STRICTLY CONFIDENTIAL

BATTERY

MEGGER
TRADE MARK

TESTER

Catalogue Nos. 40003
40004
40007
40008

INSTRUCTION DATA FOLDER

EVERSHED & VIGNOLES LTD
Acton Lane, Chiswick, London, W.4.

PUB.391/1

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AMENDMENT SHEET FOR DATA FOLDER 391/1

BATTERY "MEGGER" TESTERS - CAT.NOS. 40007 & 40008

These instruments supersede Cat.Nos. 40003 and 40004 respectively. Certain changes have been made in the Continuity range and protection arrangements:-

1. Continuity range 0-200 ohms instead of 0-20 ohms. Central scale value 5-ohms instead of 1-ohm.

2. A 1-ampere fuse is now fitted in series with the negative terminal to provide additional protection. This fuse occupies the holder that held the spare fuse in the previous instruments. It has not been possible to fit spare fuse holders in the new instruments owing to lack of space.

3. The wiring diagram for the new instruments is RD.3310.

Instrument Data Folder

THE BATTERY "MEGGER" TESTER. CAT. NO. 40003

(For internal circulation and Agents only).

INCLUDED:

AMENDMENT SHEET (dated February 1965) TO COVER MODIFICATIONS TO THIS INSTRUMENT:

CATALOGUE NOS. 40007 & 40008.

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SECTION 1 - INTRODUCTION

The Battery Megger Tester has been designed to meet the need for a reasonably-priced and self-contained 'new look' instrument offering simple press-button testing, in a modern-styled case, as an alternative to the hand-driven generator models of insulation and continuity testers.

The instrument is an ideal one for general installation and maintenance work, having a.c. and d.c. voltage ranges as well as insulation and continuity ranges. It is also finding considerable usefulness in electrical and electronic workshops by virtue of the ranges offered.

The re-chargeable battery and built-in charging circuit ensure that the instrument is always ready for use, and the rotary switch with central 'test' button provides for single-handed working in awkward or confined spaces. Since, on 200-240 volt circuits the battery can be re-charged from 'flat' in 12 hours or less, the charging can be carried out overnight (see Pages 4 and 11 for further details of the battery).

A neon indicator is fitted to guard against accidental connection to a live circuit during insulation or continuity testing.

SECTION 2 - SPECIFICATION

Dimensions and weight:		see Drawing No. RF.2714.
Case material:		high-impact Krylastic ABS polymer (black).
Terminals:		spring-loaded, for use with leads provided.
Scale ranges: (Cat.No. 40003)	*	0.4 to 50 megohms and infinity 0 to 20 ohms 0 to 500 volts a.c. 0 to 500 volts d.c.
Meter accuracy:		insulation ± 10% of indication above 3 megohms and below 0.6 megohm. ± 5% of indication from 0.6 to 3 megohms. continuity ± 0.05 ohm. voltage ± 4% of f.s.d.
Sensitivity on voltage ranges:		900 ohms/volt (a.c.) 1000 ohms/volt (d.c.)
Movement:		moving coil, f.s.d. 1 mA, resistance 80-85 ohms.
Insulation testing pressure:		approximately 500 volts according to load resistance. Calibrated at 500 volts (see Graph in the Reprint*)
Continuity testing pressure:		Supplied direct from the battery at 8.15 to 10 volts according to state of charge. The open-circuit voltage resulting at the terminals is 80 to 85 millivolts, depending also on the resistance of the individual moving-coil movement.
Adjustments:		screwdriver-slot controls for SET MEGOHMS, SET OHMS, and meter mechanical zero.
Battery:		9V DEAC nickel-cadmium (8 cells) type 8/225/DK 2. Capacity 225 mA. hr.
Fuses :	*	100 mA cartridge type (charging circuit only) 1 A " " Instrument circuit.

* See Amendment Sheet for Cat.No. 40007/8.

SECTION 3 - ACCESSORIES

The instrument is supplied with one pair of test leads which are fitted with screw-on clips. The clips can be unscrewed and prods which are also supplied can be fitted in their place. The leather case is made so that tests can be carried out with the instrument in position, there being two holes in line with the terminal sockets, whilst the shoulder strap holds the instrument in the correct position for reading.

A spare fuse is fitted alongside the charging circuit fuse.

In instruments Cat.Nos. 40007 and 40008 there is no spare fuse position (see Amendment Sheet Feb. 1965)

SECTION 4 - CIRCUIT DESCRIPTION

Insulation Range: A 9 volt battery is fed via two transistors in a common-base chopper circuit to the primary of a step-up transformer. The operating frequency of the converter formed by this arrangement is in the region of 500 c/s. The secondary winding of the transformer is fed to a symetrical voltage doubler/rectifier circuit. The primary current is arranged so that saturation of the transformer occurs with all but the very lowest input voltages. This ensures constancy of output voltage over reasonable periods of time as the battery voltage falls.

The converter is connected in series with the moving coil indicator (sensitivity 1 mA d.c. full scale), a neon lamp and its limiting resistance and the test terminals, when the switch is set to "Megohms". The limiting resistance is used with the neon lamp only, it is not part of the resistance measuring circuit. The neon lamp - resistance combination is, in fact, a live line detector and it is removed from the circuit when the push button is depressed. The only effective series resistance in the insulation test circuit is made up of the movement resistance plus the internal resistance of the converter. In the "Set Megohm" position the circuit is similar to the above but a 1 megohm resistor is inserted in circuit in place of the external circuit under test. R5 is the "Set Megohm" control and acts by varying the input to the converter. Half scale on the indicator is marked 1 megohm and the movement draws 500 µA at this point. One therefore has 500 µA flowing in a circuit of resistance 1 megohm and the voltage is 500 volts. This ensures correct calibration as to test voltage and insulation readings.

Continuity range: The converter is switched out of circuit and the indicator is connected across R8 plus R14. The parallel combination of R8 plus R14 and the indicator is adjusted to give a resultant resistance of 5 ohms during manufacture. This is an internal pre-set (R8 is adjusted) adjustment to cater for manufacturing tolerances on indication resistance. The remainder of the circuit comprises the "SET OHMS" control R6 in series with R7 (a current limiting resistor) and the 9-volt battery connected across the indicator - R8 combination. In use, R6 the "Set Ohms" control is adjusted until the indicator reads full scale deflection which is marked "SET" on the continuity scale. The circuit under test is applied in shunt with the indicator combination mentioned above. This means that an external resistance of 5 ohms will shunt a 5 ohm indicator combination to half scale as the current will divide equally between the two branches.

In general, the continuity scale is calibrated on this principle, but it might be argued that zero should coincide with the indicator zero current point. The discrepancy represents contact resistance in the switch together with lead resistance.

D.C. Voltage: Here the indicator is placed in series with a 500 kilohm resistor and the test terminals. This is a straightforward voltmeter circuit which will function even if the internal battery is removed or run-down. The sensitivity is 1000 ohms per volt.

A.C. Voltage: Here the circuit is similar to that for the D.C. volts but a full wave bridge type instrument rectifier is interposed between indicator and series resistor and terminals. The series resistor is 450 kilohms and the sensitivity is 900 ohms per volt. This reduction in sensitivity occurs because the instrument responds to mean values of voltage but is calibrated in terms of R.M.S. values assuming a sine wave of form factor 1.11. Should the instrument be used on voltages having distorted wave shapes the indication will not be correct. In general, this type of error does not exceed ± 4% and is often lower.

Battery charging facility

The sixth position of the switch sets up a circuit for re-charging the internal battery from an a.c. mains supply. The battery is connected to the output of a full wave bridge rectifier. The A.C. mains input is fed to the rectifier via a 100 mA fuse, a 0.3 microfarad capacitor and a 1,500 ohm safety resistor all connected in series. The capacitor is used to drop the voltage to a reasonable figure whilst the resistor protects the other components in the rare event of a capacitor breaking down. The fuse in the charging circuit does not perform any other function than protection of the charging circuit.

SECTION 5 - SERVICING AND CALIBRATION INSTRUCTIONS

Dismantling

1. Insert plugs in terminal sockets.
2. Turn instrument over and remove seals and the screws under them.
3. The bottom part of the case containing the battery can then be raised sufficiently to enable one to reach most parts of the instrument.
4. To remove the bottom of the case completely unsolder the wires to mains connector and battery, noting position of wires before unsoldering.
5. One can then remove the top part of the case by unscrewing the four 4 B.A. screws in the corners but care is necessary in dealing with the terminal push buttons. These are spring-urged and the springs are released when the top of the case is removed. The wires to the live line detector neon lamp are long enough to enable the top of the case to be moved far enough to carry out most repairs.

NOTE: Carry out all these operations on a surface free from iron filings or dust, preferably using a tray so that small parts are not lost if inadvertently dropped.

Re-assembly

1. Set movement zero adjuster to mid point of travel, also set zero adjuster stud on case to corresponding position.
2. Turn top cover so that front faces downwards. Insert springs in terminal tops.
3. Place printed circuit on top cover, making sure zero adjuster of movement engages with the adjuster stud in the cover. Hold the two parts together at lower end and insert screws in upper corners. Partly

tighten these screws. Then insert the two remaining screws and finally tighten all four screws.

4. Re-solder wires from battery and mains connector.
5. Place bottom of case in position, insert screws and seal, thereby completing the re-assembly.

Calibration Adjustments

Insulation range: See that moving coil indicator zero adjustment screw is set so that instrument reads "infinity" on insulation scale with instrument set to "Megohms" and not connected to any external circuit. Turn switch to "Set Megohms" position and adjust appropriate control until pointer indicates "1 megohm" on scale. No other adjustments are possible. If the above procedure does not enable the pointer to be brought to the 1 megohm point the battery requires re-charging or replacement. Other points on the scale can of course be checked by using a standard resistance box.

Continuity range: Set to appropriate switch position and adjust "set ohms" control until pointer reads to "set" position. The scale can then be checked against a resistance box. If the battery is in good condition, but the calibration is incorrect, after carrying out the above, adjustment of the preset control R8 is necessary, using a standard resistance box to check calibration.

Voltage ranges: There is no adjustment other than indicator zero adjuster. The scales can be checked by reference to a standard voltmeter. A voltage source

having a pure sine wave-form must be used in the 500 volt a.c. range as the instrument is of rectifier operated moving coil type.

Battery Data

1. Average useful life: 250 charge/discharge cycles after which the useful charge period will have dropped to 75% of the original.
2. Shelf life: There is a loss of charge of 1½% per week. Thus an idle battery should be charged every six months for at least 7 hours and at most 14 hours at the normal rate (230V with our standard charging circuit). After 18 months idleness the batteries must be subjected to at least 2 charge/discharge cycles before they regain their proper operating condition.
3. Operating temperatures: The electrolyte freezes at - 28°C . No permanent damage is done below this temperature but the battery must be warmed up above this lower limiting temperature before use. The graphite oxidises above + 55°C and the battery should not be subjected to temperatures exceeding this as irreversible changes resulting in loss of battery capacity are likely.

It is recommended that the batteries be recharged before despatch if they have been in stock for over 3 months. Alternatively, the customer should be warned that the first cycle before recharging may be shorter than normal, and that this will right itself after the first full charge.

Overcharging beyond 30 hours will cause damage to the batteries and the upper limit of 14 hours is stated to allow for forgetfulness.

SECTION 6 - LITERATURE AVAILABLE

Catalogue Sheet: No. 23 English
No. F23 French
No. G23 German

Throw-away leaflets: Nos. 0105 and 0110

General folder on Evershed instruments: No. 382
(available in French, German, Russian & Spanish)

Instruction Card: No. EBMT 516 English
No. EBMT 518 French

The following items are also available, on request

Technical Reprint: "Transistorized Insulation Tester"
(reprinted from Electrical Review of 9.3.62).

Wall Chart: No. 13980

Education Leaflet No. 2 - Publication No. 392 (in preparation).

Spare Parts & Price List (Home) No. SPPL 7/95
Price Schedule No. 388

Spare Parts & Price List (Overseas) No. SPPL 7/95 O.R.
Price Schedule No. 389

Direct Mail leaflet: No. DM.16

Slide, 2" x 2", for lectures.

Display card.

SECTION 7 - COMPETITIVE EQUIPMENT

Instrument	Insulation Range	Continuity Range	Voltage Ranges	Rechargeable Battery
EVERSHED* Cat. 40003	0.4-50 megohms 500V pressure	0-20 ohms	0-500 volts a.c. & d.c.	Yes
Chauvin et Arnoux Mod.T (French)	0-100 megohms 500V pressure	not fitted	not fitted	No uses dry battery
Norma Model 667 (Austrian)	0-0.5 megohms 0.4-10 megohms 10-5000 megohms at 500V multiplied by 2 at 1000V and divided by 2 at 250V or by 5 at 100V.	not fitted	not fitted	No uses dry battery
Hartmann & Braun Isolavi 6 (German)	0-5 megohms 0-500 megohms	not fitted	0-500 V a.c. 0-500 V d.c.	Yes
Muller & Ziegler Muzitestet (German)	0-50 megohms	0-500 ohms	0-300V d.c. 0-600V a.c.	No uses dry battery
Nordisk-instrument Handy Meg (Danish)	0-50 megohms	not fitted	0-500V d.c. 0-500V a.c.	No uses dry battery
TETTEX type 5401 (Swiss)	0-100 megohms	not fitted	not fitted	No uses dry battery
Everett Edgcumbe Metrohm (English)	0-15-50 megohms	0.1-50 ohms	not fitted	No uses dry battery

* See Amendment Sheet February 1965 for revised continuity range (0-200 ohms) for modified instruments.