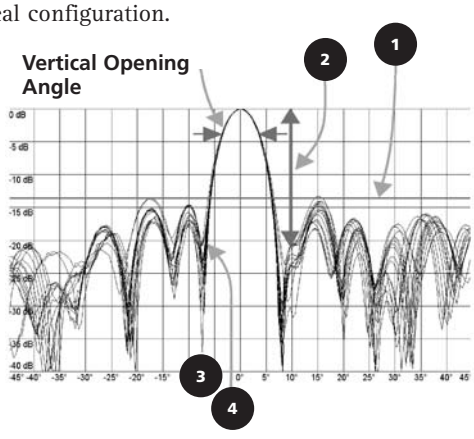
Suppression of the closest lobe to the horizon (adjacent to the main beam) critical for interferences mastering. The USLS impacts the frequency reuse and enhance noise rise in neighbor cells. The USLS is referred to the main beam. The smaller the magnitude of the USL, the larger will be the number of dB down.

3. 1st null:

First minimum corresponding to the lower side lobes adjacent to the main beam.

4. 1st null fill:

Trick allowing to reduce coverage attenuations due to the 1st null. Naturally filled by fading and multipath in real configuration.



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Other Parameters

Voltage standing wave ratio [VSWR]

Capacity of the antenna in radiating the energy without reflecting a part towards the BTS. Faculty of antenna impedance matching to system impedance. Value guaranteed across the frequency band of operation.

Impedance [Ω]

Fundamental electrical parameter allowing the complete adaptation between the antenna and the feeding system. Fixed as a standard at 50Ω.

Front to back ratio [dB]

- Denotes the highest level of radiation relative to the main beam in an angular area of 180o +/- 40o.
- Allows the evaluation of losses at the rear side of the antenna
- Controls back interferences
- Reduces site coupling.

Isolation between access [dB]

Denotes the ratio in dB of the power level applied to one port of a dual polarized antenna to the power level received in the other input port of the same antenna. Quantity of energy received by one port when the other port is supplied.

Power max [W]

Maximum power bearable for an antenna, without degradation of the feeding system, or radiating elements.

Intermodulation [dBc]

Spurious and unwanted signal issued from a non linear device or material, that could make the wanted signal difficult to be identified.

Several combinations of two carrier frequencies are generated, and occupy the frequency ranges that are used by an other service. Could consequently disturb the low receive signal. Become a criteria reflecting the quality of the product. Measured relatively to the carrier.

Survival wind speed [m/s]

The antenna should survive the specified wind speed without any permanent deformation or changes of shape. Depends essentially on the surface area of the radome.

Wind load [N]

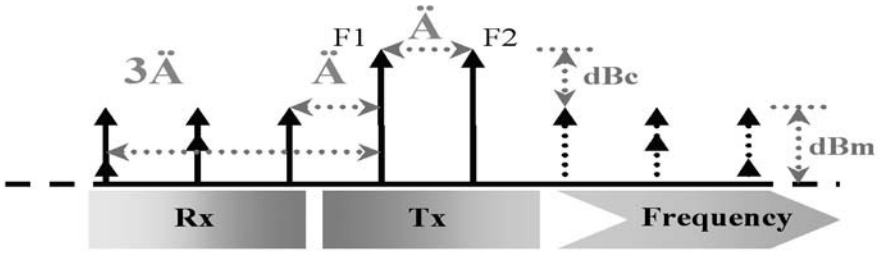
F= rair x V x 8 x C/2

rair: Air density (kg/m= ≈)

V: Wind speed (m/sec)

8: Surface area (m= ≈)

C: 4th coefficient



IP3: Ä
TYP > 160 dBc
2 * 38 dBm
GSM 1800

IP7: 3Ä
TYP > 171 dBc
2 * 46 dBm
UMTS

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Filters

Filters are important passive RF devices that perform selective frequency discrimination. As a class, filters also include duplexer and cavity resonators. Filters are designed to pass a band of frequencies, reject a band, or to combine those actions.

Four prime filter characteristics of concern to the system designer are insertion loss, attenuation, bandwidth, and selectivity. Each must be considered carefully in the selection of a filter product in order to ensure satisfactory system performance.

Insertion loss and attenuation

Both represent reduction of available signal power after filtering. Generally speaking, the designer selects the filter with the least loss and the most attenuation consistent with other application requirements.

Although one may discuss loss directly in terms of Watts, it is common practice to use the Decibel to express the ratio of power output to power input. Using Decibels makes insertion loss and attenuation performance characteristics independent of the actual powers or voltages in use.

The Decibel (abbreviated dB, where the B is in honor of Alexander Graham Bell) is computed as 10log (Pout/Pin). where log is the common logarithm function (base 10). Pout is the measured output power from the filter; Pin
is the measure of power input to the filter. A few useful ratios and their corresponding Decibels are tabulated on the following chart.

Decibel Loss =	Power Loss
0.5 dB	10.8%
1.0 dB	20.5%
2.0 dB	36.9%
3.0 dB	50.5%
10.0 dB	90.0%

As may be seen from the table, the often-heard expression “half-power point” signifies that spot on the response curve where the output power has been reduced by 3 dB, regardless of the actual power level.

Insertion loss is the amount of power unavoidably absorbed by the filter. It’s an unintended side effect... a “cost of doing business” with the filter. In the band pass region of the filter’s response curve, this figure sets the maximum amount of desired signal passed through to the output after processing. There are practical lower limits on insertion loss, around 0.5 dB. A 3 dB insertion loss, for example, spends half your power in the filter. Sometimes a relatively high amount is unavoidable, as in transmitter combiners.

More on attenuation

Attenuation is also power absorbed by the filter as an intentional benefit. It applies to band rejection, and is the extent to which the undesirable signal is blocked from the filter’s output. This is a key parameter in duplexers, whose task is to prevent transmitter power from entering the receiver’s input.

Some filters offer up to 100 dB or more attenuation, a very significant reduction in the unwanted signal. For repeater service, consult the radio manufacturer’s data sheet for recommended attenuation required.

Isolation

Isolation is the amount of attenuation between named ports of a filter. For example, a duplexer specified as having 80 dB of attenuation between the receiver port and the transmitter port may be said to have 80 dB port-to-port isolation.

Bandwidth

The amount of frequency spectrum within the insertion loss points specified of a filter’s response curve is defined as the filter’s pass bandwidth. In most cases this will be significantly less than the 3 dB bandwidth of the filter. If the filter has a complex response curve, there may be one or more pass bandwidths and reject bandwidths associated with the device.

Selectivity

The shape of the filter’s response curve defines the filter’s selectivity characteristics. Sharp curves with steep “skirts” have relatively narrow bandwidths, and are considered highly selective. A relatively wide bandwidth has broad selectivity. Each selectivity extreme has utility for a given set of circumstances facing the system designer.

Types of filters

Types of filters available to the designer include low pass, high pass, band pass, and band reject filters.

Low pass filters attenuate radio frequency energy above a certain cutoff point. In other words, they pass low. A typical use of a low pass filter involves suppressing the unwanted second harmonic and others above it from a transmitter. For example, a transmitter designed for 27 MHz service will generate a second harmonic at 54 MHz and, to a lesser extent, higher multiples. A good low
pass filter will only permit the 27 mHz energy to reach the antenna, thus preventing interference with other radio services.

High pass filters attenuate radio frequency energy below a certain cutoff point. These filters pass high. They are the electrical mirror image of low pass filters.

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Band pass filters pass a band of frequencies between specified low and high frequency cutoff points. RF energy above and below these cutoff frequencies is attenuated. Bandpass filters find wide application in land- mobile communications work. A typical application involves high power paging transmitters, where digital modulation tends to create adjacent channel interference with nearby receivers. Use of a band pass-style filtering device (usually a cavity resonator) will "sharpen" the paging transmitter's RF output spectrum, permitting only the energy in the immediate vicinity of the carrier to be radiated from the antenna.

Band reject filters block, or "notch out" a band of frequencies between specified low and high frequency cutoff points. These devices are the electrical mirror image of band pass filters. RF energy below and above the cutoff points is passed to the filter output. Band reject filters also find wide application in the land mobile industry. As in the paging transmitter example, receivers with insufficient inherent selectivity that experience such interference can be outfitted with a notch filter adjusted to the offending transmitters frequency, which effectively eliminates the interfering signal. Sometimes filters are required on both radios to completely solve interference problems at a site.

Cavities

Resonant cavities

Successful commercial products are usually based on one of three basic designs: helical, transverse electromagnetic (TEM), and waveguide. In most common use at this time are the helical and TEM styles.

TEM cavities

TEM cavities are usually built as quarter- or three-quarter-wavelength resonators, with the long design used for low loss, high selectivity applications. The Q or quality factor of a TEM cavity increases as the diameter is increased to a limit point, depending upon the conductivity of the materials used in its construction. Silver plating can be applied to improve the cavity's Q.

Frequency stability of a TEM cavity can be precisely controlled by incorporating an invar rod for tuning the inner conductor. Invar, with its low coefficient of expansion vs. temperature, allows the cavity to be tuned over a wide range of frequencies while the length of the tuning rod remains nearly constant over an extended range of ambient temperatures. RFS product designers take full advantage of all of these techniques to offer superior frequency stability performance.

Helical cavities

Helical cavities have generally been designed for low power, low Q applications such as receiver front-ends and mobile duplexers. As with the TEM style, the Q of the helical type is proportionate to the cavity diameter. Temperature compensation in helical cavities is more difficult to control than with TEM cavities, so helical designs are not specified for narrow bandwidth requirements.

Duplexers

These products are an integration of filter sections, generally cavity resonators, and are used predominantly to facilitate duplex repeater operation utilizing a single antenna and feedline. Duplexers range in size and power handling capability from small mobile types to high-power base station units. They provide the critical isolation between receiver and transmitter that allows both to be connected to the antenna simultaneously without the need for a transmit-receive relay.

A note of caution

The cost and construction of duplexers varies with the transmit-receive frequency separation (offset) required, power handling capability, and ambient RF environmental constraints. For applications in which the offsets are relatively wide duplexers can be constructed using band pass filters. The inherent advantage of this design is that unwanted signal rejection occurs for all frequencies outside the intended pass bands, not just at the duplexer's own transmit frequency. This duplexer design is preferred for high ambient RF environments where it provides strong defense against unwanted signals from nearby antennas.

Where the frequency offsets are closer (between about 0.5 MHz and 4.5 MHz) band reject cavities can be used to build a duplexer. This cavity style offers the benefits of high isolation and low insertion loss, but the resulting duplexer generally lacks attenuation at frequencies other than the transmit and receive frequencies specified. Consequently, this design should not be used where high ambient RF levels exist, unless other auxiliary filtering is considered.

Filter tuning

A good rule-of-thumb to remember when tuning any RF filter of the types described above: Never tune the unit under full power. Always rely upon small-signal methods using service monitors, frequency generators, calibrated receivers, etc. The reason: during the tune-up process, off-resonance conditions occur when the tuning screws are adjusted for their optimum setting. At resonance, the reactive components increase sharply, as does the corresponding voltage drop across insulating parts. High voltage drops may lead to arcing, which can leave permanent carbon traces across internal insulating material. Leakage across these traces causes instability in the filter's tuning, and noisy duplex operation. In designs employing moving finger stock for ground contact, arcing and pitting will occur when the finer stock position is changed in the presence of power, resulting in the same deteriorated performance. Damage of this nature is generally ruinous to the filter.

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UHF Television Systems Utilizing Panel Arrays

Introduction

This guide is issued by RFS as an aid for those people involved in the design of UHF TV transmitting systems. It is based on the use of broadband panel arrays incorporating the PHP and PVP panels for horizontal and vertical polarization respectively. The guide is fully supported by our professional engineers who are available to give advice as required.

The systems described herein cover 1 to 16 bay antennas. Large arrays almost always require special engineering considerations which cannot be incorporated here, but the information provided is intended to cover the broader system aspects of panel array design. Please consult our engineers for further information and assistance.

Electrical Considerations

Polarization

Horizontal Polarization:

The model PHP panel is horizontally polarized. It covers all of 470-860MHz.

Vertical Polarization:

The model PVP panel is vertically polarized and like the PHP panel covers all of 470-860MHz.

Gain

All antenna systems considered here incorporate equal numbers of panels on all faces.

For such systems the peak gain of the antenna is the product of the horizontal and vertical pattern directives less any distribution losses incurred within the antenna feed system. Null fill loss is included in the vertical directivity.

So in decibels the antenna peak gain is given by:

G_{APK} = GH + GV - LD dBd

where

GH = Horizontal pattern directivity (dB)
GV = Vertical patter directivity (dB)
LD = Distribution losses

For omni directional systems it is normal to consider the RMS gain which is given by:

G_{ARMS} = GV - LD

The distribution losses for an antenna will vary depending on the size of the array and the type(s) of distribution cables used. The latter is a function of the power handling requirements for the system. Typically, the following figures can be used for low/medium power systems.

ANTENNA SIZE	LOSS (DB)
1-Bay	0.05
2-Bay	0.1
3-Bay	0.1
4-Bay	0.2
6-Bay	0.3
8-Bay	0.3

Antennas incorporating larger distribution feeder and/or operating at lower frequencies will have lower losses than those described above. Higher powered arrays larger than eight bays usually have losses of approximately 0.2dB.

Impedance and VSWR

For low and medium power arrays the input VSWR of the arrays will be better than 1.1:1 over approximately 300 MHz bandwidth or greater.

For higher power arrays the VSWR will be better than 1.05:1 on each vision carrier and better than 1.1:1 over each operating channel. Other specifications to customer requirements are available.

Power Handling Capacity

Analog Services

The average power-handling requirement of an antenna is the sum of the average input powers. The average power of a black level PAL TV picture with 10:1 vision/sound ratio is 0.71 times the peak sync power.

The average power rating is a measure of the antenna capacity to dissipate the heat generated due to losses.

V_{PEAK} = 1.4 divided by Ppeak x 50

For low and medium power arrays the average power rating will be generally limited by the size of the input power divider as follows:

7/8" EIA: 2kW average
1-5/8" EIA: 5kW average
3-1/8" EIA: 12kW average
4-1/2" IEC 36kW average
6-1/8" EIA 55kW average

For high power arrays the average power rating can be limited by any part of the distribution system or the panels and will vary depending on the configuration of the array. Input connectors are usually 4-1/2" IEC or 6-1/8" EIA. 7-3/16" EIA and larger inputs are available on request.

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The peak power rating is a measure of the voltage breakdown or flashover point of the antenna. It is common to express peak power rating in terms of the peak voltage rating. Generally the peak power handling capacity will not be a limiting factor in the antenna design, however it needs to be checked especially where there are a large number of input channels.

The peak power handling requirement of an antenna will be PPK = 1.4 n2 PAV where n = the number of input channels and PAV is the average power input per channel where all channels are of the same power.

Digital Services

Because of the much higher peak to average power ratios of digital services the peak power ratings are far more significant than for analog services. Digital services are rated using the peak power. The total power is the sum of the peak powers of the digital services.

System Losses

The system design must take account of losses incurred by the main feed cable(s) and any internal plant equipment such as combiners and switch frames.

Feeder Losses

The attenuation figures for Heliflex flexible coaxial transmission line can be found on the relevant specification pages of this catalog. This technical information section also contains a good explanation of how the specifications are derived.

Combiner Losses

Combiner losses vary according to the type of combiner used, frequency spacings between channels transmission line sizes utilized and the number of channels to be combined.

For the purposes of this guide it will be assumed that the frequency spacing is 3 channels and that between two and six channels will be combined.

Two different constant impedance combining systems are used: commutating line and balanced (bandpass filter). The former is commonly used for 2, 3 or 4 channel systems. The latter is used for any number of channels. The commutating line devices are less expensive however they generally have higher losses especially at close frequency spacing.

Typical Combiner Losses (per channel, 21 MHz spacing)

Commutating Line Combiner (CUC Series):

INPUT CONNECTOR	N	1-5/8"	3-1/8"	4-1/8"
2 channels Loss (dB)	0.7	0.4	0.3	0.25
3, 4 channels Loss (dB)	1.3	0.6	0.45	0.4

Bandpass Filter Combiner (CU Series):

INPUT CONNECTOR	1-5/8"	3-1/8"
First Channel Loss (dB)	0.4	0.3
Additional Channels Loss (dB)	0.1	0.1

Switch Frame Loss

If a switch frame is incorporated in the system allow 0.1dB insertion loss.

Internal Rigid Line Loss

Allowance should be made for any internal rigid line (or jumper cables) between the transmitter and any switch frames, combiners and main feed cables.

Rigid line losses are as follows.

LINE SIZE	1-5/8"	3-1/8"	4-1/8"
Loss dB/100m at 500 MHz	1.6	0.8	0.55
Loss dB/100m at 800 MHz	1.95	1.0	0.70

Typical Performance Summary

An example of a system performance summary of an 8 channel directional system as shown in the table below for a low power site. (only 3 of the 8 channels are included). The antenna directivity shown is the sum of the horizontal and vertical pattern directivities.

Typical System Performance Summary

FREQUENCY, MHZ	813-820	750-757	547-554
Antenna Directivity, dBd	15.9	16.8	17.4
Antenna Losses, dB	0.3	0.3	0.3
Feeder Loss (50m of HF 1-5/8"), dB	0.95	0.90	0.75
Combiner Loss, dB	0.5	0.8	0.9
U Link panel and rigid line loss, dB	0.2	0.2	0.2
10m of HF 7/8" internal feeder, dB	0.35	0.33	0.28
System Peak Gain, dBd	13.6	14.3	15.0
Peak ERP (5kW), kW	5.0	5.0	5.0
Tx Power, Watts	218	187	159

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Mechanical Considerations

Support Columns

Standard support columns are available for 1 to 16-bay systems for both cantilever and side-mounting. They are made of hot dipped galvanized steel.

Columns up to eight levels are provided as a single piece. Six and eight level columns may be provided as an option in two modules to facilitate ease of transport and installation. Columns above eight levels are always provided in modules.

Small arrays can be pole mounted.

Ladders

On cantilever columns external ladders can be provided to allow external access to the antenna for horizontally polarized systems. For vertically polarized systems climbing spikes are available. Internal ladders are usually incorporated into all columns.

Pressurization

All feed systems are pressure-tight to the panel inputs. It is strongly recommended that these systems be pressurized with dry air to inhibit the ingress of moisture. Pressure is supplied via the main feed cable. Recommended operating pressure is in the range 20-35kPa.

All pressure-tight components are tested in the factory at 70kPa. The entire antenna system is also pressure-tested.

Lightning Protection

Cantilever columns are provided with one or two 1.5m long lightning spikes. The antenna system is firmly bonded to the column. On installation it is important that the column is solidly bonded to the support structure.

Shipping

Up to eight bay arrays are shipped fully assembled unless modular antenna systems are requested. Antennas are supported on steel frames for shipment.

Interface and Tower Design Considerations

As well as designing a tower capable of accommodating the weight and wind loading of the column, the physical deflection of the tower must also be limited. This is necessary because of the very narrow beam in the vertical plane. Excessive tower deflection may cause TV pictures to flutter as the signal in the viewer's direction fluctuates from the main beam to the nulls on either side in the vertical plane.

A deflection of 3/8 wavelengths (139mm at 800 MHz) is a reasonable limit for the top of the antenna at the serviceability wind speed.

The main feeder cable may be a significant weight (6-1/8" feeder weighs approximately 11kg/m) and it must be protected so it is recommended that the tower incorporates a vertical cable runway inside the tower, usually alongside the ladder.

Access is required at the base of the antenna column to commission the antenna and it is recommended that a maintenance platform be situated approximately 1.5 - 2m below the base of the antenna.

Installation Considerations

Care should be taken during the lifting operation to ensure that the feeder or antenna is not damaged.

Once the antenna has been installed it should be purged with dry air for a minimum of 6 hours to ensure that all moisture is removed. Consult the antenna handbook for the correct purging procedure.

If the antenna has dual inputs it will be necessary to equalize the main feeder cables to ensure each antenna stack is fed with the correct phase.

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Balanced Combiner Modules

The balanced combiner module, also referred to as a "constant impedance" or "Lorenz" combiner comprises two 3dB couplers, two band-pass filters and a balancing load.

Balanced combiners provide the best technical performance, offering a broadband low VSWR input (hence the term "constant impedance") and good isolation performance.

A single channel signal enters via the narrow band input. This signal is split by the input 3dB coupler and passes through the band pass filters. Because of the phase relationship, the two signals enter the output 3dB coupler and are combined at the output port.

The wideband input port is isolated by the output 3 dB coupler, so the level of the narrow band input signal at this point is determined by the directivity of the 3 dB coupler. A level of 30 - 35 dB below the input level is typical.

Because the narrow band input signal passes through the band pass filters, they experience some insertion loss. This loss depends on the selectivity of the filter and also the physical size of the filters Broader filters, suitable for wider channel spacings, have lower insertion loss, and larger filters have more surface area, making them suitable for higher powers also have lower loss.

The signal entering the combiner at the wide band input port can be any frequency in the operating band except the narrow band input frequency. This signal is split by the output 3 dB coupler, and passes to the band pass filters, where the signal is reflected back to the coupler. Again, because of the phase relationship between these signals, they combine to the output port.

The balancing load absorbs any signal arriving at that point due to finite directivity of the input 3dB coupler and any signal from the wideband input that passes through the band-pass filters.

Balanced combiner modules can be cascaded to form a combiner chain, as shown in Figure 2.

The isolation between narrow band inputs in a balanced combiner chain is determined by the directivity of the 3 dB couplers and also the selectivity of the band pass filters. Generally, at least 20 dB additional isolation is obtained from the band pass filters for non adjacent channel operation, so the isolation between inputs is typically > 50dB. For adjacent channel operation, the filters provide minimal rejection at the channel edge, although the high selectivity of the filters ensures high isolation across most of the operating channels.

Particular care is required when designing balanced combiner chains, in order to keep the overall combiner system specifications within reasonable limits. For example, the VSWR at the wideband input

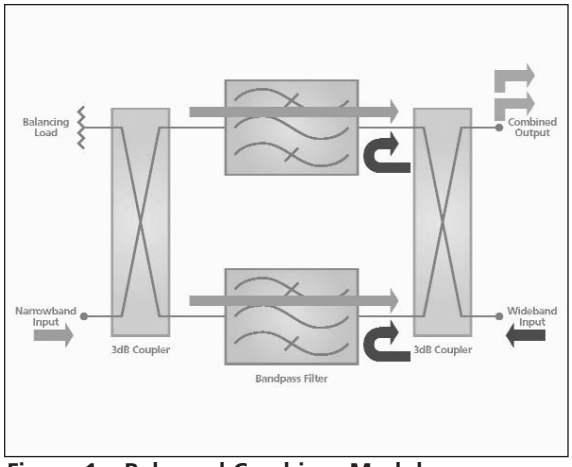

Figure 1 – Balanced Combiner Module

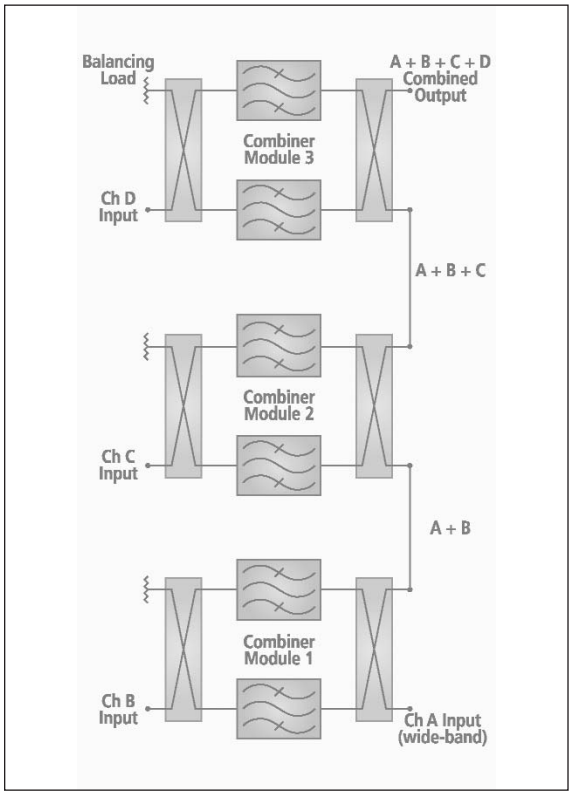

Figure 2 – Balanced Combiner Chain

of each module is cumulative, so unless the reflections from these ports are controlled, they will add in phase on some frequencies, causing very poor VSWR performance at the bottom of the chain.

RFS designs the combiner chains (usually in frequency ascending or frequency descending order) and tunes the combiner chains to obtain the quoted overall system specifications. These system specifications can differ quite significantly from the specifications of a single module because of the interaction of the various modules.

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Balanced Combiner Modules

Interference (intermodulation products generated in the output stage of the transmitter) are minimized by both the isolation performance of the combiner and also the band pass filtering inherent in the combiner.

It is also possible to use the band-pass filters in the combiner to perform the DTV mask filtering function. In this case, high selectivity band pass filters are used, whether or not adjacent channel operation is required. In this case, no mask filter is required within the transmitter. This approach has the advantage that overall filtering of the signal is reduced (only one band pass filter is used), so cost and insertion loss, group delay distortion, etc. are also minimized. Consult RFS for further information, if required.

The measured isolation of the combiner after installation may differ from factory tests, owing to antenna VSWR. Generally, the difference is expected to be minor and reasonable correlation between factory tests and final performance is expected.

RFS TV Combiner Range

RFS manufactures a large range of components for virtually all required channel combining applications.

The CW series of waveguide directional combiners are for broadband high powered applications. These combiners cover a wider frequency range than traditional waveguide combiners and are also much more compact, whilst still handling very high powers, that is possible with waveguide.

For these reasons, the CW series has been employed for the most technically difficult projects, requiring very high powers and many channels within a compact space. At the Sears Tower in Chicago, no other channel combiner could be accommodated within the available space. Many combiner chains have been supplied globally, with up to 10 channels per chain.

The CA series combiners use coaxial technology - 3dB couplers and band-pass filters. RFS manufactures filters in four sizes, for various power ratings - 50 mm, 100 mm 150 mm and 200 mm (50E, 100E, 150E and 200E series, respectively). For each basic filter size, 3 pole, 5 pole and 6 pole cross-coupled and 8 pole filters are available for various channel spacings (7 pole is available for 50E series, rather than 6 pole cross-coupled).

6 pole cross-coupled and 8 pole filters are used for adjacent channel combining and for DTV mask filtering. 5 pole filters are used for 1 channel spacing and 3 pole filters are used for wider frequency spacings. 8 pole filters are also available.

The 50E series of combiners are designed as integrated combiners, with the 3dB couplers built into the filter bodies. This ensures minimum component count, reducing the cost and also ensures minimum insertion losses, as there are no discrete connections between couplers and filters.

The 100E, 150E and 200E combiners are supplied with discrete filters and couplers.

The power rating of lower order filters is higher because of the lower insertion loss, meaning that there is less heat generated.

The CA series of combiners are fully tuneable across the 470 - 860 MHz frequency range and are temperature compensated to a drift of < 2 kHz / °C.

Power monitoring is available as an option on all RFS combiners, and a directional coupler to monitor narrowband input power is standard on the 50E series.

RFS channel combiners can also be integrated into U-Link systems, ensuring low VSWR systems and compact designs. Consult RFS for further details.

Channel Combiner Design

RFS has been manufacturing channel combiners for VHF and UHF applications for more than 20 years. Many features of RFS designs have been developed to ensure the optimum technical performance:

- **Welded construction in areas of high RF current ensures high Q - low insertion losses and higher power ratings**
- **Efficient use of available space - filters are as large as possible with the design size of the combiner to ensure lowest loss, and highest power ratings.**
- **Connections between components and modules are as simple as possible to ensure minimum losses and optimum VSWR.**
- **Filters are designed in an "in line" configuration whenever power rating is important - this allows best heat dissipation and also minimizes the combiner footprint.**

RFS combiner components are modeled using sophisticated computer techniques and then tested to destruction to ensure adequate power and voltage safety factors. As a consequence, combiners can be operated at their maximum ratings for long periods of time with a high degree of confidence.

Generally, RFS combiners (except the 50E series) are designed with vertical inputs and outputs, which ensures that interconnecting rigid line is simple and easy - no additional elbows are required.

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Television Channel Frequency Allocations

CH.	U.S.	EUROPE Channel Limits (MHz)	AUSTRALIA
0	-	-	45 - 52
1	-	-	56 - 63
2	54 - 60	47 - 54	63 - 70
3	60 - 66	54 - 61	85 - 92
4	66 - 72	61 - 68	94 - 101
5	76 - 82	174 - 181	101 - 108
5A	-	-	137 - 144
6	82 - 88	181 - 188	174 - 181
7	174 - 180	188 - 195	181 - 188
8	180 - 186	195 - 202	188 - 195
9	186 - 192	202 - 209	195 - 202
9A			202 - 209
10	192 - 198	209 - 216	209 - 216
11	198 - 204	216 - 223	216 - 223
12	204 - 210	-	223 - 230
13	210 - 216	-	-
14	470 - 476	-	-
15	476 - 482	-	-
16	482 - 488	-	-
17	488 - 494	-	-
18	494 - 500	-	-
19	500 - 506	-	-
20	506 - 512	-	-
21	512 - 518	470 - 478	-
22	518 - 524	478 - 486	-
23	524 - 530	486 - 494	-
24	530 - 536	494 - 502	-
25	536 - 542	502 - 510	-
26	542 - 548	510 - 518	-
27	548 - 554	518 - 526	-
28	554 - 560	526 - 534	526 - 533
29	560 - 566	534 - 542	533 - 540
30	566 - 572	542 - 550	540 - 547
31	572 - 578	550 - 558	547 - 554
32	578 - 584	558 - 566	554 - 561
33	584 - 590	566 - 574	561 - 568
34	590 - 596	574 - 582	568 - 575
35	596 - 602	582 - 590	575 - 582
36	602 - 608	590 - 598	582 - 589
37	608 - 614	598 - 606	589 - 596
38	614 - 620	606 - 614	596 - 603
39	620 - 626	614 - 622	603 - 610
40	626 - 632	622 - 630	610 - 617
41	632 - 638	630 - 638	617 - 624
42	638 - 644	638 - 646	624 - 631
43	644 - 650	646 - 654	631 - 638
44	650 - 656	654 - 662	638 - 645
45	656 - 662	662 - 670	645 - 652
46	662 - 668	670 - 678	652 - 659
47	668 - 674	678 - 686	659 - 666
48	674 - 680	686 - 694	666 - 673
49	680 - 686	694 - 702	673 - 680
50	686 - 692	702 - 710	680 - 687
51	692 - 698	710 - 718	687 - 694
52	698 - 704	718 - 726	694 - 701

CH.	U.S.	EUROPE Channel Limits (MHz)	AUSTRALIA
53	704 - 710	726 - 734	701 - 708
54	710 - 716	734 - 742	708 - 715
55	716 - 722	742 - 750	715 - 722
56	722 - 728	750 - 758	722 - 729
57	728 - 734	758 - 766	729 - 736
58	734 - 740	766 - 774	736 - 743
59	740 - 746	774 - 782	743 - 750
60	746 - 752	782 - 790	750 - 757
61	752 - 758	790 - 798	757 - 764
62	758 - 764	798 - 806	764 - 771
63	764 - 770	806 - 814	771 - 778
64	770 - 776	814 - 822	778 - 785
65	776 - 782	822 - 830	785 - 792
66	782 - 788	830 - 838	792 - 799
67	788 - 794	838 - 846	799 - 806
68	794 - 800	846 - 854	806 - 813
69	800 - 806	854 - 862	813 - 820
70	806 - 812	-	
71	812 - 818	-	
72	818 - 824	-	
73	824 - 830	-	
74	830 - 836	-	
75	836 - 842	-	
76	842 - 848	-	
77	848 - 854	-	
78	854 - 860	-	
79	860 - 866	-	
80	866 - 872	-	
81	872 - 878	-	-
82	878 - 884	-	-
83	884 - 890	-	-

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VSWR CONVERSIONS

Reflection Coefficient	VSWR	Return Loss dB	VSWR	Reflection Coefficient	Return Loss dB	Return Loss dB	Reflection Coefficient	VSWR
0.005	1.010	46.0	1.01	0.005	46.1	10	0.316	1.925
0.01	1.020	40.0	1.02	0.010	40.1	11	0.282	1.785
0.015	1.030	36.5	1.03	0.015	36.6	12	0.251	1.671
0.02	1.041	34.0	1.04	0.020	34.2	13	0.224	1.577
0.025	1.051	32.0	1.05	0.024	32.3	14	0.200	1.499
0.03	1.062	30.5	1.06	0.029	30.7	15	0.178	1.433
0.035	1.073	29.1	1.07	0.034	29.4	16	0.159	1.377
0.04	1.083	28.0	1.08	0.039	28.3	17	0.141	1.329
0.045	1.094	26.9	1.09	0.043	27.3	18	0.126	1.288
0.05	1.105	26.0	1.10	0.048	26.4	19	0.112	1.253
0.06	1.128	24.4	1.11	0.052	25.7	20	0.100	1.222
0.07	1.151	23.1	1.12	0.057	24.9	21	0.089	1.196
0.08	1.174	21.9	1.13	0.061	24.3	22	0.079	1.173
0.09	1.198	20.9	1.14	0.065	23.7	23	0.071	1.152
0.10	1.222	20.0	1.15	0.070	23.1	24	0.063	1.135
0.11	1.247	19.2	1.16	0.074	22.6	25	0.056	1.119
0.12	1.273	18.4	1.17	0.078	22.1	26	0.050	1.106
0.13	1.299	17.7	1.18	0.083	21.7	27	0.045	1.094
0.14	1.326	17.1	1.19	0.087	21.2	28	0.040	1.083
0.15	1.353	16.5	1.20	0.091	20.8	29	0.036	1.074
0.16	1.381	15.9	1.21	0.095	20.4	30	0.032	1.065
0.17	1.410	15.4	1.22	0.099	20.1	31	0.028	1.058
0.18	1.439	14.9	1.23	0.103	19.7	32	0.025	1.052
0.19	1.469	14.4	1.24	0.107	19.4	33	0.022	1.046
0.20	1.500	14.0	1.25	0.111	19.1	34	0.020	1.041
0.21	1.532	13.6	1.26	0.115	18.8	35	0.018	1.036
0.22	1.564	13.2	1.27	0.119	18.5	36	0.016	1.032
0.23	1.597	12.8	1.28	0.123	18.2	37	0.014	1.029
0.24	1.632	12.4	1.29	0.127	18.0	38	0.013	1.026
0.25	1.667	12.0	1.30	0.130	17.7	39	0.011	1.023
						40	0.010	1.020

DBM - DBW - POWERS OF 10 AND PREFIXES EXPRESSED IN WATTS

dBm	dBW	Watts	Multiple	Prefix
+150	+120	1,000,000,000,000	10^{12}	1 Terawatt
+140	+110	100,000,000,000	10^{11}	100 Gigawatts
+130	+100	10,000,000,000	10^{10}	10 Gigawatts
+120	+90	1,000,000,000	10^{9}	1 Gigawatt
+110	+80	100,000,000	10^{8}	100 Megawatts
+100	+70	10,000,000	10^{7}	10 Megawatts
+90	+60	1,000,000	10^{6}	1 Megawatt
+80	+50	100,000	10^{5}	100 Kilowatts
+70	+40	10,000	10^{4}	10 Kilowatts
+60	+30	1,000	10^{3}	1 Kilowatt
+50	+20	100	10^{2}	1 Hectrowatt (100 w)
+40	+10	10	10^{1}	1 Decawatt (10 w)
+30	0	1	10^{0}	1 Watt
+20	-10	0.1	10^{-1}	1 Deciwatt (100 mw)
+10	-20	0.01	10^{-2}	1 Centiwatt (10 mw)
0	-30	0.001	10^{-3}	1 Milliwatt
-10	-40	0.0.001	10^{-4}	100 Microwatts
-20	-50	0.00.001	10^{-5}	10 Microwatts
-30	-60	0.000.001	10^{-6}	1 Microwatt
-40	-70	0.0.000.001	10^{-7}	100 Nanowatts
-50	-80	0.00.000.001	10^{-8}	10 Nanowatts
-60	-90	0.000.000.001	10^{-9}	1 Nanowatt
-70	-100	0.0.000.000.001	10^{-10}	100 Picowatts
-80	-110	0.00.000.000.001	10^{-11}	10 Picowatts
-90	-120	0.000.000.000.001	10^{-12}	1 Picowatt

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Application Overview

Introduction

HF communication systems offer an independence that makes them unique compared to other types of communication. This has led to continued use by military forces, no matter what other means they have for communication. Personnel in embassies and consulates have also found that HF can be advantageous during times of civil disturbance. There are also many civilian applications, where the cost-effectiveness of HF provides a useful solution, particularly in remote areas.

HF communication systems operating in the range of 2 to 30MHz primarily use sky waves reflected and refracted by the ionosphere. Successful propagation depends greatly on ionospheric conditions, and changes within the ionosphere may require a change of operating frequency. Wide band antennas are therefore, preferred for HF communication systems, and will be discussed in detail later in this guide.

Expectations of HF operation can cause early challenges, particularly if the user has been involved with satellite, VHF or UHF communications. High quality communication can be affected by sunspots, bad choice of frequencies, low power and an inefficient antenna.

The usefulness of an HF system depends on:

- power output
- selection of frequency
- ionospheric variations
- the antenna system.

Power is important, but only if it can be radiated. An increase in power must be considerable if it is to have a significant effect. An increase from 100 to 400W is only 6dB, which at HF may, or may not, be noticeable. A change from an inefficient to an efficient antenna can be far more significant. It is the antenna that ultimately determines the efficiency of an HF system. The modern HF antenna has radiation pattern characteristics that are matched to the required transmission distance, so that the maximum amount of power is received at the receiving location.

The choice of frequencies is also extremely important. Since the radio spectrum is a valuable resource and is finite, the allocation of frequencies is usually the function of a government authority. Propagation characteristics of HF radio waves are such that the lower frequencies are more suitable for short distance communications, whereas higher frequencies are suitable for long distance communications. The choice of frequencies is based on the distances to be covered and variations in the ionosphere. The ionosphere directly affects radio signal reflection or absorption and, therefore, the distance of communication.

Ionosphere

These effects are due to the various ionized layers of the ionosphere that are caused by radiation from the sun (Fig. 1). Therefore any change in solar radiation will affect these layers. Variations in the ionosphere and the nature of radio waves mean that no radio system will give 100% communications all the time.

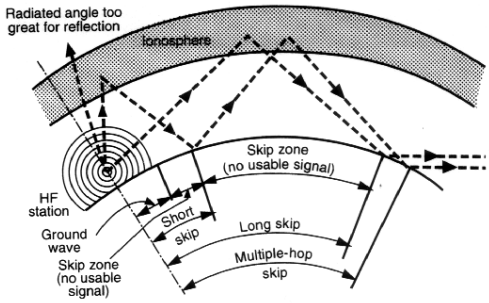

Fig. 1 Ionospheric propagation

The predictable variations occur with the time of day, seasons of the year and the regular ll-year sunspot cycle (Fig. 2). Solar flares and solar storms may also affect HF communications.

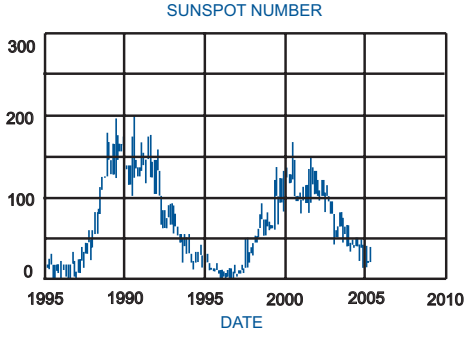

Fig. 2 Picture of 11 year sunspot cycle

Take-off Angle

The take-off angle is the elevation angle, measured from the ground, at which the maximum radiation takes place, or is desired to take place. Whether the antenna is directional or omni-directional there are three basic needs for take-off angle corresponding to the following transmission distances.

Groundwave propagation

For very short distance communication: 0-100km. Effectively, the desired take-off angle is zero degrees and only vertical polarization can be used.

High angle radiation

Using a single reflection or refraction from the ionosphere to achieve short distance communication over the distance 0-1000km. For this requirement, an antenna with maximum radiation at high elevation angles is most suitable.

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Application Overview

Low angle radiation

Using a single refraction from the ionosphere, or multiple refractions combined with reflections from the earth's surface, to achieve medium to long distance communication over the distance 1000km or more. An antenna with maximum radiation at low elevation angles is most suitable.

The angle of take off appropriate for the range to be covered can be selected by varying the height above ground, as shown for a simple half wave dipole (Fig. 3). For short distances a high angle of radiation is required, e.g. H = /4. For longer distances a lower angle, where H= or higher, will produce better results. For more complicated broadband antennas, the principle is the same, except that it is the effective height of the antenna that is optimized over the frequency band.

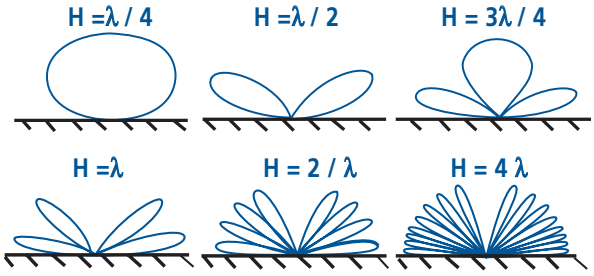

Fig 3. Dipole Take-off Angle Variation with Mounting Height

Horizontal & Vertical Polarization

What is the meaning of polarization in HF communication systems? Many publications present radiation patterns for horizontal as well as vertical polarization. However, the polarization of waves refracted and reflected from the ionosphere is in many cases different from the polarization of the wave radiated from a transmitting antenna. It is, therefore, most important and more practical to consider the total radiated power intensity than the field strength of one or two components.

However, there is one area where the polarization has a great impact. The interaction of an HF antenna with real or "lossy" ground is very dependent on the polarization. The reflection of a horizontally polarized wave is almost perfect from real ground, regardless of the incident angle. However, a vertically polarized wave is substantially absorbed by real ground, and at a certain angle of incidence, known as the Brewster angle, may be almost completely absorbed. A vertically polarized antenna may therefore have much less gain over real ground, than is predicted on the basis of a perfectly conducting or "ideal" ground model. The use of ground screens to recover this gain will be discussed later.

Transmitting or Receiving

When considering an antenna to do a specific task at frequencies below 30MHz, some of the essential differences between transmitting and receiving requirements can be overlooked, frequently to the detriment of overall cost-effectiveness. Often the same transmitting antenna type is also specified for reception, without consideration of the differing roles - a good transmitting antenna is not always a good receiving antenna.

Requirements For Transmitting

The main requirement is to obtain the highest possible field intensity in the desired area of coverage at the appropriate take-off angle. For this, we need to

- maximize the realized gain of the antenna
- ensure that antenna efficiency is as high as possible
- optimize the impedance match to the source to be as close as possible.

Gain and Radiation Pattern

The gain, or more exactly, directive gain of an antenna when used for transmitting, may be regarded as the sensitivity of that antenna when receiving a plane wave of the same polarization. The three-dimensional geometrical surface representing the directive gain, or sensitivity as a function of direction, is called the radiation pattern, which describes equally the performance of either a transmitting, or a receiving antenna.

Directive gain for HF antennas is usually specified with reference to a radiator that radiates uniformly in all directions, the so-called isotropic radiator. Gain specified in this way is designated as X dBi. An alternative method of specifying gain is with reference to a resonant half-wave dipole under the same conditions, in which case, the gain is stated as Y dBd. The dipole has a directive pattern, having a directive gain of 2.13dBi, therefore the gain expressed in dBi is 2.13dB more than the figure expressed in dBd.

Input impedance and VSWR

Another antenna characteristic, which is the same when connected to either a transmitter or receiver, is its input or feed point impedance. When driven from a transmitter, this represents the load impedance appearing across the feed point terminals of the antenna. When connected to a receiver it represents the internal impedance of the antenna, acting in series with the voltage induced by an incident wave. A quantity that describes the effect of the antenna on connected equipment, and vice versa, is the voltage standing wave ratio (VSWR). The meaning and the limitations of this quantity will be investigated later. It will be shown that there is a marked difference

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between the transmitting and receiving operation of an antenna, and that the VSWR assumes different significance, when considered for transmit or receive antennas.

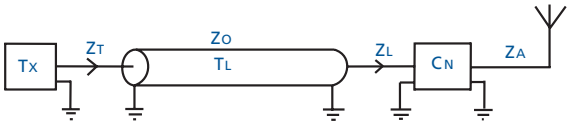

Fig. 4 Radio Transmission System

Fig. 4 shows a schematic circuit diagram of a typical radio transmission system. The power of a transmitter is usually delivered to an antenna by means of a transmission line, in the frequency bands under consideration. TX designates the transmitter operating into a load impedance ZT. TL is the transmission line of characteristic impedance Z0, feeding the output power of the transmitter to the transmit antenna via the coupling network CN, which transforms the antenna input impedance Z0 into ZL, the terminating or load impedance of the transmission line.

Some antennas have been developed to match directly to suitable transmission lines. The coupling network CN, Fig. 4, is then unnecessary, and the antenna terminals are directly connected to the transmission line. Examples include:

- Wideband HF conical vertical monopoles with a typical unbalanced input impedance of 50 ohms.
- Wideband HF biconical horizontal dipoles, with a typical balanced input impedance of 300 ohms allowing direct connection to 300 ohm balanced line.
- Wideband HF vertical or horizontal HF log-periodic dipole antennas, also designed for 300 ohm balanced line.

The wide-band properties of these antennas make them very useful for transmitting stations. Although it is practically not possible to obtain a constant resistive antenna input impedance over the wanted wide frequency band, the designer keeps the fluctuations of the antenna input impedance ZA with respect to Z0, the characteristic impedance of the line, within specified limits. A departure of ZA from Z0 produces a partial reflection of the electromagnetic power from the antenna feed point thus producing standing waves along the feeder line TL.

The standing waves are characterized by the “voltage standing-wave-ratio (VSWR), which is the ratio of the maximum voltage on the line to the minimum voltage. The transmitter is adjusted for optimum operation when the line, TL in Fig. 4, is terminated in a resistive load equal to Z0. The power delivered to this load is the practically obtainable maximum. If the line feeds the antenna and ZA differs from Z0, a part of the power will be reflected back towards the transmitter and the antenna radiated power is reduced, correspondingly, loss on the transmission line increases when VSWR rises. In a high power transmitting system corona effects can occur on the line due to high VSWR.

A practical characteristic of a transmit antenna is the maximum permissible VSWR, which may be designated by SA. A frequently specified maximum VSWR, for antennas in the HF and MF bands is 2:1 (i.e. SA = 2). This means that the mis-match between antenna impedance ZA and characteristic impedance Z0 of the line reflects {(SA-1) / (SA+1)}2 x 100% = 11% of the power and the signal strength is reduced by 0.5dB.

Coupling Networks

A more general problem is encountered when an antenna is used which has a nominal impedance ZC different from the characteristic impedance Z0 of the selected transmission line. A coupling network CN will then be inserted between antenna and line, as in Fig. 4. The maximum VSWR of the antenna in the operating frequency range, with respect to a line of characteristic impedance ZC, may be designated by SC. The coupling network, designed for transfer of a terminating impedance ZC, into an input impedance ZL = Z0, will exhibit some fluctuations of the input Impedance ZL due to variations in its frequency response. The maximum VSWR appearing on the Z0 line when the network CN is terminated by a resistive impedance ZC, may be designated by SC.

If a coupling network is used with the antenna, as shown in Fig. 4, the standing waves produced on the transmission line TL will depend on the frequency response of the antenna and the coupling network. The corresponding VSWR on the line TL may be designated by S0. Its value will be between limits given by the inequality:

SASC S0 SA/SC, when SA > SC (If SA < SC, the last term has to be inverted).

Antenna Efficiency

The output power of the transmitter, reduced by the loss on the transmission line and in networks inserted between transmitter and antenna, represents the input power PA to the antenna. A part of this input power may be dissipated in conductors and dielectric components of the antenna and in the environment. e.g. in a ground system. The remaining power

P = hPA (h£1) is radiated

The antenna efficiency depends on the frequency, the type of the antenna and on the environment.The efficiency can be improved in certain cases, e.g. by improving the ground system to reduce losses. Many

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antennas, at HF and higher frequencies experience a negligible loss with respect to the radiated power; i.e. the efficiency is practically unity.

Radio Noise

At frequencies below 30 MHz, radio noise is a significant factor in Signal to Noise Ratio S/N. The graph, Fig. 5, adapted from C.I.R. Report 322-3: "World Distribution and Characteristics of Atmospheric Radio Noise", Geneva, 1963, page 345, indicates for 2.5 KHz bandwidth, average noise values for midnight in summer.

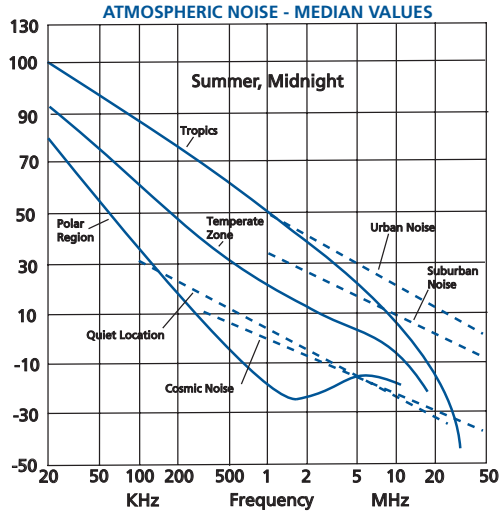

Fig. 5 Radio Noise Levels

The radio noise level is dependent upon geographical position, the operating frequency band, the time of day, season, etc. The noise power N is therefore a given design parameter, and the antenna must be designed or selected so that the operating S/N satisfies the condition S/N >S0/N where S0 is the minimum signal power required at the receiver input.

There are two ways available to increase the signal power if required - either by increasing the radiation of the transmit antenna as described earlier, or by increasing the directivity of the receive antenna.

The resulting S/N ratio, which affects the quality of the signal on demodulation, depends on the cumulative effect of all noise sources, i.e. the external radio noise mentioned above, plus thermal noise due to the resistance of antenna elements and transmission line, and also due to active elements – transistors in the receiving system, particularly in the input stages.

Requirements For Receiving

- main requirement is to obtain the largest possible signal to noise ratio.
- high efficiency and a good match may not be essential to maximize the signal to noise ratio.

External Factors Affecting Signal to Noise Ratio:

- Interfering Signal

Where a strong interfering signal is present, a radiation pattern null in that direction is main requirement.

- High External Noise Environment

At frequencies below 10MHz, the external atmospheric noise produced by distant thunderstorms is of such a level that a resonant dipole antenna may receive 20 to 30dB more external noise than that generated by the receiver stages, the feeder, or the antenna itself. An appreciable mismatch between antenna and the receiver system reduces the signal level to the receiver, but since the noise level is also reduced in proportion. S/N remains unchanged.

Under these conditions a loss of 10dB or more due to antenna efficiency or poor impedance match to the receiver has virtually no effect on signal to noise ratio.

This situation can often be used to advantage since it allows the use of resistively loaded broadband travelling wave antennas, which have a low efficiency at low frequencies. It also allows the use of compromise matched short antennas, e.g. whips, which are a poor impedance match to the receiver, but offer great advantages in terms of cost and portability.

In some applications, antennas of reduced efficiency may actually improve the receiving system performance. By offering lower signal levels of the same S/N to the receiver, the receiver operates at a more favorable point in its dynamic range, reducing the likelihood of overload conditions, so reducing intermodulation products and improving spurious signal rejection capability of the receiving system.

The frequency range 10 to 30MHz represents a transition stage from predominantly external noise which is reducing (see graph. Fig. 5) as the equipment noise component is increasing with frequency. In practice, therefore in this band system VSWR limits should be generally less than 3:1, if degradation of S/N by the antenna system is to be avoided.

Receiving Antennas

A receive antenna responds to waves incident to the antenna, from all directions if the antenna is omnidirectional, or from specified directions if the antenna has directional properties. The sensitivity as a function of direction follows the same law as the radiation of the same antenna when transmitting. The radiation pattern of the antenna therefore also describes its directional response as a receive antenna.

At any one time, a receiving system is usually required to receive information carried on a wave

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originating from one transmitting station of a complete communication system. All other waves in the operating frequency band of the antenna are either interfering transmissions, or random radiation from space and environment, described as radio noise. Satisfactory communication is possible, only if the power extracted by the antenna system from the wanted wave, (the signal S) is sufficiently higher than the power received from interfering waves so that, after processing in the receiver, the demodulated signal is reasonably clear and undistorted.

Assuming that interference received by the antenna is only radio noise, the noise power N in the ratio S/N refers to the radio noise received by the antenna and the thermal noise in the receiving system. S/N is the most important design parameter of any receiving antenna installation since it is of primary importance in the complete receiving system. A secondary design parameter is the signal level, the signal power S delivered to the receiver input. Modern receivers are highly sensitive, so that the choice of the antenna is not usually affected by the required minimum signal level, but by a specified S/N.

S/N Ratio of a Receiving Antenna System

It can be shown, under the assumption that radio noise is received equally from all directions (not always the case in practice) that:

noise power N received by the antenna is independent of its directivity. The S/N ratio can be increased by increasing the directivity.

In practice, since noise levels received from different directions can vary e.g. man-made noise from an adjacent city, or electric power lines, it is important to try to select the best site available. The directional receiving antenna's advantages are enhanced, whenever its directional pattern discriminates against unwanted interference, in favor of the desired radio wave.

Broadband vs. Narrowband Antennas

HF antennas can be separated into broadband and narrowband groups according to their frequency response.

Narrow Band Antennas

Monopoles

The vertical radiator or monopole (Fig. 6) often has an insulated mast as the antenna. It can be resonant at a quarter wavelength (half the length of a dipole) or non-resonant and tuned with an antenna tuning unit, but that introduces inefficiencies. The guy wires must be interrupted with insulators at regular intervals, although part of the top guy wire may be a component of the antenna circuit.

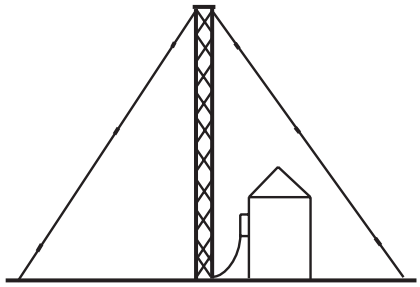

Fig. 6 Vertical Radiator (Monopole)

A good ground is required, and, since top soil often has low conductivity, an artificial ground mat is used. This consists of 60 or more radials of heavy copper wire laid on, or just below, the soil surface and connected to a central copper ring. The length of the radials should be at least a quarter wavelength at the lowest operating frequency. Sometimes metallic spikes are driven into the ground at regular intervals and soldered to the radials to improve contact with the surrounding soil.

A good ground wave makes communication with mobiles over short ranges more reliable. However, high angle radiation is poor, so that performance may be unsatisfactory at intermediate distances. Receiver noise level is generally high, since man-made noise is predominately vertically polarized.

Dipoles

The simple dipole (Fig. 7) is efficient and inexpensive, but will only operate on one frequency.

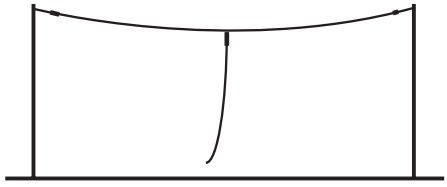

Fig 7 Dipole

A variation is the inverted vee dipole (Fig. 8). This has basically the same characteristics as the horizontal dipole, but requires only one mast.

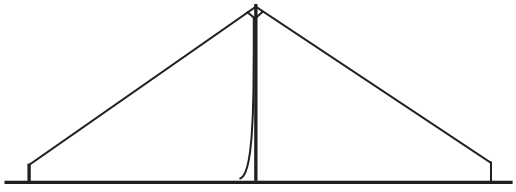

Fig 8 Inverted V Dipole

Broadband Antennas

The clever way to go, when more than one frequency is involved, is to use a broadband antenna that will operate on all the required frequencies without adjustment. RFS broadband antennas operate on either

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the travelling wave principle or the log-periodic principle. The pictures in this guide illustrate the great variety of broadband antennas available for a multitude of operational needs.

Travelling Wave Antennas

Travelling wave antennas are very successful. With these the input impedance remains within reasonable limits and so does the radiation pattern. Two techniques are available to obtain travelling waves in antennas – to avoid reflections leading to standing waves:

- antennas having a conical shape of the radiators, which increases the energy radiated along the antenna conductors so that very little energy is reflected back to the input.
- insertion of resistive components into more simple wire radiators to avoid reflections and standing waves.

Conical Antennas

Fig 9 is a horizontal dipole based on the geometrical principle. With this the conical or biconical shape of each dipole arm causes waves starting at the feed point to become disengaged, i.e. to be radiated. Biconical dipole antennas are designed for short to long range communication with power ratings in excess of 40kW PEP and are available in 2-30MHz or 3-30MHz frequency ranges.

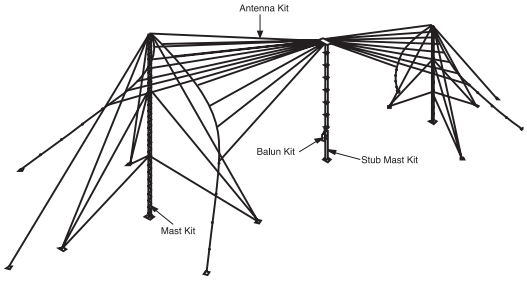

Fig 9 Broadband Dipole (BDH Series)

The monopole (Fig. 10) is designed for medium to long range omni-directional coverage, and covers the standard bands of 2-30MHz or 3-30MHz. Power ratings are usually up to 80kW PEP.

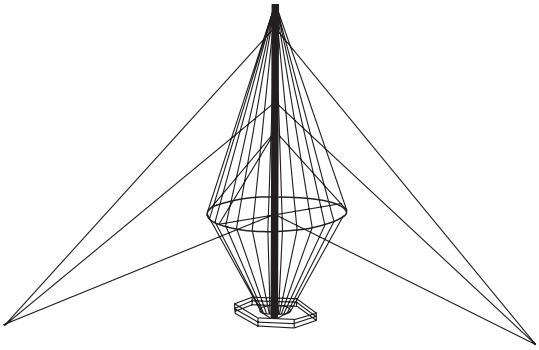

Fig 10 Broadband Monopole (WM Series)

Resistively Loaded Antennas

Fig 11 shows a horizontal travelling-wave dipole based on the principle of inserting resistive components to avoid reflections. In each dipole arm is a resistor inserted at about two-thirds of an arms length from the feed point. There are several models of broadband travelling wave dipole covering 2-30MHz, 3-30MHz and 5-30MHz. Standard power rating is 1kW Av or 4kW PEP. These antennas are ideal for short to medium range communication up to 3000km.

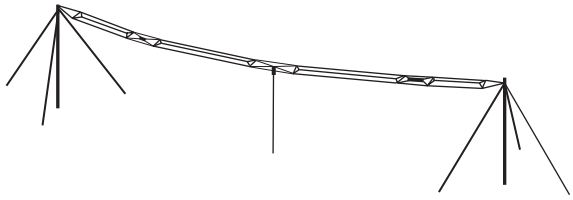

Fig 11 Travelling Wave Dipole (TWD Series)

If one mast and one half of the dipole are removed, and the remaining arm is tilted, the semi-delta antenna of Fig 12 is obtained, i.e. a tilted travelling-wave monopole. Between the lower longer section of the monopole and the upper section, a resistor with a parallel inductor is inserted to avoid standing waves. Operation is from 2-30MHz with a power rating of 250W Av, 1000W PEP. Where soil is poor and operation below 3.5MHz is essential, a low frequency kit is available.

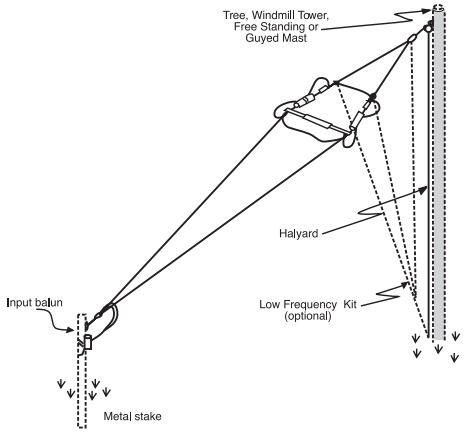

Fig 12 Semi-Delta Antenna (SD Series)

Another popular HF antenna, the Sloping Vee illustrated in Fig 13 has been used for decades for directional transmitting and receiving. This antenna consists of two wires assembled as a Vee with the apex at the top of a mast. Each wire slopes down and is terminated in a grounded resistor RE. A balanced feeder transmission line is used to drive the Vee at the apex. Experience has shown that VSWR with these antennas is affected by ground conditions. This is because ground existing between the earth terminals

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of the terminating resistors acts like a resistive/capacitive component and VSWR usually exceeds acceptable values at some frequencies.

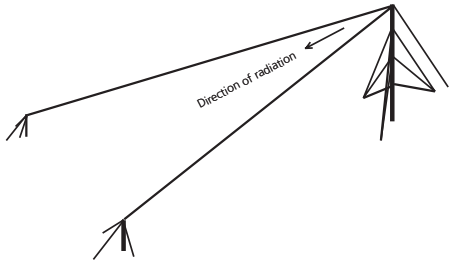

Fig 13 Sloping Vee

To improve the VSWR performance of the historical Sloping-Vee antenna, RFS developed the Sloping-Triangle Antenna shown in Fig 14. VSWR does not exceed 2:1, because antenna current does not pass through the soil. It is designed for medium to long distance communication over 3-30MHz or 5-30MHz. Power ratings are up to 1kW Av, 4kW PEP.

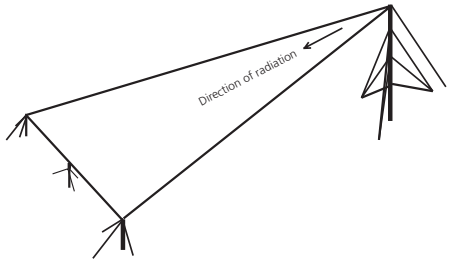

Fig 14 Sloping Triangle (ST Series)

Broadband delta antennas (Figs 15 - 18) are possibly the most used series of broadband antennas in the world. These antennas are designed for high-angle ionospheric propagation over short to medium distances from 0-1000km or more. Radiation results from a wave travelling upward to a resistive termination of the apex of the antenna.

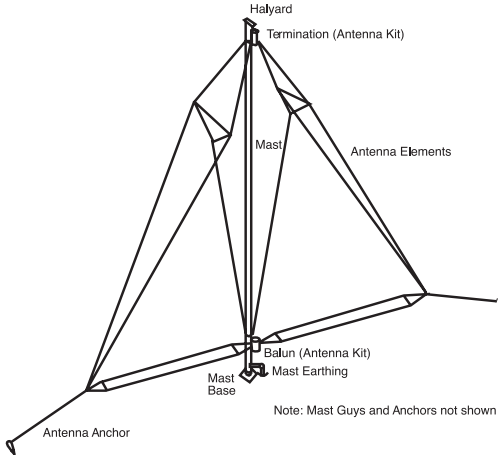

Fig 15 Delta Antenna (D Series)

The dual wing delta in Fig. 15 is omni-directional. There are two versions: 2-30MHz and 3-30MHz. Power ratings available are up to 1kW Av, 4kW PEP. The radiating wings are fed via open wire line, or by coaxial cable using a balanced/unbalanced impedance transformer (balun).

The antenna in Fig. 16 is similar to that in Fig. 15 but the radiating elements are fed by co-axial cable that can be buried instead of above-ground open wire line. This enhancement can be useful where personnel have access – on parade grounds, etc.

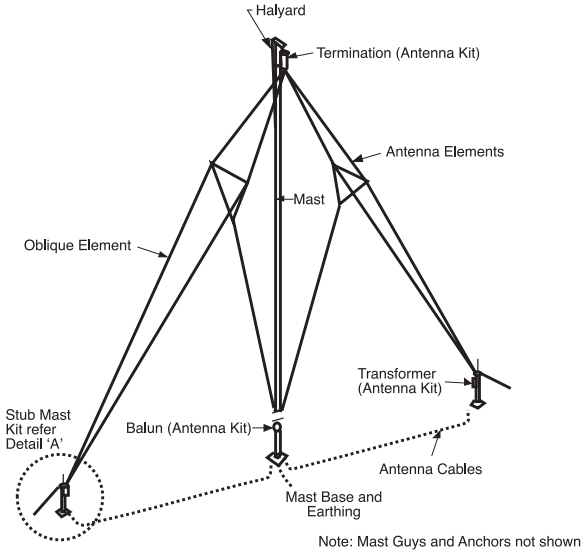

Fig 16 Cable-Fed Delta Antenna (DC Series)

Two dual wing deltas can be mounted on one mast to enable two transmitters to operate simultaneously and independently. The isolation between the two antennas is greater than 30dB.

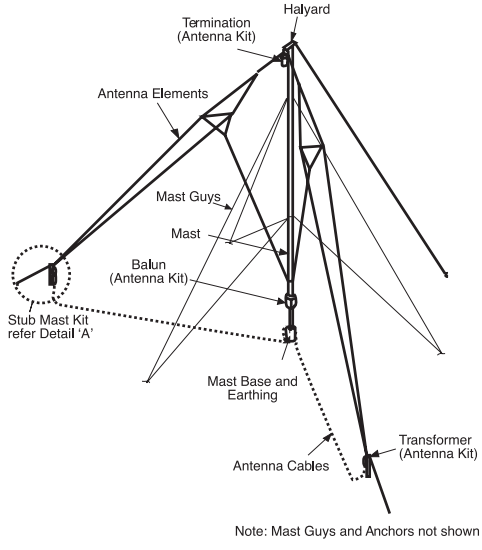

Fig 17 Directional Delta Antenna (DDC Series)

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To enhance the radiation in a particular direction, the two arms of a delta antenna can be moved around the mast as shown in Fig. 17. This model is known as a directional delta and extends the range of communication to up to 1600km or more. It is available to cover 2-30MHz and 3-30MHz and power ratings are from 1kW Av. to 4kW PEP.

The tandem delta (Fig. 18) is specifically designed for high grade short to medium distance circuits for communications and HF broadcasting. The tandem delta does not have a resistive termination at its apex. It is actually two delta antennas. One delta is terminated in another and so nearly 100% of the energy is radiated, giving the tandem delta a 2dB to 4dB gain over the standard delta. Power ratings are up to 80kW PEP.

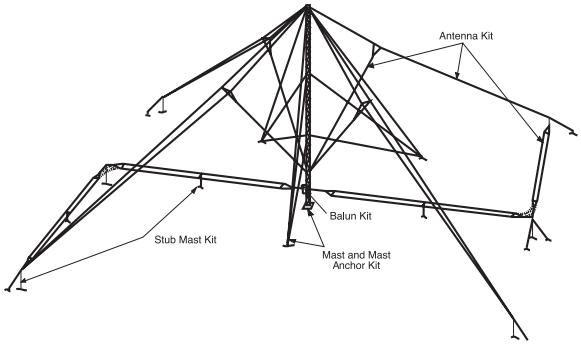

Fig 18 Tandem Delta Antenna (TDG Series)

Log-periodic Antennas

Wide-band antennas incorporating another principle are log-periodic antennas. These are of particular interest for high performance HF communication systems. They comprise an array of tapered dipoles with tapered spacing between adjacent dipoles where the tapering is constant (i.e. the ratio of adjacent dipole length and adjacent spacing is constant) in each model. The log-periodic dipole antenna is a resonant antenna. However, due to the tapered configuration, it is resonant at any operating frequency. Actually only three, four or five dipoles (the so called "active region"), which are close to resonance, operate at the incidental frequency.

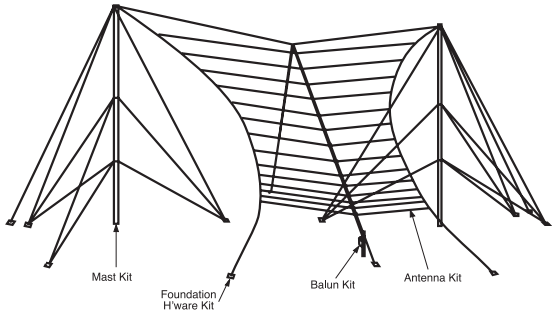

Fig 19 Horizontal Log Periodic Dipole Antenna (HLP Series)

The horizontal log periodic dipole array (Fig. 19) is for medium to long distance communication. It is available with a wide range of take off angles and gains. Power ratings are from 1 to 20kW Av. and frequency ranges are from 2-30MHz. No ground screen is required.

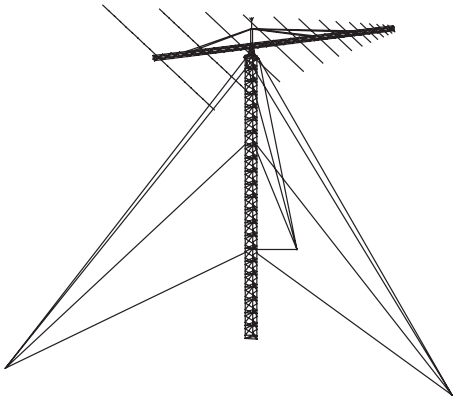

Fig 20 Rotatable Log Periodic Dipole Antenna (HLO Series)

A rotatable version of the horizontally polarized log periodic antenna is shown in Fig 20. This antenna can be used to achieve high quality transmission with some flexibility in selection of the transmission direction. The antenna is available in 4-30 MHz and 6-30 MHz versions with power ratings up to 10kW Av, 40KW PEP.

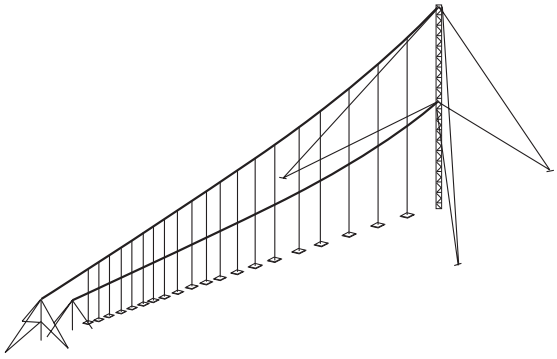

Fig 21 Vertical Log Periodic Dipole Antenna (VLP Series)

The vertically polarized version shown in Fig 21 provides a very low take-off angle for radiation that is ideal for long distance communication. Power ratings are from 1 to 20kW AV, 40kW PEP and frequency ranges are from 3.5-30MHz. For optimum performance, the low angle radiation can be enhanced by extending a ground screen for several wavelengths in front of the antenna.

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The electronically steerable log periodic dipole rosette (Fig. 22) is designed for shore-ship or ground-air communications. Four separate antennas share a common mast and operators can achieve full 360 degree coverage by switching power to the appropriate antenna. These antennas provide maximum opportunity to optimize circuit performance in the selected directions.

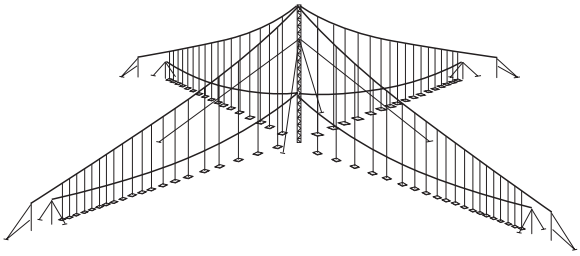

Fig 22 Vertical Log Periodic Dipole Rosette Antenna (VLPR Series)

Ground Screens

Ground screens have two main purposes:

- They form an essential part of vertically polarized monopole antenna systems (WM series, for example) by providing a return path for the current being fed to the monopole. In this application they are referred to as impedance stabilization ground screens, and typically extend radially for one-quarter wavelength at the lowest frequency of operation. They can be placed on the surface of the ground, or buried slightly below the surface, for convenience. Although not strictly required to stabilize impedance for other antenna types, they can improve the efficiency of vertical dipoles, and certain other antennas, by reducing ground losses.
- They can enhance the low angle radiation of vertically polarized antennas. Unfortunately, to be effective for this purpose, very large ground screens are required. These usually consist of grids or mesh of wires and typically extend 10 to 20 wavelengths in the required transmission direction. It usually requires a performance / cost trade-off analysis to determine if there is a need for such a screen. Note that the impedance stabilization ground screens are usually much too small to perform this function.

Conclusion

As can be seen, RFS manufactures a wide range of broadband antennas. Selecting the right antenna is crucial if the operational objectives of the system are to be realized. RFS can offer advice to ensure that the antenna selection is tailored to suit your individual requirements.

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