

SECTION 1

INTRODUCTION

1-1 About this Instruction Manual

This Instruction Manual provides guidance on how to survey with the RM4 Resistance meter. This includes use of accessories such as probe arrays PA1, PA3 and PA5.

1-2 Introducing the RM4 Resistance Meter

The RM4 Resistance Meter and accessories have been designed for the archaeologist who wishes to carry out his own resistivity surveys but has no prior knowledge of the techniques involved.

The RM4 uses only low voltage and low currents for measuring earth resistance making it impossible to get an electric shock. Its low power consumption gives it long battery life and makes it one of the most compact and lightweight designs available. A 3 1/2 digit display provides all the resolution required without the need for back-off or balancing controls, making readings much faster and easier to take. Once a range has been selected, there will normally be no need to change it during the course of a survey.

A major source of error in earth resistivity surveying can be the high contact resistance which often occurs between probes and ground. However the RM4's combination of precision constant current transmitter and high input impedance receiver renders these effects negligible, giving reliable results in all but the very driest of conditions. A special contact resistance indicator tells you when the mobile probes of the twin array have been inserted deep enough into the ground for reliable results. This can help you avoid the temptation to push the probes deep into the ground in an attempt to reduce contact resistance, a process which can needlessly add seconds to each reading. If proper electrical contact is not made between the current probes and earth, then the RM4 will override the display preventing a false reading being taken.

If conditions are very dry and readings cannot be made with the normal 1mA constant current range, then the RM4 can be switched over to the HCR (High Contact Resistance) mode. This reduces the constant current by approximately one third, whilst still maintaining the same output voltage, resulting in a three fold increase in the constant current compliance. Readings will then be approximately 1/3 of their true value.

Synchronous detection and multipole filtering help reduce noise effects due to natural and power line earth currents, a problem which can be particularly serious on urban sites. Since it is not possible to have narrow bandwidth and fast settling at the same time, a choice of two time constants is provided which you can switch between depending on severity of the interference. The fast time constant, or rural setting, allows the reading to settle in about 1 second, yet will be useable on most urban sites. For severe cases of interference the slow time constant, or urban setting, will allow readings to be taken, but at the expense of a 2 second settling time.

AC operation overcomes polarisation and contact voltage effects between the probes and earth. The frequency is carefully chosen to avoid power line operating frequencies, harmonics and sub-harmonics and thus provides maximum rejection of power line earth currents.

An analogue output is provided for driving a chart recorder or for data logging purposes. In the latter case, a range status output is also available which not only tells the data logger which range is in use, but also tells it if probes are out of the ground. This may be used to provide semi-automatic data logging. Please note that the DL10 Data Logger (designed for use with the RM4) is no longer available.

1-3 Construction and Accessories

Waterproof components are used throughout, including all connectors, instrument housing, keypad, display, leads etc. The polycarbonate case of the RM4 has exceptionally high impact strength, making it extremely durable but at the same time lightweight.

Accessories available at the moment include the PA1 Twin Electrode Array, PA3 Four Probe Array, and PA5 Multiprobe array. Adapters AD1, AD2, AD3 and AD4 are also available to interface these arrays to the RM4. A range of additional wings, probes and struts are available for the PA5. Program GEOPLOT, suitable for IBM compatible PC's, is available for manual data input, processing and presentation of data.



RM4 Resistance Meter mounted on a PA1 Probe array frame (Above)
Close up of the RM4 Resistance Meter (Right)

1-4 Typical Specifications

(Subject to change)

TRANSMITTER Output voltage	40 V
Constant current ranges (p-p)	1 mA (0.33 mA - HCR mode)
Maximum contact resistance	40 Kohm (120 Kohm - HCR mode)
Current variation with contact resistance	< 0.6%, plus < 0.2 ohm +/- 1 digit
RECEIVER Resistance ranges	20ohm 200ohm 2000ohm (x3 in HCR mode)
Resolution (ohm)	0.01 0.1 1 (x0.33 in HCR mode)
Reading variation with battery voltage (8-12 V)	< 1% / V
Operating Frequency	137.5 Hz
Receiver input impedance	100 Mohm in parallel with 1000pF
Bandwidth	13Hz - 700 Hz, -3dB points
Response Time - Rural Filter	Approx. 1 second for 0.5 % accuracy
- Urban Filter	Approx. 2 seconds for 0.5 % accuracy
SP correction range (automatic)	+/- 2 V
Analogue output	+/- 2V fsd each range at 220 ohms // 0.1uF imp.
Status Outputs (2 bits)	Logic Levels 1 = -0.7V wrt battery +ve 0 = -4.7V wrt battery +ve
GENERAL Power supply	8 AA Nickel-Cadmium batteries
Battery life	22 hr at 1mA
Battery voltage range	8 - 12 V
Working temperature	0 degrees C.....+ 50 degrees C
Weight (inc. batteries)	0.9 Kg
Case dimensions	85 x 80 x 160 mm
BATTERY CHARGER Output	70 mA at 25 V constant current
Charge time for full capacity	10 hours (Nickel-Cadmium)
Input voltage to charger	120 V, 220 V, 240 V, 50/60 Hz (specify USA/Japan, European, UK)

(HCR mode refers to High Contact Resistance mode activated by internal DIP switch).



