

FreeWave Technologies Inc.

1880 S. Flatiron Court, Suite F
Boulder CO 80301

August 8, 2003

**RE: Grantee Code KNY
 FCC ID No. KNY-6231812519
 Model No. DGR09RMS
 Request for Class II Permissive Change**

The antenna's specifications

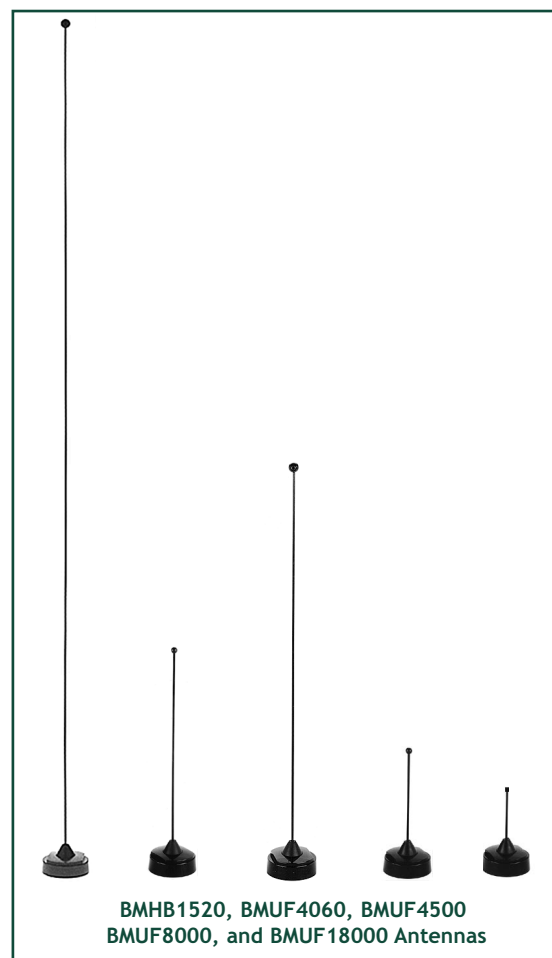
Manufacturer	Part Number	Pages
Maxrad	MUF9000	2-3
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Chrome Nut Antennas

These antennas feature a super flexible design that protects the .062" diameter rod against damage that can be caused by limited vehicle height clearance. They also include a rubber seal gasket to prevent water leakage. All models are available in bright chrome or black finish.

Features

- Economical
- Flexible rod
- Ready to install; no rod cutting is required
- Available in either bright chrome or black finish
- Antenna includes rubber seal gasket to prevent water leakage
- Mates with all 1-1/8"-18 thread mounts, including 3/4" mounts



Multiple Bands

Electrical Specifications

Maximum Power:

150 Watts: UHF and VHF models

100 Watts: PCS, DCS, 700, 800 and 900 MHz models

VSWR at Resonant Point:

<1.5:1

Nominal Impedance:

50 Ohms

Antenna Type:

1/4 Wave (all models except 800/900 MHz colinears)

5/8 Wave over a 1/4 Wave (800/900 MHz colinear)

Mechanical Specifications

Radiator Material:

.062" diameter stainless steel, bright or black finish

Mount Nut:

Brass; bright or black chrome finish

Antenna Height:

(B)MUF19000: 1-1/2" at 1.9 GHz

(B)MUF18000: 1-5/8" at 1.8 GHz

(Approximate height at lowest frequency)

(B)MUF7000: 3.3"

(B)MUF8063: 14-1/2"

(B)MUF8253: 14"

(B)MUF8963: 12"

(B)MUF9093: 12-3/8"

All collinear models: 2.9"

All UHF models: 7-3/8"

All VHF models: 21-5/8"

Chrome Nut Antennas

Model #	Frequency Range	Factory Tuned Frequency	Gain	List Price Chrome Models	List Price Black Models
(B)MUF19000	1850-1990 MHz	1900 MHz	Unity	\$7.84	\$14.10
(B)MUF18000	1710-1880 MHz	1800 MHz	Unity	\$7.84	\$14.10
(B)MUF9000	896-940 MHz	898 MHz	Unity	\$7.84	\$14.10
(B)MUF8000	806-896 MHz	835 MHz	Unity	\$7.84	\$14.10
(B)MUF7000	760-870 MHz	811 MHz	Unity	\$7.84	\$14.10
(B)MUF9093	870-950 MHz	898 MHz	3 dB	\$12.00	\$18.35
(B)MUF8963	896-940 MHz	898 MHz	3 dB	\$12.00	\$18.35
(B)MUF8253	825-896 MHz	835 MHz	3 dB	\$12.00	\$18.35
(B)MUF8063	806-866 MHz	815 MHz	3 dB	\$12.00	\$18.35
(B)MUF4900	490-512 MHz	501 MHz	Unity	\$7.84	\$14.10
(B)MUF4700	470-490 MHz	480 MHz	Unity	\$7.84	\$14.10
(B)MUF4500	450-470 MHz	460 MHz	Unity	\$7.84	\$14.10
(B)MUF4300	430-450 MHz	440 MHz	Unity	\$7.84	\$14.10
(B)MUF4060	406-430 MHz	418 MHz	Unity	\$7.84	\$14.10
(B)MUF3800	380-406 MHz	393 MHz	Unity	\$7.84	\$14.10
(B)MHB2200	220-225 MHz	222 MHz	Unity	\$7.84	\$14.10
(B)MHB1620	162-174 MHz	167 MHz	Unity	\$7.84	\$14.10
(B)MHB1520	152-162 MHz	157 MHz	Unity	\$7.84	\$14.10
(B)MHB1440	144-152 MHz	148 MHz	Unity	\$7.84	\$14.10
(B)MHB1360	136-144 MHz	140 MHz	Unity	\$7.84	\$14.10

Prefix "B" indicates black

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2 year warranty
Made in the USA

3dB Gain Omnidirectional Antenna - Model V-9183 902-928 MHz

Advantages

- This is a rugged 3dB gain omni optimized for wide bandwidth, all-weather performance. The broad vertical beamwidth provides wide area coverage and no field tuning is required to obtain maximum performance.
- Astron's all-brass center fed dipole delivers a clean radiation pattern without ground radials.

Features

- Encased in a heavy wall fiberglass radome for superior weather resistance.
- Flexible feedline with N Female termination simplifies the final installation.
- Stainless steel V-Bolts and custom V-Blocks for easy and secure mounting.
- Individually factory tested.

ELECTRICAL SPECIFICATIONS

Frequency Range, MHz	902-928
Gain, dBd	3 dB
VSWR (50 Ohms)	1.5:1 typical
1.5:1 bandwidth, MHz	26 minimum
3 dB Beamwidth E/H Planes, degrees	33/360
Maximum Power, watts	50*
Termination, feet (m), coax	N Female, 1 (.3), RG58 type
Polarization	Vertical
*Limited by feedline. Higher power ratings are available as an option.	

MECHANICAL SPECIFICATIONS

Overall Length, inches (cm)	30 (76)
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Radome Material	1.0" OD; .125" wall Fiberglass
Element Material	All-brass components
Mast Diameter, inches, (cm)	1.25-2.0 (3.2-5.1)
Mounting Hardware	Base to mast, supplied
Wind Surface Area, feet² (m²)	.14 (.013)
Wind Survival, mph (kph)	150 (240)
Weight, pounds (kg)	2.0 (.9)

ASTRON specializes in designing and manufacturing custom antennas. If this particular antenna does not meet with your requirements, **ASTRON** can provide you with other antenna solutions optimized to your specific application. This antenna is available in various frequencies.

[Astron Wireless Technologies, Inc.](#)
22560 Glenn Drive, Suite 114 , Sterling, Virginia 20164-4440
Voice: 703.450.5517 Fax:703.450.9753 [Commercial Sales](#)
or call **Toll Free: 1-877-567-7646**



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Low Profile "Disc" Antenna
800/900/2400 MHz



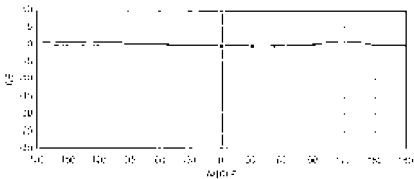
Advantages

- Broadband Performance
- Low Profile, Economical Design
- Designed for Indoor & Outdoor Use
- Rugged UV ABS Stable Radome
- Easy to Mount

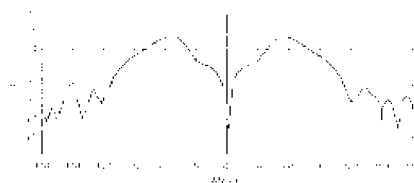
Electrical Specifications

Frequency	*824-896, 890-940,806-866, 2400-2500 MHz
Element Type	Edge Slot Radiator
Polarization	Vertical
Gain (min)	+3 dBi
Azimuth	Omnidirectional
Elevation	Cosine Shaped Monopole
VSWR	<1.5:1 @ resonance 2:1
Impedance	50 Ohm
Power	100 Watts
Cable Type	RG-58U

Azimuth Pattern



Elevation Pattern



Mechanical Specifications

Connector	Several Types Available
Mounting	Base Mounting Plate, Adhesive Backed
Wind Survival	150 MPH
Temperature	-40° to 160°F
Dimensions	3.0" Dia. Top, 4.5" Dia. Base, 0.62" Height
Weight	<1 lbs

*Please note: Model No. PCNLP-08V is for the 824-896 MHz frequency range, Model No. PCNLP-09V is for the 890-940 MHz frequency range, Model No. PCNLP-08V1 is for the 806-866 MHz Frequency Range and Model No. PCNLP-24V is for frequency 2400-2500 MHz.

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Astron Wireless Technologies, Inc.
22560 Glenn Drive, Suite 114 , Sterling, Virginia 20164-4440
Voice: 703.450.5517 Fax: 703.450.9753 [Commercial Sales](#)

EXR

Part Number (P/N):

EXR150 + Connector
EXR450 + Connector
EXR806 + Connector
EXR821 + Connector
EXR902 + Connector

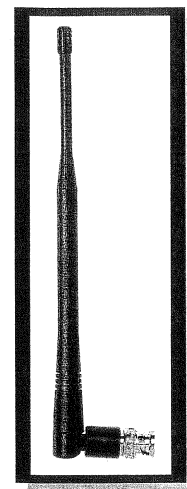
Features:

- Injection molded flexible right angle antenna
- 1/4 wave antenna in VHF and UHF and a 1/2 wave antenna in
- High durability, high efficiency
- Textured finish with adjustable 0-90° elbow
- Allows for 360° movement
- Available in various standard connectors
- An original 'Tuf Duck' antenna

Specifications:

All Centurion products are designed for maximum efficiency and are customizable and scalable to meet your frequency and application requirements.

Frequency Range	VHF UHF Trunking/ Cellular
Polarization	Vertical
Nominal Impedance	50 ohms
VSWR	1.5:1 max at resonance
Power Rating	50 watts
Temperature Range	-40°C to +85°C
Drop Test	1M



EXR806BN

The EXR model antenna is available in the following frequencies and connectors. Order by antenna model, frequency and connector. For example: EXR806TN. Length of each antenna will vary according to the connector chosen.

Part Number	Frequency Band	Connectors	Average Length (inches)	Color Code
EXR-150	150-162 MHz	BN	7.70	-
EXR-450	450-470 MHz	BN & TN	6.62 – 6.95	-
EXR-806	806-869 MHz	BN, MU & TN	9.25 – 9.50	-
EXR-821	824-896 MHz	BN	9.16	Yellow
EXR-902	902-960 MHz	BN & TN	8.85 – 9.03	Green

Specifications subject to change without notice

EXR 3 - 4/29/03

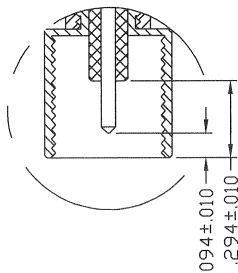


ALL DIMENSIONS ARE IN INCHES

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SECTION A-A

APPROVED

ALL DIMENSIONS ARE IN INCHES

- GAIN: UNITY (>2.5dBd)
VSWR 1.5:1 MAX AT RESONANCE
POWER RATING: 50 WATTS
IMPEDANCE: 50 OHMS NOMINAL
OPERATING TEMPERATURE: -40°C TO +85°C
LINEAR PULL: 22lbs (10kg) MINIMUM

OPERATING TEMPERATURE: -40°C TO +85°C											
LINEAR PULL: 22lbs (10kg) MINIMUM											
CENTURION PART NO.	FREQUENCY CODE	FREQUENCY RANGE	COLOR CODE	LET	REVISION	DATE	CK	APP	SCALE:	2:1	TOL. UNLESS NOTED:
											XXX = .005
				A	EC090155	10/90	BT		DR: SP	CK:DW	XXX = .0105 ANGULAR ± .30°
				B	EC092413	08/92	SP				PH 402-467-4429 FAX 402-467-4528 1000 RD., #26450 LINCOLN, NE 68501
EXS-806-TN	806MHZ	806-866MHZ	NONE	C	EC093697	06/93	MS				
CXS-8821-TN	821MHZ	824-896MHZ	YELLOW	D	EC0931295	10/93	DM				
CXS-872-TN	872MHZ	872-950MHZ	BROWN	E	EC0931376	11/93	MS				
CXS-802-TN	902MHZ	896-941MHZ	GREEN								
CXS-950-TN	950MHZ	950-1000MHZ	RED								
CAF5304	821MHZ	824-896MHZ	BLUE								
MATERIAL:										N/A	
CENTURION INT., INC.										ANT.,CELL,HELICAL,CXS-TN	
DATE:				10/17/90				DVG NO.:		PG: REV:	
								CAF29250		1/2 E	

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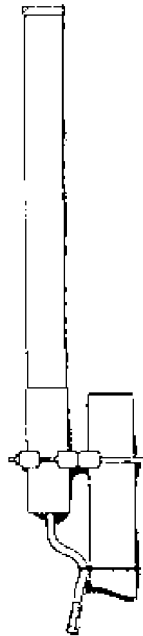


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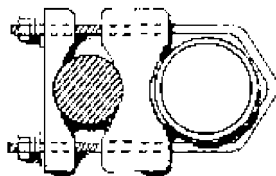
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2 year warranty

Omnidirectional Antenna - Model V-9180 902-928 MHz

Advantages

- This is a rugged unity gain omni optimized for wide bandwidth, all-weather performance. The broad vertical beamwidth provides wide area coverage and no field tuning is required to obtain maximum performance.
- Astron's all-brass center fed dipole delivers a clean radiation pattern without ground radials.

Features

- Encased in a heavy wall fiberglass radome for superior weather resistance.
- Flexible feedline with N Female termination simplifies the final installation.
- Stainless steel V-Bolts and custom V-Blocks for easy and secure mounting.
- Individually factory tested.

Electrical Specifications

Frequency Range, MHz	902-928
Gain, dBd	Unity
VSWR (50 Ohms)	1.2:1 typical
1.5:1 bandwidth, MHz	26 minimum
3 dB Beamwidth E/H Planes, degrees	77/360
Maximum Power, watts	50*
Termination, feet (m), coax	N Female, 1 (.3), RG58 type
Polarization	Vertical
*Limited by feedline. Higher power ratings are available as an option.	

Mechanical Specifications

Overall Length, inches (cm)	12.0 (30.5)
Radome Material	1.0" OD; .125" wall Fiberglass
Element Material	All-brass components
Mast Diameter, inches, (cm)	1.25-2.0 (3.2-5.1)
Mounting Hardware	Supplied
Wind Surface Area, feet ² (m ²)	.071 (.007)
Wind Survival, mph (kph)	150 (240)
Weight, pounds (kg)	1.5 (.68)