



Item ref: 600.104UK

# **MTR01**

## TRUE RMS DIGITAL MULTITESTER WITH USB INTERFACE

### User Manual




**Please read this manual thoroughly and ensure all contents are fully understood before using the apparatus.**




## **WARNING**

To avoid possible electric shock or personal injury, and to avoid possible damage to the tester or to the equipment under test, adhere to these following rules:

- Before using the tester inspect the case. Do not use the tester if it is damaged or the case (or part of the case) is removed. Look for cracks or missing plastic. Pay attention to the insulation around the connectors.
- Inspect the test leads for damaged insulation or exposed metal. Check the test leads for continuity.
- Do not apply more than the rated voltage, as marked on the tester, between the terminals or between any terminal and grounding.
- The rotary switch should be in the right position and no changeover of range shall be made while measurement is conducted to prevent damage.
- When the tester is working at an effective voltage over 60V in DC or 30Vrms in AC, special care should be taken for there is danger of electric shock.
- Use the proper terminals, function, and range for your measurements.
- Do not use or store the tester in an environment of high temperature, humidity, explosive, flammable, damp or of a strong magnetic field. The performance of the tester may deteriorate after being exposed to any of these elements.
- When using the test leads, keep your fingers behind the finger guards.
- Disconnect circuit power and discharge all high-voltage capacitors before testing resistance, continuity, diodes.
- Replace the battery as soon as the battery indicator  appears. With a low battery, the meter may produce false readings that can lead to electric shock and personal injury.

- Remove the connection between the testing leads and the circuit being tested, and turn the meter power off before opening the meter case.
- The internal circuit of the meter shall not be altered at will to avoid damage of the meter and any accident.
- A soft cloth and mild detergent should be used to clean the surface of the tester on a regular basis. No abrasive and solvent should be used to prevent the surface of the tester from corrosion or damage.
- The tester is suitable for indoor use only.
- Turn the tester power off when it is not in use and take out the battery when not using for a long time. Check the battery regularly; replace the battery immediately if any signs of leaking appear. Battery acid will damage the tester.

## General Specifications

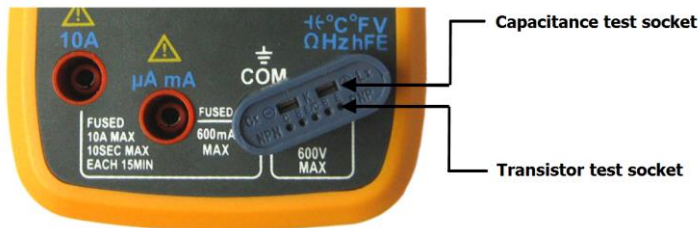
Max display:	LCD (6000 count) 64 x 43mm
Polarity:	Automatic, indicated minus, assumed plus
Measure method:	double integral A/D switch implement
Sampling speed:	2.5 times per second
Over-load indication:	"OL" is displayed
Operating temperature:	0°C to 40°C, at <75%RH
Storage temperature:	-30°C to 60°C, at <85%RH
Power:	9Vdc (1 x PP3 battery supplied)
Low battery indication:	"  "
Display resolution:	6000 counts
Resistance:	600Ω to 60MΩ
Capacitance:	40nF - 4000μF
Frequency:	9.99Hz - 9.99MHz
Test temperature:	-20°C - 1000°C
Duty cycle:	5% to 95%
Dimensions:	188 x 81 x 48mm
Weight:	420g (including battery)

**Layout:**

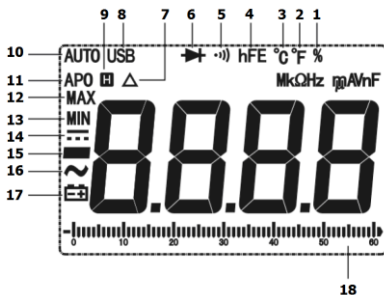
1. LCD Display, maximum reading of 5999.
2. Relative and USB mode switch. Press to switch between auto reading mode "auto" and relative mode " $\Delta$ ". Press and hold for 2 seconds to switch between USB mode "USB" and auto power off mode "APO".
3. Hz/Duty display, when measuring AC voltage or current, press to display between the frequency and duty cycles of the measuring signals.
4. "**H** **\***" Press this button to data hold the display and press again to release data. Press and hold for 2 seconds to toggle the back light on for 10 seconds.
5. "Max/Min" Press this button to display the maximum and minimum reading from the moment this button is pressed. Press and hold this button for 2 seconds to exit Max/Min display mode.
6. Function/Range switch for selecting different measuring ranges and also serves as an ON/OFF switch. To preserve battery life, please ensure the range switch is turn to OFF position when not in use.
7. "10A" Probe socket, socket for the positive (red) probe when measuring current between 400mA to 10A.
8. "uA/mA" Probe socket, socket for the positive (red) probe when measuring current below 400mA.
9. "COM" Probe socket, socket for the negative (black) probe.
10. "Positive" Probe socket, socket for the positive (red) probe for measuring everything apart from current.
11. "Range" switch, when measuring voltage, current, capacitance or resistance, pressing this button with disengage the auto range function and allow you to manually set the displaying range.
12. "Select" has following functions:
  - When measuring signal with combined AC+DC, pressing this button will allow the AC and DC to be measured separately.
  - To switch between measuring function of resistance, continuity and diode.

- To switch between displaying Fahrenheit and Celsius when measuring temperature.
  - Press and hold this button when switching the meter on to disable the auto power off function, this allows the meter to stay on standby unless manually switched off.
13. Strong magnet that allows meter to be attached to any iron/steel surface, in case both hands are required to take the measurement.
  14. Mini USB socket at the bottom of the unit to connect to a PC.

For testing transistors and capacitors, the measuring adaptor supplied should be connected as below. The two square sockets on the top are for testing capacitors and the 6 smaller sockets at the bottom are for testing the PNP and NPN type transistors.



## LCD Display



These signs and symbols indicate:

1. Duty cycle is selected
2. Temperature measurement is selected and measuring in Fahrenheit.
3. Temperature measurement is selected and measuring in Celsius.
4. Transistor testing mode is selected.
5. Continuity testing mode is selected, use "Select" button to choose between resistance measuring, diode testing and continuity testing.
6. Diode testing mode is selected, use "Select" button to choose between resistance measuring, diode testing and continuity testing.
7. Relative mode is selected, use "Rel/USB" button to select between auto range mode and relative mode.
8. USB mode is selected; meter is now sending live readings out through the USB output to connected PC.
9. Data hold, press "HOLD" to resume live reading.
10. Auto Range mode is selected, use "Rel/USB" button to select between auto range mode and relative mode.
11. Auto power off mode, meter will automatically switch off when it is not in use.
12. Displays the maximum reading from the moment the Max/Min function is enabled.

13. Displays the minimum reading from the moment the Max/Min function is enabled.
14. Currently measuring DC range.
15. Negative reading.
16. Currently measuring AC range.
17. Low battery indicator; replace battery immediately when this sign is shown to avoid false reading that may lead to electric shock.
18. Bar graph.

The bar graph on the bottom of the LCD display is the analogue display of the reading when measuring voltage, current or resistance. The length of the bar is proportionate to the 0-5999 digital count above it. The bar graph has a sampling rate 10 times higher of the digital number display, this make it ideal for observing measurements with rapid changes.

## Technical Specifications

This meter has been calibrated in the factory and accuracies of following are guaranteed for 1 year at 18°C to 28°C and less than 75% RH.

### DC Voltage

RANGE	RESOLUTION	ACCURACY
60mV	10uV	$\pm(1\% \text{ of rdg} + 7D)$
600mV	0.1mV	$\pm(0.8\% \text{ of rdg} + 5D)$
6V	1mV	$\pm(0.5\% \text{ of rdg} + 5D)$
60V	10mV	
600V	0.1V	$\pm(0.8\% \text{ of rdg} + 5D)$

Input Impedance:  $>100M\Omega$  for 60 and 600mV range,  $10M\Omega$  for 6, 60 and 600V.

Overload Protection: 600V



## AC Voltage

RANGE	RESOLUTION	ACCURACY
60mV	10uV	$\pm(2.0\% \text{ of rdg} + 10D)$
600mV	0.1mV	$\pm(1.6\% \text{ of rdg} + 10D)$
6V	1mV	$\pm(1.5\% \text{ of rdg} + 10D)$
60V	10mV	
600V	0.1V	

Input Impedance: >100M $\Omega$  for 60 and 600mV range, 10M $\Omega$  for 6, 60 and 600V.

Frequency Range: 40Hz ~ 400Hz

Overload Protection: 600Vrms

Reading: True rms

Max. Input voltage: 750Vac rms

## DC Current

RANGE	RESOLUTION	ACCURACY	Remark
600uA	0.1uA	$\pm(1.0\% \text{ of rdg} + 7D)$	Auto range
6000uA	1uA		
60mA	0.01mA		
600mA	0.1mA		
6A	1mA	$\pm(1.5\% \text{ of rdg} + 7D)$	
10A	10mA		

Overload Protection:

mA: F0.4A/600V fuse

10A: F10A/600V fuse (for measurement >5A, duration need to be less than 10 sec and use no more than once every 15 min)

### AC Current

RANGE	RESOLUTION	ACCURACY	Remark
600uA	0.1uA	$\pm(2.0\% \text{ of rdg} + 7D)$	Auto range
6000uA	1uA		
60mA	0.01mA		
600mA	0.1mA		
6A	1mA	$\pm(2.5\% \text{ of rdg} + 7D)$	
10A	10mA		

Overload Protection:

mA: F0.4A/600V fuse

10A: F10A/600V fuse (for measurement >5A, duration need to be less than 10 sec and use no more than once every 15 min)

Frequency Range: 40Hz ~ 400Hz

Reading: True rms


### Resistance

RANGE	RESOLUTION	ACCURACY	Remark
600Ω	0.1Ω	$\pm(1.0\% \text{ of rdg} + 5D)$	Auto range
6KΩ	1Ω	$\pm(0.8\% \text{ of rdg} + 5D)$	
60kΩ	10Ω		
600kΩ	100Ω		
6MΩ	1kΩ	$\pm(1.5\% \text{ of rdg} + 5D)$	
60MΩ	10kΩ	$\pm(3.0\% \text{ of rdg} + 5D)$	

Open Circuit Voltage: 0.7V


Overload Protection: 600Vdc/ac rms

### Audible Continuity

RANGE	DESCRIPTION	Remark
	Built-in buzzer sounds if resistance is less than $30 \pm 20\Omega$	Open circuit voltage: about 0.7V

Overload Protection: 600Vdc/ac rms

### Diode testing

RANGE	Resolution	Test Current	Remark
	1mV	About 0.8mA	Open circuit voltage: ≈ 3.0V

### Capacitance

RANGE	RESOLUTION	ACCURACY
40nF	10pF	±(3.5% of rdg + 5D)
400nF	100pF	±(2.5% of rdg + 5D)
4.0uF	1nF	±(3.5% of rdg + 5D)
40uF	10nF	±(4.0% of rdg + 5D)
400uF	100nF	±(5.0% of rdg + 5D)
4.0mF	1uF	Not Specified

Over-load protect: 600Vdc/ac rms

### Transistor

Range	Resolution	Test condition
hFE	1	Vce ≈ 2.2V, Ib ≈ 4uA

Over-load protect: 600Vdc/ac rms

### Temperature

RANGE	Scope	RESOLUTION	ACCURACY
°C	-20 to 0°C	0.1°C	±(6.0% of rdg + 5°C)
	0 to 400°C	0.1°C	±(1.5% of rdg + 4°C)
	400 to 1000°C	1°C	±(1.8% of rdg + 5°C)
°F	-4 to 32°F	0.1°C	±(6.0% of rdg + 5°C)
	32 to 752°F	0.1°C	±(1.5% of rdg + 4°C)
	752 to 1832°F	1°C	±(1.8% of rdg + 5°C)

Type K thermocouple supplied is for measuring up to 230°C only, a high temperature type K thermocouple will required for measuring 230°C onward.

## Frequency

RANGE	RESOLUTION	ACCURACY	Remark
9.999Hz	0.001Hz	±(1.0% of rdg + 5)	Auto range
99.99Hz	0.01Hz		
999.9Hz	0.1Hz		
9.999kHz	1Hz		
99.99kHz	10Hz		
999.9kHz	100Hz		
9.999MHz	1kHz	Not Specified	

Input Voltage: 0.5 ~3Vpp

Overload protection: 600Vrms

## OPERATING INSTRUCTIONS

### VOLTAGE MEASUREMENT

1. Connect red test lead to “-II-°C°F VΩHzhFE” jack, black lead to “COM” jack.
2. Set RANGE switch to desired VOLTAGE option (AC, DC or combine).
3. Connect test leads to device or circuit being measured.
4. Turn on power of the device or circuit being measured. The voltage value will appear on the digital display along with the voltage polarity.

Please note:

- In small range, the meter may display an unstable reading when the test leads have not been connected to the load to be measured. It is normal and will not affect the measurements.
- To avoid damage to the meter, don't measure a voltage which exceeds 600Vrms.

### CURRENT MEASUREMENT

1. Set the range switch to desired measuring range (uA, mA or A), if value of the measure is unknown, always ensure to start with highest value until appropriate reading figure is displayed.

2. Plug the red probe into "10A" socket if measurement is 400mA upward or "uA mA" socket if it is below 400mA. Plug the black probe into "COM". Ensure both plugs are fully inserted before taking measurement.
3. Open the circuit to be measured. Ensure circuit is off and all capacitors are discharged. Connect test leads in SERIES with the load in where the current is to be measured.
4. Current reading will be displayed on LCD, press "Select" button to choose between AC/DC measurements. For DC current measurement, the polarity of the red probe will also be indicated.

Please note:

When the display shows the over range symbol "OL", a higher range must be selected. In addition "10A" function is designed for intermittent use only.

## RESISTANCE MEASUREMENT

1. Connect red lead to "-II-°C°F VΩHzhFE" and black lead to "COM".
2. Set the range switch to "Ω▶▶)", three functions are available by pressing "Select". For resistance measurement, press "Select" until "Ω" is displayed on the screen. The resistance display is auto ranged and can be manually adjusted by pressing the "Range" button.
3. If the resistance being measured is connected to a circuit, turn off power and discharge all capacitors before measurement.
4. Connect test leads to the circuit being measured.
5. Read resistance value on the digital display.

Please note:

- For resistance measurements  $>1M\Omega$ , the meter may take a few seconds to stabilize the reading. This is normal for high-resistance measurement.
- When the input is not connected, i.e. at open circuit, the symbol "OL" will be displayed as an over range indicator.

## CONTINUITY TEST

1. Connect red lead to “-II-°C°F VΩHzhFE” and black lead to “COM”.
2. Set the range switch to “Ω▶▶▶”, three functions are available by pressing “Select”. For continuity testing, press “Select” until “▶▶▶” is displayed on the screen.
3. Ensure all capacitors within the circuitry are discharged then connect the test leads across the load to be measured.
4. If the circuit resistance measured is lower than 20Ω, the built-in buzzer will sound. For resistance 600Ω or over, “OL” will be displayed indicates measurement is out of range.

## DIODE MEASUREMENT

1. Connect red lead to “-II-°C°F VΩHzhFE” and black lead to “COM”.
2. Set the range switch to “Ω▶▶▶”, three functions are available by pressing “Select”. For diode measurement, press “Select” until “▶▶▶” is displayed on the screen.
3. Connect the red test lead to the anode of the diode to be measured and black test lead to cathode.
4. The meter will show the approximate forward voltage of the diode. If the connections are reversed, “OL” will be shown on the display.

## CAPACITY MEASUREMENT

1. Connect red lead to “-II-°C°F VΩHzhFE” and black lead to “COM”.
2. Set the Range switch to “-II-”. Capacitance can be either measured using probe or adaptor supplied. (NOTE: The polarity of the RED lead is positive “+”)
3. Connect test probe across the capacitor and be sure the polarity of the connection is observed. Alternatively insert capacitor into the connected adaptor.

### Please Note:

To avoid damage to the meter, disconnect circuit power and discharge all high-voltage capacitors before measuring capacitance. The tested capacitor should be discharged before the testing procedure. Never apply voltage to the input, or serious damage may result.

Maximum display count for capacitance is "3999", capacitance measurement is auto range and can be manually adjust by pressing the "Range" button. For measurement in the max range of 4000uF, it may take up to 30 seconds before measurement completes.

### **TRANSISTOR hFE MEASUREMENT**

1. Set the range switch to hFE range.
2. Connect the adapter to the "COM" jack and the "II-°C°F VΩHzhFE" jack. Don't reverse the connection.
3. Identify whether the transistor is NPN or PNP type and locate Emitter, Base and Collector lead. Insert the leads of the transistor to be tested into the correct holes of the transistor test socket of the adaptor.
4. LCD display will show the approximate hFE value.

### **TEMPERATURE MEASUREMENT**

1. Using the K-type thermocouple, connect red lead to "II-°C°F VΩHzhFE" and black lead to "COM".
2. Set the Range switch to "°C°F".
3. Attach the end of the thermocouple to the surface of the object that needs measuring.
4. Check the reading on the display.
5. Change reading between Celsius and Fahrenheit by pressing the "Select" button.

Please note: the K-type thermocouple supplied is for measuring of up to 230°C only, for measurement of 230°C and higher, a thermocouple with higher temperature rating is required.

### **FREQUENCY AND DUTY CYCLE**

1. Connect red probe to "II-°C°F VΩHzhFE" and black probe to "COM".
2. Set the range switch to "Hz Duty".
3. Connect the testing probe across the source or load to be tested.
4. Read the reading on display.
5. Select reading between frequency and duty cycle by pressing "Hz/Duty" button.

Please note:

The display range of frequency measurement is auto from 0-10MHz, the scope of the input signal should 0.5 – 3Vpp.

The display range of duty cycle is 0-100%, the scope of the input signal should be 4-10Vpp.

When measuring AC voltage or AC current, frequency and duty cycle can be toggled by press "Hz/Duty" button. To exit back to AC voltage/AC current measurement, press and hold the "Hz/Duty" button for 2 seconds.

### **RELATIVE MODE**

When measuring voltage, capacitance, temperature or current, relative mode is available for measuring changes to a reference value you set.

1. Press "Rel/USB" button while measuring the reference value, the unit will memorize the reference value and enter relative mode with "Δ" displayed on the screen and reading display with 0.
2. Now any measurement taking the unit will only display the difference between the reference value and the current reading value.
3. To exit relative more, press "Rel/USB" again

### **USB MODE**

In USB mode this tester allows the live reading to feed to a computer and display on screen via the supplied software. To enter USB mode, press and hold "Rel/USB" for 2 seconds. To exit USB mode, press and hold "Rel/USB" again for 2 seconds.

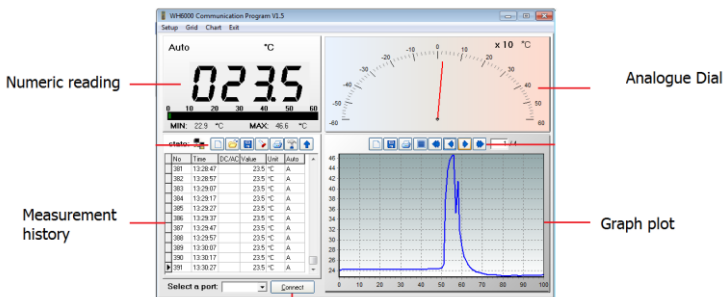
Software is supplied or can be downloaded from the URL below:

[http://cdn.avslgroup.com/downloads/600104\\_MTTR01-software.zip](http://cdn.avslgroup.com/downloads/600104_MTTR01-software.zip)

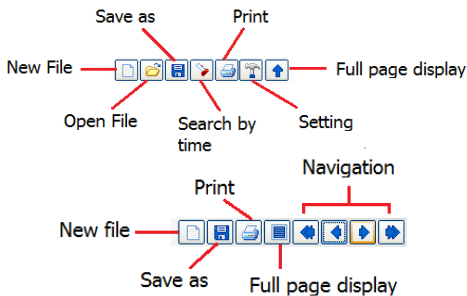
Minimum system requirement - Windows 2000, XP, Vista & 7  
Pentium 233MHz processor or faster (300MHz recommended), 512MB of RAM, 1GB of available space on the hard disk, CD-ROM or DVD-ROM drive, USB 1.0/2.0 port, monitor with Super VGA (800 x 600) or higher resolution.



## Software



Manual connect  
and disconnect

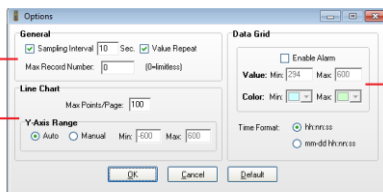


[http://cdn.avslgroup.com/downloads/600104\\_MTTR01-software.zip](http://cdn.avslgroup.com/downloads/600104_MTTR01-software.zip)

## Setting

**Sampling interval setting**

**Graph limit setting**



**Data limit highlight**

## BATTERY AND FUSE REPLACEMENT



**Undo the two screws and lift up the back cover**



**PP3 9V battery**

**500mA, 600V Fast blow**

**10A, 600V Fast blow**

- 1) Battery and fuse replacement should only be carried out after the test leads have been disconnected and the power is off.
- 2) Loosen screws with a suitable screwdriver and remove case from the bottom.
- 3) The meter is powered by a single 9V PP3 battery. Snap the battery connector leads to the terminals of a new battery and reinsert the battery into the case top. Tidy the battery leads so that they will not be pinched by the battery cover.
- 4) The meter is protected by fuses:
  - mA: F0.5A/600V Fast blow. Breaking capacity is 20KA. dimensions are 38 x 10mmØ
  - 10A: F10A/600V Fast blow. Breaking capacity is 20KA. dimensions are 38 x 10mmØ

Replace the cover and reinstall the three screws. Never operate the meter unless the case bottom is fully closed.

## **ACCESSORIES**

- Instruction manual
- Set of test leads (red and black)
- 9V PP3 battery
- USB lead
- Mini CD (software)
- K type thermocouple
- Capacitor/Transistor testing adaptor

# COMPLIES WITH EN61010–1:2010 CATIII



This product is classed as Electrical or Electronic equipment and should not be disposed with other household or commercial waste at the end of its useful life. The goods must be disposed of according to your local council guidelines.

*Errors and omissions excepted.  
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