TECHNICAL MANUAL FOR
Advanced Antennas LPD – 100M1G Log Periodic Antenna
100 - 1100 MHz

ADVANCED ANTENNAS

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SECTION 1. GENERAL DESCRIPTION

The LPD-100M1G is a collapsible, lightweight, medium-gain, log-periodic array designed to transmit or receive over the frequency range of 100 MHz to 1.1 GHz. It is linearly polarized, and its construction allows orientation of polarization in any plane with an optional universal joint (see Figure 1-2). The log-periodic design produces a linear polarized antenna with very broadband characteristics and a unidirectional radiation pattern.

The LPD-100M1G is characterized by an unusually high front-to-back ratio well in excess of 20 dB at all frequencies in the band. The VSWR is excellent over the entire band (see Figure 2-1). The power gain varies somewhat with frequency, averaging about 6 dBi over the band (see Figure 2-2). The antenna can be used to make accurate electric field strength measurements, and for this purpose an individually calibrated antenna factor (AFE) curve can be optionally provided with each antenna. For a typical antenna factor curve, see Figure 2-3.

The LPD-100M1G is capable of handling a substantial amount of power for use with a transmitter. The amount of CW power that can be applied is limited primarily by heating in the cable, is higher at the low frequencies than at the high end of the band. The peak power handling is limited by the voltage developed in the connectors and at the feed point, is a function of the VSWR. Although the antenna is weather resistant, power should be applied only with discretion when the structure is wet.

The LPD-100M1G is supplied in kit form for compactness in packaging. No tools are required for assembly. The boom comes in three sections, which are held together by metal inserts attached to the middle and front sections of the boom. There are no parts which are longer than 30.5”.

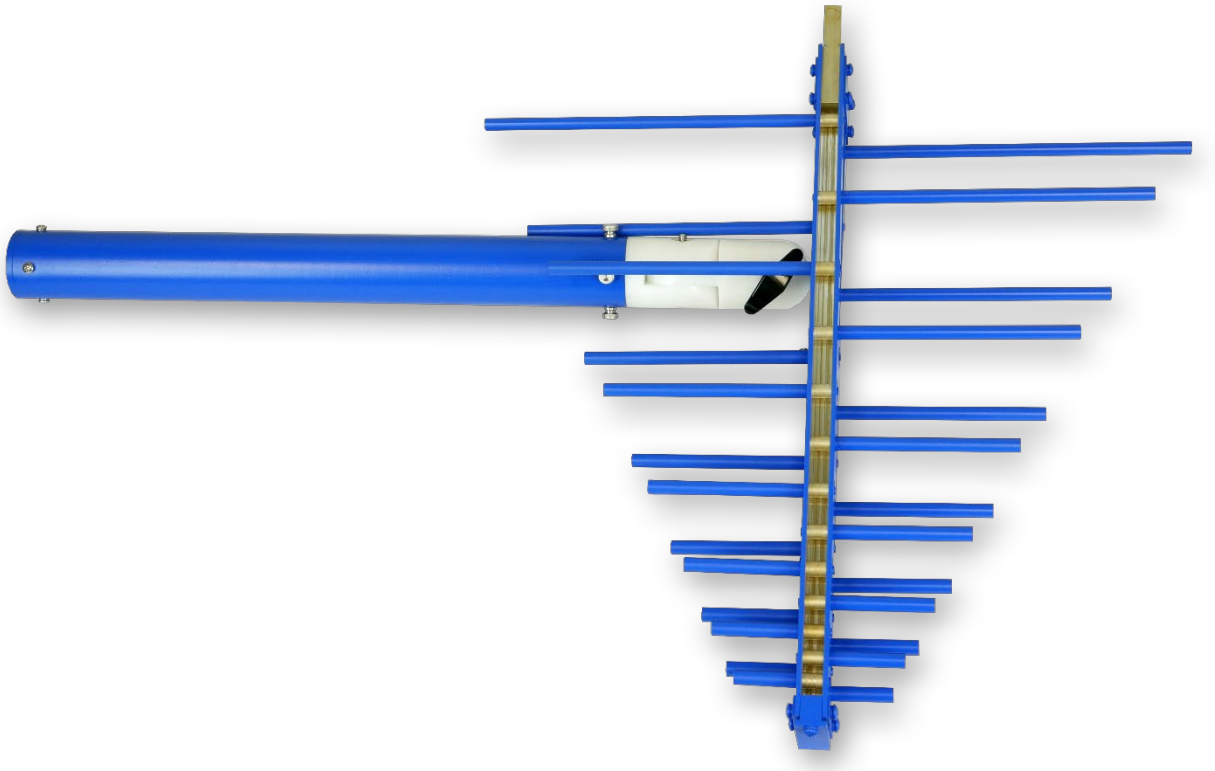

Figure 1-1 The LPD-100M1G (Vertical Polarization)

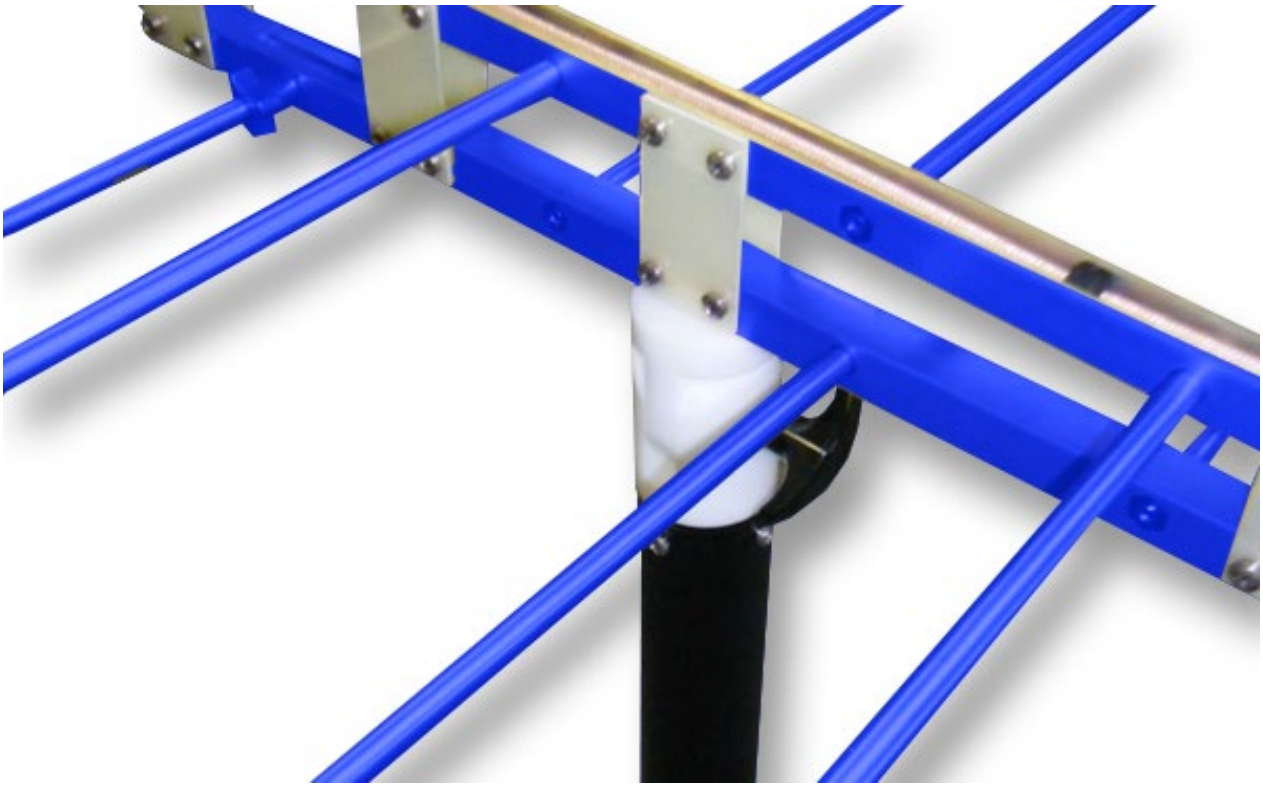

Figure 1-2 The LPD-100M1G (Optional Polarization U-Joint Detail)

SECTION 2. TECHNICAL SPECIFICATIONS

2.1. Electrical Specifications

Frequency Range:	100 MHz to 1.1 GHz.
Output Impedance:	50 Ohms Nominal.
VSWR:	2.0: 1 Typical (see Figure 2-1).
Gain:	6 dBi Typical (see Figure 2-2).
Radiation Pattern:	Unidirectional beam off tip of antenna, in E and H Planes.
3 dB Beam width:	
E-Plane:	75°.
H-Plane:	120°.
Front to Back Ratio:	20 dB Minimum, 25 dB Typical.
Beam Direction:	Continuously adjustable elevation ±90° from horizontal (with optional universal joint).
Polarization:	Linear (continuously adjustable ±90° from horizontal, with optional universal joint).
RF Connector:	Type N Female.
Antenna Factor:	6 dB/m to 26 dB/m over the band (see Figure 2-3).
Transmitting Power:	1,400 Watts CW to 640 Watts CW over the band.

2.2. Mechanical Specifications

Antenna Dimensions (Maximum):

Length:	60” (152 cm).
Width:	60” (152 cm).
Height (without mast):	5” (13 cm).
Height (with mast):	25” (64 cm).
Weight:	7.6 lbs. (3.5 kg).
Mounting:	One ¼-20 hole on mast base.
Universal Joint (Optional):	Delrin, with slide-handle type screws for firm, easy locking in any position.
Material:	Aluminum, G10 Fiberglass, Delrin, Brass, & Stainless Steel.
Finish:	Gold Iridite

2.3. Typical Data

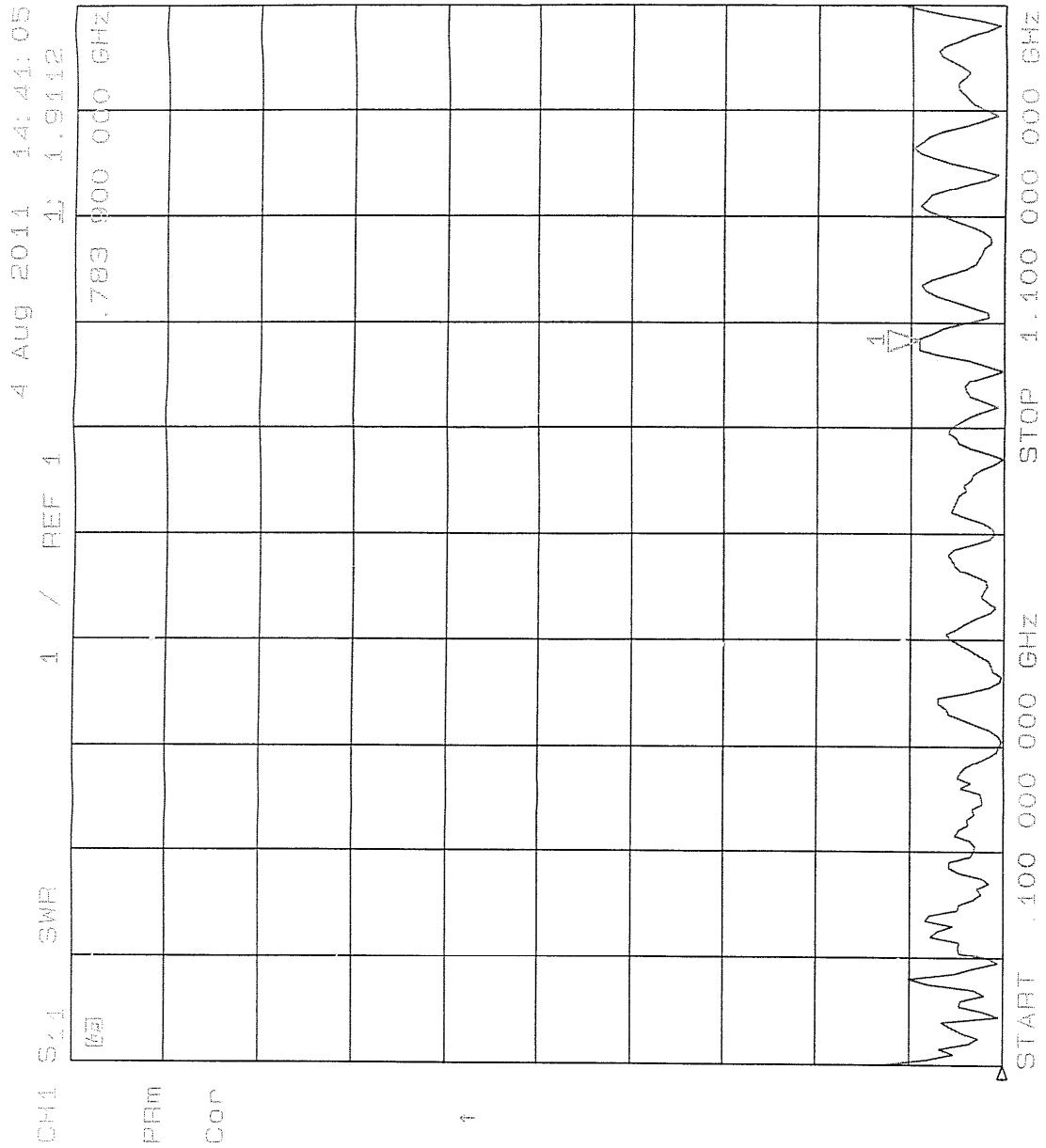

Figure 2-1 LPD-100M1G Typical VSWR Plot

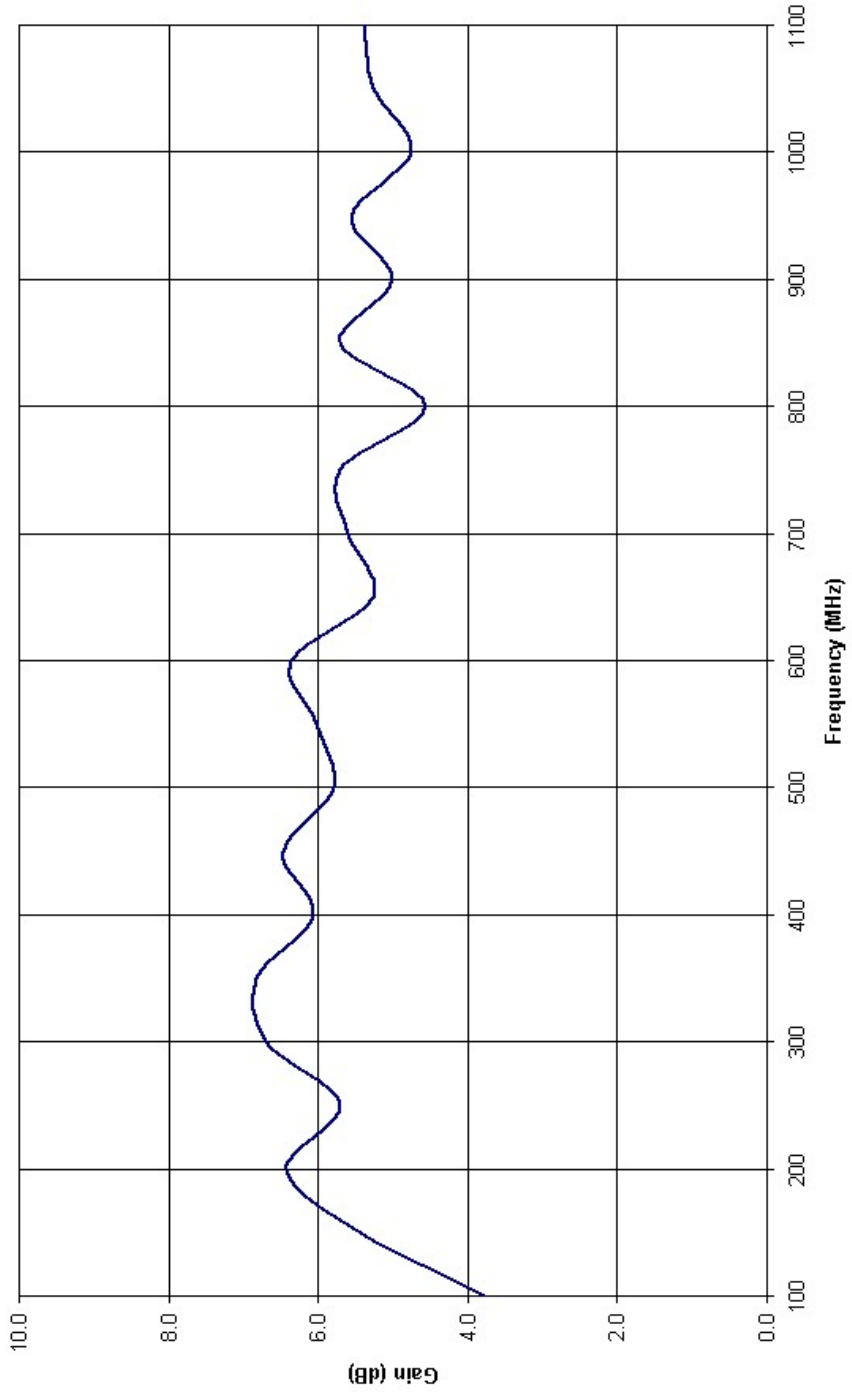

Figure 2-2 LPD-100M1G Typical Gain Plot

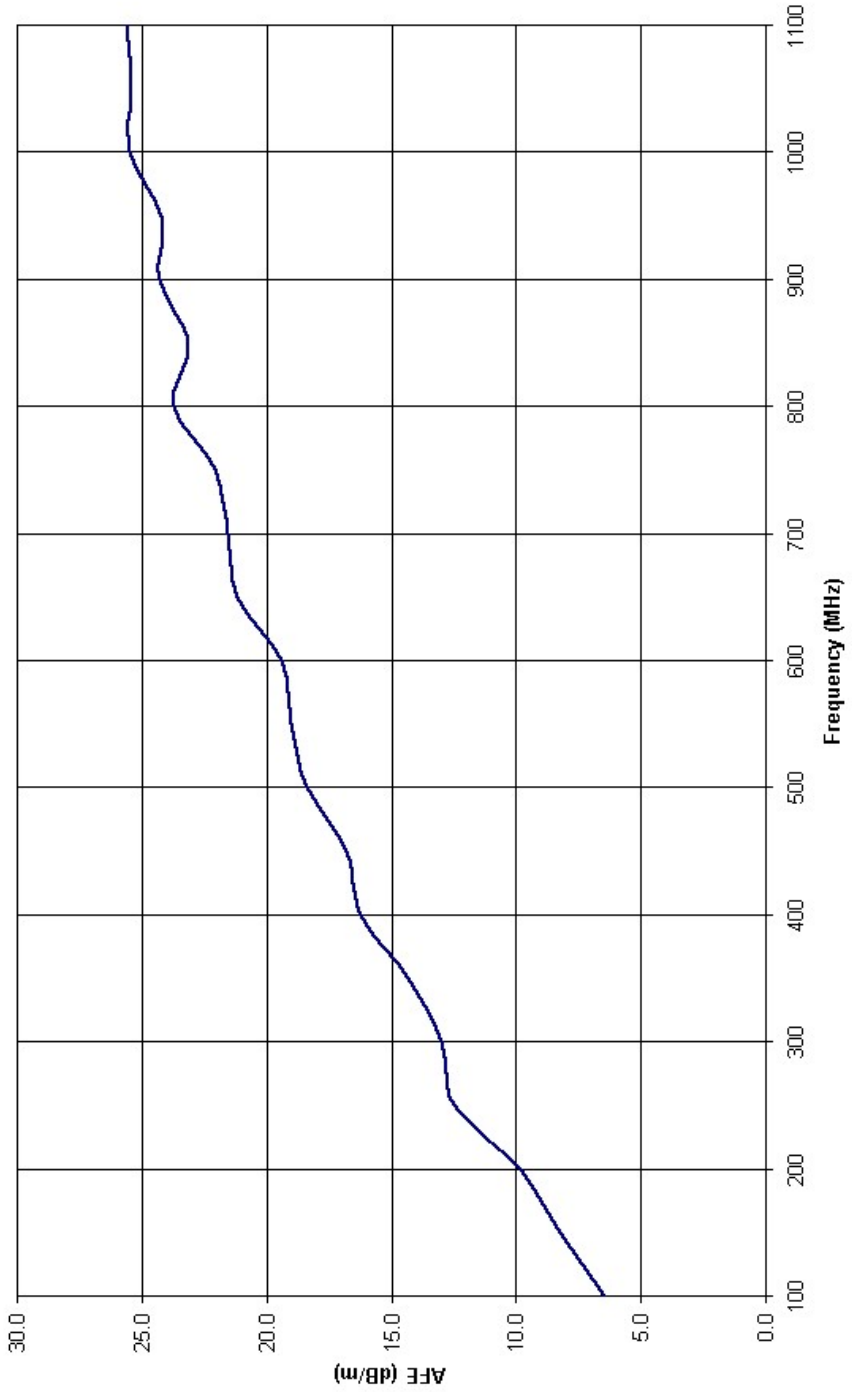

Figure 2-3 LPD-100M1G Typical AFE Plot

SECTION 3. THEORY

3.1. General

The LPD-100M1G is a backward traveling wave structure. It has a unidirectional beam pattern with its maximum gain off the tip of the structure in the direction of the boom axis.

Such antennas act as directional traveling-wave couplers, which require quasi-plane traveling wave field conditions in order to respond according to specifications in a receiving application. The antenna cannot be used to measure E-field intensity dependably in applications where the incident field is other than predominantly plane traveling-wave, because the reception sensitivity is dependent upon direction. A mixed field, comprised possibly of many plane-wave components arriving from different directions, cannot produce a response from the antenna proportional to the resultant E-field at the point at which the antenna is stationed. In the case of Tempest and RFI measurements, a minimum distance of the order of D^2 / λ must be provided between the active region of the antenna and the point at which a source is centered for the antenna to respond accurately. Here, D is the dominant dimension of the source, and λ is the wavelength of the signal measured in the same units as D. If the source is elevated above a ground plane, images exist which effectively increase the size of the source, making larger distances necessary to achieve a satisfactory approximation to a plane wave.

On some occasion it may be desirable to know the distance of the active region of the antenna from the received signal source. In the case of a log periodic antenna, the active region for the lowest frequency is near the rear of the antenna where the elements are long. The active region moves gradually forward with increasing frequency.

3.2. Field Measurement

The Power gain G, relative to an isotropic antenna, and the E-Field antenna factor AFE are related by

$$AFE\ (dB/m) = 20*\log_{10}f - G\ (dBi) - 29.78 \quad \text{(Equation 3-1)}$$

where f is frequency in MHz. The E-field antenna factor AFE for a directional antenna is defined as the ratio of the field intensity E (volts/meter) of an incident plane traveling wave, to the output voltage V_O of the antenna across a specified terminating resistance, when the antenna beam is pointed in the direction of arrival of the wave. The formula given above is valid only for a 50ohm termination.

Individually calibrated antenna factor curves can be provided as an option (see Figure 2-3 for typical antenna factor calibration data) and can be used to measure electric field strengths. To measure the electric field strength, first set up the antenna (see Section 4). Make sure the RF output of the antenna is connected to the receiver. The incident electric field strength seen by the antenna, denoted by E, is then determined from the voltage level V_O at the receiver (when the output connector of the antenna is matched to 50 ohms). E is the electric field component that is parallel to the antenna dipole elements. The quantities E and V_O are related through the frequency-dependent electric field antenna factor (AFE) by

$$E\ (V/M) = AFE\ (1/m) \times V_O\ (V). \quad \text{(Equation 3-2)}$$

Converting Equation 3-2 into decibel form gives

$$E\ (dB\ V/m) = AFE\ (dB/m) + V_O\ (dB\ V). \quad \text{(Equation 3-3)}$$

SECTION 4. ASSEMBLY & SETUP

4.1. Antenna Assembly

1. Lay out the three boom sections with the cable and connector mount at the top of the assembly (see Figure 4-1 & 4-2). Fit the three sections of the boom together. Do not press the cable into place unless the booms are securely fastened together.
2. If the elements are not yet installed on the boom sections, lay the elements out by pairs in order of increasing length. There are 20 pairs of elements.
3. Fasten the elements to the assembled boom in order of increasing length. The longest elements are located closest to the connector mount. Make sure that each element passes through one wall of the boom channel and securely fastens to the other wall. The elements with the knobs serve the additional purpose of clamping the three boom sections together.
4. Once the elements with knobs are installed, it is safe to install the cable. Attach the cable connector to its mount and tighten the knurled thumbnut provided (see Figure 4-2). Press the cable into the top boom, working from the front of the antenna to accumulate slack toward the connector at the rear (see Figure 4-3). Avoid tensioning the cable or bending it sharply at the connector.
5. Recheck all elements for tightness. The antenna assembly is now complete.

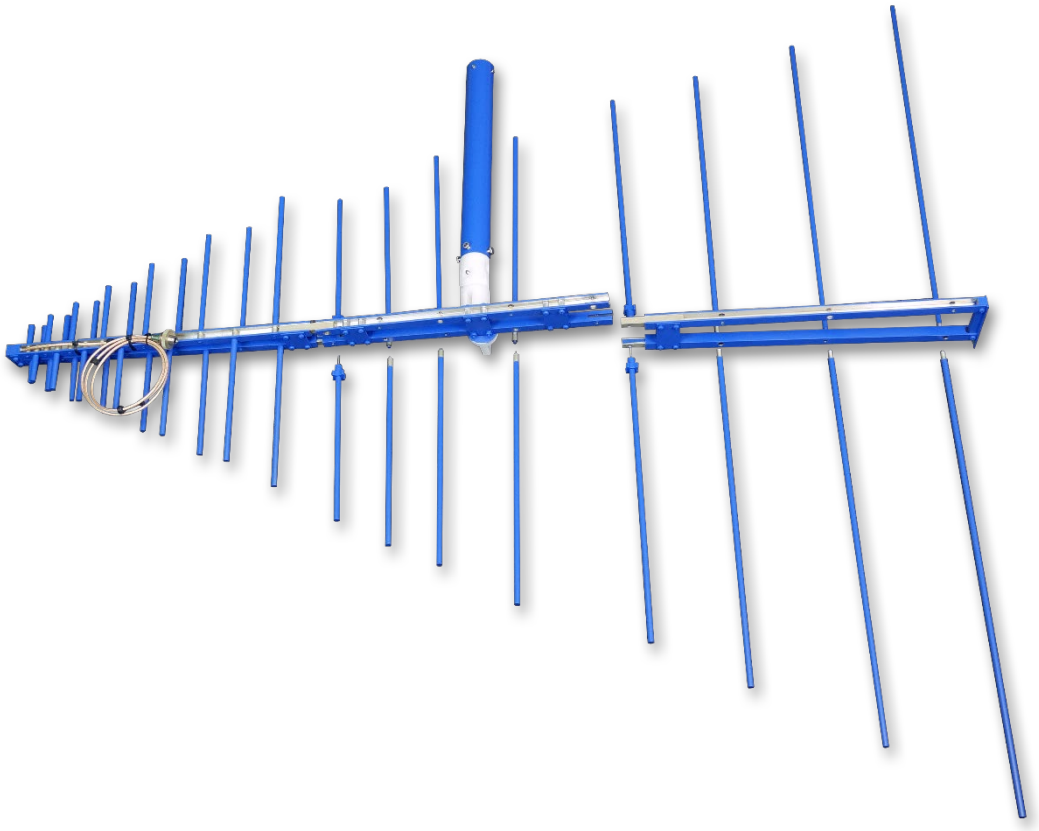

Figure 4-1 LPD-100M1G Assembly

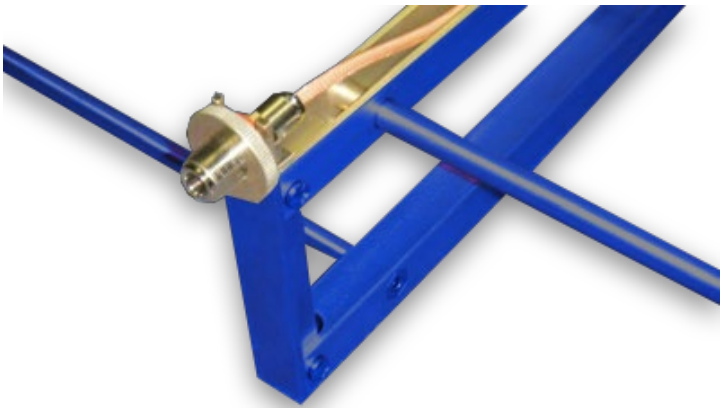

Figure 4-2 LPD-100M1G Connector Detail

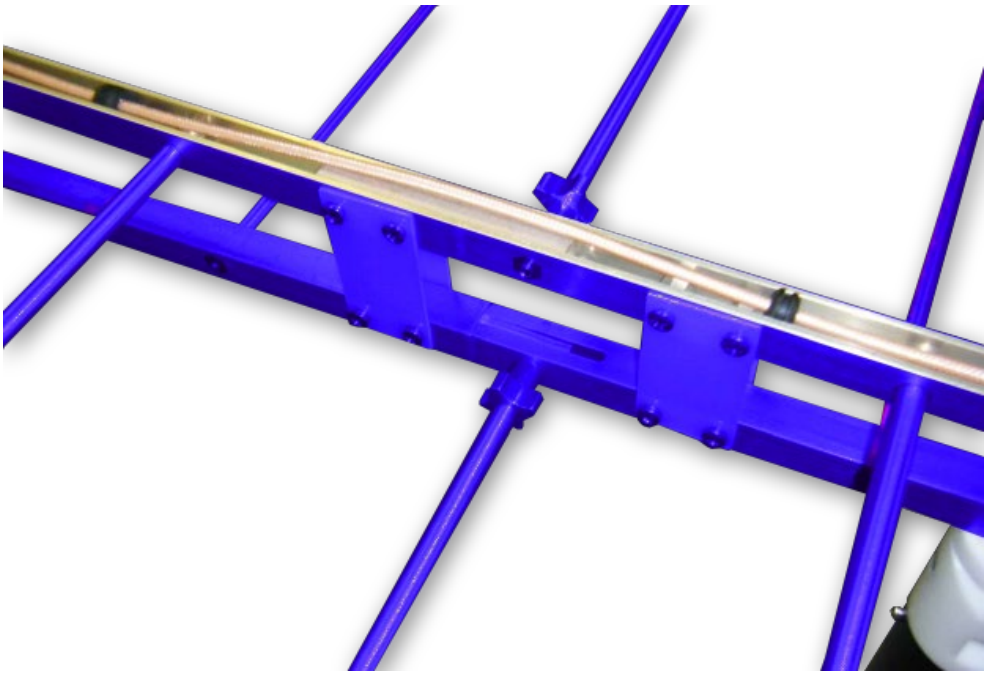

Figure 4-3 LPD-100M1G Boom Joint & Cable Grommet Details

4.2. Setup

Mount the LPD-100M1G using the provided ¼-20 hole on the bottom of the mast. Connect the RF output of the antenna (Type N Female; see Figure 4-2) to the receiver or test equipment using an appropriate coaxial cable. If using the optional Polarization U-Joint, adjust the polarization angle as necessary. The antenna is now ready for use.

SECTION 5. MAINTENANCE & TROUBLESHOOTING

5.1. General Maintenance

The design of the LPD-100M1G antenna is such that little or no maintenance is required under normal usage. Physical damage to the structure (bent elements, etc.) should be repaired prior to placing the antenna in service. It should be clean, especially at the nose of the boom.

5.2. Troubleshooting

If the antenna should fail to operate properly, a few simple tests will quickly isolate the trouble. The first test consists of a close visual inspection of the coaxial connector at the rear, and of the assembly details at the nose of the boom. The inside part of the connector may have been damaged.

Assuming the antenna is assembled, the second test is to measure the resistance of the connector, using an ohmmeter or other means. One should find a short circuit because of the metal bridge that connects the two booms of the antenna together at the rear of the antenna. If an open circuit is found, either a bad connector or a break at the nose feed point is the probable cause. The connector is more likely the culprit because of the flection of the cable at the connector during assembly and disassembly of the antenna. The nose construction is very durable, and capable of withstanding hard usage.

The third test is to repeat the cable continuity test, but with the antenna disassembled. This removes the short circuit across the booms, and one should find a DC open circuit. If a short circuit still exists, either the connector or the nose connection may be assumed shorted. Reinspect the nose construction for possible obscure damage, flex the cable at the connector while observing the test meter, and finally take the connector apart carefully to examine for the cause of the (possibly intermittent) short.

5.3. Maintenance Service Requests

Repair as indicated or return to factory for service. Address requests for replacement parts or service to:

ADVANCED ANTENNAS

10401 Roselle Street

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SECTION 6. REPLACEABLE PARTS LIST

When placing orders, please include the following information: Model Number, Part Number, Serial Number, Color, and Description of the item.

Example:	Model Number:	LPD-100M1G
	Part Number:	AA-LPD-100M1G
	Serial Number:	000
	Color:	Blue
	Description:	ELEMENT CLAMP ASSY, LPD-100M1G, 20.043

The following are replaceable parts lists. All assembly hardware is American Standard for Unified Screw Threads.

Part Number	Description
AA-LPD-100M1G	LOG-PERIODIC ANTENNA, 100 MHz TO 1.1 GHz
21303	BOOM COUPLER
21301	BOOM COUPLER
30692-3	FEED END ASSY
21228	LPD MAST ADAPTER
30698	OPTIONAL UNIVERSAL-JOINT ASSEMBLY
21234-2	MAST, 17.50”
21265	MAST BASE

Table 6-1 LPD-100M1G Replaceable Parts List

Part Number	Description
21255-10	ELEMENT, LPD-100M1G, 30.250
21255-11	ELEMENT, LPD-100M1G, 26.367
21255-12	ELEMENT, LPD-100M1G, 22.986
21232-3	ELEMENT CLAMP ASSY, LPD-100M1G, 20.043
21255-14	ELEMENT, LPD-100M1G, 17.480
21255-15	ELEMENT, LPD-100M1G, 15.250
21255-16	ELEMENT, LPD-100M1G, 13.308
21232-4	ELEMENT CLAMP ASSY, LPD-100M1G, 11.618
21255-18	ELEMENT, LPD-100M1G, 10.146
21255-19	ELEMENT, LPD-100M1G, 8.865
21255-20	ELEMENT, LPD-100M1G, 7.750
21255-21	ELEMENT, LPD-100M1G, 6.779
21255-22	ELEMENT, LPD-100M1G, 5.934
21255-23	ELEMENT, LPD-100M1G, 5.198
21255-24	ELEMENT, LPD-100M1G, 4.558
21255-25	ELEMENT, LPD-100M1G, 4.000
21255-26	ELEMENT, LPD-100M1G, 3.515
21255-27	ELEMENT, LPD-100M1G, 3.092
21255-28	ELEMENT, LPD-100M1G, 2.724
21255-29	ELEMENT, LPD-100M1G, 2.404
21255-30	ELEMENT, LPD-100M1G, 2.125

Table 6-2 LPD-100M1G Replaceable Elements List

WARRANTY

All equipment manufactured by **Advanced Antennas** is warranted against defects in materials and workmanship for a period of one year from the date of shipment. **Advanced Antennas** will repair or replace any defective item or material if notified within the warranty period.

You will not be charged for warranty services performed at our factory. You must, however, prepay inbound shipping costs. This warranty does not apply to:

a) Products damaged during shipment EX-WORKS our plant

b) Products which have been improperly installed

c) Products which have been improperly used (operated outside the specification)

d) Products which have been improperly maintained

e) Consumable items such as batteries, lamps, fuses, customer replaceable solid-state components, etc.

f) Products which have been modified

g) Normal wear of materials

h) Calibration of products

Any warranties or guarantees, whether expressed or implied, that are not specifically set forth herein, will not be considered applicable to any equipment sold or otherwise furnished by **Advanced Antennas**. Under no circumstances does **Advanced Antennas** recognize or assume any liability for any loss, damage or expense arising either directly or indirectly from the use or handling of products manufactured by **Advanced Antennas**, or any inability to use them separately or in combination with other equipment or materials.

The warranty is void if items are shipped outside the U.S.A. without prior knowledge of **Advanced Antennas**.

A return authorization is required for repairs under warranty. Please contact **Advanced Antennas** for additional information.

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