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MIT400 Series Insulation and continuity testers

USER GUIDE

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1. Introduction

Thank you for purchasing the Megger insulation test instrument.

For your own safety and to get the maximum benefit from your instrument, please ensure that you read and understand the following safety warnings and instructions before attempting to use the instruments.

This user guide describes the operation and functions of the MIT400 series of insulation and continuity test instruments:

These instruments are designed and manufactured by:

Megger Ltd
Archcliffe Road
Dover Kent
CT17 9EN
England

Megger Limited reserves the right to change the specification of these instruments at any time without prior notice.

2. ⚠ Safety Warnings

MIT400 series insulation testers

Safety Warnings and Precautions must be read and understood before the instrument is used. They **must** be observed during use.

- 1 The circuit under test must be switched off, de-energised, securely isolated and proved dead **before** test connections are made when carrying out insulation and continuity tests.
- 2 Circuit connections and exposed-conductive-parts and other metalwork of an installation or equipment under test **must not** be touched during testing.
- 3 The live circuit warning and automatic discharge are additional safety features, which may fail, and therefore **safe working practices must be observed**.
- 4 The voltage function will only work if the instrument is functional and switched on.
- 5 After insulation tests, capacitive circuits must be allowed to discharge **before** disconnecting test leads.
- 6 The instrument **should not** be used if any part of it is damaged.
- 7 All test leads, probes and crocodile clips must be in good order, clean and with no broken or cracked insulation.
- 8 Ensure that hands remain behind guards of probes/clips when testing.
- 9 National Safety Authorities may recommend the use of fused test leads when measuring voltage on high-energy systems.
- 10 Replacement fuses **must** be of the correct type and rating. Failure to fit the correctly rated fuse may result in a safety hazard and may cause damage to the instrument in the event of an overload.
- 11 The battery cover **must** be in place whilst conducting tests.

NOTE
THE INSTRUMENT MUST ONLY BE USED BY SUITABLY TRAINED AND COMPETENT PERSONS.

Users of this equipment and/or their employers are reminded that National Health and Safety Legislation requires them to carry out valid risk assessments of all electrical work so as to identify potential sources of electrical danger and risk of electrical injury such as inadvertent short circuits. Where the assessments show that the risk is significant then the use of fused test leads may be appropriate.

3. Symbols used on the instrument

F Caution: risk of electric shock

G Caution: refer to accompanying notes

Displayed on the LCD during an insulation test, warns that a hazardous voltage may exist at the test lead probes also observe voltage discharges to a safe level.

On battery cover see section 2.0 notes 10 and 11.

At terminals do not exceed rated input voltage.



Equipment protected throughout by Double Insulation (Class II)



Equipment complies with relevant EU Directives

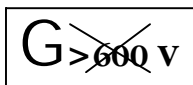
N13117



Equipment complies with 'C tick' requirements



Do not dispose of in the normal waste stream



Maximum input voltage 600 V rms

4. General Description

4.1 Case contents

There are important documents that you should read and keep for future reference.

Please complete the pre-paid warranty card and return it to Megger Limited as soon as possible to help us reduce any delays in supporting you should the need arise.

4.2 Case contents (all instruments)

- 1 x MIT400 series instrument
- 1 x Hard carry case
- 1 x Red/black test lead set with clips
- 5 x AA (LR6) batteries fitted
- 1 x Warranty card
- 1 x Calibration certificate
- 1 x Owners CD manual
- 1 x SP5 remote switched probe (Not MIT400 & MIT480)
- 1 x Download Manager software CD (MIT430 and MIT485 only)



MIT400 storage with holster

MIT400 storage with no holster

5. Preparations for use (all instruments)

5.1 Batteries

The Megger MIT400 series instruments are supplied with batteries fitted. When batteries become exhausted, refer to section 17 for battery replacement.

Warning: Do not switch the instrument on or connect test leads with the battery cover removed.

5.2 Preliminary test lead check

Functional verification

1. Before each use of the instrument visually inspect the test leads, prods and crocodile clips to confirm that their condition is good, with no damaged or broken insulation.
2. Check continuity of the test leads by firmly shorting the leads together and read the test lead resistance measurement directly from the display, which should be less than 1.0 Ω .

Supply voltage

With the exception of voltage measurement range, this instrument is designed for use on isolated (dead) circuits. Prior to any testing and using an approved method, ensure the circuit to be tested has been fully disconnected and is securely isolated from the supply prior to using the instrument.

6. General operating instructions

Safety note:

If greater than 25 V appears on the circuit under test the instrument will default to a voltage measurement and display the supply voltage.

On supply voltages over 50 V the instrument will be prevented from performing an insulation test, protecting your instrument from damage.

Note: This limit is increased on MIT480, MIT481 and MIT485 to 75 V, but a warning buzzer will indicate voltages above 50 V.

Use extreme care when using or measuring voltages above 30 V, particularly in high energy systems.

Fused test leads are available as an optional accessory for local situations where increased protection is required.

Hazardous voltages can exist on the insulation test range all the time the [TEST] button is locked down.

6.1 General functions

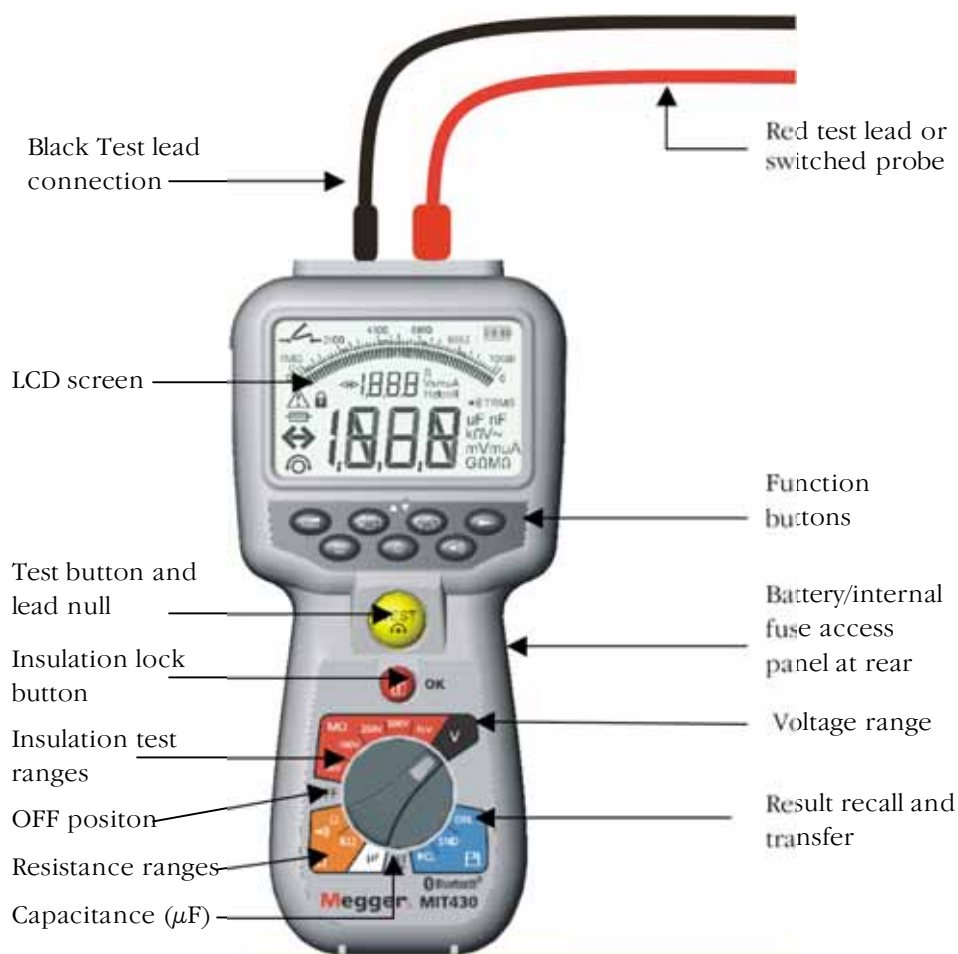


Figure 3 Main features (MIT430 shown)



Figure 4 Function buttons (MIT430 shown)

6.2 LCD Display

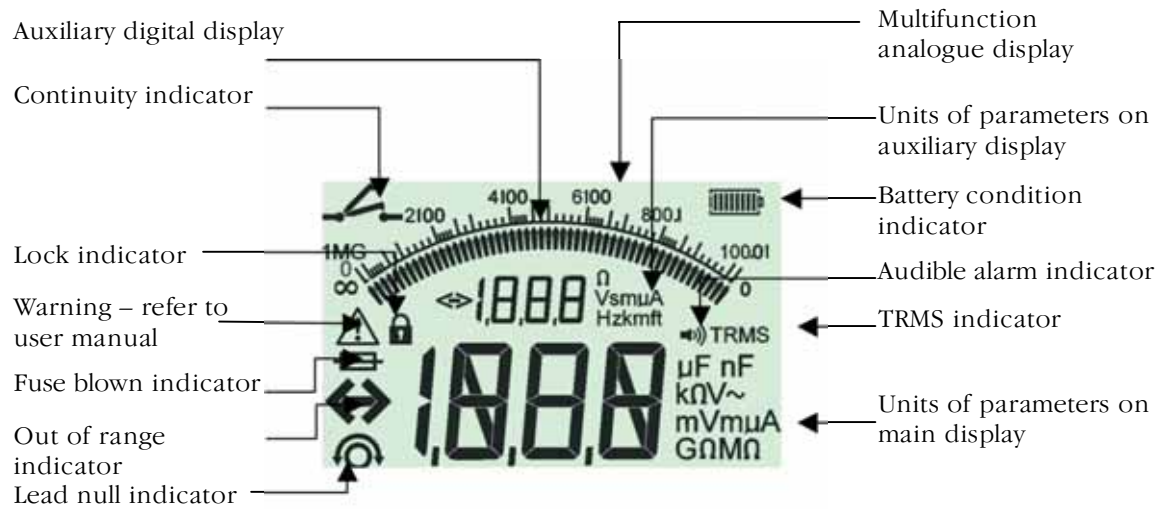


Figure 1 LCD display

6.3 Voltage warning


If the voltage is greater than 25 V the meter automatically displays the voltage.

For MIT400, MIT405, MIT410, MIT420, MIT430 and MIT40X instruments, if a voltage greater than 50V exists, testing will be automatically inhibited and voltage measurement will be displayed.

For MIT480, MIT482, MIT485 instruments, if a voltage greater than 75 V exists, testing will be automatically inhibited and a voltage measurement will be displayed. Voltages higher than 50 V will be indicated by a warning buzzer.

In continuity mode, if a voltage greater than 25 V exists, testing will be automatically inhibited and voltage measurement will be displayed.

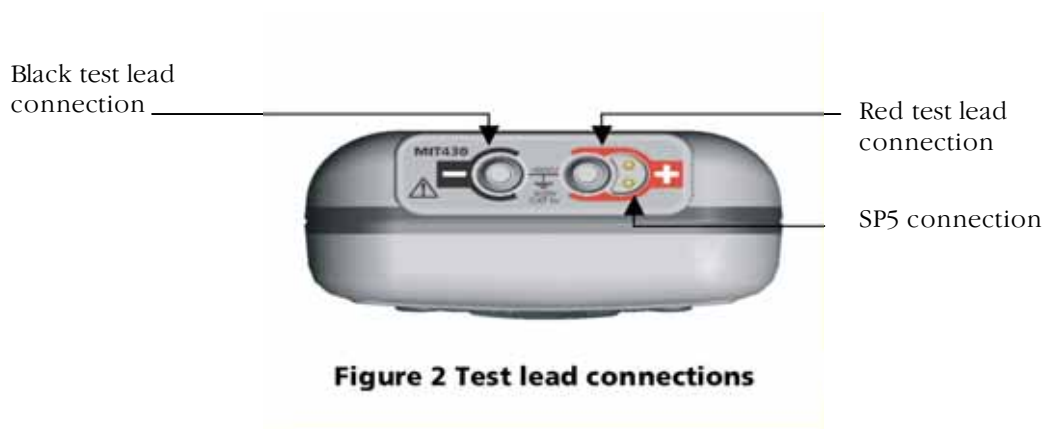
6.4 Backlight operation

All instrument displays are backlit. The backlight function can be selected at any time while the instrument is switched on by pressing the BACKLIGHT [] button. Refer to figure 4.

The backlight function will switch off automatically after 20 seconds.

7. Test lead connections

Test leads connections are as indicated in figure 2 which shows the test lead sockets at the top of the instrument, as well as the switched probe socket and test lead.



7.1 Standard test leads

The Red/Black test lead set should be connected to the appropriate sockets on the top of the instrument marked + and –, respectively. (see figure 2)

Test probes and crocodile clips are supplied for connection to the circuit under test.

Fused test leads are available as an optional accessory.

7.2 SP5 Switched probe (not MIT400, MIT405, MIT480 and MIT40X)

The SP5 switch probe allows the user to start a test by pressing the [TEST] button on the probe, instead of on the instrument. This allows for complete hands-free testing and increases user safety.

1. Connect the SP5 probe to the instrument using the special 3-pole +ve socket (in place of the RED test lead).
2. Select a suitable insulation resistance range.
3. Press and hold down the SP5 probe button. The instrument will start an insulation resistance test.
4. To end the test, release the probe test button.

The SP5 remote switch probe replaces the standard red test lead. The test button on the probe duplicates the test button operation on the instrument when insulation testing.

To operate the switch probe, connect the probe to the circuit to be tested and press and hold down the button on the probe. The insulation test will commence. Releasing the button will terminate the test.

The test lead resistance can be nulled for continuity testing. Refer to section 11.2

8. AC/DC voltage and frequency measurements

Note: Measured voltage must not exceed 600 V phase to earth or Phase to Phase

Frequency measurement is not available on MIT400, MIT405 and MIT480 models.

Procedure for measurement of voltage and frequency (Refer to Figure 5)

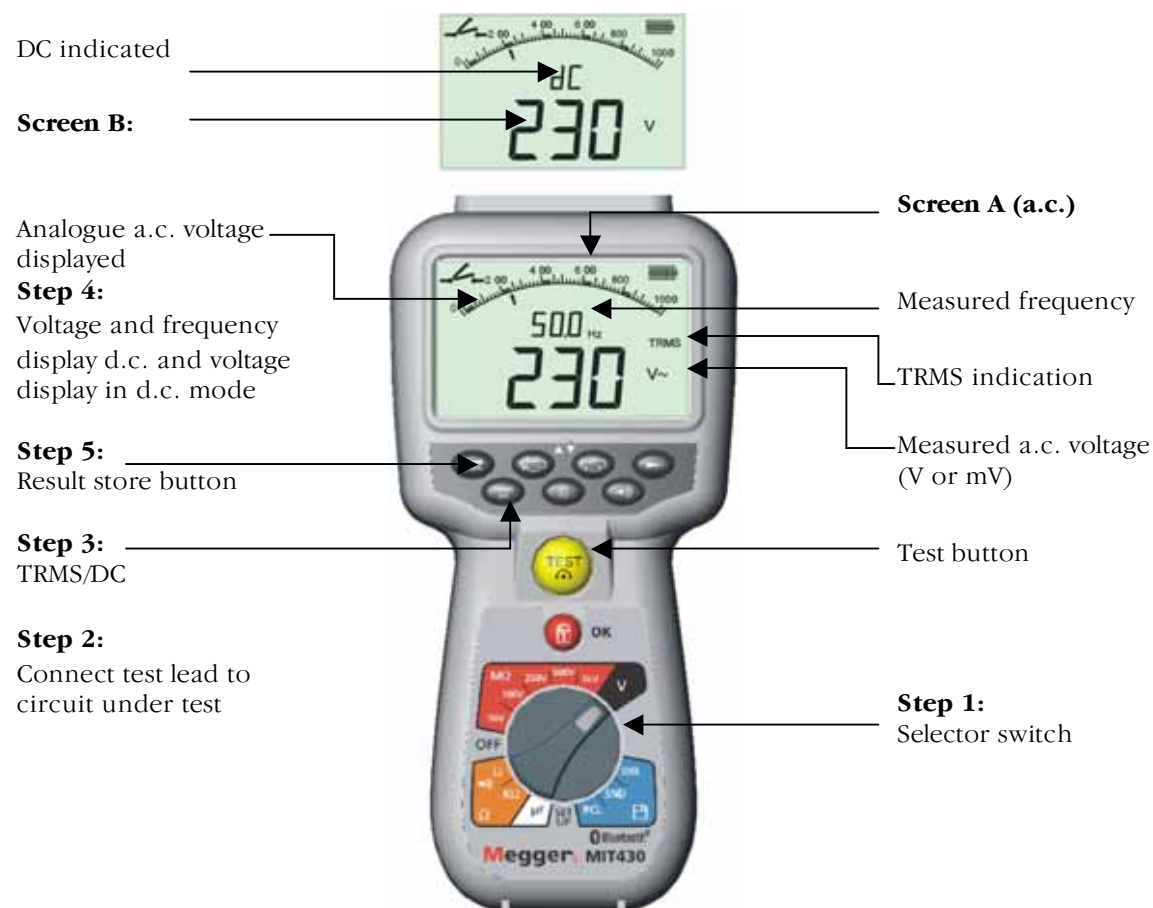


Figure 5 Voltage and frequency measurement

Note on TRMS measurement:

IN TRMS mode the MIT400 will measure both AC and DC components of the supply voltage (AC+DC). In DC mode only the DC component is measured.

1. Rotate selector switch to the 'V' position.
2. Connect test leads to the circuit under test.
3. 'TRMS' is the default mode on power-up. Press the [TRMS] button to select DC or return to TRMS if required.
4. The measured voltage will be displayed on the main digital scale in units of V or mV, as appropriate. In TRMS mode, the measured frequency (Hz) will be simultaneously displayed on the MIT410, MIT420, MIT430, MIT 481, and MIT 40X instruments (as shown on Screen A). See [Figure 5 Screen B](#) for dc mode display.
5. For MIT420, 430, 481 and 485, the measured result may be stored if required by pressing the 'STORE' button. Refer to section 14 for further information.

9. Insulation resistance testing - general

Safety note:

Insulation resistance testing is performed at high DC voltages and is hazardous if touched. Always observe the safety precautions when performing an insulation resistance test, and ensure all necessary health and safety precautions are observed.



Automatic Discharge: Capacitive circuits are automatically discharged when the test button is released following an insulation test.

The circuit under test **must be** completely **de-energized** and securely **isolated** before test connections are made.

9.1 Standard insulation resistance testing

(Refer to Figure 6)

Note: For MIT40X refer to section 10.

1. Connect the test probes to the isolated circuit under test.
2. Turn the instrument 'ON' by rotating the selector switch to the desired test voltage (50 V, 100 V 250 V, 500 V or 1 kV).
3. Press and hold the [TEST] button to start the test.
4. The insulation resistance value, in both analogue and digital form is displayed together with the actual test voltage displayed on the secondary display (see Screen A of figure 6).
5. The insulation test can be locked on, by pressing the lock button  whilst holding down the [TEST] button. To disable lock press the [TEST] button or lock  button.
6. By pressing the [uA/V/s] button, the leakage current can be displayed (see Screen B). Not available on the MIT400 or MIT480.
7. Release the [TEST] button before removing the test leads (to enable the instrument to discharge the circuit under test). If the display shows VOLTS, wait until it reaches zero.
8. On completion of testing, switch to the 'OFF' position. Alternatively **auto shut-off** operates after 15 minutes of inactivity.

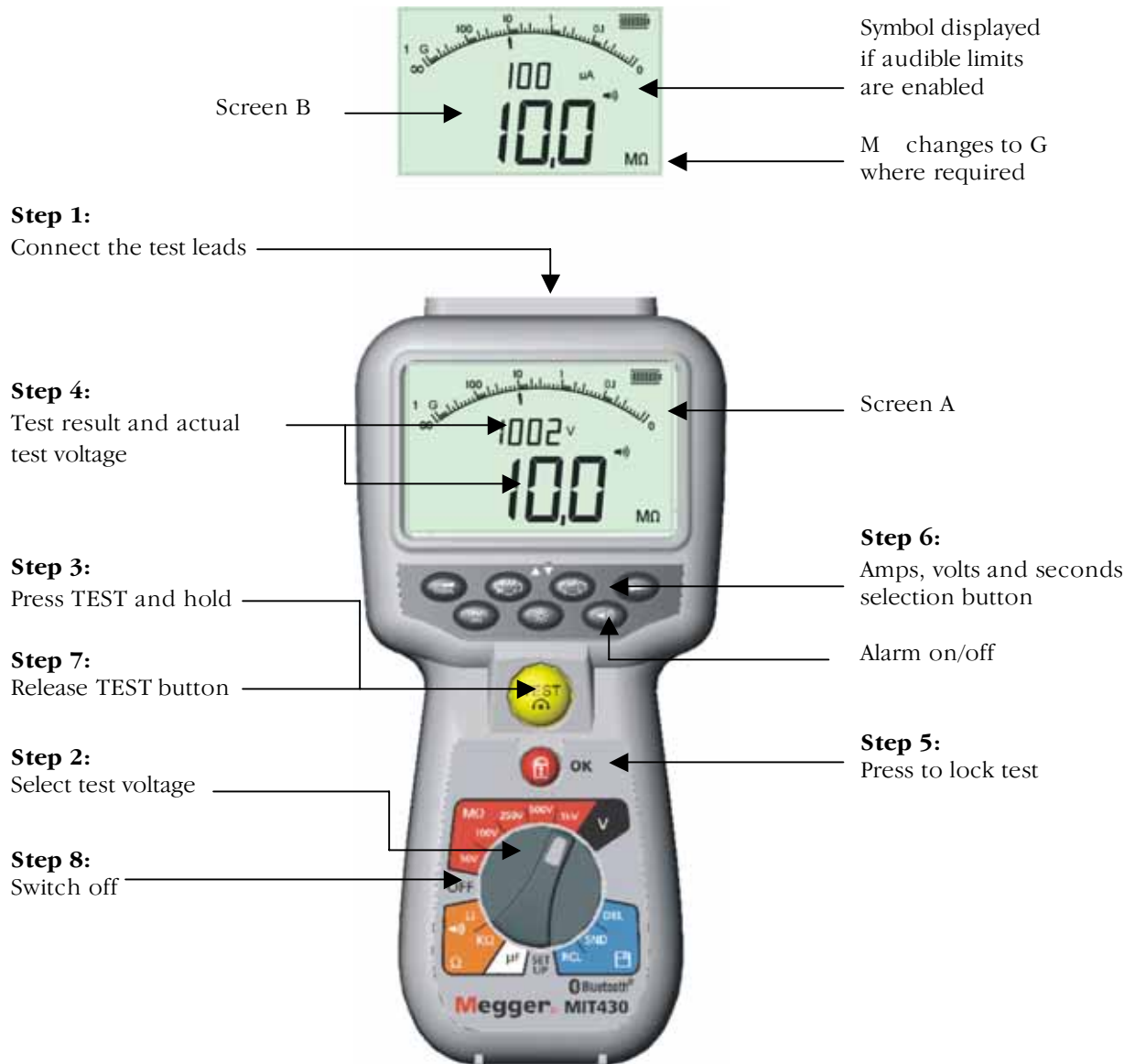


Figure 6 Standard mode insulation test

9.2 Insulation resistance testing – timed modes ‘t’, PI and DAR

Three types of timed test are possible:

(a) Standard count down timer (t)

Timed tests are performed over a timed period defined by parameter ‘t’ (also refer to Set-up procedures 13).

(b) Polarization Index (PI)


PI is the ratio between the insulation resistance values recorded at 1 minute (assigned t1) and at 10 minutes interval (assigned t2). i.e. after 1 minute and 10 minutes.

$$PI = 10 \text{ minute value} / 1 \text{ minute value}$$

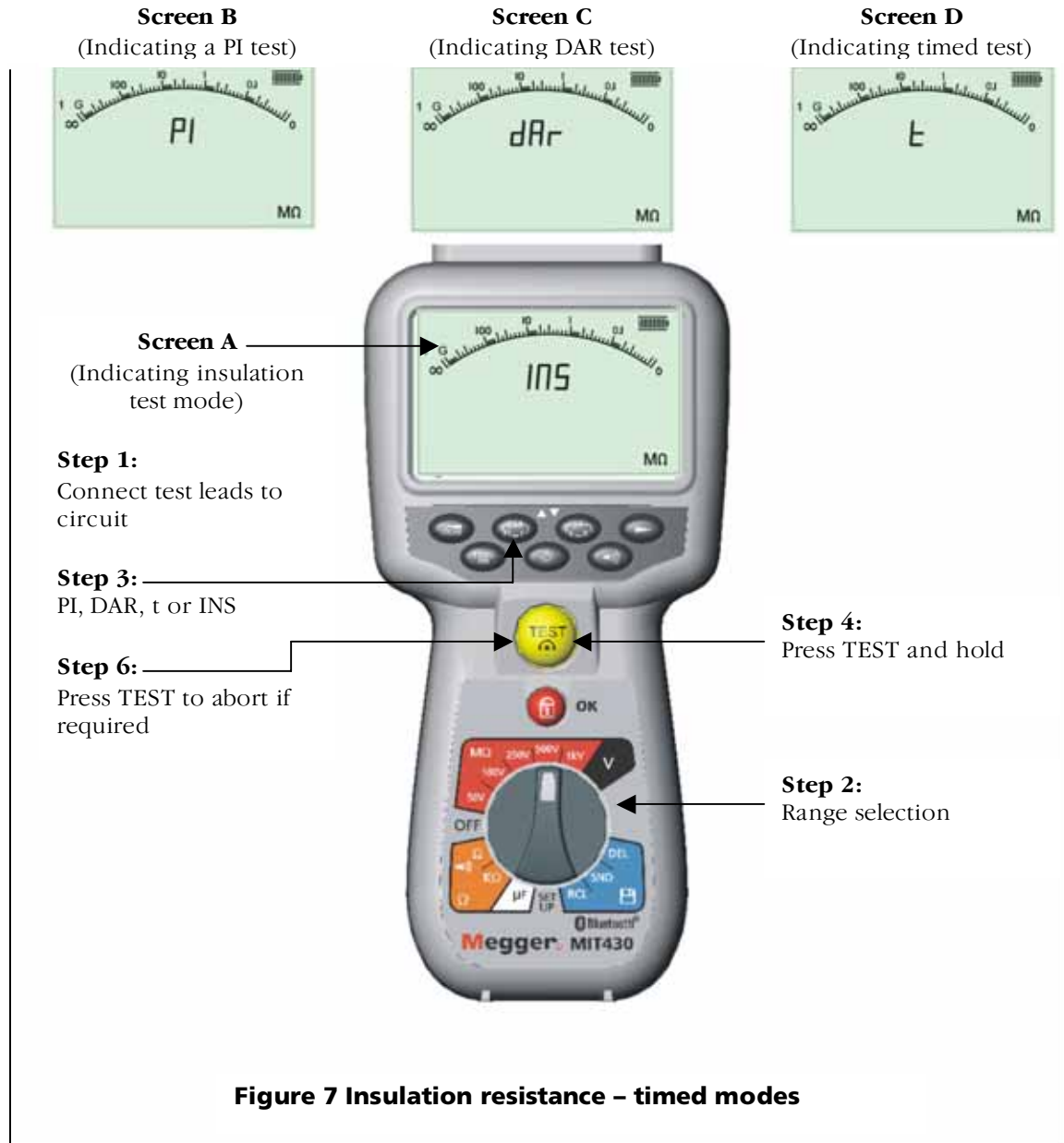
(c) Dielectric Absorption Ratio (DAR)

DAR is the ratio between the insulation resistance values at 30seconds (assigned t1) and at 60 second interval (assigned t2). i.e. after 30seconds and 60seconds.

$$\text{DAR} = 60 \text{ second value} / 30 \text{ second value}$$

During all insulation tests the symbol  will flash indicating that a test voltage is present.

(a) Insulation resistance testing – timed procedure (not MIT400, MIT405 or MIT480).
(Refer to Figures 7)



1. Connect the test probes to the isolated circuit under test.
2. Turn the instrument 'ON' by rotating the selector switch to the required test voltage position either 50 V, 100 V, 250 V, 500 V or 1 kV.
3. Select the timed test (t) by pressing 'PI/DAR/t' function button repetitively until the desired function is displayed.
Note: the test type defaults to insulation resistance when the range switch is moved.
See figure 7 screens B, C & D.

4. Once selected, press and hold the [TEST] button to start the test.
5. Use the LOCK [🔒] button only for standard insulation resistance tests if required. 'PI', 'DAR' and 't' automatically lock the test on for the duration of the test.
6. For timed tests, the test will run for the time period defined in Set-up (see [Set-up procedures 14](#)). To abort the test early, press TEST or LOCK [🔒] buttons.
7. At the end of the tests, the voltage will be discharged.

(b) Insulation resistance testing – PI and DAR (not MIT400, MIT405 and MIT480)

The **PI** test will run for a period of 10minutes. After one minute a test result is stored (t1). After 10 minutes a second test result is stored (t2). The resultant ratio is then displayed on the screen.

The same procedure applies for the **DAR** timed tests, however the test duration is 60 seconds, with the first result (t1) taken at 30 seconds and the second at 60 seconds (t2).

Results can be recalled to screen using the uA/v/s [▼] keys.

Note: DO NOT press PI/DAR/t [▲] as it will change the test mode and erase the current results.

Figure 8 illustrates the t1 and t2 screens.

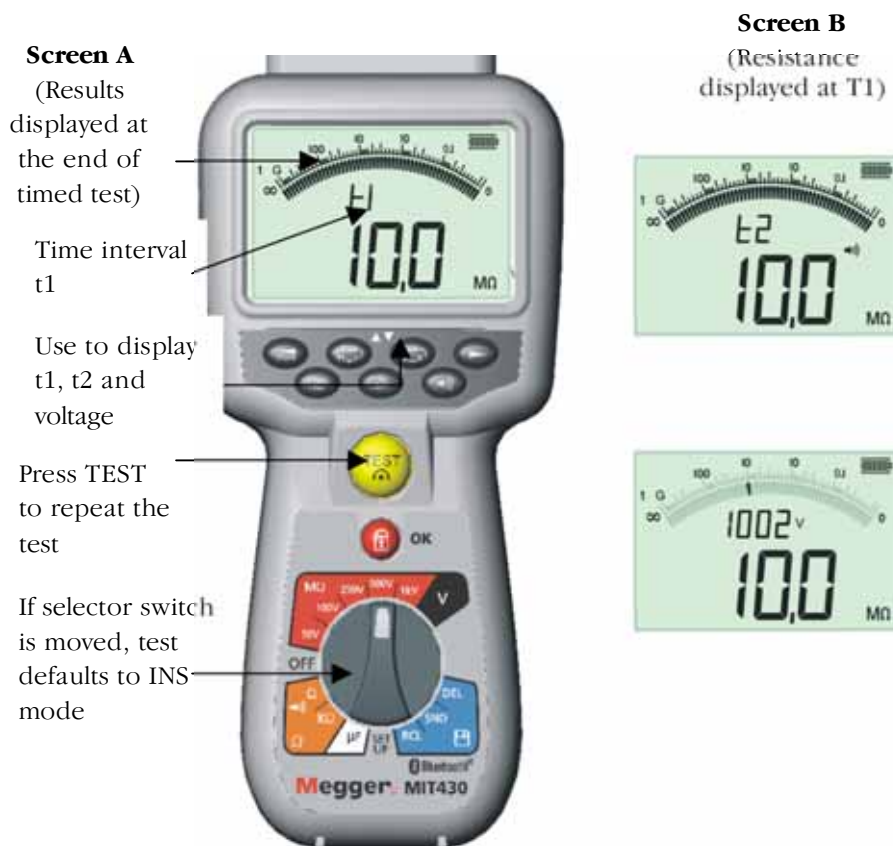


Figure 8 Insulation test – timed mode

10. MIT40X testing

The MIT40X has a selectable insulation test range from 10 V to 100 V in 1 V increments. The test voltage selected is the nominal test voltage. e.g. If 10 V is selected the actual voltage at the probe tip will be within the stated tolerance of ± 1 V.

The MIT40X is supplied with a default setting of 10 V. This can be adjusted in the setup procedure between 10 V and 100 V. To adjust the insulation test voltage refer to the Setup procedure.

Testing is performed in exactly the same manner as a standard insulation test in section 9.1 above.

11. Continuity testing [Ω] and buzzer [🔊]

Test procedure (refer to Figure 9)

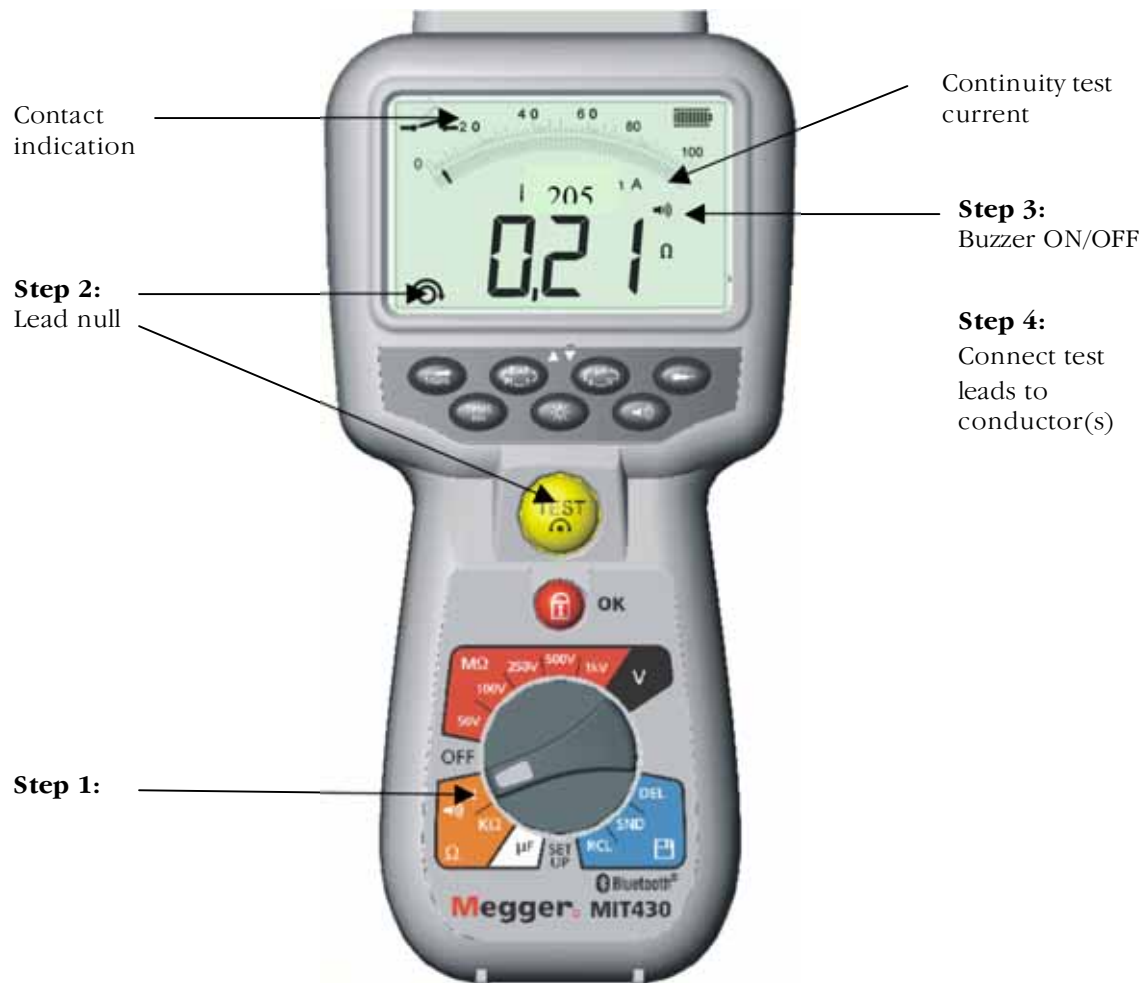


Figure 9 Continuity test and buzzer

1. Turn the instrument 'ON' by rotating the selector switch to the desired Ω position.
2. If required the test lead resistance can be set to Zero (null) by shorting the test leads together and pressing TEST. The null [🔊] symbol will show when this has been achieved and the display will read 0.00 Ω .
3. Press the [🔊] button to enable/disable the audible buzzer function. When enabled, the sounder symbol will be shown on the screen display. The pass threshold is set to 2 Ω by default, but is adjustable, as defined in Setup, see section 13.

Note that the buzzer defaults to OFF on power-up.

4. Connect the test leads to the isolated conductor(s) under test.
5. Observe the test result, displayed automatically. The auxiliary display indicates the actual test current (e.g. 205 mA. The maximum is defined in section 13, setup menu.

Note: The test current displayed is the actual test current used during the test, which will depend on the resistance of the circuit under test.

12. Resistance measurements ($k\Omega$ Range)

(Except MIT40X and MIT480)

Test procedure (refer to Figure 10)

Step 2:

Connect leads to conductors

Step 3:

Result displayed

Step 1:



Figure 10 Resistance – k range

1. Turn the instrument 'ON' by rotating the selector switch to the desired [$k\Omega$] position.
2. Connect the test leads to the isolated conductors under test.
3. Observe the test result, displayed automatically.

13. Capacitance measurements (Except MIT400, 405, 410, 480)

13.1 Capacitance measurement procedure

(refer to Figure 11)



Figure 11 Capacitance range

1. Turn the instrument 'ON' by rotating the selector switch to the capacitance [μF] position.
2. Connect the test leads to the isolated conductors under test.
3. Observe the test result, displayed automatically.

13.2 Distance measurement by capacitance

4. For the MIT481 and MIT485 instrument only, cable length is also be displayed in feet, km, or kft, as defined in Setup. This is calculated from the stored capacitance value (default 50 nF/km).

This can be adjusted in section 13 (Setup) from 40 nF/km to 60 nF/km.

14. Setup options

The setup position permits the user to adjust various threshold values and default settings. When SETUP is selected, the instrument firmware revision is displayed, followed by the buzzer alarm threshold.

Displayed symbol	Meaning	Default setting	Setting options	Instrument
BUZ	Set top threshold for continuity buzzer in ohms. Buzzer sounds is result is less than set value.	2 Ω	1, 2, 5, 10, 20 Ω	All
Loc	Lock button ON/OFF	ON	ON / OFF	All
ISC	Setup maximum continuity short-circuit current .	200 mA	20 mA, 200 mA (default 200 mA)	All
InS	Sets low threshold for insulation test buzzer in Mohms. Buzzer sounds is result is more than set value.	0.5 M Ω	0,5, 1, 2, 5, 10, 20 M Ω	MIT420 → MIT40X
t	Timer for insulation test. Test will count down to 0 seconds. Test is active during countdown.	1 minute	1 to 10 minutes (in 1 minute increments)	MIT410 → MIT481→
diS	Setup units for distance measurement	m	m (meters), ft (feet)	All
CAB	Setup cable capacitance in nF (distance measurement)	50 nF	40nF to 60nF 1nF increments	MIT481→
Set v	Setup insulation resistance voltage	10 V	10V to 100V 1 volt increments	MIT40X
bt	Bluetooth® Paring setup	-	-	MIT430 MIT485



Figure 12 Set up

Setup procedure (refer to Figures 12)

1. Turn the instrument '**ON**' by rotating the selector switch to the Setup position. The firmware version is displayed prior to the first setting BUZ.
2. Press the TEST button repeatedly to select the desired parameter, BUZ, Loc, ISC etc.
3. When the function to be changed is displayed, **press and hold** the TEST button to change the value. Each subsequent press increments the limit. Holding down the TEST button will automatically increment.
4. Changing a value will start the lock [🔒] symbol flashing. This indicates a value has been changed but not saved.
5. Save new limit by pressing the Lock [🔒] button. Saved changed are effected when the Screen Lock symbol stops flashing and disappears.

15. Saving, recalling and downloading test results.

(MIT420, MIT430, MIT481 and MIT485)

15.1 Saving test results

After completing any test the result remains displayed on the screen for one minute. During this time the result may be saved in memory and recalled later.



Figure 13 Test results storage

Procedure for storing test results (refer to Figure 13)

1. After completion of a particular measurement, ensure the test result is displayed on the instrument display, refer to Figure 13 Screen A.
The test result will remain displayed for one minute during which time the result may be stored.
2. Press [STORE] to record the test result. A unique identification number is allocated to each test result which is displayed for 15 seconds before returning to the test result.
3. Result is now stored.

15.2 Test results recall

(MIT420, MIT430, MIT481 and MIT485)

All stored test results may be recalled to the screen.

Procedure for recalling stored test results

(refer to Figure 14)

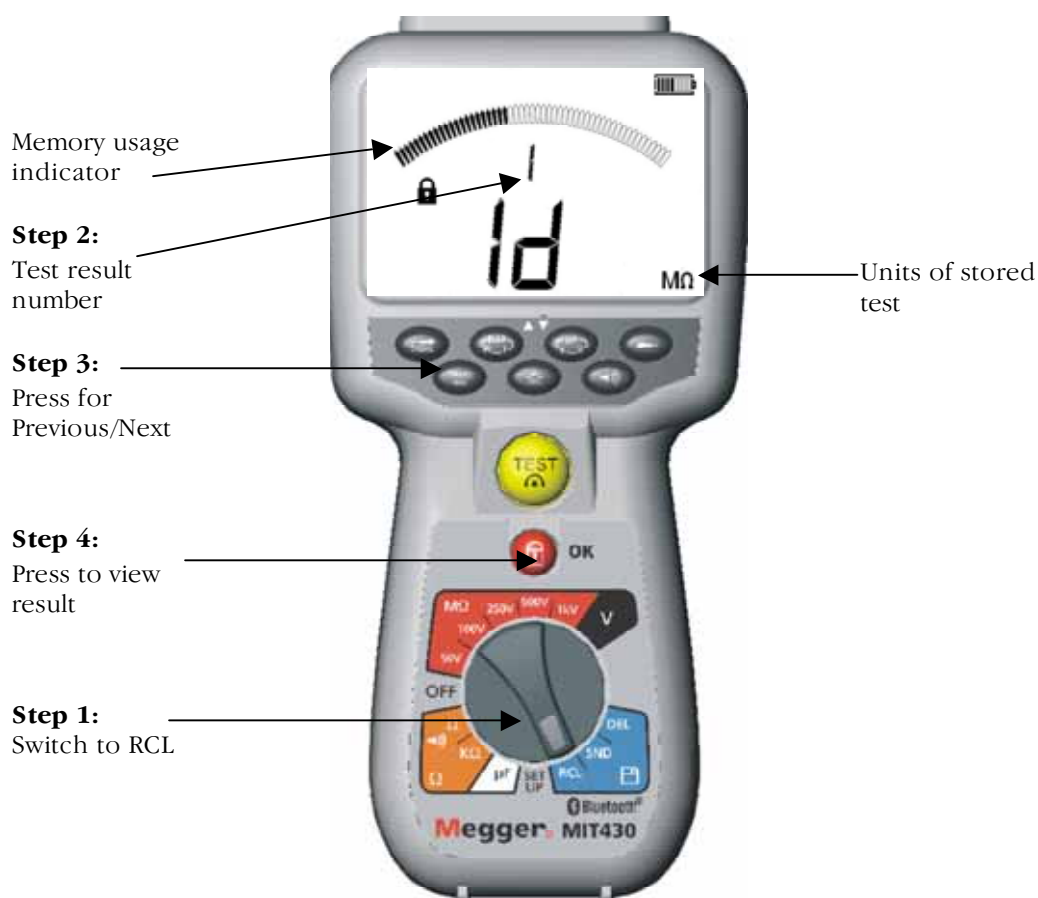


Figure 14 Recall test results

1. Turn the instrument 'ON' by rotating the selector switch to the recall (RCL) position.
2. Observe the latest unique test result identification number displayed. Where no results have previously been stored, the display will indicate this by three dashes.
3. Press [OK] to display last stored result, or select the particular test result identification number by using the [▲] and [▼] buttons, then press 'OK' to select.
4. The test result will be displayed. Additional information stored with the test result may be viewed using the relevant button. For example on insulation test μA can be recalled using the $\mu\text{A}/\text{S}/\text{V}$ key. The TRMS key will operate on voltage results.

15.3 PI and DAR recall.

Additional recall information is available if the result stored was a PI or DAR test, as the result is a ratio of two measured values.

Figure 15 illustrates the displays, which will be shown during a Dielectric Absorption Ratio (DAR) test result recall.

Screen A - DAR



Step 2:
Select
result

Step 1:
Switch to RCL

Screen B – t2



Screen C – t1



Screen D – VOLTAGE



Screen E – ID

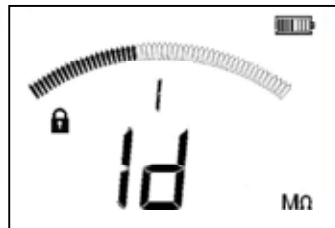


Figure 15 DAR recall results

To recall a PI or DAR result:

1. Rotate the selector switch to the recall (RCL) position and observe the latest unique test result identification number displayed.
2. Locate the particular test result identification number by using the [▲] and [▼] buttons, then press 'OK' to select.
3. The test result will be displayed. To scroll through the different measurements used in calculating the PI or DAR ratio, use the [▼] only button. See figure 15 screens B to E.

16. Deleting test results

(MIT420, MIT430, MIT481 and MIT485 only)

Stored test results may be deleted singularly or all together.

16.1 Procedure for deleting a single test result (refer to Figure 16)

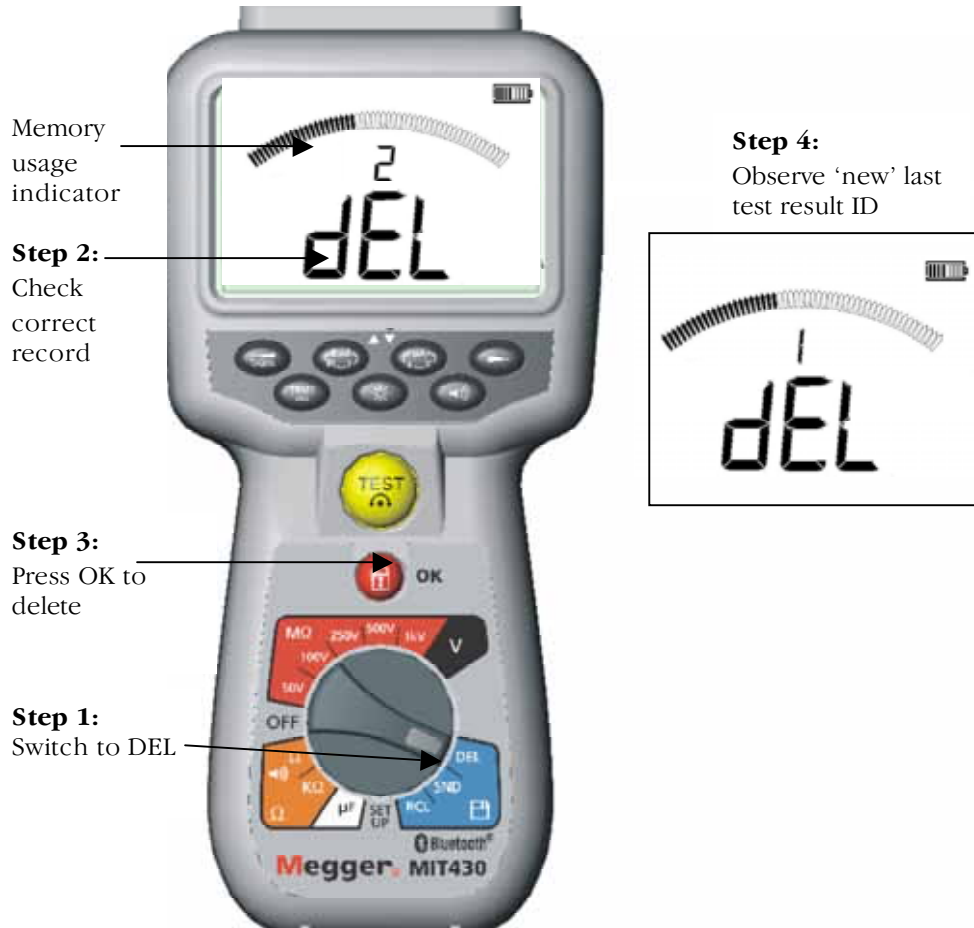


Figure 16 Deleting a single test result

1. Turn the instrument 'ON' by rotating the selector switch to the delete [DEL] position.
2. The latest test result will be displayed. Where no results have previously been stored, the display will indicate this by three dashes.
3. Press 'OK' to delete the displayed test result.
4. Observe the 'new' last test result identification number, which may be deleted as previously described.

16.2 Procedure for deleting all test results (refer to Figure 17)

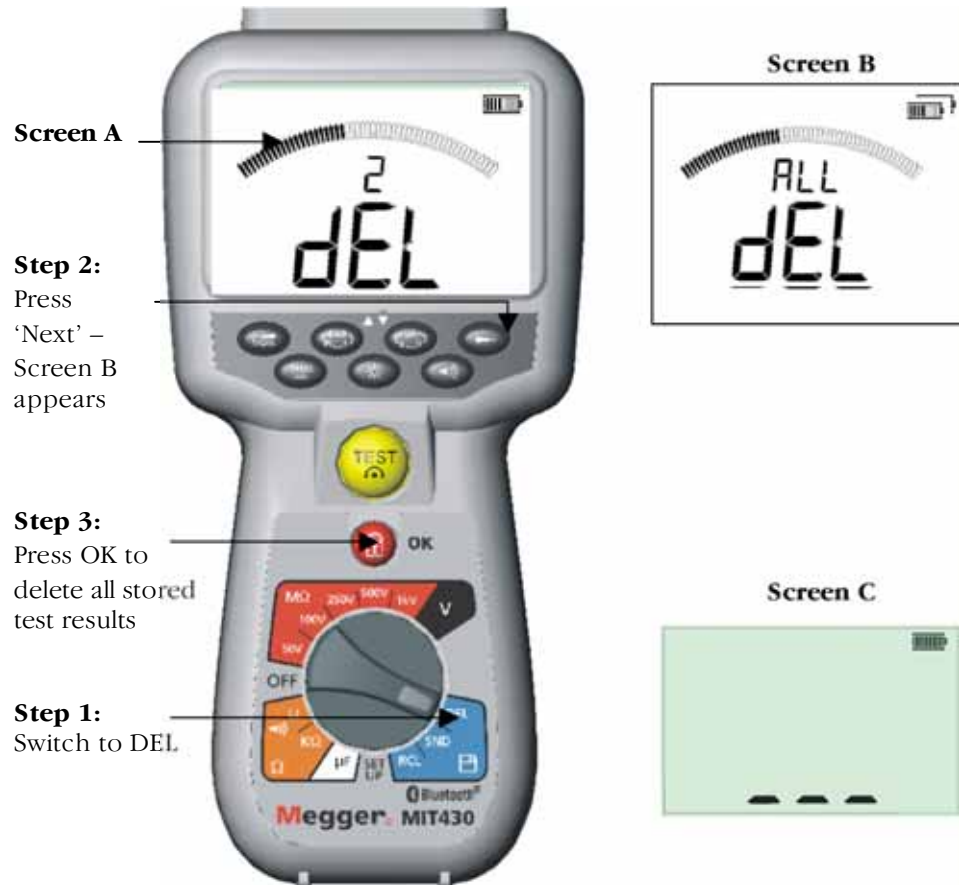


Figure 17 Deleting all test results

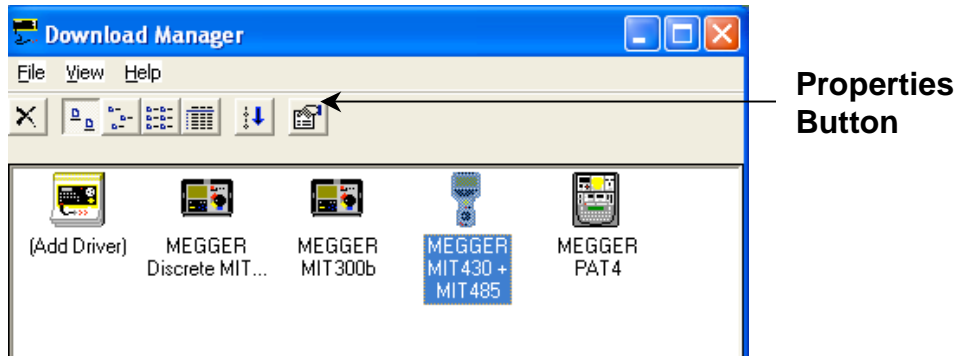
1. Turn the instrument 'ON' by rotating the selector switch to the delete [DEL] position. The latest test result will be displayed. Where no results have previously been stored, the display will indicate this by three dashes.
2. Press next (▶) button. Note that the display now indicates 'ALL'
3. Press 'OK' to delete all the test results. Note the progress bar decays as the contents of memory are deleted.
4. On completion of the deletion progress the display indicates three dashes signifying that no result remains stored. See figure 17 screen C.

16.3 Downloading test results

Preparing your MIT430 or MIT485 for “Bluetooth” Communications.

“Megger Download Manager” software and a computer with “Bluetooth” capabilities are required to communicate with MIT430 and MIT485 instrument. Notes on installing these options are explained in the document “Additional Bluetooth Information” which can be found on the User CD. Run “Megger Download Manager” from the Windows start menu. Enable the Bluetooth function on your PC. Refer to your PC manual if necessary.

Select Megger “MIT430 + MIT485” product by clicking the icon as shown. Load the properties screen by clicking the “Properties Button”.

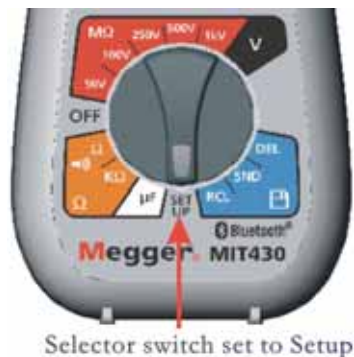


Click on the Bluetooth tab to display the current Bluetooth configuration.

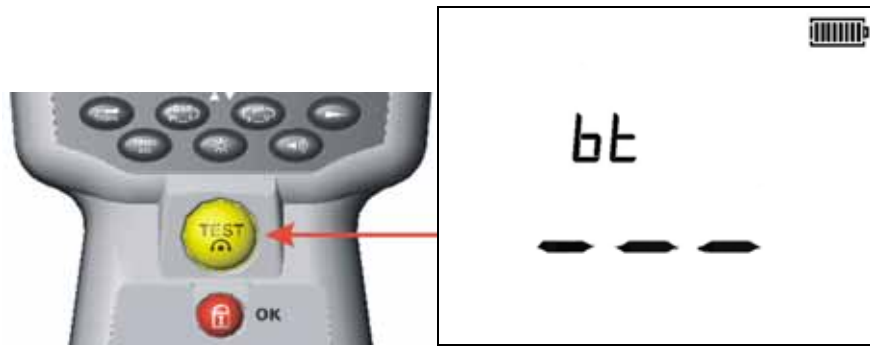
The preferred method is to Pair **From** the MIT430 / MIT485 **To** the PC. As described in in detail below. Users familiar with “Bluetooth” devices may wish to “Pair **From** the PC. In this case “Open” your “Bluetooth Manager” usually located in the “Status Bar”. Switch your MIT430 / MIT485 to “SETUP” and follow the procedure for “Scan for new devices”. Once the MIT430 / MIT485 has been located Pair up using the Pin 1234. On IBM laptops use “Fn” with “F5” to access “Bluetooth Services”.

Procedure for Pairing your MIT430 or MIT485 to your PC.

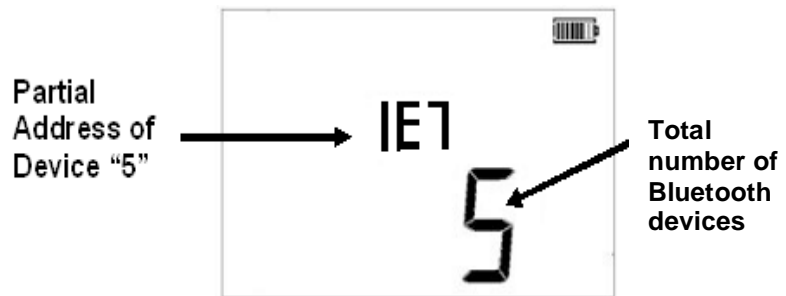
1. Switch the MIT430 / MIT485 Range Switch to the “Setup” position.




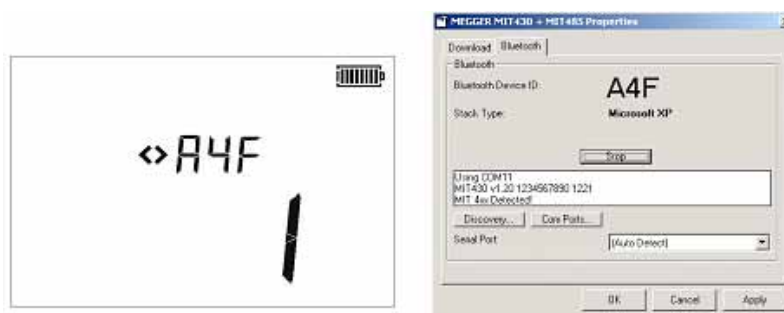
2. Scan for local “Bluetooth” computers. Press the yellow test button 5 times until the MIT430 / MIT485 displays “bt” with three dashes or a 3 digit number. (The three dashes indicate that the instrument has not yet been paired with a p.c., otherwise the current paired Bluetooth device ID will be displayed).



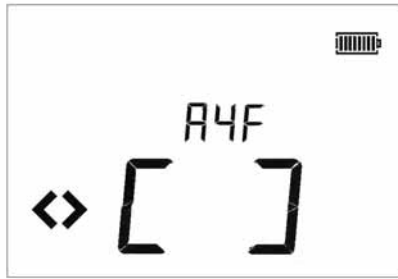
- Now press and hold the test button until you see the “<” and “>” symbols oscillating. Release the test button. The MIT430 /485 will search for “Bluetooth” computers. At the end of this search, the total number of “Bluetooth” devices will be shown on the main display. The partial address of the last detected device will be shown on the auxiliary display.



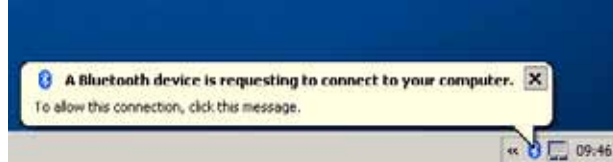
- Use the  keys to scroll round and locate the address that matches the required one shown on Download manager window.



- With the required address displayed (the three-digit code should match the one displayed on the properties screen) pair the module by pressing the test button until the < > symbols on the auxiliary display alternate.



6. A message bubble may also be displayed on the pc against the Bluetooth icon.



7. Click on this message and enter a Passkey of “1234” to accept the connection of the test instrument. (You may also need to accept other message prompts that may be displayed as part of this setup sequence) If you get a message bubble or prompt asking you to accept a serial port connection then click and accept, ticking the “**Always allow**” check box if available.
8. When complete the display will indicate “End”.



9. The MIT430 / MIT485 must now be switched to “OFF” after pairing to complete the process.



Standard Download Operation

Having completed the initial installation and pairing, future downloads to the nominated PC becomes a very straightforward operation as described in the following simple steps.

- a) Run Megger Download Manager from the Windows start menu or short cut.
- b) Click once on the “Megger MIT430 + MIT485” icon.

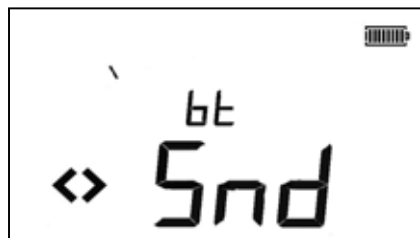


- c) Click on the download button.



- d) Switch the instrument to the SND position to initiate the communications port and start the download. (The download may take a few seconds to start if you have the Auto Detect serial port option set in Download Manager properties screen).

Additional messages may appear to allow MIT to communicate. These should be accepted.



- e) After successful file transfer the MIT430 MIT485 will display “End”.



- f) The MIT430 / MIT485 should be switched to “OFF”.



17. Battery and fuse replacement

(refer to Figure 18)

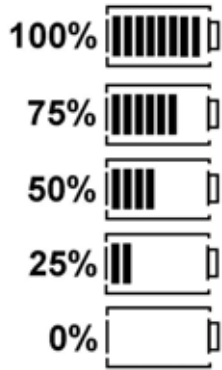


Figure 17

17.1 Battery condition and replacement

The battery condition indicator is displayed at all times that the instrument is switched on, as below: 100%, 75% and 50%

Replacement batteries type is: 5 x LR6 (AA), 1.5 V Alkaline, or 5 x 1.2V NiMH

Note: NiMH or NiCAD rechargeable batteries show a lower charge than Alkaline batteries, and may not give much warning before becoming exhausted.

Procedure to replace batteries

Warning: Do not switch the instrument on with the battery cover removed.

1. The rear cover **must not** be opened if the test leads are connected.
2. Switch off the instrument and disconnect (the instrument) from any electrical circuits.
3. To avoid the possibility of electric shock, **do not** press the test button or touch the fuse when changing batteries.
4. To remove the rear cover, remove the screws from the rear of the battery cover, lift the cover off.
5. Remove the dead cells and refit new batteries, observing the correct polarity as marked on the battery compartment.
6. Replace the cover and retaining screws.

Warning: - **Incorrect battery cell polarity can cause electrolyte leakage or damage the instrument. If the battery condition indicator does not show a full charge, a cell may be reversed.**

Note: Battery cells should not be left in an instrument, which may remain unused for an extended period.

17.2 Blown fuse indicator

Figure 21 shows the blown fuse indicator which operates on continuity [Ω] range. The symbol will operate if the fuse has blown after contact with a live supply has occurred. A blown internal fuse will be shown by the symbol flashing until the instrument is switched off.

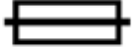


Figure 21

Fuse replacement procedure (user replaceable)

The fuse is located behind the rear cover (see Figure 3). The rear cover **must not** be opened if test leads are connected.

Follow the same procedure as for battery replacement.

A replacement fuse **must** be of the correct type and rating:
i.e. 500 mA (FF) H.B.C.50 kA min 1000 V (32mm x 6mm)

18. Preventive maintenance

The MIT400 series instruments require very little maintenance.

Test leads should be checked before use to ensure there is no damage.

Ensure batteries are removed if the instrument is left unused for an extended period.

When necessary, the instrument can be cleaned with a damp cloth.

The rubber boot can be removed to aid cleaning.

Do not use alcohol, based cleaners as these may leave a residue.

19. Specification

All quoted accuracies are at +20 °C.

Insulation

Nominal test voltages

MIT400, 405	250 V, 500 V, 1000 V
MIT410, 420,430	50 V, 100 V, 250 V, 500 V, 1000 V
MIT480	50 V, 100 V
MIT481, 485	50 V, 100 V, 250 V, 500 V, 1000 V
MIT40X	10 V to 100 V variable (1 V increments)

Range full scale accuracy (Model dependant)

All ranges $\pm 2\%$ ± 2 digits up to 100 M Ω .

Then:	1000 volts	$\pm 3\%$	± 2 digits	$\pm 0.2\%$ per G Ω
	500 volts.	$\pm 3\%$	± 2 digits	$\pm 0.4\%$ per G Ω
	250 volts.	$\pm 3\%$	± 2 digits	$\pm 0.8\%$ per G Ω
	100 volts.	$\pm 3\%$	± 2 digits	$\pm 2.0\%$ per G Ω
	50 volts.	$\pm 3\%$	± 2 digits	$\pm 4.0\%$ per G Ω
	Analogue range			1 G Ω full scale

Analogue range: 1 G full scale

Short circuit current: 2 mA +0% -50%

Terminal voltage: -0% +20% ± 1 V ($I_i < 1$ mA)

Test current on load: 1 mA at min. pass value of insulation specified in BS7671, HD384 and IEC364, EN61152-2, 2 mA max.

EN61557 operating range: 0,10 M Ω to 1,00 G Ω

Leakage current range: 10 μ A to 2000 μ A

Leakage current: 10% ± 3 digits

Voltage display: 3% ± 3 digits $\pm 0.5\%$ of rated voltage

Polarisation Index (PI): 10min / 1minute ratio

Dielectric absorption Ratio (DAR): 60sec / 30sec ratio

Notes:

- (1) All ranges measure from 0,00 M Ω upwards.
- (2) Above specifications only apply when high quality silicone leads are being used.

Continuity

EN61557 operating range: 0,01 Ω to 99,9 Ω (0 to 100 Ω on analogue scale)

Accuracy: $\pm 2\%$ ± 2 digits (0 to 100 Ω)

Open circuit voltage: 5 V ± 1 V

Test current: 205 mA (± 5 mA) (0.01 Ω to 9.99 Ω)
20 mA (± 1 mA) (10.0 Ω to 99.9 Ω)

Zero offset at probe tips: 0,10 Ω typical

Lead resistance zeroing: Up to 9,99 Ω
Buzzer: Variable limit 1 Ω , 2 Ω , 5 Ω , 10 Ω , 20 Ω

Resistance

EN61557 operating range: 0,01 k Ω to 1000 k Ω (0 to 1 M Ω on analogue scale)
Accuracy: $\pm 3\%$ up to 50 k Ω then $\pm 5\%$ ± 2 digits
Open circuit voltage: 5 V ± 1 V
Short circuit current: 1.5 mA ± 0.2 mA

Voltage range

0 to 600 V d.c. $\pm 2\%$ ± 2 digits
10 mV to 600 V TRMS sinusoidal (40 – 400 Hz) $\pm 2\%$ ± 2 digits
0 to 1000 V on analogue scale
Unspecified input level 0 – 10 mV (40 – 400 Hz)
For non sinusoidal waveforms additional specifications apply:
 $\pm 3\%$ ± 2 digits 101 mV – 600 V TRMS and
 $\pm 8\%$ ± 2 digits 10 mV – 100 mV TRMS

Default Voltmeter

Operates at >25 volts a.c. or d.c., on any range except **OFF**

Frequency: 15-400Hz (15Hz - 99,9Hz) $\pm 0.5\%$ ± 1 digit
(100Hz to 400Hz)

Capacitance measurement

MIT420, MIT430, MIT481 and MIT485.

Measurement range: 100 pF to 10 μ F
Accuracy: $\pm 5.0\%$ ± 2 digits

Distance by capacitance:

MIT420, MIT430, MIT481, MIT485

Arithmetic conversion from capacitance measurement

Default capacitance distance measurement: 50 nF/km

Capacitance range: 40 nF/km to 60 nF/km

Result storage:

Capacity: >1000 test results
Download: Bluetooth wireless
Bluetooth class: Class II
Range: up to 10m

Power supply: 5 x 1,5V cells type IEC LR6 (AA, MN1500, HP7, AM3 R6HP)
Alkaline NiMH rechargeable cells may be used.

Battery life: 2200 insulation tests with duty cycle of 5 sec on 55 sec OFF
@ 1000 V into 1 M

Dimensions:

Instrument 220 x 92 x 50 mm (8.66in x 3.63in x 1.97in)
Instrument + case 456 x 178 x 89mm (18in x 7in x 3.5in)

Weight:

Instrument only 590gms, 775gms with boot (20.73oz (27.22oz))
Instrument plus case 1.75kg (3.86lb)

Fuse: Use only a 500 mA (FF) 1000 V 32 x 6 mm ceramic fuse of high breaking capacity HBC 50 kA minimum. Glass fuses **MUST NOT** be fitted.

Safety Protection

The instruments meet IEC 61010-1 to 600 V phase to earth, Category IV. *

Refer to safety warnings (see section 2).

*MIT 405 IEC 61010-1 600 V phase to earth Category III

Application

IEC 61010 defines measurement categories from I to IV relating transient over voltages and the location within electrical installations. This instrument is designed for use at Category IV (Primary supply level) on 600 V phase to earth systems.

E.M.C.

In accordance with IEC 61326-1

Temperature effects

Temperature coefficient <0,1% per °C up to 1 GΩ
<0,1% per °C per GΩ above 1 GΩ

Environmental

Operating range: -20°C to +55 °C
Operating humidity: 95% RH at 0°C to +35°C, 70% RH +35°C to +55°C
Storage temperature range: -30°C to +80 °C
Calibration Temperature: +20 °C
Maximum altitude: 2000 m
Dust and water protection: IP54

20. Basic and service errors

The basic error is the maximum inaccuracy of the instrument under ideal conditions, whereas the service error is the maximum inaccuracy taking into effect of battery voltage, temperature, interference, system voltage and frequency, where applicable.

20.1 Basic error: See section 19

20.2 Service error:

Insulation range	±15% ±2 digits
Continuity range	±26% ±2 digits
Resistance range	±12% ±2 digits
Voltage range	±10% ±2 digits
Capacitance range	±18% ±2 digits
Distance range	±18% ±2 digits
Frequency range	±5% ±2 digits

21. Accessories

Includes accessories

2 wire test lead set and crocodile clips	6220-813
SP5 Remote switch probe (not MIT400, 405, 40X, 480)	6220-812
Owner's information CD	6172-965
Calibration certificate	
Quick start guide	5270-923
Rubber boot	6231-802
Instrument case	5410-420

Additional in MIT430 and MIT485

Download Manager CD	6111-442
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Optional accessories and replacements

Fused 2 wire test lead set and crocodile clips	6220-789
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***Bluetooth* Module qualifications details**

***Bluetooth* identifier: B02872**

QPLN Reference: Q11406_WT12_SGS

“Contains Transmitter Module FCC ID: QQQWT12”

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