MEGGER INSTRUMENTS LIMITED

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An AVO INTERNATIONAL company

MEGGER

Battery MEGGER® Tester BM10

Operating Instructions

MEGGER®

SAFETY WARNING

- ★ ***The circuit must be de-energized and isolated BEFORE connections are made for any test, (except a voltage measurement).***
- ★ ***Do not touch the circuit during an insulation test.***
- ★ ***After insulation tests, capacitive circuits MUST be allowed to discharge BEFORE disconnecting the test leads.***
- ★ ***Test leads, including prods and crocodile clips, must be in good order; clean and having no broken or cracked insulation.***
- ★ ***Replacement fuses MUST be of the correct type and rating.***
- ★ ***When making voltage measurements on high energy systems it is essential that test leads with fused prods are used.***

Refer also to page 8 for further explanations and other precautions. The warnings and precautions must be read and understood before the instrument is used. They must be observed during use.

NOTE

This instrument is only to be used by a suitably trained and competent person.

CONTENTS

GENERAL DESCRIPTION

The BM10 Battery MEGGER® Tester is a battery operated, portable multi-voltage d.c. insulation tester covering five test voltages. Insulation resistance readings are given directly, the scale plate carrying a single insulation resistance range calibrated 0 to 100GΩ (100 000MΩ) and infinity. This scale is used for all insulation resistance ranges except 50V, when the reading must be divided by 10.

A continuity test range is included; this reads between 0 and 200Ω with a resolution of 0,1Ω. There is also a voltage range for measurements up to 500V a.c. or d.c. This range is in operation on all switch positions until the 'test' button is depressed and thus serves to check that a circuit is 'dead' before a resistance test is made. Until the 'test' button is depressed this voltmeter circuit presents a load of 100kΩ to any external voltage source. It therefore provides a discharge monitor after measurements on capacitive circuits have been made. To measure voltage with an input impedance of 10MΩ, the range switch is set to the position and the 'test' button depre

Range selection is accomplished by rotary switch. In order to engage th insulation resistance range, it is nec slide the interlock button, located t 'test' button, to the left. The 'test' energises the tester enabling the tes appear at the instrument terminals.

Three terminals are provided for me +, – and Guard. The + terminal is f viding overload protection to all ran is also a fuse in the Guard terminal.

The tester is powered by four self-c cells. Rechargeable cells may be use charger is available. A battery check provided, selected by the main rang

The instrument is housed in an attra moulded case and supplied with a c protective cover. A PVC covered ca is available as an accessory.

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A continuity test range is included; this reads between 0 and 200Ω with a resolution of 0,1Ω. There is also a voltage range for measurements up to 500V a.c. or d.c. This range is in operation on all switch positions until the 'test' button is depressed and thus serves to check that a circuit is 'dead' before a resistance test is made. Until the 'test' button is depressed this voltmeter circuit presents a load of 100kΩ to any external voltage source. It therefore provides a discharge monitor after measurements on capacitive circuits have been made. To measure voltage with an input impedance of 10MΩ, the range switch is set to the 'V' position and the 'test' button depressed.

Range selection is accomplished by a large rotary switch. In order to engage the 1000V insulation resistance range, it is necessary to slide the interlock button, located below the 'test' button, to the left. The 'test' button energises the tester enabling the test voltage to appear at the instrument terminals.

Three terminals are provided for measurements: +, – and Guard. The + terminal is fused, providing overload protection to all ranges. There is also a fuse in the Guard terminal.

The tester is powered by four self-contained 1,5V cells. Rechargeable cells may be used, and a charger is available. A battery check position is provided, selected by the main range switch.

The instrument is housed in an attractive moulded case and supplied with a clip-on protective cover. A PVC covered carrying case is available as an accessory.

SPECIFICATION

RANGES

Insulation Resistance Ranges

Test Voltage d.c. (±5%)	Resistance at highest scale point	Accuracy at 20°C	Minimum loading Resistance *	Maximum Overload
50V	10GΩ (10 000MΩ)	±2% of arc length	500kΩ	250V a.c./d.c.
100V	100GΩ (100 000MΩ)		1MΩ	
250V	100GΩ (100 000MΩ)		2MΩ	
500V	100GΩ (100 000MΩ)		2MΩ	
1000V	100GΩ (100 000MΩ)		5MΩ	

* This is the minimum value of loading resistance on each range which ensures that the test voltage across the circuit under test is maintained to within a nominal value of ±5%.

Continuity Range

Test conditions d.c.	Resistance at highest scale point	Accuracy at 20°C	Resolution	Maximum Overload
300mV open circuit 60mA short circuit	200Ω	±2,5% of arc length	0,1Ω	250V a.c./d.c.

SPECIFICATION

Voltage Range

Present on marked switch position, and all other ranges when 'test' button not depressed

Range	Input Impedance	Accuracy at 20°C	Resolution
500V a.c./d.c.	10MΩ*	±2,5% of arc length	10V

* This is the input impedance when the range switch is at the V position and the test but
On all other ranges without the button depressed, the impedance is 100kΩ and the over
is 1kV.

GENERAL

Short Circuit Current 4mA ±1mA

Storage Temperature Range −55°C to +70°C.

Temperature Coefficient of Accuracy

Insulation ranges ±0,2%/°C

Other ranges ±0,25%/°C

Humidity Range 0 to 80% (guaranteed up to 40

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	Resistance at highest scale point	Accuracy at 20°C	Minimum loading Resistance *	Maximum Overload
	10GΩ (10 000MΩ)	±2% of arc length	500kΩ	250V a.c./d.c.
	100GΩ (100 000MΩ)		1MΩ	
	100GΩ (100 000MΩ)		2MΩ	
	100GΩ (100 000MΩ)		2MΩ	
	100GΩ (100 000MΩ)		5MΩ	

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Voltage Range

Present on marked switch position, and all other ranges when 'test' button not depressed

Range	Input Impedance	Accuracy at 20°C	Resolution	Maximum Overload
500V a.c./d.c.	10MΩ*	±2,5% of arc length	10V	1kV a.c./d.c.

* This is the input impedance when the range switch is at the V position and the test button is depressed. On all other ranges without the button depressed, the impedance is 100kΩ and the overload rating is 1kV.

GENERAL

Short Circuit Current 4mA ±1mA

Storage Temperature Range −55°C to +70°C.

Temperature Coefficient of Accuracy

Insulation ranges ±0,2%/°C

Other ranges ±0,25%/°C

Humidity Range 0 to 80% (guaranteed up to 40°C).

SPECIFICATION

Discharge Monitor		When the test button is released after an insulation resistance test, an impedance of 100kΩ appears across the terminals and discharges the circuit under test. The time is less than 1s for a 2μF capacitor charged to 1kV to discharge to 50V. The voltmeter monitors this discharge.
Movement		Centrepole, moving coil movement with pivot and jewel suspension.
Batteries	Type	Four 1,5V cells, IEC R14 'C' size (R14B, 114C, 214, U11 MJ). Batteries not supplied.
		or
		Four rechargeable cells, IEC R14 (NCC 200 or equivalent).
		External charger available.
	Life	20 hours approx. for dry cells or rechargeable cells. Power is only consumed when the 'test' button is depressed, thus allowing approximately 10 000 measurements, of average duration 7 seconds each.
Fuses		Two x ceramic cartridge 20 x 5mm. 1A 240V IEC 127/1.
Dimensions	Instrument only	185 x 147 x 87mm (7,3 x 5,8 x 3,4in.)
	With protective cover	185 x 150 x 106mm (7,3 x 5,9 x 4,2in.)
Weight		1,5kg approx.

OPERATION

PRECAUTIONS

USE EXTREME CARE WHEN USING OR MEASURING VOLTAGES ABOVE 50V, particularly in high energy situations. Fused test leads are available as optional extras. These are recommended for use when making voltage tests.

CHECK THE FUSE BEFORE PROCEEDING WITH MEASUREMENTS.

AVOID MAKING CONNECTIONS TO A LIVE CIRCUIT WHENEVER POSSIBLE.

DO NOT PRESS THE TEST BUTTON IF THERE IS A METER DEFLECTION, EXCEPT ON THE 'V' POSITION.

Caution:— The instrument circuit contains a static sensitive device. If the instrument casing is opened for any reason, (this will automatically invalidate any warranty covering the instrument), care must be exercised in handling the printed circuit board. This should be done in accordance with DEF STAN 59-98 and BS 5783, specifications for handling electrostatic sensitive devices.

POWER SUPPLY

The instrument is powered by

(a) four dry cells, 1,5V, type R

or

(b) four rechargeable cells, 1, NCC 200.

(a) Dry Cells

The cells are housed beneat instruction plate. To install remove the rear cover by tu 'OPEN'. TAKE CARE TO CORRECT POLARITY WH THE NEW BATTERIES, ar battery divider is correctly two pairs of cells. If the me unused for several months, be removed.

To check the battery condit press the test button. The b replaced if the meter deflec marked position.

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	Centrepole, moving coil movement with pivot and jewel suspension.
Type	Four 1,5V cells, IEC R14 'C' size (R14B, 114C, 214, U11 MJ). Batteries not supplied.
	or
	Four rechargeable cells, IEC R14 (NCC 200 or equivalent).
	External charger available.
Life	20 hours approx. for dry cells or rechargeable cells. Power is only consumed when the 'test' button is depressed, thus allowing approximately 10 000 measurements, of average duration 7 seconds each.
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POWER SUPPLY

The instrument is powered by either

(a) four dry cells, 1,5V, type R14B

or

(b) four rechargeable cells, 1,2V, type NCC 200.

(a) Dry Cells

The cells are housed beneath the rear instruction plate. To install new batteries, remove the rear cover by turning the screw to 'OPEN'. TAKE CARE TO OBSERVE THE CORRECT POLARITY WHEN INSERTING THE NEW BATTERIES, and ensure that the battery divider is correctly placed between the two pairs of cells. If the meter is going to stand unused for several months, the batteries should be removed.

To check the battery condition, select ⊣|⊢ and press the test button. The batteries should be replaced if the meter deflection is less than the marked position.

(b) Rechargeable Cells

The cells are housed beneath the rear instruction plate. To install the cells, remove the rear cover by turning the screw to 'OPEN', TAKE CARE TO OBSERVE THE CORRECT POLARITY WHEN INSERTING THE BATTERIES, and ensure that the battery divider is correctly placed between the two pairs of cells.

To check the battery condition, select ⊣|⊢ and press the test button. The batteries should be recharged if the meter deflection is less than the marked position.

A special battery charger is available as an optional accessory. ONLY THE MEGGER® CHARGER SHOULD BE USED AND THEN ONLY WHEN RECHARGEABLE CELLS ARE FITTED. Unlike calculator-type chargers, the MEGGER® charger operates at constant current, NOT constant voltage. The charger has a maximum short-circuit charging current of 500 mA and a maximum open-circuit voltage of 9 V.

Use of MEGGER® Battery Charger

(i) Ensure that the charger has the correct voltage rating for the mains supply used. Two different chargers are available: 220/240 V 50/60 Hz or 110/120 V 50/60 Hz. The voltage rating is clearly marked on the charger unit. A suitable mains plug should be fitted. If a fused plug is used, the fuse rating is 1 A.

(ii) Connect the charger to the BM10 via the jack socket in the side of the instrument.

(iii) Turn on the mains supply and leave connected for up to 10 hours for a fully discharged battery.

(iv) Disconnect the charger, select ⊣|⊢ and press the test button. If the meter indication is still below the marked position, either the rechargeable cells need replacing after several years service, or there is a fault in the charger, or its connectors, (the charger has an internal thermal fuse). To check that the charger is working correctly connect a voltmeter across the right hand battery terminals; with the batteries in place the voltage should rise to approximately 5 V, with the batteries removed it will be more than 6 V.

TEST LEADS

Check that the test leads have

(a) no break in the insulation.

(b) no break in the conductor.

(a) Connect the leads to the instrument terminals without separating or uncoiling them. Ensure that the outer ends are not touching anything. Set the range selector switch to 1000V; the inter-lock button must be moved to the left to engage this range. Press the 'test' button. The pointer should indicate at least 100GΩ. Failure to do this indicates that the leads may be faulty, and should be inspected.

(b) Connect the + and — leads together at the outer ends. Select the Ω range. Press the 'test' button. The meter should read zero, within ±3 mm. Failure to do this indicates that the leads may be faulty and should be checked individually for a break. See also 'Fuse Replacement'.

TEST BUTTON

The test button is the upper of the two buttons on the front panel. When the button is not pressed, the instrument acts as a low impedance voltmeter, for all positions of the range switch. This is a safety feature. When making insulation or continuity measurements, or when checking the battery condition, ALWAYS ENSURE THAT THERE IS NO READING ON THE METER BEFORE PRESSING THE TEST BUTTON. If attempts are made to carry out resistance measurements on a live circuit, DAMAGE TO THE INSTRUMENT MAY RESULT.

OPERATION

To make high impedance voltage it is necessary to select the V po range switch and then press the

INSULATION RESISTANCE TI

(i) Insert the red test lead int and one of the black test — socket.

(ii) Switch to ⊣|⊢ and check condition, as described in

(iii) Check the test leads as des 'Test Leads'.

(iv) Set the range selector swit required voltage. To make test, slide the interlock bu and simultaneously select position on the range swit

(v) Connect the red test lead under test, and the black t or the frame of the equipr let the leads trail across a

(vi) Check that there is no def meter. If there is a reading PROCEED WITH THE TE the power to the circuit ar meter deflection again.

(vii) Press the test button.

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(ii) Connect the charger to the BM10 via the jack socket in the side of the instrument.

(iii) Turn on the mains supply and leave connected for up to 10 hours for a fully discharged battery.

(iv) Disconnect the charger, select ⊣|⊢ and press the test button. If the meter indication is still below the marked position, either the rechargeable cells need replacing after several years service, or there is a fault in the charger, or its connectors, (the charger has an internal thermal fuse). To check that the charger is working correctly connect a voltmeter across the right hand battery terminals; with the batteries in place the voltage should rise to approximately 5 V, with the batteries removed it will be more than 6 V.

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(b) no break in the conductor.

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(b) Connect the + and — leads together at the outer ends. Select the Ω range. Press the 'test' button. The meter should read zero, within ±3 mm. Failure to do this indicates that the leads may be faulty and should be checked individually for a break. See also 'Fuse Replacement'.

TEST BUTTON

The test button is the upper of the two buttons on the front panel. When the button is not pressed, the instrument acts as a low impedance voltmeter, for all positions of the range switch. This is a safety feature. When making insulation or continuity measurements, or when checking the battery condition, ALWAYS ENSURE THAT THERE IS NO READING ON THE METER BEFORE PRESSING THE TEST BUTTON. If attempts are made to carry out resistance measurements on a live circuit, DAMAGE TO THE INSTRUMENT MAY RESULT.

OPERATION

To make high impedance voltage measurements, it is necessary to select the V position on the range switch and then press the test button.

INSULATION RESISTANCE TESTS

(i) Insert the red test lead into the + socket and one of the black test leads into the — socket.

(ii) Switch to ⊣|⊢ and check the battery condition, as described in 'Power Supply'.

(iii) Check the test leads as described in 'Test Leads'.

(iv) Set the range selector switch to the required voltage. To make the 1000V test, slide the interlock button to the left and simultaneously select the 1000V position on the range switch.

(v) Connect the red test lead to the circuit under test, and the black test lead to earth or the frame of the equipment. Do not let the leads trail across a metal bench.

(vi) Check that there is no deflection on the meter. If there is a reading, DO NOT PROCEED WITH THE TEST. Turn off the power to the circuit and check the meter deflection again.

(vii) Press the test button.

(viii) Read off the insulation resistance from the MΩ scale. When testing at 50V, divide the reading by 10.

(ix) Release the test button. Observe the voltmeter reading. DO NOT DISCONNECT THE TEST LEADS UNTIL THE VOLTMETER READING IS ZERO. The voltmeter acts as a discharge monitor after measurements on capacitive circuits have been made and the test button is released.

Some capacitors can recover terminal voltage following charge and discharge as a result of the energy stored in the dielectric. It is recommended that, if capacitors are tested at more than 100V a short circuit is fitted across their terminals for some time after test.

(x) If there is a possibility of surface leakage, see 'Use of Guard Terminal'.

CONTINUITY TESTS

(i) Insert the red test lead into the + socket and one of the black test leads into the — socket.

(ii) Switch to ⊣⊢ and check the battery condition as described in 'Power Supply'.

(iii) Check the test leads as described in 'Test Leads'.

(iv) Set the range selector switch to the Ω position.

(v) Connect the leads to the circuit to be tested.

(vi) Press the test button.

(vii) Read off the resistance from the Ω scale.

(viii) Release the test button.

VOLTAGE MEASUREMENTS

EXERCISE EXTREME CAUTION WHEN MEASURING VOLTAGES ABOVE 50V.
Check the fuses and the leads as described in 'FUSE REPLACEMENT'and'TEST LEADS'.

Voltages up to 500V may be measured at an input impedance of 10MΩ as follows:

(i) Insert the red test lead into the + socket and one of the black test leads into the — socket.

(ii) Check the test leads as described in 'Test Leads'.

(iii) Set the range selector switch to the 'V' position.

(iv) Connect the leads to the circuit to be tested.

(v) Press the test button.

(vi) Note that the meter will show a deflection before the test button is depressed. In this state, the voltage is measured at an input impedance of 100kΩ. In order to obtain a more accurate reading of voltages with appreciable source impedance, the button must be pressed.

(vii) Read off the voltage from the V scale.

(viii) Release the test button.

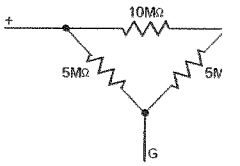
FUSE REPLACEMENT

A 1A fuse is located in each of the + and G sockets. The fuses may be checked as follows:

(i) Connect the + and — leads together at the outer ends. Select the Ω range and press the 'test' button. The meter reading should be zero, within ±3mm. If not, check the fuse in the + socket.

(ii) To check the fuse in the G socket, connect the three leads to the instrument. Between the ends of the test leads connects resistors as shown opposite:—

Select the 50V insulation testing range. Operate the instrument and note the reading, it should be 10MΩ. Disconnect the G test lead and opera
ment again. The reading t
be 5MΩ. If there is no dif
the two readings i.e. both
the fuse in the G socket h



The fuses may be changed as fol

(i) Remove all the test leads
instrument.

(ii) Use the key provided to r
appropriate socket from t
instrument.

(iii) Remove the fuse and inse
replacement.

(iv) Use only the correct type
ceramic cartridge, 20 :
1A 250V IEC 127 she

Two replacement fuses ar
beneath the rear cover.

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ESTS

red test lead into the + socket
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⊣⊢ and check the battery
as described in 'Power Supply'.

(iii) Check the test leads as described in 'Test Leads'.
(iv) Set the range selector switch to the Ω position.
(v) Connect the leads to the circuit to be tested.
(vi) Press the test button.
(vii) Read off the resistance from the Ω scale.
(viii) Release the test button.

VOLTAGE MEASUREMENTS

EXERCISE EXTREME CAUTION WHEN MEASURING VOLTAGES ABOVE 50V.
Check the fuses and the leads as described in 'FUSE REPLACEMENT'and'TEST LEADS'.

Voltages up to 500V may be measured at an input impedance of 10MΩ as follows:

(i) Insert the red test lead into the + socket and one of the black test leads into the — socket.
(ii) Check the test leads as described in 'Test Leads'.
(iii) Set the range selector switch to the 'V' position.
(iv) Connect the leads to the circuit to be tested.

OPERATION

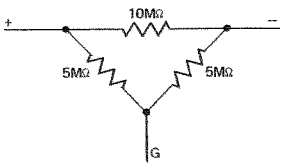
(v) Press the test button.
(vi) Note that the meter will show a deflection before the test button is depressed. In this state, the voltage is measured at an input impedance of 100kΩ. In order to obtain a more accurate reading of voltages with appreciable source impedance, the button must be pressed.
(vii) Read off the voltage from the V scale.
(viii) Release the test button.

FUSE REPLACEMENT

A 1A fuse is located in each of the + and G sockets. The fuses may be checked as follows:

(i) Connect the + and — leads together at the outer ends. Select the Ω range and press the 'test' button. The meter reading should be zero, within ±3mm. If not, check the fuse in the + socket.

(ii) To check the fuse in the G socket, connect the three leads to the instrument. Between the ends of the test leads connects resistors as shown opposite:—
Select the 50V insulation testing range. Operate the instrument and note the reading, it should be 10MΩ. Disconnect the G test lead and operate the instrument again. The reading this time should be 5MΩ. If there is no difference between the two readings i.e. both are 5MΩ then the fuse in the G socket has ruptured.



The fuses may be changed as follows:

(i) Remove all the test leads from the instrument.
(ii) Use the key provided to remove the appropriate socket from the front of the instrument.
(iii) Remove the fuse and insert a suitable replacement.
(iv) Use only the correct type of fuse:
ceramic cartridge, 20 x 5mm,
1A 250V IEC 127 sheet 1.
Two replacement fuses are located beneath the rear cover.

MEASUREMENT TECHNIQUES

USE OF THE GUARD TERMINAL

The guard terminal G is available for use when there is a possibility of surface leakage interfering with an insulation resistance reading.

In cable testing, for example, there may be a path of leakage across the insulation between the bared cable and the external sheathing, perhaps caused by the presence of moisture or dirt. Where it is required to disregard this leakage, particularly at high test voltages, a bare wire should be bound tightly around the insulation and connected to the guard terminal, G. A second black lead is supplied for this purpose. Since the leakage resistance is effectively in parallel with the resistance to be measured, the use of the guard wire causes the current through the surface leakage path to be diverted from the measuring circuit.

The maximum load that can be connected to the guard terminal before appreciable effects on the meter accuracy is approximately 1MΩ.

INDUCED VOLTAGES IN THE TEST OBJECT

When measuring the insulation between cable conductors, currents in neighbouring conductors may cause induced voltages in the test cable. This may result in an increased resistance reading. The presence of induced voltages may be checked, by switching the BM10 to the V range and pressing the 'test button'.

CIRCUIT DESCRIPTION

This circuit description should be read in conjunction with the block diagram and the circuit diagram. Caution: The circuit design contains a static sensitive device, (see page 8).

POWER SUPPLY

The instrument is powered by four 1,5V dry cells, which can be of the rechargeable type. It is important that the cells are inserted the correct way round, as the instrument is not protected for reversed batteries. The battery recharger provides a constant current to charge the cells, and not to supply the circuit directly. The re-chargeable cells provide voltage regulation when the charger is connected. It is therefore necessary to have rechargeable cells fitted when the battery charger is connected.

STORED ENERGY INVERTER

This circuit provides a range of d.c. voltages up to 1000 volts, from the battery voltage. Energy is put into the transformer core when the primary is being driven (TR1 and TR2 ON). Then the abrupt cutting of the primary current produces a large voltage which is multiplied up by the turns ratio of the transformer to produce 1000 volts. The wave-form controlling TR1 and TR2 is produced by the oscillator (IC1 and associated timing capacitors C4, C5) and is controlled by a constant current
TR6 and TR9) and a feedback v
TR3. In the maximum power cc
feedback voltage is near zero, so
flowing through TR5, adjusted b
C4 and gives a minimum OFF ti
current through R15, R16 gives
time, adjusted by R15. Hence m
is transferred through the transf
feedback voltage approaches nor
adjusted by R7 to give 1kV on t
constant current through TR5 is
differently through TR3 and TR
ON time decreases to keep the fe
ing at a nominal 50V. The maxir
throughput is converted to a ma
by the short circuit resistor R12.

RATIOMETRIC DETECTOR CI

This circuit replaces the conventi
EVERSHED Cross-coils moveme
TR18, TR19 and associated com
produce the log. of the ratio of t
reference current at the base of T
shaping is introduced here, and a
circuit (TR16, TR17) provides th
characteristic for the meter scale.

ENT TECHNIQUES

ARD TERMINAL

l G is available for use when
y of surface leakage interfering
resistance reading.

r example, there may be a
oss the insulation between
l the external sheathing,
the presence of moisture or
quired to disregard this
y at high test voltages, a bare
ınd tightly around the
nected to the guard terminal,
lead is supplied for this
leakage resistance is
lel with the resistance to
se of the guard wire causes
ı the surface leakage path
to be diverted from the measuring circuit.

The maximum load that can be connected to the guard terminal before appreciable effects on the meter accuracy is approximately 1MΩ.

INDUCED VOLTAGES IN THE TEST OBJECT

When measuring the insulation between cable conductors, currents in neighbouring conductors may cause induced voltages in the test cable. This may result in an increased resistance reading. The presence of induced voltages may be checked, by switching the BM10 to the V range and pressing the 'test button'.

CIRCUIT DESCRIPTION

This circuit description should be read in conjunction with the block diagram and the circuit diagram. Caution: The circuit design contains a static sensitive device, (see page 8).

POWER SUPPLY

The instrument is powered by four 1,5V dry cells, which can be of the rechargeable type. It is important that the cells are inserted the correct way round, as the instrument is not protected for reversed batteries. The battery recharger provides a constant current to charge the cells, and not to supply the circuit directly. The re-chargeable cells provide voltage regulation when the charger is connected. It is therefore necessary to have rechargeable cells fitted when the battery charger is connected.

STORED ENERGY INVERTER

This circuit provides a range of d.c. voltages up to 1000 volts, from the battery voltage. Energy is put into the transformer core when the primary is being driven (TR1 and TR2 ON). Then the abrupt cutting of the primary current produces a large voltage which is multiplied up by the turns ratio of the transformer to produce 1000 volts. The wave-form controlling TR1 and TR2 is produced by the oscillator (IC1 and associated timing capacitors C4, C5) and is controlled by a constant current generator (TR5, TR6 and TR9) and a feedback voltage applied to TR3. In the maximum power condition, the feedback voltage is near zero, so all the current flowing through TR5, adjusted by R18, goes into C4 and gives a minimum OFF time. The bleed current through R15, R16 gives a maximum ON time, adjusted by R15. Hence maximum power is transferred through the transformer. When the feedback voltage approaches nominally 50V, adjusted by R7 to give 1kV on the output, the constant current through TR5 is divided differently through TR3 and TR4, and so the ON time decreases to keep the feedback winding at a nominal 50V. The maximum power throughput is converted to a maximum current by the short circuit resistor R12.

RATIOMETRIC DETECTOR CIRCUIT

This circuit replaces the conventional EVERSHED Cross-coils movement. IC5, IC6, TR18, TR19 and associated components produce the log. of the ratio of the test to reference current at the base of TR18. Scale shaping is introduced here, and an antilog. circuit (TR16, TR17) provides the required characteristic for the meter scale. Leakages to

CIRCUIT DESCRIPTION

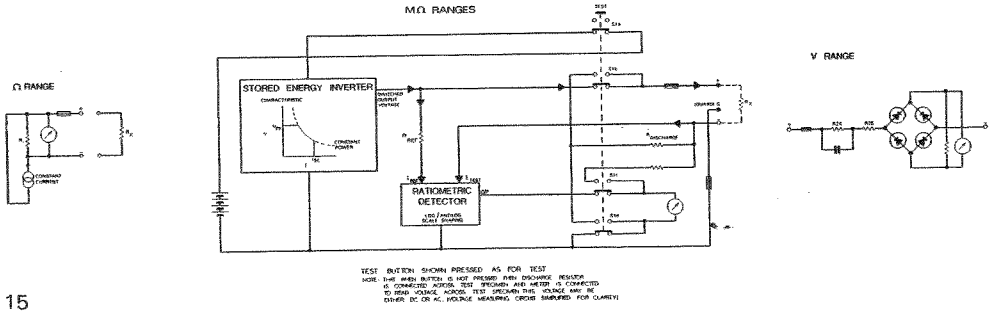
IC5 pin 2 cause the pointer to move away from ∞ on the MΩ ranges, and therefore have been reduced as much as is practicable.

VOLTMETER CIRCUIT

The switching is arranged so that the instrument acts as a voltmeter (a.c. and d.c.) when not being used for any function. The impedance in this case is low, and is such that it discharges a capacitor after testing insulation at high voltages. When the test button is depressed on the V range, the impedance is 10MΩ and the instrument will measure a.c. or d.c. up to 500V. The form factor for a.c. sine wave is compensated for by shorting out R24 with C6 at frequencies between 40Hz and 400Hz. C9, C10, C18 and C19 provide a short-circuit for pick-up.

RESISTANCE CIRCUIT

This circuit supplies a constant current through R_{ref} (R19) in parallel with the unknown resistor. The voltage drop across R19 is measured and the scale calibrated accordingly. The constant current is produced by the operational amplifier buffer (IC2, TR10) with reference to +1,5V (R32, R33 junction), with series adjustable resistor R21, R20, R22, so that when $R_{unknown} = \infty$, full scale deflection is produced when measuring across R19.



ACCESSORIES

Supplied with Instrument

Three test leads, two black, one red.
Three crocodile clips, two black, one red.
Two prods, one black, one red.
Operating instructions.
Protective cover.

Supplied at extra cost

Four rechargeable cells, NCC 200 with external battery charger
For 220/240V supply Part No. 6310-573
For 110/120V supply Part No. 6310-574

Replacement rechargeable cell (4 required) Part No. 25511-839

Carrying case Part No. 6310-575
(for use with the instrument without its protective cover).
This is constructed of PVC covered fibreboard and provides space for the BM10, leads and instruction book. When fitting the instrument into the case; take out the lead compartment first, then fit the instrument and afterwards replace the lead compartment. The instrumer without being removed from opened case may be suspend from the user's neck, with th supported face upward, by n straps provided. Note that th each pair of connecting strap attached to the end of the ca the pivot and the shorter stra end.

Tests leads with fused prods — unsuitable for continuity measurements. (Comply with Health and Safety Executive doc. GS38).
black
red

›ESCRIPTION

› the pointer to move away from
›nges, and therefore have been
›h as is practicable.

CIRCUIT

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›ter (a.c. and d.c.) when not being
nction. The impedance in this
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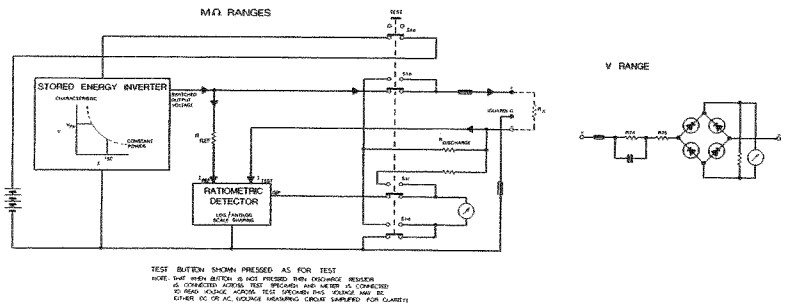

TEST BUTTON SHOWN PRESSED AS FOR TEST

ACCESSORIES

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Three crocodile clips, two black, one red.
Two prods, one black, one red.
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Protective cover.

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Tests leads with fused prods — unsuitable for continuity measurements. (Comply with Health and Safety Executive doc. GS38).
black Part No. 6121-125
red Part No. 6121-126

INSTRUMENT REPAIRS AND SPARE PARTS

The manufacturer's service and spare parts organisation for MEGGER® instruments: —

MEGGER INSTRUMENTS LIMITED,
Archcliffe Road,
Dover,
Kent CT17 9EN,
England.
Tel: Dover (0304) 202620
Fax: Dover (0304) 207342
Telex: 96283 Avomeg G

Approved Repair Companies

A number of independent instrument repair companies in the U.K. have been approved for repair work on most MEGGER® instruments, using genuine MEGGER® spare parts. Their names and addresses are listed in the Warranty Card, supplied with each new instrument.

Overseas

Instrument owners outside Great Britain should consult the Appointed Distributor/Agent for their country regarding spare parts and repair facilities. The Distributor/Agent will advise on the best course of action to take.

If returning an instrument to Britain for repair, it should be sent, freight pre-paid to the address shown opposite. A copy of the Invoice and of the Packing Note should be sent simultaneously by airmail to expedite clearance through the U.K. Customs.

A repair estimate showing return freight and other charges will be submitted to the sender, if required, before work on the instrument commences.

NEW MEGGER® INSTRUMENTS ARE GUARANTEED FOR 12 MONTHS FROM THE DATE OF PURCHASE BY THE USER.

BM10 CIRCUIT DIAGRAM Part No. 6170-712

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