INSTRUCTION MANUAL

WIDEBAND DISCONE

ANTENNA

MODEL DCA-30

9 kHz – 30 MHz

INSTRUCTION MANUAL

ACTIVE LO0P ANTENNA

9 kHz – 30 MHz

ELECTRO-METRICS

MODEL ALR-30B

SERIAL NO: N/A

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WARRANTY

This Model ALP-30B Active Loop Antenna is warranted for a period of 12 months (USA only) from date of shipment against defective materials and workmanship. This warranty is limited to the repair of or replacement of defective parts and is void if unauthorized repair or modification is attempted. Repairs for damage due to misuse or abnormal operating conditions will be performed at the factory and will be billed at our commercial hourly rates. Our estimate will be provided before the work is started.

DESCRIPTION AND USE
ELECTO-METRICS
MODEL ALR-30B ACTIVE LOOP ANTENNA

1.0 Introduction

The Electro-Metrics Model ALR-30B is an active broadband loop antenna operating from 9 kHz to 30 MHz and is specifically designed to perform three meter VDE 0871 Limit B magnetic emissions testing. It is also suitable for FCC Part 15 and 18 testing plus SAE and other government\commercial standards.

The antenna is a 43.2 cm (17") diameter loop mounted onto a rectangular base. The base contains a preamplifier which matches the low impedance of the loop to the 50-ohm impedance of most spectrum analyzers\receivers plus an overload indicator and a Type N (male) Connector.

Power is supplied by an external BP-6000 Battery Pack which contains a battery-powered 15 VDC power supply, rechargeable sealed lead acid batteries, and battery charge circuit. The nominal operating time on a fully charged battery pack is 8 hours while the battery charging time is approximately 12 hours.

The bottom of the base has a 1/4-20 threaded receptacle for mounting to the Model TRI-3022 Tripod or with adapter to the Model TRI-136 Tripod. This allows the loop antenna to be mounted either vertically or horizontally with respect to a horizontal plane.

2.0 Specifications

2.1 Electrical

Frequency Range:	10 kHz to 30 MHz.

(Antenna Factor Graph furnished with each antenna.)

Dynamic Range:	85 dB at 10 kHz. 125 dB at 1 MHz.
Sensitivity:	50 dB(µV/m) at 10 kHz. -1 dB(µA/m) at 10 kHz. 10 dB(µV/m) at 1 MHz. -41 dB(µA/m) at 1 MHz.

(At 200 Hz bandwidth and Average detector function on analyzer\receiver.)

1 dB compression Point:	5 V/m, 13 mA/m.
Output Impedance:	50Ω nominal.

Power Source:	15 VDC supplied by external BP-6000 Battery Pack/Charger Module.

(Refer to Section 7.0 for complete BP-6000 specifications)

Connector:	Type "N" Male.

2.2 Mechanical

Loop Diameter:	432 mm (17").	
Base Dimensions:	Height:	51 mm (2").
	Width:	165 mm (6.5").
	Depth:	102 mm (4").
Height (overall): (Base + Loop Diameter)	483 mm (19").	
Weight:	1 kg (2.2 lbs).	

3.0 ALR-30B Description

The ALR-30B comprises an approximate 0.5-meter (17-inch) loop welded onto a rectangular base containing the active circuitry, an overload indicator, and a Type N (male) Connector. The loop and base are made of aluminum.

3.1 Active Circuitry

Type: Preamplifier.

Magnetic field signals are intercepted by the 0.5-meter loop antenna and coupled to an amplifier circuit which matches the low impedance of the loop to the 50Ω impedance of most receivers. In addition, it permits the loop antenna to have relatively high sensitivity and dynamic range compared to a non-active antenna.

The active circutry equalizes the frequency response of the loop antenna to produce a relatively constant antenna factor across the 9 kHz-30 MHz range of the loop antenna.

3.2 Overload Indicator

Type: LED.

Color: Amber.

Function: To indicate when the input signal intensity exceeds the 1 dB compression level of 5 V/m.

3.3 RF Output Connector

Type: "N", Male.

Function: The connector has two functions:

a. To connect the output of the ALR-30B to the RF INPUT Connector of the BPA-6000 which then connects the signal to the 50Ω instrument being used.

b. To supply the DC power required to operate the active circuitry of the antenna. The center conductor feeds the +15 VDC while the shield is the DC ground return.

4.0 Operating Procedure

4.1 Antenna Set-Up Procedure

a. Mount the antenna base to the Model TRI-3022 Tripod. The antenna base is secured to the tripod by screwing it in a clockwise direction, as viewed from above.

4.2 Electrical Connection

a. Connect the 2 m (6'), N FEMALE-TO-FEMALE, coaxial cable (CNC-6) from the RF OUTPUT Connector (Type "N" Male) on the antenna base to the "INPUT" Connector (Type "N" Male) on the BP-6000 front panel.

b. Connect the 3 m (10'), N MALE-TO-MALE, low loss armored coaxial cable (LLACP-10) from the OUTPUT Connector (Type "N" Female) on the BP-6000 front panel to the spectrum analyzer or receiver being used.

4.3 Power Turn-On

a. Activate the ALR-30B circuitry by turning on the BP-6000 front panel POWER ON Switch (two position rocker). This activates the +15 VDC power supply within the BP-6000.

NOTE: **The internal DC power supply of the Bp-6000 is designed to operate only with the internal battery. <u>THE BP-6000 WILL NOT OPERATE CONNECTED TO AN AC POWER SOURCE</u>.**

4.4 Operational Checkout

NOTE: **The following procedure is performed using a 50-ohm spectrum analyzer. Any similar 50-ohm instrumentation could be used.**

a. Turn "ON" the spectrum analyzer.

b. Set the spectrum analyzer front panel controls to obtain a trace line on the CRT.

c. Tune the spectrum analyzer to a frequency between 9 kHz and 200 MHz.

d. Connect the spectrum analyzer to the OUTPUT Connector on the front panel of the BP-6000.

e. Connect the ALR-30B Output to the INPUT Connector of the BP-6000.

f. Turn on the BP-6000 and note an increase in the noise level on the front panel CRT of the spectrum analyzer.

5.0 ALR-30B Calibration Information

5.1 Calibration Data Usage

a. ELECTRIC FIELD STRENGTH

In order to calculate the Electric Field Strength of a detected signal, the following equation is used:

ELECTRIC			ELECTRIC
FIELD STRENGTH =	SIGNAL LEVEL +	CABLE LOSS +	ANTENNA FACTOR
[dB(µV/m)]	[dB(µV)]	(dB)	(dB/m)

b. MAGNETIC FIELD STRENGTH

In order to calculate the Magnetic Field Strength of a detected signal, the following equation is used:

MAGNETIC			MAGNETIC
FIELD STRENGTH =	SIGNAL LEVEL +	CABLE LOSS +	ANTENNA FACTOR
[dB(µA/m)]	[dB(µV)]	(dB)	(dB/Sm^{-1})

NOTE: Both signal level and cable loss must be measured.

5.2 Calibration Method

Loop antennas are calibrated using the IEEE Std-302 Induction-Field Method of Calibration. The test geometry is shown in Figure 1.

The antenna factor (dB/m) is the difference between the field strength [dB(µV/m)] at the antenna and the voltage [dB(µV)] at the terminals of the antenna. By determining each of these values, the antenna factor is calculated. The antenna factor of the loop can be used to measure the field strength at any distance from an object being tested.

6.0 Magnetic Field Measurements

The ALR-30B Loop Antenna can be used as either a directional or omni-directional antenna.

When mounted in a horizontal position, the antenna is omni-directional in its response and is thus able to detect a signal from any direction.

When mounted in a vertical position, the antenna has a notched or directional response and thus can be used to locate the source of a signal.

At frequencies below 30 MHz, it is a good idea to make electric/magnetic field measurements in the near field since one component may be much stronger then the other.

7.0 BP-6000 Battery Pack/Charger Module

7.1 BP-6000 Specifications

7.1.1 Electrical

DC Output:	15 VDC, Nominal.
AC Power Source:	90-265 VAC, 47-440 Hz.
DC Power Source:	18 V rechargeable battery (sealed lead acid)
Operating Time:	Nominal 8 hours between rechargings.
Recharge Time:	Nominal 12 hours.
Fuse:	0.5 AMP 2AG FAST ACTING (subminiature)
Connectors:	INPUT: Type "N" Male. OUTPUT: Type "N" Female.

7.1.2 Mechanical

Height:	88 mm (3.47").
Width:	212 mm (8.35").
Depth:	168 mm (6.6").
Weight:	2.7 kg (6 lbs).

7.2 BP-6000 Description

The BP-6000 comprises a rectangular aluminum box containing a battery-powered 15 VDC power supply, rechargeable sealed lead acid batteries, and battery charge circuit. The

nominal operating time on a fully charged battery pack is 8 hours while the battery charging time is approximately 12 hours.

The controls/indicators/connectors located on the front and rear panel of the BP-6000 include:

a. Power Switch,

b. Power On Indicator (green LED),

c. Battery Charge Indicator (red LED),

d. Type "N" (male) Antenna Input Connector,

e. Type "N" (female) RF Output Connector,

f. DC Power Accessory Connector,

g. AC Input Connector (RP),

h. Fuse Holder (RP).

7. 3 Description Front/Rear Panel

7.3.1 Front Panel

a. ON/OFF (Power) Switch

Type: Two cycle rocker switch.

Function: Turns on DC regulator circuit to supply +15 VDC for antenna active circuitry.

b. Power On Indicator

Type: LED.

Color: Green.

Function: To indicate that the DC regulator circuit is activated and functional.

Whenever the battery voltage has decreased to the point that recharging is required, the LED will be extinguished. At this point the DC regulator circuitry is disabled and is non-operational until the battery is recharged.

Battery recharging should be initiated as soon as possible after the Power On Indiciator LED is extinguished. Failure to do so could compromise the useful life of the battery.

NOTE: Whenever the BP-6000 is connected to the AC power source, the Power On Indicator is extingushed and the DC regulator disabled.

c. Battery Charge Indicator

Type: LED.

Color: Red

Function: To indicate that the BP-6000 is connected to the selected AC power source and the battery is being recharged. The DC regulator is disabled during battery recharging.

d. Input Connector

Type: "N" (male).

Function: The connector has two functions:

1) To receive the RF Output of the antenna being used (ALR-30B, DCA-30).

2) To supply the DC power required to operate the active circuitry of the antenna being used. The center conductor feeds the +15 VDC while the shield is the DC ground return.

e. Output Connector

Type: "N" (female).

Function: Connects the RF input from the INPUT Connector to the spectrum analyzer or receiver being used.

f. DC Power Accessory Connector

Type: 4-pin

Function: Provides a +15 VDC output.

7.3.2 Rear Panel

a. AC Power Connector

Type: IEC, male, grounded.

Function: Connects the BP-6000 to the selected AC power source for use by the charging circuit.

b. Fuse Holder

Type: Panel mount for subminiature fuse, screw-driver slot knob.

Function: Self-explanatory.

7.4 Description Battery/Charger/Regulator Circuitry

The battery supplies the operating voltage for the regulator circuitry of the BP-6000. When the Power Switch is in the ON position, the output of the battery is connected to the Cutoff/Monitor and Regulator circuits. If the battery voltage is a minimum of +15.5 VDC, a sensor network will supply battery voltage to the DC regulator circuit. The DC regulator supplies the +15 VDC for the antenna circuitry and to activate the Power "ON" LED. The conduction of a series pass transistor is controlled by a feedback network. A potentiometer is adjusted for a regulated +15 VDC output to the INPUT Connector and the Accessory Connector. Whenever the battery voltage goes below +15.5 VDC, the sensor network turns off the regulator circuit which extinguishes the Power "ON" LED.

To recharge the internal battery, the BP-6000 is connected to the selected AC power source which automatically disconnects the battery power from the regulator circuit and activates the "CHARGE" LED. This is accomplished by a relay within the charger circuitry.

NOTE: **1)** The position of the power switch has **NO EFFECT** on the operation of the charger circuit.

2) The BP-6000 will not operate when connected to an AC power source.

A constant voltage charge circuit is used to supply a constant voltage for charging the battery. The series-pass transistor is current-limited, while additional resistors and diodes serve as a feedback network. A potentiometer is used to adjust the level of the charge voltage.

7.5 Operating Procedure

7.5.1 Battery Recharging

7.5.1.1 AC Power Source

The BP-6000 uses an AC power source of:

90-265 VAC, 47-440 Hz

7.5.1.2 Fuse Specifications

The BP-6000 uses the following fuse:

0.50 AMP 2AG FAST-ACTING, subminiature.

7.5.1.3 Battery Recharging Procedure

a. Connect the BP-6000 to the selected AC power source.

b. Leave the unit connected to the AC power source for a minimum of 12 hours before operating the BP-6000.

NOTE: The internal DC power supply of the Bp-6000 is designed to operate only with the internal battery. THE BP-6000 WILL NOT OPERATE CONNECTED TO AN AC POWER SOURCE.

7.5.2 BP-6000 Operation

a. Connect the 2 m (6'), N FEMALE-TO-FEMALE, coaxial cable (CNC-6) from the RF OUTPUT Connector (Type "N" Male) on the antenna being use to the "INPUT" Connector (Type "N" Male) on the BP-6000 front panel.

b. Connect the 3 m (10'), N MALE-TO-MALE, low loss armored coaxial cable (LLACP-10) from the OUTPUT Connector (Type "N" Female) on the BP-6000 front panel to the spectrum analyzer or receiver being used.

c. Activate the BP-6000 by turning on front panel "POWER ON" Switch. This activates the +15 VDC regulator circuit within the BP-6000 and the front panel "POWER ON" LED.

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ANTENNA FACTORS

MAGNETIC & ELECTRIC

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ACTIVE LOOP ANTENNA

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