Model 3159C

High-Power Biconical Antenna

User Manual

ETS·LINDGREN®
An ESCO Technologies Company

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Revision Record

MANUAL,3159C HIGH POWER BI-CONICAL ANT | Part #399775, Rev. D

Revision	Description	Date
A	Initial Release	November, 2005
B	Rebrand	November, 2008
C	Update specifications	February, 2018
D	Update specifications, add extension information	July, 2020

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Notes, Cautions, and Warnings

	**Note:** Denotes helpful information intended to provide tips for better use of the product.
CAUTION	**Caution**: Denotes a hazard. Failure to follow instructions could result in minor personal injury and/or property damage. Included text gives proper procedures.
WARNING	**Warning**: Denotes a hazard. Failure to follow instructions could result in SEVERE personal injury and/or property damage. Included text gives proper procedures.

See the ETS-Lindgren *Product Information Bulletin* for safety, regulatory, and other product marking information.

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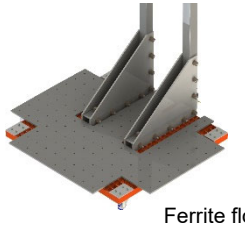
1.0 Introduction

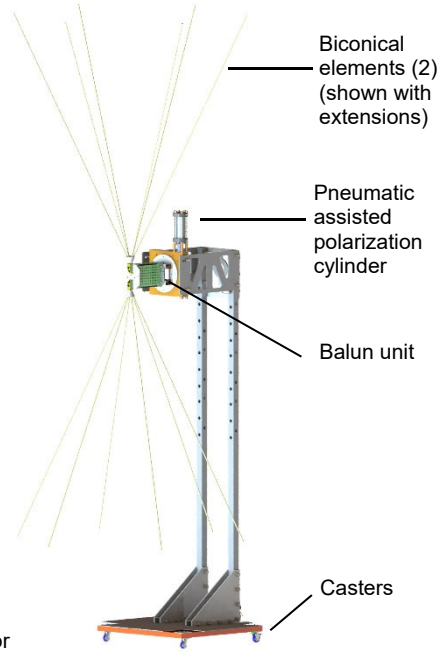
The **ETS-Lindgren Model 3159C High-Power Biconical Antenna** is a broadband, linearly polarized biconical antenna with a 20 MHz to 100 MHz frequency range. This antenna exhibits a wide beamwidth and is designed to handle up to 10 kW input power for generating high electric field strength over a large uniform area.

The standard configuration for the Model 3159C consists of:

- Two open-end biconical elements
- High-power balun
- Pedestal with polarization control



Ferrite floor



The pedestal allows antenna height and tilt-angle to be easily adjusted, plus features a wheeled base so that the antenna can be rolled out of the chamber and stored when not in use. Slots below the base allow for easy transport with a pallet jack or forklift. Horizontal and vertical polarization rotation is performed by a toggle switch on the back. The air valve assembly for pneumatic polarization is mounted onto the mast. The base is a steel plate covered in 137 ferrite tiles. Each tile has a 10 mm hole in its center.

Unlike the top hat, capacitive-loaded, log periodic dipole antenna normally used in this frequency range, the phase center/source distance is the same for low and high frequencies. This ensures high field strength at frequencies as low as 20 MHz. The design of the Model 3159C takes advantage of the wide beamwidth feature of a biconical antenna. In addition, the optimized design provides low VSWR and high radiation efficiency.

ETS-Lindgren Product Information Bulletin

See the ETS-Lindgren *Product Information Bulletin* included with your shipment for the following:

- Safety, regulatory, and other product marking information
- Steps to receive your shipment
- Steps to return a component for service
- ETS-Lindgren calibration service
- ETS-Lindgren contact information

2.0 Maintenance

CAUTION

Before performing any maintenance, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.

Maintenance of the Model 3159C is limited to external components such as cables or connectors.

If you have any questions concerning maintenance, contact ETS-Lindgren Customer Service.

- Check all screws periodically and tighten any that are loose.
- Check the air filters weekly; more often, as necessary. The air used to feed the cylinder must be free of dirt and moisture. Never allow the air filters to fill with water.
- Lubricate all O-rings and pistons at 18-month intervals to prevent excessive wear. The air cylinder uses a special O-ring lubricant that can be purchased from any seal or bearing store or from ETS-Lindgren.

Annual Calibration

See the *Product Information Bulletin* included with your shipment for information on ETS-Lindgren calibration services.

Service Procedures

For the steps to return a system or system component to ETS-Lindgren for service, see the *Product Information Bulletin* included with your shipment.

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3.0 Specifications

Electrical Specifications

Frequency:	20 MHz–100 MHz
Input Impedance:	50 Ω
VSWR:	• **Typical—**2:1 • **Maximum—**4:1
Average RF Input Power:	10 kW
Maximum RF Input Power:	15 kW
RF Connector:	1 5/8 in EIA flange

Physical Specifications

MODEL 3159C ANTENNA

Length:	5.4 m (17.7 ft)
Length without extension:	3.6 m (11.8 ft)
Length with one extension:	4.5 m (14.8 ft)
Length with both extensions:	5.4 m (17.7 ft)
Diameter:	2.4 m (7.9 ft)
Weight without extensions:	12.7 kg (28 lbs)
Weight with one extension:	14.06 kg (31 lbs)
Weight with both extensions:	15.42 kg (34 lbs)

MODEL 3159C PEDESTAL

Length:	4.47 m (14.7 ft)
Width:	160 cm (63 in)
Total height with antenna:	6.52 m (21.42 ft)
Weight (without antenna):	272.16 kg (600 lbs)
Air Pressure Required:	80–120 PSI

- **FERRITE FLOOR**

Length:	130 cm (51.18 in)
Width:	150.01 cm (59.06 in)
Individual tiles:	100 mm x 100 mm x 6.7 mm (3.94 in x 3.94 in x 0.26 in)
Weight:	113.40 kg (250 lbs)

4.0 Mounting Instructions

CAUTION **Before connecting any components, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.**

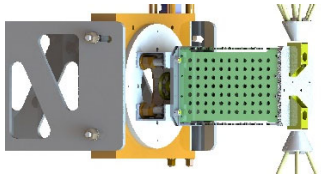
Do not cross thread connections or permanent damage could occur.

Mounting the Balun Unit

Due to the size of the Model 3159C biconical elements, you must mount the balun unit onto the pedestal prior to attaching the elements.

1. Align mounting channels to pedestal and fasten with stud and nuts.

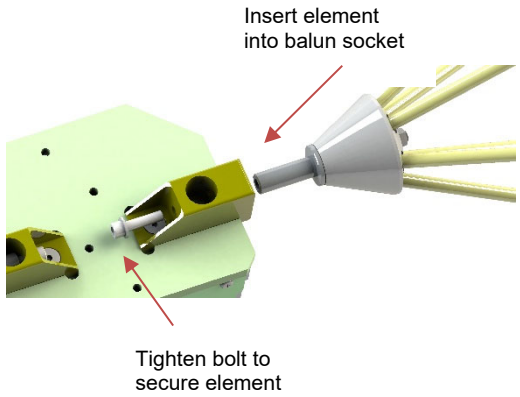
Align threaded holes on balun with holes on boom; then insert knobs.



2. Align balun to mounting channels and firmly secure with hex bolt, lock washer, and nut.

Mounting the Biconical Elements

1. Once the balun unit is securely connected to the boom, align the threads on one of the biconical elements with the receptacle on the end of the balun, and then turn the biconical element until it is firmly seated in the balun.

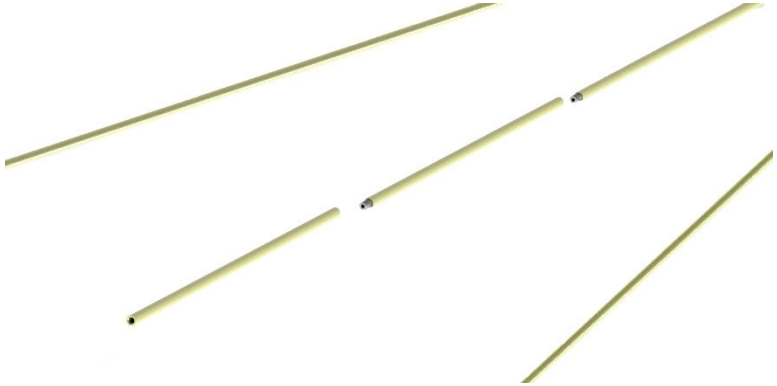


2. Tighten bolt to secure element.
3. Repeat steps for the remaining biconical element.
4. Once both elements are connected, attach the input cable to the connector on the bottom of the balun.

Adjusting the Tube Extensions

Each side has a main tube with two (2) screw on extensions.

1. To add and adjust the extensions, screw them onto the elements.
2. To remove the extensions, unscrew them from the elements.



Element Extensions

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5.0 Operation

CAUTION

Before connecting any components or operating the Model 3159C, follow the safety information in the ETS-Lindgren *Product Information Bulletin* included with your shipment.

The Model 3159C High-Power Biconical Antenna has a 4:1 Guanella balun for matching the impedance to the amplifier. The balun maintains a low operating temperature due to the efficient radiation pattern and high power design.

Model 3159C Pedestal

CAUTION

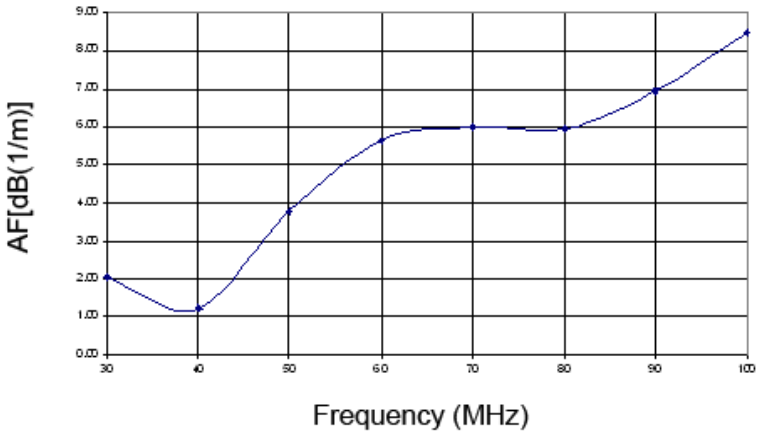
To prevent damage to the cables, you must disconnect the RF cables from the Model 3159C before polarization or movement of the boresight feature.

The Model 3159C pedestal has one air cylinder that controls the polarization movement of the antenna. The switch on the back of the pedestal toggles air control. Boresight is accomplished manually.

Electrical Field Distribution

The Model 3159C may be used for both horizontal and vertical polarization. It exhibits a dipole-like radiation pattern; for example, a toroidal shape with an omnidirectional pattern in the H-plane. In a low frequency range such as 30 MHz (wavelength l = 10 m), the equipment under test (EUT) is in the near field of the antenna, allowing the antenna to behave as a field generator.

TYPICAL ANTENNA FACTOR AT 6M



CALCULATED FORWARD POWER AT 3.5M

A calculation was used to derive the forward power data once the six-meter calibration was complete. The following equation was used to determine the power required to generate the desired field strength at a given distance when antenna factors are known:

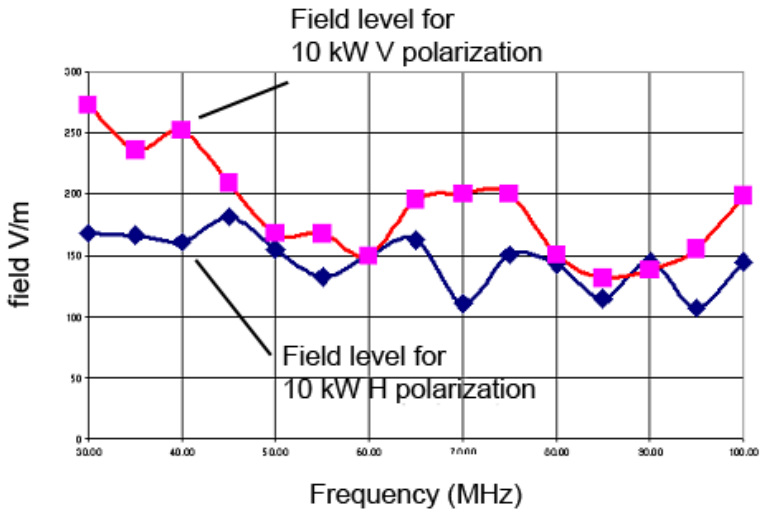
$$P\ dB(W) = 20 \log 10 \text{ [E desired (V/m)]}$$

$$+ 20 \log 10\ (dm)$$

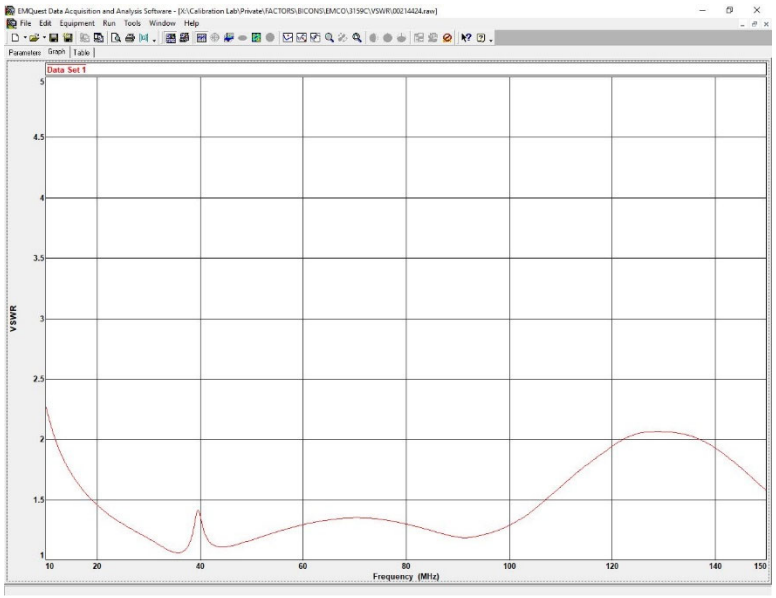
$$- 20 \log 10\ (fMHz)$$

$$+ AF\ dB(m-1) + 15$$

With this equation, you can calculate the forward power needed to generate 100 V/m at a given distance. Following is the performance for the Model 3159C at 3.5m:



VSWR



VSWR taken August 2017