AUDIOTEL
INTERNATIONAL
Limited

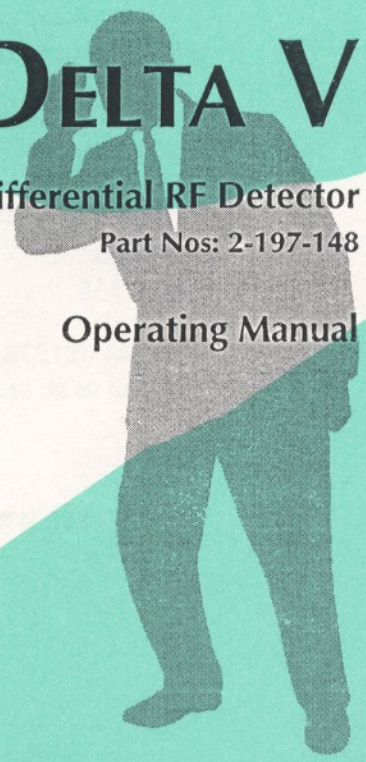
AUDIOTEL
INTERNATIONAL
Corby Road Weldon
CORBY Northants
NN17 3AR UK

DELTA V

Differential RF Detector

Part Nos: 2-197-148

Operating Manual



Every effort has been made to ensure the accuracy of this manual. The instructions and descriptions are accurate at the time of publication. However, succeeding versions of the equipment and manuals are subject to change without notice. Audiotel assumes no liability for damages incurred directly or indirectly from errors, omissions or discrepancies between the equipment described and the manual.

If you have any comments or suggestions on improving this manual please contact Audiotel at the following address:

Audiotel International
Corby Road
Weldon
CORBY
Northants
NN17 3AR

Fax: +44 (0)1536 266711
or Email us at: marketing@audiotel-international.com

Contents

PREFACE

To the user!

Thank you for buying Delta V ECM. The operating manual will enable you to get the best out of your Delta V ECM Differential Transmitter Locator

If you have any questions regarding the satisfactory operation of your unit please do not hesitate to contact us direct or alternatively your local agent or supplier.

Should you be visiting our area and can spare an hour or so we will be pleased to meet you and show you our manufacturing and product development site.

Audiotel International prides itself on its after sales service and care. Our address, Email and fax details are inside the front cover of this manual. We will be delighted to receive any comments you may have regarding our products and services.

Andrew Martin - Managing Director

October 1996

INTRODUCTION

Delta V ECM is the latest differential RF field strength detector from Audiotel. The advantages of the differential technique lie in the high degree of rejection of distant signal sources regardless of strength. This is achieved by measuring the rate of change in field strength rather than its absolute strength. This technique gives greater discrimination against outside signals so that the transmitting source can be located with considerable accuracy. Delta V ECM is ideal for locating radio bugs, basic RFI/EMC testing and for localising high power, illegal broadcast transmitters. Whilst the main application of Delta V ECM is as a stand alone detector and locator it is also an excellent accessory for a spectrum analyser, countermeasures receiver or non linear junction detector where the Delta V ECM's excellent search characteristics and portability give an operational advantage.

FEATURES

- Excellent high frequency response. Measured response from a 50 ohm source is uniform to 6.5GHz.
- Delta V ECM has passive front end for excellent dynamic range and common mode rejection
- Good dynamic range of click rate indicator
- Push-button sensitivity reduction to aid location of strong signal sources
- Low power consumption

Equipment Supplied

- Delta V ECM unit
- Pouch
- Rod Antennas, nominal 100 mm, 2 supplied
- Earphone with 3.5mm Jack Plug
- PP3 Alkaline Battery

Installing the Battery

On the underside of the Delta V ECM is a 'coin-operated' screw which retains the battery cover. Remove the screw to release the cover.

Clip the battery lead onto the new battery, insert battery and replace the cover. Finger-tighten the 'coin-operated' screw. It is not necessary to tighten the screw using a coin - the end of a finger will provide sufficient torque. Avoid over-tightening. Always use good quality Alkaline type batteries.

If a battery is momentarily connected the wrong way round the battery will be short-circuited by protection circuitry within the Delta-V ECM. Avoid prolonged reversed connection as this will cause excessive heating of the battery.

A failed battery lead can be easily removed by gently pulling its plug out of the socket. It is most important to ensure that the new lead is fitted correctly. The red wire on the plug must be furthermost from the battery space.

BASIC OPERATION

The knob on the rear panel is a combined ON/OFF and volume control. The unit is off when fully anticlockwise. Rotate clockwise to turn on and adjust the volume to suit. About 10 seconds after switch-on the unit will have settled and the click rate should be very low or absent altogether (although this depends on whether antennas are connected and the level of local radio signals). Before fitting the earpiece provided or other earphones always reduce the volume control. Inductive earpiece sets can be used.

If the 'POWER' Light Emitting Diode (LED) does not illuminate then the battery should be changed. If the LED extinguishes during a search the unit can be used for roughly another hour.

Connection of one antenna only (to either socket) provides monopole operation with the unit indicating the absolute radio signal strength level. This typically gives the greatest sensitivity.

When both antennas are connected the unit responds to the gradient of the local radio signal strength and therefore tends to reject signals from distant signals whose local gradient is nearly zero.

Users will develop their own search techniques. One method is to start with one antenna to get a 'feel' for the area and then connect the second antennae to investigate any suspicious results.

SEARCH TECHNIQUES

Delta V ECM responds to radio signals by emitting a click whose repetition rate varies with field strength (one antenna connected) or with the rate of change (gradient) in field strength (both antennae connected). From its lowest rate (typically no clicks) to its maximum rate the input power variation is typically 55dB (when switch on the side is pressed). In general the click rate will increase as the transmission source is approached. Under some conditions local peak readings will occur away from the source due to reflections - usually caused by metallic objects. The strongest response will always be at the signal source.

When approaching the signal source there may be wide variations in click rate caused in some orientations by the signal strength being equal or nearly equal at both antennas.

Effective sensitivity is a function of the throroughness of the search and this requires that the Delta V ECM is moved as close as is practical to potential transmission sources. The distance between the Delta V ECM and a source at which it becomes obvious that there is a local transmission depends not only on the power output of the source but also on the strength of other, more distant, sources. Use of both antennae helps reduce the effect of distant sources.

If a powerful source is being located then the click rate may reach a maximum before the source is reached. To reduce sensitivity push and hold the switch on the right-hand-side of the unit.

TAKING CARE OF DELTA V ECM

POINTS TO REMEMBER ARE:

- Always turn the unit off before changing the battery and ensure that the polarity is correct. Avoid straining the battery leads. If the unit is not to be used for long periods remove the battery (contact the battery manufacturer if the unit is damaged by a leaking battery)
- Do not allow the unit to be immersed or splashed in water or other liquids or contaminants, consult your supplier if this should occur. Operation in humid environments may cause condensation which will result in faulty operation. Allow the unit to dry before re-use
- If you need to return the unit for servicing contact the dealer or manufacturer before sending the equipment. When sending ensure that the equipment is adequately packed for transit
- Static electrical discharge through the unit will damage components resulting in reduced performance - avoid touching objects with the antennae
- If you connect test equipment do not exceed 9 VDC input to the battery contacts, do not apply more than 10 VDC to the antennae inputs and do not apply more than 200 milliwatts continuous or pulsed RF energy at 25 degrees Centigrade. Derate to 0 W at 150 deg. C above this temperature
- The outside of the unit can be cleaned with a water-dampened cloth. Use of polishes or other cleansers is not recommended

PRINCIPLES OF OPERATION

The antennas are connected via high frequency SMA connectors to a pair of matched Schottky barrier diode detectors. The output from the detectors is amplified by a low noise, wide dynamic range DC logarithmic amplifier with automatic drift and offset cancelling. A following logarithmic amplifier feeds a precision rectifier to produce a DC voltage proportional to the differential input signal strength. This drives a Geiger type click generator giving a rising tone indication of the location of the hidden transmitter.

With both antennas connected Delta V ECM measures the gradient in the local electromagnetic field between its two antennae rather than the absolute value which is given by a monopole detector. The differential detector in Delta V ECM when compared with a monopole detector discriminates in favour of a transmitter that is nearer.

In free space the power from a signal source falls according to the inverse square of the distance from the source. A monopole responds to the local power level. In contrast, a differential detector responds to the difference in power level between its two antennas (the gradient) which falls off according to the inverse cube of the distance from the source. Consequently, the differential detector will respond less to a distant signal when compared with a monopole detector.

In practice, the fields from transmitters do not fall off as they would in free space. However, the field strength still diminishes with distance and the gradient therefore falls off at a greater rate. A differential detector is thus better able to detect a local low power transmitter in the presence of a nearby strong signal source.

SPECIFICATIONS

Detection Method	Differential Electromagnetic Field measurement discriminating in favour of local transmitters
Detection Capability	All transmitter types
Frequency response	+/- 5dB 10MHz to beyond 6500MHz
Sensitivity	Average -50dBm
Dynamic range	Greater than 50dB, typically -50dBm to +5dBm at 1GHz
Power source	Alkaline 9V PP3 giving 24 hours continuous operation.
Size	122mm x 62mm x 22mm
Weight	245g

Delta V Operating manual - Part No: 2-197-244