



## INSTRUCTION MANUAL

# MT1877<sup>IV</sup>

## 1000V AC/DC TRMS MULTIMETER





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## 1. SAFETY WARNINGS



The following safety information must be observed to insure maximum personal safety during the operation of this meter:

- Measurements beyond the maximum selected range must not be attempted.
- Extreme care must be taken when measuring above 50 V, especially on live bus-bars.
- To measure voltage, the instrument must not be switched to a current or resistance range, or to the diode check or buzzer position.
- Circuits must be de-energized and isolated before carrying out resistance tests.
- The rotary selector switch must only be turned after removing test connections.
- External voltages must be disconnected from the instrument before removing the battery.
- Test leads and prods must be in good order, clean, and with no broken or cracked insulation.
- 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.
- The instrument must not be used if any part of it is damaged.
- Warnings and precautions must be read and understood before an instrument is used. They must be observed during the operation of this instrument.

## 2. SAFETY SYMBOLS

Symbols used on this instrument are:



**Caution: refer to accompanying notes.**

This symbol indicates that the operator must refer to an explanation in the Operating Instructions to avoid personal injury or damage to the meter.



**Caution: risk of electric shock**

This WARNING symbol indicates a potentially hazardous situation, which if not avoided, could result in death or serious injury.

This **CAUTION** symbol indicates a potentially hazardous situation, which if not avoided, may result damage to the product.

**CAUTION**



This symbol advises the user that the terminal(s) so marked must not be connected to a circuit point at which the voltage with respect to earth ground exceeds (in this case) 1000 VAC or VDC.



**Equipment protected throughout by Double Insulation (Class 11)**



**Equipment complies with current EU directives.**

## 2. SYMBOLS AND ANNUNCIATORS



Continuity



Low Battery



Diode test

HOLD

Data Hold

AUTO

Auto Ranging

AC

Alternating Current or Voltage

DC

Direct Current or Voltage

V

Volts

A, mA,  $\mu$ A

Current range

## 3. OPERATION

To turn on the instrument turn the range knob from the OFF position to any measurement range.

**Note:** For best battery life always turn the function switch to the OFF position when the meter is not in use. This meter has Auto OFF that automatically shuts the meter OFF if 15 minutes elapse between uses.

**Note:** On some low AC and DC voltage ranges, with the test leads not connected to a device, the display may show a random, changing reading. This is normal and is caused by the high-input sensitivity. The reading will stabilize and give a proper measurement when connected to a circuit.

### 3.1. MODE BUTTON

To select AC or DC measurement when in Voltages, Amps, mA,  $\mu$ A,  $\Omega$ , , , CAP.

### 3.2. BACKLIGHT BUTTON

1. Press the Backlight button, the blue back light will turn ON
2. Press the Backlight button again to turn the light off.

### 3.3. DATA HOLD BUTTON

The Data Hold function allows the meter to "freeze" a measurement for later reference.

1. Press the Data Hold button to "freeze" the reading on the indicator. The indicator "HOLD" will be appear in the display.
2. Press the DATA HOLD button to return to normal operation.

### 3.4. RANGE BUTTON

When the meter is first turned on, it automatically goes into Auto Ranging. This automatically selects the best range for the measurements being made and is generally the best mode for most measurements. For measurement situations requiring that a range be manually selected, perform the following:

1. Press the **RANGE** button. The "**Auto Range**" display indicator will turn off, The "**Manual Range**" display indicator will turn on
2. Press the **RANGE** button to step through the available ranges until you select the range you want.
3. Press and hold the **RANGE** button for 2 seconds to exit the **Manual Ranging** mode and return to **Auto Ranging**.

### 3.5. REL BUTTON

REL Key is the relative value measurement key that acts with trigger. Except for Hz/Duty, Diode and continuity, all other functions can do the relative value measurement.

### 3.6. HZ/DUTY BUTTON

Hz/Duty is the Frequency/Duty cycle select key that acts with trigger. In frequency measurement mode, press the key to select frequency or duty cycle measurement mode; in AC/DC Voltage or AC/DC Current mode, press the key to proceed to Voltage/Frequency/Duty Cycle or Current/Frequency/Duty cycle measurement mode select **HZ/Duty button**.

### 3.7. DC/AC VOLTAGE MEASUREMENT

1. Insert the black test lead into the negative COM terminal and the red test lead into the positive V terminal.
2. Set the function switch to the VAC or VOE position.
3. Use the MODE button to select AC or DC Voltage
4. Connect the test leads in parallel to the circuit under test.
5. Read the voltage measurement on the LCD display

### 3.8. DC CURRENT MEASUREMENT

1. Insert the black test lead banana plug into the negative (COM) jack.
2. For current measurements up to 4000 $\mu$ A DC, set the function switch to the  $\mu$ A position and insert the red test lead banana plug into the ( $\mu$ A) jack.
3. For current measurements up to 400mA DC, set the function switch to the mA range and insert the red test lead banana plug into the (mA) jack.
4. For current measurements up to 1 QA DC, set the function switch to the A position and insert the red test lead banana plug into the 10A jack.
5. Press the MODE button until "DC" appears on the display.
6. Remove power from the circuit under test, then open up the circuit at the point where you wish to measure current.
7. Connect the black test probe tip and the red test probe tip in series to the circuits current that you want to measure.
8. Apply power to the circuit.
9. Read the current on the display. The display will indicate the proper decimal point, value and symbol.

### 3.9. AC CURRENT MEASUREMENT

1. Insert the black test lead plug into the negative (COM) socket.
2. For current measurements up to 10A, set the function switch to the A position and insert the red test lead plug into the (10A) jack.
3. For current measurements up to 400mA, set the function switch to the mA range and insert the red test lead banana plug into the (mA) jack.
4. For current measurements up to 10A AC, set the function switch to the A position and insert the red test lead banana plug into the 10A jack.
5. Press the MODE button. The measurement mode will change between AC or DC as required.
6. Remove power from the circuit under test, then open up the circuit at the point where you wish to measure current.
7. Connect the black test probe tip and the red test probe tip in series to the circuits current that you want to measure.
8. Apply power to the circuit.
9. Read the current on the display. The display will indicate the proper decimal point, value and symbol.

### 3.10. RESISTANCE [ $\Omega$ ] MEASUREMENT



**WARNING:** To avoid electric shock, disconnect power to the unit under test and discharge all capacitors before taking any resistance measurements. Remove the batteries and unplug the line cords.

1. Set the function switch to the position.
2. Insert the black test lead plug into the negative (COM) socket and the red test lead plug into the positive  $\Omega$  jack.
3. Press the MODE button until " $\Omega$ " appears on the display.
4. Touch the test probe tips across the circuit or part under test. It is best to disconnect one side of the part under test so the rest of the circuit will not interfere with the resistance reading.
5. Read the resistance on the display. The display will indicate the proper decimal point, value and symbol.

### 3.11. CONTINUITY CHECK



**WARNING:** To avoid electric shock, never measure continuity on circuits or wires that have voltage on them.

1. Set the range switch to the  $\bullet\))$  position.
2. Insert the black test lead plug into the COM socket and the red test lead plug into the positive  $\bullet\))$  socket.
3. Press the MODE button until " $\bullet\))$ " appears on the display.
4. Touch the test probe tips to the circuit or wire you wish to check.
5. If the resistance is less than  $50\Omega$ , the audible signal will sound. The display will also show the actual resistance in ohms.

### 3.12. DIODE TEST



**WARNING:** To avoid electric shock, do not test any diode that has voltage on it.

1. Set the function switch to the  $\blacktriangleright$  position.
2. Insert the black test lead plug into the COM socket and the red test lead plug into the  $\blacktriangleright$  socket.
3. Press the MODE button until " $\blacktriangleright$ " appears on the display.
4. Touch the test probe tips to the diode or semiconductor junction you wish to test. Note the meter reading.
5. Reverse the probe polarity by switching probe position. Note this reading.
6. The diode or junction can be evaluated as follows:
  - A. If one reading shows a value and the other reading shows OL, the diode is good.
  - B. If both readings show OL, the device is open.
  - C. If both readings are very small or zero, the device is shorted.

**NOTE:** The value indicated on the display during the diode check is the forward voltage.

### 3.13. CAPACITANCE MEASUREMENT



**WARNING:** To avoid electric shock, discharge the capacitor under test before measuring.

1. Set the function switch to the **CAP** capacitance position. Press the MODE button until "nF" appears on the display.
2. Insert the black test lead banana plug into the negative **COM** jack and the red test lead banana plug into the **CAP** positive jack.
3. Touch the test probe tips across the part under test.
4. Read the capacitance value on the display.
5. The display will indicate the proper decimal point and value.

### 3.14. FREQUENCY MEASUREMENT

1. Set the function switch to the Hz position.
2. Insert the black test lead banana plug into the negative (COM) jack and the red test lead banana plug into the positive Hz jack.
3. Touch the test probe tips to the circuit under test.
4. Read the frequency on the display. The digital reading will indicate the proper decimal point, symbols (Hz, kHz, MHz) and value.

### 3.15. NON-CONTACT VOLTAGE (NCV)

The NCV function works on any rotary switch position.

1. Test the detector on a known live circuit before use.
2. Hold the top of the meter very close to the voltage source as shown.
3. If voltage is present, the back light will flash a bright red.

#### 4. SPECIFICATIONS

Function	Range
Insulation	Class2, Double insulation.
Over voltage category	CAT IV 600V, CAT III 1000V
Maximum voltage between any terminal and earth ground	1000V DC/AC RMS
Surge Protection	Peak IEC 61010
Display	4000 counts LCD display, 21mm high
Polarity	Automatic, (-) negative polarity indication.
Over-range	"OL" mark indication
AC Response	True RMS
Crest Factor	$\leq 3$ at full scale up to 500V, decreasing linearly to $\leq 1.5$ at 1000V

**NOTE:** These meters meet CAT III and CAT IV IEC 61010 standards. The IEC 61010 safety standard defines four over voltage categories (CAT I to IV) based on the magnitude of danger from transient impulses. CAT III meters are designed to protect against transients in fixed-equipment installations at the distribution level; CAT IV meters are designed to protect against transients from the primary supply level (overhead or underground utility service).

#### 4.1. NON-CONTACT VOLTAGE (NCV)

The NCV function works on any rotary switch position.

1. Test the detector on a known live circuit before use.
2. Hold the top of the meter very close to the voltage source as shown.
3. If voltage is present, the back light will flash a bright red.

Function	Range
Low battery indication	a battery "  " symbol is displayed when the battery voltage drops below the operating level.
Measurement rate	3 times per second nominal.
Auto power off	Meter automatically shuts down after approx. 15 minutes of inactivity. To disable the auto power off feature, hold down the MODE Button and turn the meter on.
Operating environment	0°C to 50°C (32°F to 122°F) at <70% relative humidity.
Storage temperature	-20°C to 60°C (-4°F to 140°F) at <80% relative humidity.
Relative humidity	90% (0°C to 30°C); 75% (30°C to 40°C); 45% (40°C to 50°C);
For inside use, max height:	Operating: 3000m, Storage 10,000m.
Pollution degree	2
Safety	The instrument complies with IEC/EN 61010-1:2001 and IEC/EN 61010-031 :2002
Power	One 9V battery, NEDA 1604, IEC 6F22.
Dimensions	182 (H) x 82 (W) x 55 (D) mm
Weight	Approx.: 375g.
Accuracy	Accuracy is given at 18°C to 28°C (65°F to 83°F), less than 70% RH

#### 4.2. DC VOLTAGE (AUTO-RANGING)

Range	Resolution	Accuracy
400.0mV	0.1mV	± 0.5% of rdg ± 5 digits
4.000V	1mV	
40.00V	10mV	
400.0V	100mV	± 0.6% of rdg ± 6 digits
1000V	1V	

Input Impedance: 10M $\Omega$ .

Maximum Input: 1000V DC or 1000V AC RMS.

#### 4.3. AC VOLTAGE (AUTO-RANGING)

Range	Resolution	Accuracy
400.0mV	0.1mV	± 0.8% of rdg ± 8 digits
4.000V	1mV	
40.00V	10mV	
400.0V	100mV	
1000V	1V	

Input Impedance: 10M $\Omega$ .

All AC voltage ranges are specified from 5% of range to 100% of range.

AC voltage bandwidth: 50Hz to 1 kHz (Sine); 50Hz to 60Hz (All wave).

Maximum Input: 1000V DC or 1000V AC RMS.

#### 4.4. DC CURRENT (AUTO-RANGING)

Range	Resolution	Accuracy
400.0uA	0.1uA	± 1.0% of rdg ± 3 digits
4000uA	1uA	
40.00mA	10uA	
400.0mA	100uA	± 1.5% of rdg ± 3 digits
4.000A	1mA	
10A	10mA	

Overload protection: FF500mA / 1000V and F10A / 1000V Fuse.

Maximum Input: 400uA DC on uA range

400mA DC on mA range

10A DC on 10A range

#### 4.5. AC CURRENT (AUTO-RANGING)

Range	Resolution	Accuracy
400.0uA	0.1uA	±1.5% of rdg ± 3 digits
4000uA	1uA	
40.00mA	10uA	
400.0mA	100uA	
4.000A	1mA	±2.0% of rdg ± 3digits
10A	10mA	

Overload protection: 500mA / 1000V and 10A / 1000V Fuse.

All AC Current ranges are specified from 5% of range to 100% of range.

AC Current 50Hz to 1 kHz (Sine); 50Hz to 60Hz (All wave).

Maximum Input: 400uA AC RMS on uA

400mA AC RMS on mA

10A AC RMS on 10A range

#### 4.6. RESISTANCE [ $\Omega$ ] (AUTO-RANGING)

Range	Resolution	Accuracy
400.0 $\Omega$	0.1 $\Omega$	± 1.0% of rdg ± 2 digits
4.000k $\Omega$	1 $\Omega$	
40.00k $\Omega$	10 $\Omega$	
400.0k $\Omega$	100 $\Omega$	± 0.8% of rdg ± 2 digits
4.000M $\Omega$	1k $\Omega$	± 1.2% of rdg ± 2 digits
40.00M $\Omega$	10k $\Omega$	± 1.0% of rdg ± 5 digits

Input Protection: 250V DC or 250V AC RMS.

#### 4.7. CAPACITANCE (AUTO-RANGING)

Range	Resolution	Accuracy
99.99nF	10pF	± 5.0% of rdg ± 20 digits
999.9nF	0.1nF	± 4.0% of rdg ± 5 digits
9.999uF	1nF	
99.99uF	10nF	
999.9uF	0.1uF	
9.999mF	0.001mF	± 10% of rdg
99.99mF	0.01mF	

Input Protection: 250V DC or 250V AC RMS.

#### 4.8. FREQUENCY (ELECTRONIC)

Range	Resolution	Accuracy
9.999Hz	0.001Hz	±1.0% of rdg ± 5 dgts
99.99Hz	0.01Hz	
999.9 Hz	0.1Hz	
9.999KHz	1 Hz	
99.99kHz	10Hz	
999.9kHz	100Hz	
9.999MHz	1kHz	
10.00MHz	10KHz	

Sensitivity: >0.5V RMS while ≤1 MHz ;

Sensitivity: >3V RMS while >1 MHz;

Input Protection: 250V DC or 250V AC RMS.

#### 4.9. DUTY CYCLE

Range	Resolution	Accuracy
0.1%~99.9%	0.1%	±1.2% of rdg ± 2 dgts

Pulse width: > 100us, <100ms;

Frequency width: 5Hz - 150kHz

Overload protection: 250V DC or AC RMS.

#### 4.10. FREQUENCY (ELECTRICAL)

Range	Resolution	Accuracy
10.00-1kHz	0.01Hz	±0.5% of rdg ± 5 digits

Sensitivity: ACV Range (>6% Range); 6000μ/600.0mN 10.00A Range (>6% Range); 600.0μ/60.00m/6.000A (>60% Range).

#### 4.11. DIODE TEST

Range	Resolution	Accuracy
1mA typical/Open digits MAX.3.2V	1mV	±10% of rdg ± 5 digits

Open circuit voltage: MAX. 3.2V DC

Overload protection: 250V DC or AC RMS.

#### 4.12. AUDIBLE CONTINUITY

Audible threshold: Less than 50Ω Test current MAX. 1.5mA

Overload protection: 250V DC or AC RMS.

#### 4.13. ACCESSORIES

Included accessories - Standard Red/Black lead set with test probes

## 5. BATTERY AND FUSE REPLACEMENT

 **WARNING:** To avoid electric shock, disconnect the test leads from any source of voltage before removing the battery cover.

1. When the batteries become flat or drop below the operating voltage, the battery warning symbol will appear on the LCD display. The battery should be replaced.
2. Follow instructions for installing battery. See the Battery Installation section of this manual.
3. Dispose of the old battery properly.

 **WARNING:** To avoid electric shock, do not operate your meter with the battery cover removed.

### 5.1. BATTERY INSTALLATION

 **WARNING:** To avoid electric shock, disconnect the test leads from any source of voltage before removing the back cover or the battery cover. Do not operate the instrument with the battery cover removed.

1. Disconnect the test leads from the meter.
  2. Open the battery cover by loosening the screw using a Phillips head screwdriver.
  3. Insert the battery into battery holder, observing the correct polarity.
  4. Put the battery cover back in place. Secure with the two screws.
- NOTE:** If your meter does not work properly, check the fuses and battery to make sure that they are still good and that they are properly inserted.

### 5.2. REPLACING THE FUSES

 **WARNING:** To avoid electric shock, disconnect the test leads from any source of voltage before removing the fuse/battery cover.

1. Disconnect the test leads from the meter and any item under test.
2. Open the fuse door by loosening the screw on the door using a Phillips head screwdriver.
3. Remove the old fuse from its holder by gently pulling it out.
4. Install the new fuse into the holder.
5. Always use a fuse of the proper size and value (500mA/1000V fast blow for the 400mA range, 10A/1000V fast blow for the 10A range).
6. Put the fuse door back in place. Insert the screw and tighten it securely.

 **WARNING:** To avoid electric shock, do not operate your meter until the fuse door is in place and fastened securely.



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