INSTRUCTION MANUAL

REMOTE ACTIVE

VERTICAL ANTENNA

MODEL RVA-30

1 kHz – 50 MHz

INSTRUCTION MANUAL

REMOTE ACTIVE VERTICAL

ANTENNA

1 kHz – 50 MHz

ELECTRO-METRICS

MODEL RVA-30

SERIAL NO: N/A

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WARRANTY

This Model RVA-30 Remote Active Vertical 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.

DISCRIPTION AND USE ELECTRO-METRICS MODEL RVA-30 REMOTE ACTIVE VERTICAL ANTENNA

1.0 Description

The Model RVA-30 Remote Active Vertical Antenna is designed to obtain electric field measurements from 1 kHz to 50 MHz and can typically measure E-Field strengths from 1 µV/m to 1 V/m (CW) plus broadband field strengths up to 105 dB(µV/m/MHz). Though designed for use with the EMC-30 and several other Electro-Metrics instruments, it can be used with any 50Ω instrument since the output was designed to drive 50Ω.

The active circuitry within the RVA-30 is powered by an internal 18 V rechargeable battery pack with its own charging circuit. This allows the antenna to operate independently of an external power source, reducing the possibility of ground loop problems.

The Model RVA-30 is designed for use in conjunction with the Model GPA-30 Counterpoise, Model TRP-136 Tripod, and Model CAC-30 Coaxial Cable.

2.0 Specifications

2.1 Electrical

Frequency Range (Calibrated): (Antenna Factor Graph furnished with each antenna.)	1 kHz to 50 MHz.
3 dB Bandwidth:	9 kHz to 20 MHz.
Input Impedance:	5 MΩ resistive.
Sensitivity:	Refer to sensitivity chart.
Dynamic Range:	Typically 120 dB, 1 µV/m to 1 V/m.
Saturation Level:	Typically 126 dB(µV/m) CW, 105 dB(µV/ m/MHz) Broadband.
Power Source:	18 V rechargeable battery (sealed lead acid).
Operating Time:	Nominal 20 hours between rechargings.
Recharge Time:	Nominal 12 hours, battery charger operates from 120/220 VAC, 50/60 Hz.
Connector:	Type TNC.

2.2 Mechanical

Base Dimensions:	
Length:	236 mm (9.3")
Width:	186 mm (7.3")
Height:	99 mm (3.9")
Length Antenna Rod:	Standard: 1.04 m (41"). Optional: 2.1 m (82").
Weight:	3.0 kg (6.5 lbs).

3.0 RVA-30 Description

The RVA-30 consists of an approximate 1-meter (41-inch, standard) or 2-meter (82-inch, optional) telescoping rod that screws into a rectangular base containing the active circuitry and rechargeable battery plus charging circuit.

3.1 Power Switch

Type: Two position toggle switch.

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

3.2 Charger Indicator

Type: LED.

Color: Amber.

Function: To indicate the battery charge state.

The indicator will normally be illuminated when the Power Switch is in the ON position. If it does not come on or goes out during operation of the RVA-30, the battery must be recharged.

3.3 AC Input Connector

Type: Combined voltage selecting and fuse holder.

Function: Connects the RVA-30 to the selected AC power source for use by the charging circuit. Also contains the fuse holder and AC Voltage selector.

3.4 Signal Out Connector

Type: TNC, female.

Function: Connects the output of the RVA-30 to the RF INPUT Connector of a 50Ω input instrument.

4.0 Theory Of Operation

4.1 Amplifier

Electric field signals are intercepted by the 1-meter rod antenna and coupled to a source follower. The high input impedance of the source follower and its biasing network permit maximum transfer of the E-Field signal from the rod (which is essentially a small capacitance in its ideal form) to the source follower. The output of the source follower is then capacitively coupled to the base of an emitter follower which is used to drive a 50Ω load, i.e. the test receiver.

4.2 Battery/Charger/Regulator Circuitry

The battery supplies the operating voltage for the active circuitry of the RVA-30. 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 transistor switch will be biased by a zener diode to turn on the "CHARGE INDICATOR" LED giving a visual indication that the battery charge level is sufficient to operate the antenna. Another transistor switch is biased to turn on the regulator circuitry. 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 active circuitry. Whenever the battery voltage goes below +15.5 VDC, the transistor switches turn off the "CHARGE INDICATOR" LED (indicating the need for recharging the battery) and the regulator circuit.

To recharge the internal battery, the RVA-30 is connected to the selected AC power source which automatically disconnects the battery power from the amplifier and regulator circuits. 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 RVA-30 will not operate when connected to an AC power source.

A tranformer steps down the input AC line voltage which is then rectified and filtered. A constant voltage charge circuit is used to supply a constant voltage for charging the battery. A zener diode functions as a current limiter for a series-pass transistor, while additional resistors and diodes serve as a feedback network. A potentiometer is used to adjust the level of the charge voltage.

5.0 Operating Procedure

5.1 Recharging Battery

a. AC power sources:

1) 105-130 VAC, 50-60 Hz.

2) 210-260 VAC, 50-60 Hz.

5.1.1 Power Source Selector

The Power Source Selector is incorporated as part of the power input connector. The number visible in the window indicates the nominal AC power source for which the receiver is set. To change the power source setting:

a. Remove the power cord from the connector plug.

b. Slide the clear cover to the left.

c. Pull the handle marked FUSE PULL and remove the fuse.

d. Rotate the handle to the left and gently pull the printed circuit voltage selector card from its slot.

e. Orient the card so that the desired operating voltage appears on the top-left side.

f. Firmly push the voltage selector card back into its slot.

g. Rotate the FUSE PULL handle to the right and install the correct rating fuse.

h. Slide the clear cover to the right and reconnect the AC power cord to the connector.

CAUTION

Verify that the Power Source Selector setting corresponds to the AC power source being used. Operation on "220" VAC with the module set for "110" VAC can cause extensive circuit damage.

5.1.2 Fuse Specifications

The RVA-30 uses the following fuses:

a. 115 VAC operation: 0.25 AMP 3AG SLO-BLO.

b. 230 VAC operation: 0.125 AMP 3AG SLO-BLO.

5.1.3 Battery Recharging Procedure

a. Connect the RVA-30 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 antenna.

5.2 Antenna Set-Up Procedure

a. Mount the antenna base to the Model TRP-136 Tripod. The antenna base is secured to the tripod by screwing it in a clockwise direction, as viewed from above.

b. Place the Model GPA-30 Counterpoise over and attach it to the top of the antenna base. Secure the Counterpoise by screwing the four captivated thumb screws on the counterpoise into the threaded holes provided at the corners of the antenna base.

NOTE: Some test standards require that the counterpoise be bonded to the ground plane by a heavy copper strip. Check the test standard being used for method and technique.

c. Screw the telescoping rod into the socket on the top of the antenna housing. Extend the rod to its full 1-meter (41-inch) length.

5.3 Electrical Connections

Connect the 7.6 m (25-foot) coaxial cable from the "Signal Out" TNC Connector on the antenna base to the "RF Input" TNC Connector on the EMC-30 front panel or equivalent 50-ohm instrument.

NOTE: The internal circuitry of the RVA-30 is designed to operate only with the internal battery. **THE RVA-30 WILL NOT OPERATE CONNECTED TO AN AC POWER SOURCE**.

5.3.1 Checkout

NOTE: **The following procedure can be performed using any similar 50-ohm receiver. The EMC-30 is used as an example.**

a. Turn "ON" the EMC-30.

b. Set the EMC-30 front panel controls as follows:

DETECTOR.....PEAK
BANDWIDTH.....WIDE BAND
(of the frequency range selected)
FREQUENCY RANGE.....0.009-0.035 MHz
(Frequency Range 1)
FREQUENCY INDICATION.....0.022 MHz.
(Mid-range frequency point of Frequency Range 1.)

c. With the EMC-30 set to RF Frequency Range 1 (9 kHz-35 kHz), turn on the RVA-30 and note an increase in the noise level on the front panel digital meter of the EMC-30.

6.0 Electric Field Measurements

6.1 Narrowband Radiated Signals

With the Model RVA-30 Remote Active Vertical Antenna, connected to the 50-ohm receiver, as described above, tune the receiver to the frequency of interest. Read the two-terminal voltage indicated by the receiver for the particular signal of interest, following the calibration and operating procedures in the instruction manual of the receiver.

To convert the resulting two-terminal reading to the appropriate field strength when using the RVA-30, simply add the "antenna factor in dB" at the frequency of interest from the Antenna Factor Chart for the antenna being used.

EXAMPLE:

SIGNAL AMPLITUDE INDICATION.....+20 dB(µV)
Two-terminal voltage indication is thus.....+20 dB(µV)
Antenna factor from graph (typical).....+14 dB(1/m)
Field Strength intercepted by antenna is.....+34 dB(µV/m)

6.2 Broadband Radiated Signals

After determining that the signal is truly a broadband signal (refer to Section II Para. 2.4.7 EMC-30 Manual for a method of determining whether a signal is broadband or narrowband), proceed to determine the correct two-terminal broadband level using the calibration and operating procedures of the 50-ohm receiver being used.

To convert the resulting two-terminal reading to the appropriate broadband field strength when using the RVA-30, simply add the "antenna factor in dB" at the frequency of interest from the Antenna Factor Chart for the antenna being used.

NOTE: **1) DO NOT USE THE RVA-30 TO MEASURE BROADBAND SIGNALS MORE THAN 50 dB TO 80 dB ABOVE THE RVA-30 NOISE LEVEL.**

2) USE THE RVR-30 OR RVR-30M FOR MEASUREMENTS OF HIGH LEVEL BROADBAND SIGNALS.

EXAMPLE:

SIGNAL AMPLITUDE INDICATION.....+20 dB(µV)
Broadband Conversion Factor.....+40 dB(1/MHz)
Two-terminal broadband signal level.....+60 dB(µV/MHz)
Antenna factor from graph (typical).....+14 dB(1/m)

Broadband Field Strength.....+74 dB(µV/m/MHz)

6.3 Antenna Induced Voltage

Since the effective height of the 1-meter (41-inch) RVA-30 is one-half meter, antenna induced voltage (open circuit) is:

$$E_a = E \times h_e,$$

where:

E = Field strength (µV/m),
h_e = Effective height of the RVA-30 (equal to 0.5 meter).

Therefore:

$$E_a = 0.5E,$$

To find antenna induced voltage in dB(µV), simply subtract 6 dB from any field strength reading determined using the procedures stated within this manual.

FIGURE 1

TYPICAL BROADBAND SIGNAL

SATURATION LEVEL GRAPH

PAGE 8A

FIGURE 2

ANTENNA FACTOR GRAPH

PAGE 9A

FIGURE 3

CW SENSITIVITY GRAPH

PAGE 10A

NOTE: The CW Sensitivity Graph on Page 10A is normalized to a 1 Hz bandwidth.