Megger

# MFT1500/2, MFT1552 and MFT1553 Series Multifunction Tester

**USER MANUAL**

## ⚠ SAFETY WARNINGS

- **Safety Warnings** and **Precautions** must be read and understood before the instrument is used. They **must** be observed during use.
- The circuit under test must be switched off, de-energised and isolated **before** test connections are made when carrying out insulation and continuity tests.
- Continuity of protective conductors and earthed equipotential bonding of new or modified installations **must** be verified before carrying out an earth fault loop impedance test, or RCD test.
- Circuit connections and exposed metalwork of an installation or equipment under test **must not** be touched.
- The live circuit warning and Automatic discharge are additional safety features and **should not** be regarded as a substitute for normal safe working practices.
- **Do not change** the rotary switch positions while a test is in progress.
- The LCD 'neon' voltage indicators **cannot** reveal a Neutral - Earth reversal. They **cannot** be relied upon to identify circuit correctness and are for guidance only.
- After insulation tests, capacitive circuits must be allowed to discharge **before** disconnecting test leads.
- The instrument **should not** be used if any part of it is damaged.
- Test leads, probes and crocodile clips must be in good order, clean and with no broken or cracked insulation.
- Ensure that hands remain behind guards of probes/clips when testing.
- UK Safety Authorities recommend the use of fused test leads when measuring voltage on high energy systems.
- Replacement fuses **must** be of the correct type and rating.
  Failure to fit the correctly rated fuse **will** result in damage to the instrument in the event of an overload.
- 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 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 constructed in accordance with the HSE guidance note GS38 'Electrical Test Equipment for use by Electricians' should be used.

## CONTENTS



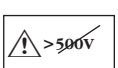
**Symbols used on the instrument are:**


Caution: risk of electric shock

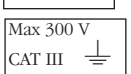

Caution: refer to accompanying notes


Equipment protected throughout by Double Insulation (Class II)


Equipment complies with current EU directives.



Maximum nominal system voltage of 500 V



Maximum 300 V a.c. CAT III to Earth

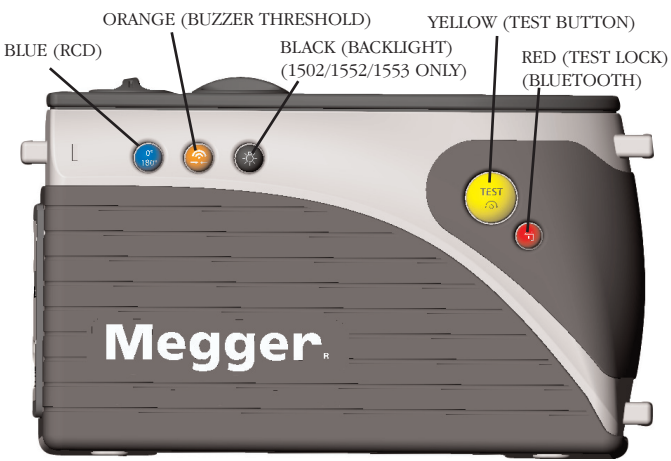
## DESCRIPTION

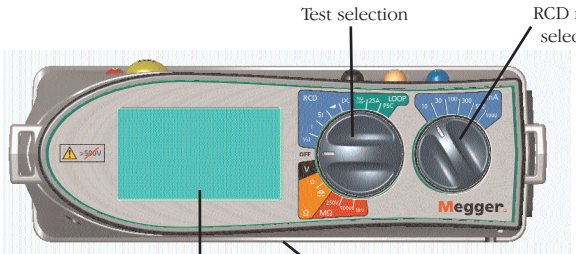
Thank you for purchasing the MFT1500 Multifunction Tester. The MFT1500 series of tester is compact and designed to perform all of the functions required by the electrical contractor to fully test domestic, commercial and industrial wiring. Specially designed to comply with UK, European and other International wiring regulations and standards, the MFT may be used on all single and three phase systems with rated voltages up to 300 Volts a.c. rms to earth/ground.

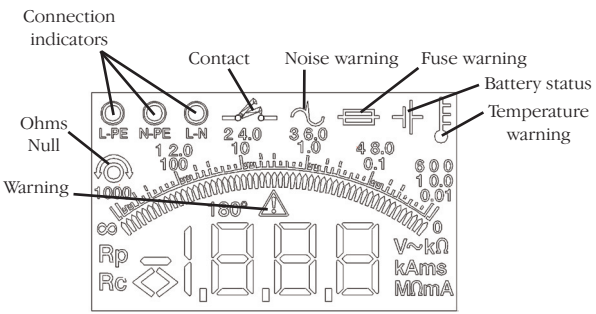
All test leads supplied with the MFT form part of the measuring circuit of the instrument and must not be modified or changed in any way, or be used with any other electrical instrument or appliance.

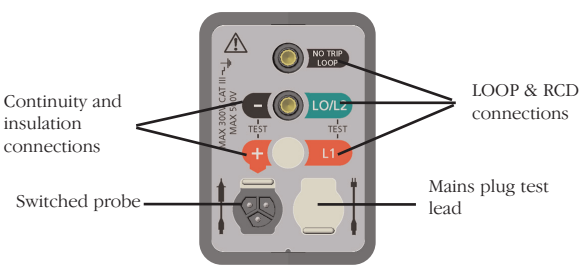
A plug severed from the power cord **MUST** be destroyed, as a plug with bare conductors is hazardous in a live socket outlet.

### OVERVIEW OF MFT SERIES



### Battery and Fuse fitting/Replacement

Battery type: 8 x 1.5 V alkaline LR6 (AA). Rechargeable batteries **must not** be used.
Fuse type: 500 mA (F) HBC 10 kA 500 V
Low battery warning symbol ⊣⊢
Fuse blown symbol ▭

**Battery charge indication**

The battery charge level is automatically indicated when the MFT is turned on.

**To replace batteries**

Switch off the instrument and disconnect (the instrument) from any electrical circuits.

Remove the battery cover.

Slide out the battery clip and remove the dead cells.

Refit new batteries following correct polarity as marked on the battery holder.

Replace the battery holder and cover.

**Note:**- Incorrect battery cell polarity can cause electrolyte leakage, resulting in damage to the instrument.

**To replace the fuse**

Should the main fuse fail, the symbol ▭ will be displayed.

Disconnect the instrument from any circuits.

Remove the battery cover as above.

The blown fuse should be replaced with a 500 mA (F) HBC 10 kA 500 V fuse (Megger part no.25950-039)

Replace the battery cover.

### Setup

**RCD Touch voltage selection (to select either 25 V or 50 V)**

1. With the instrument turned OFF, hold down the YELLOW test button and turn the left hand rotary switch to any ON position.
2. Keep the button held down until the instrument displays the ‘SET’ warning.
3. Now release the TEST button.
4. Press the TEST button again to view the current setting for the touch voltage.

   The display shows the touch voltage limit, either ‘25 V’ or ‘50 V’.

**Note:** The MFT can also display the measured Touch Voltage on a bar-graph display.

   If the touch voltage display is active, a bar-graph display will also appear.

5. Press the ORANGE (buzzer) button to change the touch voltage limit setting.
6. Press the BLUE (RCD) button to turn the bar-graph display ON or OFF.
7. Press the TEST button to exit from the set-up menu.

# OPERATION

## GENERAL OPERATION

**Note:** These functions are generally applied and not limited to an individual test function.

**Live circuit warning - Test inhibit**

Testing is automatically inhibited if:

During insulation testing - an external voltage >55 V is present on the terminals

During continuity testing - a voltage >10 V is present on the terminals

During RCD or No-Trip loop testing - a voltage >270 V is present

During Loop testing - a voltage >480 V is present

**Test button lock**

To lock the test button hold down the RED test lock button whilst holding down the YELLOW TEST button.

**Intelligent backlight (MFT1502/1552/1553 only)**

Both the display and range knobs have a backlight. To activate, press the BLACK button.

To disable the Intelligent backlight function, press the BLACK button and the RED lock button together.

Repeat to enable the intelligent backlight.

**Instrument auto shut-off**

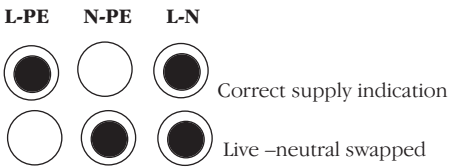
Automatically activated after 5 minutes of instrument inactivity.

To restore operation press the RED lock button or switch the instrument off and on.

**Polarity indication**

If connected to a single-phase power supply by a plug or by the 3-wire lead set, three LCD 'neons' marked L-PE, N-PE and L-N respectively will indicate supply polarity.

If a voltage is detected between their respective two wires, the 'neon'(s) will activate.




Any other combinations should be investigated further. However the LCD 'NEONS' cannot be relied upon to identify circuit correctness and are for guidance only.

**Note:**- The presence of a voltage between phase and earth does not prove earth continuity, as the earth could have a high resistance and a voltage would still be measured. To test earth continuity refer to the sections on loop resistance or RCD testing.

**Warning:** The LCD 'Neons' are invalid when using the two wire lead-set and should be ignored.

## ILLUMINATED SWITCHED PROBE SPL1000 (MFT1502/1552/1553 ONLY)

The Illuminated switched probe accessory replaces the RED 4 mm test lead. It can be used anywhere that the 4 mm lead set is specified in this user guide, and it will also add extra resistance to a loop test measurement.

**Operation (SPL1000)**

The YELLOW button duplicates the function of the TEST key on the instrument, allowing quick and easy testing.

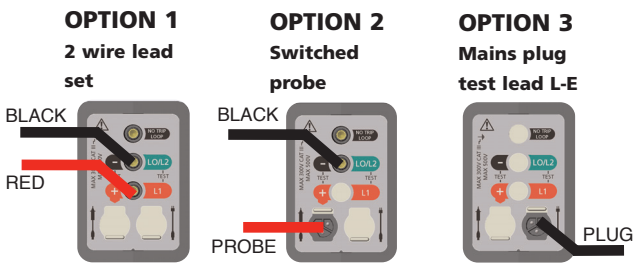
The BLACK switch operates a white LED, which illuminates the probe tip for use when testing under low light levels.

There is also a visual indication via a red/green LED to notify the user of the display status, the meanings are as follows:

Green : A valid result is present on the display or the continuity buzzer is buzzing.

Red: A warning is being shown on the display, testing will be inhibited.

## VOLTAGE MEASUREMENT [V]
## TEST LEAD CONNECTION




**Set the Rotary range knob to the [V] range**
(The position of the right hand 'mA' rotary range knob does not matter)

**Two wire lead set or Switched Probe connection**
Using the 2-wire lead set OPTION 1 or OPTION 2

1. Connect the test leads as shown.
2. DC Voltage (V) or AC Voltage (V~) is automatically displayed.

**OR** Using the mains plug lead set (OPTION3)

Voltage between the L and E pins is displayed

**Note:**- When connected to the circuit under test the instrument will automatically display AC or DC voltage measurement up to 500 V.

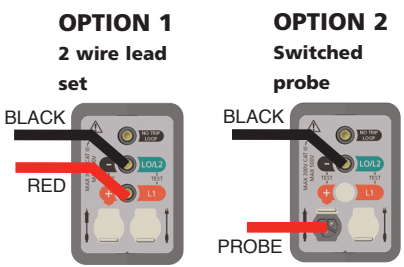
**Warning:** The voltage measurement range should not be used for verifying power has been removed (isolated) from a circuit for testing of documentation, a test lamp should be used.

This function will continue to work if the fuse is blown.

## CONTINUITY

**Warning:** Prior to any continuity testing, ensure the circuits under test are isolated and not live

## TEST LEAD CONNECTION




Set the left hand rotary range knob to the range required.
(The position of the right hand rotary range knob does not matter).

Continuity measurement can be made using one of the 2 options shown above.

A continuity measurement is made automatically when the test leads

are connected to the circuit under test. The contact symbol on the display closes when a resistance of approximately 200 kΩ or less is detected.

**Lead null (up to 9.99 Ω)**

Short test probes or clips together and press the YELLOW TEST button on the instrument (or on the switched probe if fitted). The will be displayed to indicate lead null is active.

This null value is stored until the YELLOW TEST button is pressed again.

To cancel the LEAD NULL, press the YELLOW TEST button.

**Continuity Buzzer**

Test leads OPTIONS 1 or 2 above

The MFT buzzer will sound continuously if the resistance between the leads is less than a set limit (Default value 2 Ω).

If being used with the illuminated switched probe (OPTION 2) continuity is also indicated by a GREEN LED on the probe.

To turn off the buzzer press the TEST button whilst in BUZZER mode. The display will indicate ON or OFF status.

**Buzzer threshold**

The resistance at which the buzzer stops sounding can be changed to meet individual test requirements. Press the ORANGE button to select the resistance limit.

Selectable limits of 2 Ω, 5 Ω, 10 Ω, 20 Ω, 50 Ω and 100 Ω.

This setting is stored even when the instrument is switched off.

**Notes:-**

**Method of measurement**

The 2-wire lead set must be used for this measurement. The instrument produces a d.c. voltage of nominally 4,5 V with a current limit of at least 200 mA when measuring 2 Ω.

**Possible sources of error**

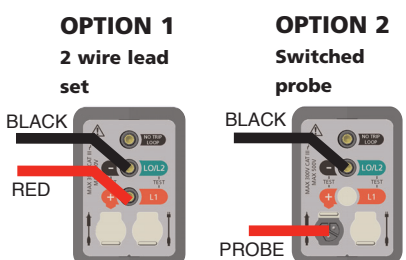
Measurement results can be affected by the following:

- The impedance of operating circuits connected in parallel.
- Impedance such as inductors that vary during the measurement.
- A poor connection to the circuit under test, which can give readings as much as 100 mΩ (0,10 Ω) high. The best way to avoid this error is to use sharp prods and press these firmly into the conductors being measured.

## INSULATION RESISTANCE [MΩ] [250 V] [500 V] [1000 V]

**Warning:** Prior to any insulation testing, ensure the circuits under test are isolated and not live.

## TEST LEAD CONNECTION



Set the left hand rotary range knob to the required INSULATION Range.

250 V Insulation measurement to 99.9 MΩ

500 V Insulation measurement to 299 MΩ

1000 V Insulation measurement to 499 MΩ

(The position of the right hand rotary range knob does not matter.)

To initiate insulation testing press and hold the YELLOW TEST button on the instrument or the switched probe if connected.

Release the test button after the displayed reading has settled.

**TEST LOCK**

To lock down the test button press the YELLOW TEST button followed by the RED LOCK button.

A warning triangle will appear in the display while the test lock is active.

Press the YELLOW TEST button to stop the test.

**Note:**- A 1000 V warning is displayed whenever the 1000 V range is selected and the test button pressed

**Warning:** The test voltage will be permanently present on the test probes or crocodile clips when in the locked modes.

**Notes:**- Auto discharge - Auto discharge facility automatically and safely discharges connected circuit after test via 250 kΩ resistor.

Live circuit warning - operates when connected to Live circuits > 25 V.

Test Inhibited - an audible alarm operates at >55 V. The instrument will not perform a test until the voltage source has been removed.

**Method of measurement**

A current limited (2 mA) d.c source is used, and the resistance is calculated from measurements of the voltage and current.

The voltage is only present when the test button is pressed or the test lock is active. A measurement of the terminal voltage is made before the test and if this exceeds 55 V the test is disabled. The reading is stable with a circuit capacitance up to 5 μF.

**LOOP IMPEDANCE [LOOP] TESTING**

Loop impedance measurement can be made via installation sockets using the plug terminated test lead at any other convenient point on the installation, using a two/three wire lead set.

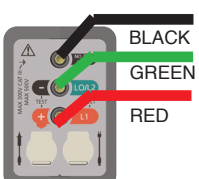
The MFT will measure the loop resistance from the supply end of the standard test leads, allowing for their resistance.

**NON TRIPPING LOOP TESTS [NO TRIP]**

Set the LEFT rotary range knob to the required LOOP range as described below:

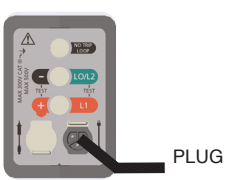
**OPTION 1**

**3 wire measurement**




**OPTION 2**

**Mains plug test lead**




(The position of the right hand rotary range knob does not matter.)

### [NO TRIP] LOOP-TESTING - SINGLE PHASE TESTING ONLY

The NO TRIP loop test is a high resolution low current earth loop resistance measurement (Loop L-PE 0.01 Ω) range which does not trip RCDs with a rated current 30 mA or higher.

### [NO TRIP] PHASE TO EARTH LOOP IMPEDANCE MEASUREMENT (AT A POWER SOCKET)

Test Lead set: OPTION 2

1. Select **NO TRIP** Loop test range.
2. Insert the plug into an installation socket.
3. Supply voltage and polarity are displayed.
4. The test will 'beep' and automatically start when voltage is detected.
5. Measured loop value is displayed

If desired the test can be repeated by pressing the YELLOW TEST button.

### [NO TRIP] EARTH LOOP IMPEDANCE MEASUREMENT (NOT AT A POWER SOCKET)

Test Lead set: OPTION 1

1. Firmly connect the GREEN lead to EARTH, the BLACK lead to NEUTRAL and the RED lead to PHASE.
2. Perform the loop test, as above for power socket.

   If desired the test can be repeated by pressing the YELLOW TEST button.

### PFC MEASUREMENT [NO TRIP PFC]

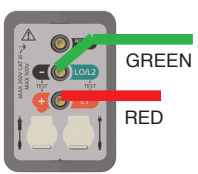
Use Test Lead set OPTION 1 or OPTION 2

1. Select NO TRIP PFC test range.
2. Connect the leads as shown.
3. Supply voltage and polarity are displayed.
4. The test will 'beep' and automatically start when sufficient voltage is detected.
5. The measured PFC result is displayed.

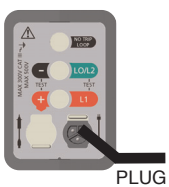
### HIGH CURRENT LOOP-TESTING [HI]

Single Phase and Phase to Phase loop testing on circuits that are NOT protected by RCD

**OPTION 1**
**2 wire lead set**




**OPTION 2**
**Mains plug test lead**




**Set the instrument to the [HI] Loop test range**

**High current Phase to Earth loop impedance measurement (at a power socket):**

Test Lead set: OPTION 2

1. Insert the plug into an installation socket.
2. Supply voltage and polarity are displayed.
3. The test will 'beep' and automatically start when voltage is detected.

4. Measured loop value is displayed.

   If desired the test can be repeated by pressing the YELLOW TEST button.

**High current Phase-Earth loop impedance (not at a power socket):**
Test Lead set: OPTION 1

1. Connect the GREEN lead to EARTH and the RED lead to PHASE
2. Supply voltage is displayed.

**Warning:** The LCD 'Neons' are invalid when using the two wire lead-set and should be ignored.

3. The test will automatically start when voltage is detected.
4. Measured loop value is displayed.

   If desired the test can be repeated by pressing the YELLOW TEST button.

## BONDED METALWORK TESTING

Test Lead set: OPTION 1

1. Connect the GREEN lead to the bonded metalwork.
2. Connect the RED lead to PHASE.
3. Supply voltage is displayed.

**Warning:** The LCD 'Neons' are invalid when using the two wire lead-set and should be ignored.

4. The test will automatically start when voltage is detected.
5. Measured loop value is displayed.

   If desired the test can be repeated by pressing the YELLOW TEST button.

## PHASE-NEUTRAL OR PHASE-PHASE LOOP IMPEDANCE

Test Lead set: OPTION 1

1. Connect the GREEN lead to NEUTRAL and the RED lead to PHASE (or the 2nd PHASE for Phase to Phase loop measurement).
2. The supply voltage is displayed.

**Warning:** The LCD 'Neons' are invalid when using the two wire lead-set and should be ignored.

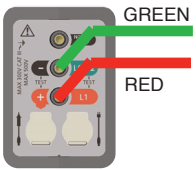
3. The test will automatically start when voltage is detected.
4. Measured loop resistance is displayed.

   If desired the test can be repeated by pressing the YELLOW TEST button.

## PROSPECTIVE FAULT CURRENT [PFC HI]

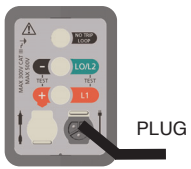
**OPTION 1**

**2 wire measurement**




**OPTION 2**

**Mains plug test lead**




Set the instrument to the [PFC Hi] range

Hi current PFC is a 25 A two wire test.

## PHASE TO EARTH PFC

Test Lead set: OPTION 1,2

1. For Single phase measurement connect the test leads as shown above.

   For Phase to Phase measurement connect the GREEN lead to the 2nd Phase.

2. Supply voltage and polarity are displayed.

3. The test will 'beep' and automatically start when voltage is detected.

4. Measured PFC value is displayed.

   If desired the test can be repeated by pressing the YELLOW TEST button.

## PHASE TO NEUTRAL PFC

As for the 25 A Phase to Earth PFC test but with the following test lead connections:

1. Connect the GREEN lead to the NEUTRAL and the RED lead to PHASE.

2. The test will 'beep' and automatically start when voltage is detected.

3. Measured PFC value is displayed.

**Notes**:-

The PSCC of a circuit is the largest Prospective Fault Current (PFC). In a single phase system, this would be the larger of the earth loop PFC and the neutral loop PFC. In a multi-phase system phase-phase loops also need to be considered and these can be measured using the Loop 25 A switch position.

The PFC is calculated by using the sum:-

$$\text{PFC} = \frac{\text{Nominal supply voltage}}{\text{Loop resistance}}$$

The supply voltage used in the calculation depends on the measured voltage. The instrument uses the following voltage values:-

| **Actual measured voltage** | **Nominal voltage** |
|---|---|
| > 45 V and < 80 V | 55 V |
| >80 V and <150 V | 110 V |
| >150 V and <300 V | 230 V |
| >300 V | 400 V |

### PFC measurement accuracy

An accurate PFC measurement requires an accurate measurement of the loop resistance. The difference of a few digits in the loop resistance measured will have a large effect on the PFC displayed.

### Noise Indication

The symbol is displayed when excessive noise caused by other equipment exists on the circuit under test. This noise can effect the accuracy of the loop measurement. The operator is advised to repeat the measurement or, if the noise symbol continually appears, investigate the cause.

### Method of measurement

The phase-earth, phase-neutral or phase-phase loop resistance can be measured. The instrument takes a current from the supply and measures the difference between the unloaded and loaded supply voltages. From this difference it is possible to calculate the loop resistance. The test duration will depend on the loop resistance value and the presence of noise on the supply.

The NO TRIP loop test range performs a test with a current of up to 25 A flowing Line to Neutral to measure the resistance of the source and line wires, followed by a current of 15 mA flowing Line to Earth to measure the resistance of the earth wire .

### Possible sources of error

The reading depends on a measurement of the supply voltage and therefore noise or transients caused by other equipment during the test could cause an error in the reading. One way to check for these is to do two tests and look for any difference in value. The instrument will detect some sources of noise and warn the user, where other instruments may give an incorrect reading. Any leakage current as a consequence of other appliances connected to the supply under test may affect the reading. If the Phase-Earth loop is being measured, this leakage may be due to filter capacitors, etc.

Test results may be adversely affected by supply voltage fluctuations or electrical ‘noise’ during a measurement. It is recommended that tests are repeated and the results verified, if measurement results are considered abnormal.

Errors can be reduced by:-

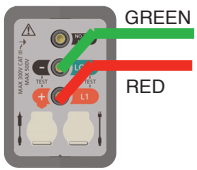
- The two-wire lead set with prods and make a firm connection to clean conductors.
- Several tests and take the average value.
- Ensure that potential sources of noise in the installation are isolated (switched off), eg: automatically switched loads or motor controllers
- Ensuring that the instrument is calibrated.

### Thermal Protection

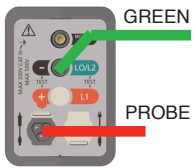
To protect the MFT from overheating during Loop testing, thermal protection is fitted. If the message ‘HOT’ appears in the display when loop testing, the instrument must be allowed to cool down before further attempts are made at loop testing.

## RESIDUAL CURRENT DEVICE [RCD] TESTING

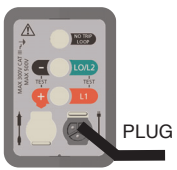
**OPTION 1**
**2 wire lead set**




**OPTION 2**
**Switched probe**




**OPTION 3**
**Mains plug test lead**




**The MFT can perform the following RCD tests:**

**1/2I** Non-tripping test at half the rated RCD trip current for 2 seconds, during which the RCD should not trip.

**I** Tripping test at the rated RCD trip current. The trip time will be displayed.

**5I** Tripping test at 5 x the rated RCD trip current. The trip time will be displayed in milliseconds.

**DC** **1/2I, I** and **5I** tests can be performed as DC tests.

**0 or 180°**
Some RCDs are sensitive to the polarity of the supply, i.e whether the test current is applied with the instantaneous voltage rising or falling. Trip tests should therefore be performed with both polarities 0° and 180° and the maximum time recorded.

**Ramp Test**
Used to check the trip current of an RCD.

**Note:** The Breaker symbol  indicates whether the test function selected is a NON-TRIPPING or TRIPPING test:

CLOSED = NON-TRIPPING test

OPEN = TRIPPING test

**1/2 I RCD Testing**
Set the LEFT [RCD] rotary range knob to the [ **1/2I** ] RCD test range.

Set the RIGHT [mA] rotary range knob to current rating of the RCD under test.

Test lead set: OPTION 1, 2 or 3

1. Ensure the right hand Rotary knob is set to the correct range for the RCD under test.
2. Press the YELLOW TEST button.
3. After 2 seconds the message >1999 ms is displayed.
4. If enabled, the touch voltage is displayed on the bar-graph display.

   If the RCD trips unexpectedly the message 'trP' will be displayed.

**1 x I RCD Testing**
Set the LEFT [RCD] rotary range knob to the [ **I** ] RCD test range.

1. Press the YELLOW TEST button.
2. The RCD trip time is displayed.
3. If enabled, the touch voltage is displayed on the bar-graph display.

4. If the RCD fails to trip, >400 ms is displayed (indicating a failed test).

**5 x I RCD Testing**

Set the LEFT [RCD] rotary range knob to the [ **5I** ] test range.

1. Press the YELLOW TEST button.
2. The trip time will be displayed.
3. If enabled, the touch voltage will be displayed on the bar-graph display.
4. If the RCD fails to trip, >40 ms is displayed (indicating a failed test).

**Note:**- The instrument can only test up to 1 A a.c. or 300 mA d.c. Any tests that exceed these limits are disabled.

**0 or 180° testing**

0° or 180° is selected by pressing the BLUE button on the side of the MFT on either the **I** or **5I** RCD test.

The **I**, and **5I** RCD tests should be performed at 0° and 180° and the greater trip time recorded.

## AUTO RCD TEST SEQUENCE (MFT1552 AND MFT1553 ONLY)

The AUTO test function will run the **1/2I, I**, and **5I** plus 0° and 180° tests automatically, and store the test results, while the operator stands by the RCD to reset it when it trips.

**To start the RCD AUTO-test:**

1. Connect the RED test lead to the "Live" terminal of the RCD and GREEN test lead to the earth conductor.

Alternatively connect the mains plug test lead to a supply outlet.

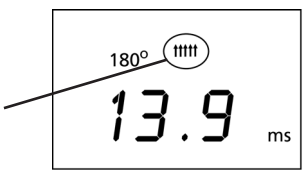
2. Select the AUTO RCD TEST function on the main range knob, and the appropriate RCD current rating on the small range knob.
3. Press the TEST button to start the test. The display will show 't1' to 't5' to indicate the current test.

   t1 = **1/2I**, t2 = **I** at 0°, t3 = **I** at 180°, t4 = **5I** at 0° and t5 = **5I** at 180°
4. Reset the RCD each time it trips.
5. On completion of testing the results can be recalled by repeatedly pressing the lock button. To indicate each test result, segments of the bar graph are displayed as below:

   NO BARS = **1/2 I** test

   ONE BAR = **I** test

   FIVE BARS = **5I** test




   Example shows a 13.9 ms trip time at **5I** on 180°.

## RAMP TEST

The RCD trip current is measured by applying a test current of half the rated trip current and increasing this every 200 ms. When the RCD trips, the current flowing is recorded and displayed in mA.

To determine the trip current of an RCD.

1. Select the appropriate RCD rated current on the right hand rotary switch.
2. Select the RAMP test on the left hand range knob.

3. Press the YELLOW TEST button
4. The trip current is displayed.
5. If the RCD fails to trip, ">***mA" will be displayed, where *** indicates the last test current applied.

## DC SENSITIVE RCD TESTING

D.C. sensitive RCDs are tested with a pulsed waveform. The RMS current is √2 x the rated operating current of the RCD. As with the normal RCDs, these should be tested with 0° and 180° polarity.

1. Select the appropriate RCD rated current on the right hand rotary switch.
2. Select the [**1/2I, I**, or **5I**] test on the left hand range knob
3. Use the BLUE button to cycle through the test options, selecting DC and the required polarity.
4. Press the YELLOW TEST button
5. The trip time will be displayed in ms.
6. If enabled, the touch voltage will be displayed on the bar-graph display.
7. If the RCD fails to trip, ">400 ms" will be displayed.

## TIME DELAYED (SELECTIVE) RCDS

The selective RCD testing is enabled by a long press on the blue degree button. As selective RCD test mode is enabled the MFT will emit a long beep and the display will show the exclamation mark (!) symbol. Once the selective RCD mode is chosen, testing of the RCDs can be performed in the same way as normal RCDs (see above for Residual Current Device (RCD) Testing, ). To disable selective RCD mode press the degree button for two seconds.

### Method of measurement

The two wire lead or plug should be used for this measurement. A constant current source is connected across the supply and the time taken for the supply to trip is measured by the instrument in ms.

### Possible sources of error

Measurement results can be affected by the following:

- Significant operating errors can occur if loads, particularly rotating machinery and capacitive loads are left connected during tests.
- A poor connection to the circuit under test.

### Thermal Protection

The RCD circuit has thermal protection fitted to prevent overheating in the event of multiple ramp tests being performed. The symbol or the message "Hot" will be displayed. Allow the instrument time to cool down before continuing.

# BLUETOOTH DOWNLOADING

## Bluetooth Pairing (PC or Laptop)

1. Set the MFT Range knob to the Bluetooth  SET UP position.
2. Press the Bluetooth (Lock) button  on the MFT, the MFT will show '- - -' if no pairing exists or the last three digits of a paired identity if already paired.

   If these three digits are the last three digits of your Bluetooth identity code (e.g. 963) then you are already paired with it. If you don't recognise them or are unsure then continue with the pairing process.
3. Push the Bluetooth (Lock) button again to start the pairing process, the MFT will display '<> - - - -'
4. Activate the "Add Bluetooth Devices" tool on your PC or mobile device to search for Bluetooth devices.
5. Your PC or mobile device will prompt for an "access key". When this happens enter 1234.
6. The MFT will display the last three digits of your Bluetooth identity code when a successful pairing has been achieved (e.g. <>963).

## Bluetooth Pairing (Windows CE)

1. Set the MFT Range knob to the Bluetooth  SET UP position.
2. Press the Bluetooth (Lock) button  on the MFT, the MFT will show '- - -' if no pairing exists or the last three digits of a paired identity if already paired. If these three digits are the last three digits of your Bluetooth identity code (e.g. 963) then you are already paired with it. If you don't recognise them or are unsure then continue with the pairing process.
3. (i) Turn on your PDA and select 'Start' then 'Settings'.

   (ii) Select the 'Connections' Tab.

   (iii) Select the 'Bluetooth' symbol and select 'Turn on'.

   (iv) Select 'Use Bluetooth Manager' option.

   (v) Select 'Menu' and 'Paired Devices'

   (vi) If there are no paired MFTs shown then select 'Add'.

**Note:** If there is a MFT symbol present check that it has the serial number displayed as your MFT. If this isn't the case then delete the MFT from the PDA and continue with the pairing procedure.

   (vii) Select the Magnifying Glass symbol to start the pairing process.

4. Push the Bluetooth (Lock) button again to start the pairing process, the MFT will display '<> - - - -'
5. Once paired double click the MFT symbol on the PDA and enter the access key code 1234.
6. The MFT will display the last three digits of your Bluetooth identity code when a successful pairing has been achieved (e.g. <>963).

## Bluetooth Pairing (Windows Mobile 5 Smartphone)

1. Set the MFT Range knob to the Bluetooth  SET UP position.
2. Press the Bluetooth (Lock) button  on the MFT, the MFT will show '- - -' if no pairing exists or the last three digits of a paired identity if already paired. If these three digits are the last three digits of your Bluetooth identity code (e.g. 963) then you are already paired with it. If you don't recognise them or are unsure then continue with the pairing process.

3. (i) Turn on your mobile and press the left hand button to select 'Start' menu.

   (ii) Select the 'Connections' symbol.

   (iii) Select the 'Bluetooth' symbol.

   (iv) Press the right hand Menu button.

   (v) Select the Devices symbol.

   (vi) Select the 'Menu' symbol and the select the 'New' symbol.

   (vii) If there are no paired MFTs shown then select 'Add'.

**Note:** If there is a MFT symbol present check that it has the serial number displayed as your MFT. If this isn't the case then delete the MFT from the PDA and continue with the pairing procedure.

4. Push the Bluetooth (Lock) button again to start the pairing process, the MFT will display '<> - - - -'

5. On the Windows Mobile 5 once paired select the MFT symbol on the mobile and enter the access key code 1234.

6. The MFT will display the last three digits of your Bluetooth identity code when a successful pairing has been achieved (e.g. <>963).

7. On the Windows Mobile 5 press the left hand menu button four times to select the following in sequence; 'Next', 'OK', 'Next' and 'Done'.

8. Continue to press the left hand button until you return to the Windows Desktop display.

**Bluetooth Pairing (Palm v5)**

1. Set the MFT Range knob to the Bluetooth SET UP position.

2. Press the Bluetooth (Lock) button on the MFT, the MFT will show '- - -' if no pairing exists or the last three digits of a paired identity if already paired.

   If these three digits are the last three digits of your Bluetooth identity code (e.g. 963) then you are already paired with it. If you don't recognise them or are unsure then continue with the pairing process.

3. (i) Select 'Bluetooth' from the main Palm desktop and make sue that it is turned on..

   (ii) Select the 'Setup Devices' symbol.

   (iii) Select the 'Trusted Devices' symbol.

   (iv) Select the 'Add Devices' symbol.

**Note:** If there is a MFT symbol present check that it has the serial number displayed as your MFT. If this isn't the case then delete the MFT from the Palm and continue with the pairing procedure.

4. Push the Bluetooth (Lock) button again to start the pairing process, the MFT will display '<> - - - -'

5. On the Palm device once paired select the MFT symbol on the display and select 'OK'.

6. Enter the access and select key code '1234' and select the top left hand menu button 'OK'.

7. The MFT will display the last three digits of your Bluetooth identity code when a successful pairing has been achieved (e.g. <>963).

8. On the Palm device select the 'Done' twice to get back to the Bluetooth

screen.

9. Select the 'Home' button to return to the main Palm desktop.

### Bluetooth Pairing (Symbian S60 Version 3)

1. Set the MFT Range knob to the Bluetooth  SET UP position.
2. Press the Bluetooth (Lock) button  on the MFT, the MFT will show '- - -' if no pairing exists or the last three digits of a paired identity if already paired.

   If these three digits are the last three digits of your Bluetooth identity code (e.g. 963) then you are already paired with it. If you don't recognise them or are unsure then continue with the pairing process.

3. (i) Select 'Bluetooth' from the main Symbian desktop and make sue that it is turned on..

   (ii) Select the right hand Tab to show paired devices..

   (iii) Select the top left hand menu button then the 'New Paired devices' symbol.

**Note:** If there is a MFT symbol present check that it has the serial number displayed as your MFT. If this isn't the case then delete the MFT from the Symbian and continue with the pairing procedure.

4. Push the Bluetooth (Lock) button again to start the pairing process, the MFT will display '<> - - - -'
5. Once paired select the MFT symbol on the display and select 'OK'.
6. Enter the access and select key code '1234' and select 'OK'.
7. The MFT will display the last three digits of your Bluetooth identity code when a successful pairing has been achieved (e.g. <>963).
8. On the Symbian device select the top left hand menu button'Yes' to authorise the Symbian device to make the connection automatically.
9. Select 'Exit' to return to the main Symbian desktop.

### Downloading Test Results

**Table of Symbols**

| Symbol | Definition |
|---|---|
| L - E | Live to Earth Test |
| L – n | Live to Neutral Test |
| n – E | Neutral to Earth Test |
| L - L | Live to Live Test |
| r1 | Circuit Protective Conductor |
| r2 | R1 + R2 |
| r12 | Live |
| rr1 | Ring Circuit Phase-Phase |
| rr2 | Ring Circuit CPC-CPC |
| rrn | Ring Circuit Neutral-Neutral |

### Insulation Testing

1. Perform a Insulation test described previously
2. Press the Bluetooth (Lock) button once to display the various options; L-E, L-n, n-E and L-L.
3. Press the Bluetooth (Lock) button repeatedly to scroll through these options until the one you need is reached.
4. Press and hold the Bluetooth (Lock) button again to send the test result to your PC or mobile device. The MFT test result will flash whilst the result is transmitted.
5. The test results will now appear in the correct box in the certificate open on your PC or mobile device.

### Continuity Testing

1. Perform a Continuity test described previously
2. Press the Bluetooth (Lock) button once to display the various options; r2, r12, r1, rr1 and rr2.
3. Press the Bluetooth (Lock) button repeatedly to scroll through these options until the one you need is reached.
4. Press the Bluetooth (Lock) button again to send the test result to your PC or mobile device. The MFT test result will flash whilst the result is transmitted.
5. The test results will now appear in the correct box in the certificate open on your PC or mobile device.

### Loop Testing

1. Perform a Loop test described previously
2. Press the Bluetooth (Lock) button once to display the various options; L-n, L-E and L-L.
3. Press the Bluetooth (Lock) button repeatedly to scroll through these options until the one you need is reached.
4. Press the Bluetooth (Lock) button again to send the test result to your PC or mobile device. The MFT test result will flash whilst the result is transmitted.
5. The test results will now appear in the correct box in the certificate open on your PC or mobile device.

### RCD Testing

1. Perform a RCD test described previously
2. Press and hold the Bluetooth (Lock) button again to send the test result to your PC or mobile device. The MFT test result will flash whilst the result is transmitted.
3. The test results will now appear in the correct box in the certificate open on your PC or mobile device.
4. Each of the RCD tests (1/2I, I @ 0° & 180° and 5 x I @ 0° & 180°) will automatically be sent to the correct box when the Bluetooth (Lock) button is pushed and held.
5. For Auto RCD tests all results are automatically transmitted to the correct boxes on the certificate (the appropriate value must be selected on the PC or mobile device for each box when prompted) when the Bluetooth (Lock) button is pushed and held on the MFT.

To force a test result into a specific certificate box double click the box within the certificate and then push and hold the Bluetooth (Lock) button.

## Electrical specification

**Voltage range**

The voltage will enable the user to ascertain if a system is live prior to testing.

**Accuracy** ±2% ±2 digits

**Voltage a.c.** - 000 V - 500 V 50/60Hz

**Voltage d.c.** - 000 V - 500 V (Indication of polarity above 10 V)

**Insulation ranges (to EN 61557-2)**
**Accuracy** ±2% ±2 digits up to 99 MΩ

**Short circuit current** <2 mA

1 mA at min. pass value of insulation specified in BS7671, HD384 and IEC364

250 V 0.01 - 99.9 MΩ

500 V 0.01 - 299 MΩ

1000 V 0.01 - 499 MΩ

250 V, 500 V and 1 kV into 1 mA load

**Output voltage** +20% - 0% at rated load or less.

Auto discharge facility safely discharges connected circuit after test.

Live circuit warning/inhibit when connected to live circuits (Threshold 55 V)

**EN 61557 Operating Range** 0.10 MΩ to 99.9 MΩ

**Loop ranges (to EN 61557-3)**

**Line/Earth (Single phase)**

**Supply** 55 V - 270 V 45Hz to 65Hz

**25 A** 0.01 Ω - 9.99 Ω (±5% ±0.03 Ω)

10.0 Ω - 89.9 Ω (±5% ±0.5Ω)

90 Ω - 899 Ω (±5% ±5Ω)

900 Ω - 3.00 kΩ (±5% ±20Ω)

**EN 61557 Operating Range** 0.25 Ω to 3.00 kΩ

**Line/Line(Three phase)**

**Supply** 55 V - 480 V 45Hz to 65Hz

**25 A** 0.01 Ω -19.99 Ω (±5% ±0.03 Ω) (at 230 V)

**EN 61557 Operating Range** 0.25 Ω to 19.99 Ω

**Low current Loop (No Trip)**

**Supply** 55 V - 270 V 45Hz to 65Hz

**15mA** 0.01 Ω - 2.00 kΩ (±5% ±0.03 Ω ± Noise Margin) (at 230 V)

**EN 61557 Operating Range** 0.5 Ω to 2.00 kΩ

**Prospective Short-circuit Current (PSC)**

Prospective Short circuit current = Nominal Voltage / Loop Resistance

Accuracy is therefore derived from the loop test.

| | |
|---|---|
| 1 A - 199 A | 1 A resolution |
| 0.02 kA - 1.99 kA | 10 A resolution |
| 2.0 kA - 19.9 kA | 100 A resolution |

**Continuity (to EN 61557-4)**

**Ohms** 0.01 Ω - 99.9 Ω (±2% ±2 digits)

100 Ω - 99.9 kΩ (±5% ±2 digits)

**EN 61557 Operating Range** 0.10 Ω to 99.9 kΩ

**Buzzer** Operates continuously at less than selected limit .

Selectable limits of 2 Ω, 5 Ω, 10 Ω, 20 Ω, 50 Ω, 100 Ω

**Open circuit voltage** 4 - 5 V d.c.

**Test current** >200 mA at 2 Ω

**Test Lead resistance zeroing** Up to 9.99 Ω (zero uses test button)

**RCD ranges (to EN-61557-6)**

**Supply** 100 V - 270 V 45Hz to 65Hz

**Ranges** 1000 mA, 500 mA, 300 mA, 100 mA, 30 mA, 10 mA

**1/2I** 1/2 times the selected current

**I** One times selected current.

**5I** Five times **I** current.

**I trip** A ramp test that displays actual trip current .

**DC sensitive** A DC test current at **I** current.

**Current accuracy** **1/2I** -8% to -2%

**I** +2% to +8%

**5I** +2% to +8%

Intrinsic Accuracy of ramp test current ±3%

**Trip time accuracy** ±1% ±1 ms

**Touch (Fault) Voltage**

**Displayed range** 0 V - 100 V

Error +5% to +15%
±0.5V

**Remote Probe MFT1502 only (Optional on MFT1501)**

**Torch feature** 5 mm White LED

1500 mcd

**Safety** CLASS 1 LED to IEC 60825:2001

**Interchangeable tips**

**Lengths** 30 mm GS38
112 mm GS38

**Battery** 9 V PP3

**Red/Green LED**

**RED** indicates that the instrument is displaying a warning (eg volts on an insulation range)

**GREEN** indicates that the display on the instrument is valid or that the Continuity Buzzer on the instrument is sounding.

## Power Supply

**Instrument** 8 x 1.5 V Alkaline cells type LR6 (AA cells)

**Note:** Rechargeable batteries **must not** be used

**Illuminated switched Probe** 1 x 9 V Alkaline cell type PP3 (6LR61)

## Fuses

**Instrument:-** Replaceable 500 mA (F) HBC 10 kA 500 V

Non-replaceable 7 A (SIBA 70-065-63) x 2

Non-replaceable 1 A

**Probe:-** Non-replaceable 7 A (SIBA 70-065-63)

## Safety

Double insulated to IEC61010-1, Installation Category III, 300 V phase to earth, 500 V phase to phase.

In addition Probe designed to meet IEC 61010-031, Double insulated to Installation Category III, 300 V phase to earth, 500V phase to phase.

## EMC

In accordance with IEC61326-1

**Operational uncertainties:** visit www.megger.com

## Environmental

**Operating range** -5 to +40ºC

**Operating Humidity** 90% RH at 40ºC max

**Storage temperature** -25 to 65ºC

**Maximum altitude** 2000 m

**Dust and water protection:** Instrument IP54, Probe no rating.

**IEC61557**

Complies with the following parts of 61557, Electrical safety in low voltage systems up to 1000 V a.c. and 1500 V d.c.- Equipment for testing, measuring or monitoring of protective measures:-

Part 1 - General requirements

Part 2 - Insulation resistance

Part 3 - Loop resistance

Part 4 - Continuity

Part 5 - Earth test

Part 6 - Residual current devices (RCD)

Part 10 - Combined measuring equipment

## ACCESSORIES

| Product | Order Code |
|---|---|
| Multifunction tester standard | MFT1501 |
| Multifunction tester with illuminated switched probe | MFT1502 |
| Multifunction tester with automatic RCD testing | MFT1552 |
| Multifunction tester with Bluetooth® Downloading | MFT1553 |
| PowerSuite On-site software | 6111-777 |

**Accessories included with MFT1501**

Quick start guide

3 wire test lead

Crocodile clips (red, black and green)

Probes (red, black)

Mains plug (BS1363) test lead

CD (including full user guide)

**Additional accessories with MFT1502/MFT1552/MFT1553**
As MFT1501 plus:

Illuminated switched probe

Instrument/document carry case

| Optional accessories | Order code |
|---|---|
| Replacement 3 wire test lead set | 6220-796 |
| Fused prod and clip set | 6180-405 |
| Standard switched probe | 6220-836 |
| Illuminated switched probe | 6311-089 |
| Test lead with Schuko plug | 6231-593 |
| Test lead with UK mains plug | 6231-601 |
| Test lead with USA mains plug | 6220-643 |
| Earth bond test lead set | 6231-586 |
| Instrument/Document carry case | 6420-143 |
| Replacement Probe Tip Set (for SPL1000) | 6121-562 |

**MFT1501/2E / MFT1502/2E**

As MFT1501/MFT1502 but supplied with a Schuko mains lead plug (6231-593) instead of a BS plug.

The instrument contains static sensitive devices, and care must be taken in handling the printed circuit board. If an instrument's protection has been impaired it should not be used, but sent for repair by suitably trained and qualified personnel.

The protection is likely to be impaired if for example; it shows visible damage; fails to perform the intended measurements; has been subjected to prolonged storage under unfavourable conditions, or has been subjected to severe transport stresses.

**NEW INSTRUMENTS ARE WARRANTED FOR 3 YEARS FROM THE DATE OF PURCHASE BY THE USER.**

**NOTE:** Any unauthorized prior repair or adjustment will automatically invalidate the Warranty.

### CALIBRATION, REPAIR AND SPARE PARTS

For service requirements for Megger Instruments **contact**:

| | | |
|---|---|---|
| Megger Limited | or | Megger |
| Archcliffe Road | | Valley Forge Corporate Centre |
| Dover | | 2621 Van Buren Avenue |
| Kent CT17 9EN | | Norristown PA 19403 |
| England. | | U.S.A. |
| Tel: +44 (0) 1304 502 243 | | Tel: +1 610 676 8579 |
| Fax: +44 (0) 1304 207 342 | | Fax: +1 610 676 8625 |

Megger operate fully traceable calibration and repair facilities, ensuring your instrument continues to provide the high standard of performance and workmanship you expect. These facilities are complemented by a worldwide network of approved repair and calibration companies to offer excellent in-service care for your Megger products.

### Returning your product to Megger - UK and USA service centres

1. When an instrument requires recalibration, or in the event of a repair being necessary, a Returns Authorisation (RA) number must first be obtained from one of the addresses shown. You will be asked to provide the following information to enable the Service Department to prepare in advance for receipt of your instrument, and to provide the best possible service to you.

   - Model, e.g. MFT1501
   - Serial number, (e.g. 61110357050305/1234)
   - Reason for return, (e.g. calibration required, or repair)
   - Details of the fault (if the instrument is to be repaired)

2. Make a note of the RA number. A returns label can be emailed or faxed to you if you wish.
3. Pack the instrument carefully with plenty of padding, but no pressure on window or glass.
4. Ensure the returns label is attached, or that the RA number is clearly marked on the outside of the package and on any correspondence, before sending the instrument, carriage paid, to Megger.
5. You make track the progress of your return on line by accessing the Service/Support facilities at www.megger.com

### Approved Service Centres

A list of Approved Service Centres may be obtained from the UK address shown. If outside UK/USA please consult your distributor for the most convenient Service Organisation.

## Megger MFT1553 Bluetooth Procedure

This guide provides detailed methods of attaching a Bluetooth Dongle to a laptop or PC.

### 1. Initial Installation and setup

### Installation of “Bluetooth Dongle”

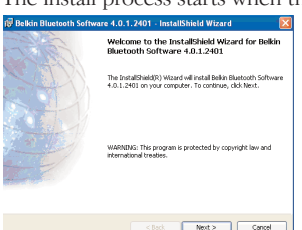
Unless previously installed or built in you must first install a third party “Bluetooth Dongle” on your computer. There are three common “Bluetooth Stacks” employed by third party dongles. This will not normally be stated on the dongle packaging but each will install slightly differently. A brief summary of the common types will follow but follow any instructions supplied with the product.

Some machines have Bluetooth communications built in but not enabled by default. The IBM T43 laptop series are such an example where you need to hold down the “Fn” key and press the “F5” key to enable “Bluetooth” operation.

It is vital that you reboot you computer after the installation is complete and before running “Megger Download Manager” for the first time.

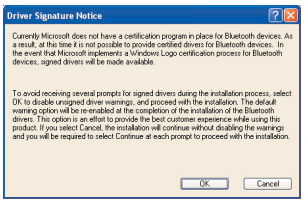
### 2. Typical install process for A Widcomm Driver (Belkin in this case)

The install process starts when the vendor CD is placed in the drive.



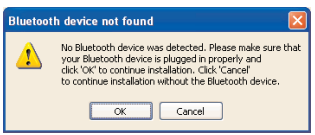

Click Next,

This message may appear




…..Click OK.

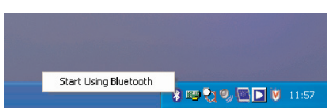
Plug the Dongle in when requested.



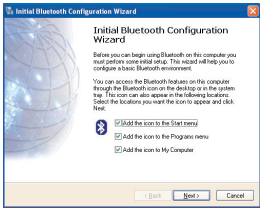

…..Click OK.


Click “Finish”

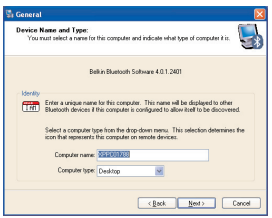
The “Bluetooth Drivers are only partially setup at this stage. To finish the setup “Right Click” on the “Bluetooth” icon in the system tray.



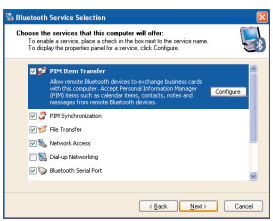

The Following box will appear.



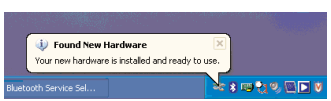

Click Next.



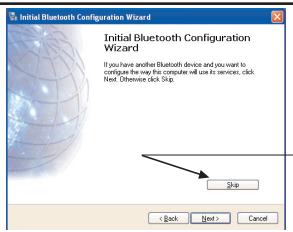

Click Next.



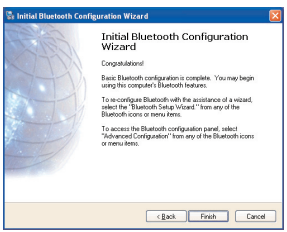

Confirm ticks are shown in the boxes shown……Click Next.




This will be confirmed with a message balloon as shown.



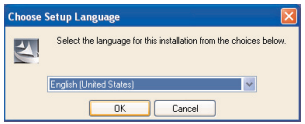

You **MUST** Click Skip at this Stage



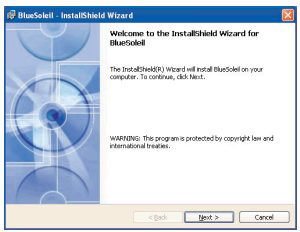

Click Finish and **you must** reboot the computer.


### 3. Typical install process for A Bluesoleil Driver.

The install process starts when the vendor CD is placed in the drive.

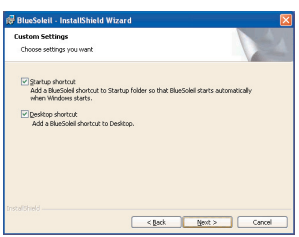



Click OK.

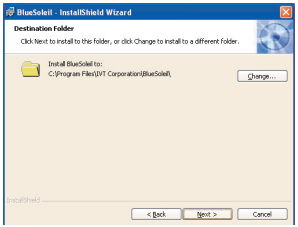



Click Next.

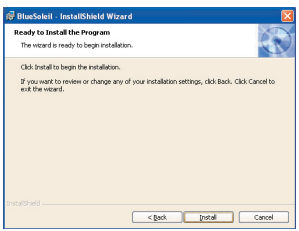

Click “I Accept…” and Next.



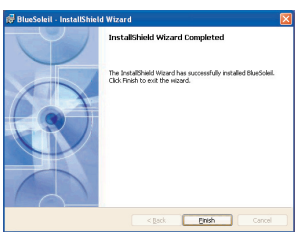

Accept the default settings and Next.



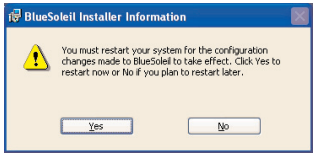

Accept the default settings and Next.



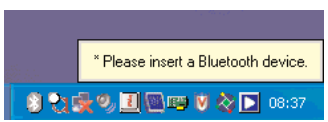

To start Install, Click on Install.




Click on Finish.




you must reboot the computer.


Plug the Dongle in when requested.

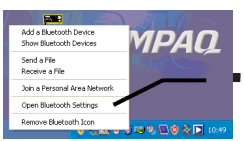

Switch Security level from Medium by removing the “Tick”. This driver exhibits unusual behaviour when set to “Medium” but “High” or “Low” work correctly.

**4. Typical install process for Microsoft Drivers.**

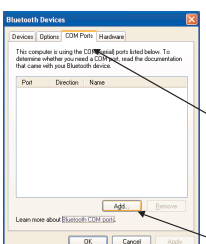
Plug “Bluetooth” Dongle into computer.


Auto detect and install will now start.


Right Click on “Bluetooth” icon in the system tray.

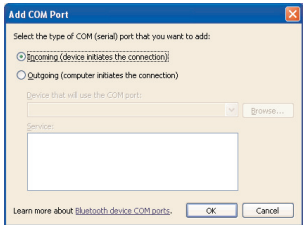



Click on “Open Bluetooth Settings”.

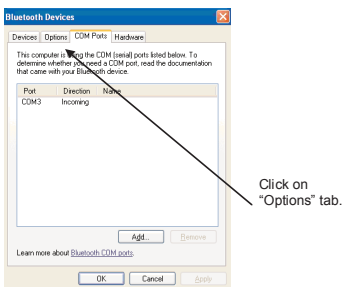


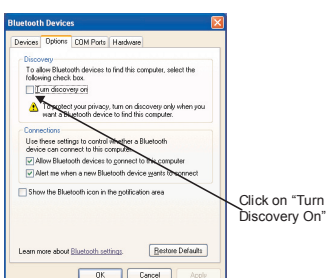

Click on “Com Ports” Tab

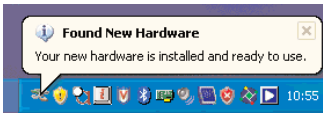
Click “Add”




Incoming should be selected by default.
If not click on radio button. Click OK.




Click Finish and you must reboot the computer.

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