

WE-030A Antenna Analyzer Manual and Supplementary Information

1.0 Description

This product is designed to perform fast graphical SWR and Return loss measurements to enable easy and proper adjustment of HF antennas. It is lightweight, small, and portable.

By restricting functionality to essential basics, measurement speed is increased and product cost substantially reduced.

For the adjustment of most antennas, scalar capability is sufficient.

Additional cost and compromised sweep speed due to increased data processing overhead associated with vector instruments is avoided.

The design is based around a stable DDS signal source, SWR bridge, and a precision logarithmic RF signal detection IC.

The BNC socket is secured to the PCB, and the PCB secured to the case in the immediate vicinity of the connector by four screws. Care was taken in the design to make sure this mechanical interface was robust.

Centre frequency and sweep width are entered via the keypad and the resultant SWR and return loss information is obtained from the graphical LCD display using a marker.

The fine frequency resolution of 200 Hz (10 kHz span) allows analysis of systems with a high Q, e.g. magnetic loop antenna.

The effects of changes to the antenna dimensions, matching networks, loading coils etc can be quickly seen to guide adjustments for minimum SWR.

A secondary RF level measurement mode is included. This is useful for signal strength measurements etc.

The product may also be used as a fixed level signal source.

The product is calibrated using an open circuit load.

The product is rechargeable and features auto power down to maximise operational time.

2.0 Specification

Electrical

1) Reflection measurement mode

| | |
|-------------------------------|--|
| Centre frequency range: | 300 kHz – 30 MHz |
| Centre frequency accuracy: | +/- 30 PPM @ 25 deg C |
| Sweep widths: | 10kHz to 10 MHz in 1,2,5 sequence and CW |
| Sweep time: | < 200ms repetitive |
| Frequency Resolution: | 50 points per sweep |
| Output level: | 4 dBm +/- 3 dB |
| Harmonics: | < -36 dBc |
| Reflection measurement range: | Return Loss: 0 to 45 dB SWR: 10 to 1.0 |
| Measurement resolution: | 1dB |
| Directivity: | > 36 dB (2 – 30 MHz) > 30 dB (0.3 – 2 MHz) |
| Source Match: | > 22 dB |
| Marker functions: | Normal, Marker to frequency of minimum SWR, Centre frequency to marker. |

2) RF level measurement mode

| | |
|---------------------------------|--------------------|
| Frequency range: | 300 kHz – 30 MHz |
| Level range: | +7 dBm to - 35 dBm |
| Level variation with frequency: | within +/- 1 dB |

General

| | |
|-------------------|---|
| System Impedance: | 50 ohm |
| Connector: | BNC |
| Display: | Graphical 64 x 128 LCD Monochrome backlit |
| Supply: | Internal 2xAA 1300mAH NiMh |
| Battery life: | > 3 Hrs continuous operation |

Charging: 3 hr fast charge with supplied PSU adapter.
Input: 90 – 264V AC Output: 5V, 1A
UK: 3 pin, Euro: 2 pin
Universal type supplied for North America,
Australia, etc

Auto power off: Switches off 5 minutes after last key press

Mechanical

Size: 155mm x 96 mm x 30mm approx.

Weight: 250g approx.

Case: Black ABS plastic

Environmental

Operating temperature range: 0 – 50 degrees Celsius

Standards

CE Compliant (EN61010-1, EN61326-1, EN61326-2-1)

3.0 Operation Instructions

SWR/Return Loss Measurement

Hold down PWR key for about four seconds until unit powers up. There are two main display modes, Parameter Set (centre frequency and span) and Marker. Pressing the E key will toggle between the two modes.

On first use Parameter set mode is entered. Otherwise the last used mode will display. Return loss versus frequency displays on the left half of the screen. The vertical axis is marked in 10 dB steps.

The following functions are available in this mode:

→ Move the cursor clockwise to select different digits for the centre frequency or the span width.

← Move the cursor anti-clockwise to select different digits for the centre frequency or the span width.

↑ Scroll the digit up.

↓ Scroll the digit down.

Marker Display Mode

In this mode the values of SWR and return loss are displayed at the marker frequency.

The following functions are available in this mode:

→ Move the marker to the right.

← Move the marker to the left.

↓ Move the marker to the centre of the resonance dip.

↑ Change the centre frequency to the marker frequency.

To set the centre frequency to the dip use first ↓ and then ↑. To return to Parameter set mode, press E key again. This enables the Span or CF to be re-adjusted if desired.

If the span and centre frequency combination result in the sweep exceeding the frequency limits of 300 kHz and 30 MHz, 'Invalid Entry' is displayed.

When measuring a high Q antenna e.g. magnetic loop, make sure the resonance dip is not missed by setting the span sufficiently small.

The product is turned off by momentarily pressing the PWR key.

Calibration

Calibration should only be required occasionally. The calibration coefficients are permanently stored in EEPROM.

With nothing connected to the RF port, the displayed Return loss level should be 0 dB (Noise may occasionally cause this to display -1 dB)

If the displayed return loss is different to this, then re-calibrate.

To do this power off unit. Power on whilst holding down the E key. This brings up the Utilities Menu. With nothing connected to the RF port, press ↑ key for Cal.

Confirm Calibration with E key otherwise use ← to exit back to Utilities Menu.

The unit will then self-calibrate and return to the Utilities menu. Press ← key to return to normal operation.

RF Level Mode

To select RF level mode, power off unit. Power on whilst holding down the E key. This brings up the Utilities Menu. Press → for RF Level Mode.

Press E to exit back to Utilities Menu. Then ← to return to frequency and span setting mode.

Battery Charging

Use supplied 5V 1A regulated adapter only for charging. Momentarily pressing the PWR key during charging will display “ Battery Charging” When the battery has finished charging pressing the PWR key will show the usual PWR up display instead.

The unit can not be operated with the charger connected.

Battery life is not guaranteed. If internal batteries need replacing, then replace with 1300mAh NiMh AA. Replacing with higher capacity will cause battery charging to operate incorrectly.

Do not interrupt the charging supply during charging. This may result in overcharging the battery, reducing battery life.

Only charge the battery when the ambient temperature is between 10 and 35 deg C
Do not charge the unit in a confined space or near naked flame.

Reset

Holding down the PWR key and ↓ key together for 3 seconds restores the default settings of the instrument. Calibration data is unaltered.

4.0 Limitations

This product, similar to most products of this type is susceptible to strong interference within HF band. If this occurs, then try operating at a different time of day.

Do not expose the product to water. Light splash resistant.

Due to the ABS case moulding process, some slight cosmetic defects may be visible under certain lighting conditions.

5.0 Precautions

This product, similar to all products of this type, emits a low power radio frequency signal.

When connected to an antenna, it may cause interference to neighbouring radio communication systems. Connect for only as long as is necessary.

The user is responsible for the consequences of any interference caused.

The antenna port connector is ESD protected. However, excessive static build up on an antenna may cause damage to the product when connected. As a precaution, discharge antenna before connecting.

6.0 Servicing and Repairs

The product may be returned to Waterbeach Electronics Ltd for servicing and repairs.

7.0 Warranty

The warranty covers defects in material and manufacture under normal use for one year (excludes batteries).

Avoid touching internal electronic circuitry- Static sensitive!

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