

TECHNI-PRO

True RMS Multimeter User Manual



Please read this manual before switching the unit on.
Important safety information inside.

Contents	Page
1-Introduction.....	4
2-WARNINGS.....	4
3-General Specifications.....	5
3-1.International Safety Symbols.....	6
3-2.Safety Category Ratings.....	6
3-3.Maintenance.....	7
4-Meter Description.....	7
4-1.Symbols Used on LCD Display.....	8
5-Operation.....	9
5-1.RANGE Button.....	9
5-2.MODE Button.....	9
5-3.REL Button.....	9
5-4.MAX/MIN/AVG Button.....	9
5-5.Backlight/HOLD Button.....	10
5-6.Flashlight/PEAK Button.....	10
5-7.AC/DC Voltage Measurements.....	11
5-8.Frequency and % Duty Cycle Measurements.....	11
5-9.Low Z Voltage.....	12
5-10.AC/DC Current Measurements.....	12
5-11.Resistance Measurements.....	13
5-12.Continuity Test.....	13
5-13.Diode Test.....	13
5-14.Capacitance Measurements.....	14
5-15.Temperature Measurements.....	14
5-16.Battery Replacement.....	14
5-17.Fuse Replacement.....	15
6-Specifications.....	15

1-Introduction

The True RMS Multimeter features True RMS measurements for more accurate AC readings and a Low Z setting for eliminating errors caused by “ghost” voltages. Functions include AC/DC voltage and current, resistance, continuity, capacitance, frequency, duty cycle, temperature, and diode test. The True RMS Multimeter also offers the added convenience of a built-in LED flashlight. This meter is fully tested and calibrated, with proper use, will provide many years of reliable service.


2- WARNINGS

- Read, understand and follow Safety Rules and Operating Instructions in this manual before using this meter.
- The meter’s safety features may not protect the user if not used in accordance with the manufacturer’s instructions.
- Ensure that the test leads are fully seated in the input jacks and keep fingers away from the metal probe tips when taking measurements.
- Before changing functions using the selector switch, always disconnect the test leads from the circuit under test.
- Use only UL listed test leads with the proper safety category rating.
- Comply with all applicable safety codes. Use approved personal protective equipment when working near live electrical circuits-particularly with regard to arc-flash potential.
- Use caution on live circuits. Voltages above 30V AC rms, 42V AC peak, or 60V DC pose a shock hazard.
- Do not use if the meter or test leads appear damaged.
- Verify operation before using meter by measuring a known live voltage.
- Do not use the meter in wet or damp environments or during electrical storms.
- Do not use the meter near explosive vapors, dust gas.
- Do not use the meter if it operates incorrectly. Protection may be compromised.
- Do not operate meter while Low Battery warning is on. Replace batteries immediately.
- Do not apply voltage or current that exceeds the meter’s maximum rated input limits.

Input Limits

Function	Maximum Input
Voltage AC or DC	1000V AC RMS/1000V DC
Low Z	600V AC RMS/600V DC
μ A, mA Current AC/DC	800mA 1000V fast acting fuse
10A Current AC or DC	10A 1000V fast acting fuse (10A for 30 seconds max. every 15 minutes)
Resistance, Continuity, Diode Test, Capacitance, Frequency, Duty Cycle	600V AC RMS/600V DC
Temperature	600V AC RMS/600V DC

3-General Specifications

Insulation	Class 2, double insulated
Enclosure	Double Molded, IP67 waterproof and dustproof
Diode Test	Test current 1.5mA typical, open circuit voltage 3V typical
Continuity Test	Audible signal if the resistance is approx. $50 \pm 5\Omega$ or less
Low Battery Indication	"  " is displayed
Display	6000 count LCD display
Over Range Indication	"OL" is displayed
Polarity	Minus symbol "-" is displayed for negative polarity
Measurement Rate	3 readings per second, nominal
Auto Power Off	After approx. 15 minutes of inactivity
Input Impedance	10M Ω AC/DC Voltage
Low Z	Approx. 3k Ω input impedance
AC Response	True RMS
AC Bandwidth	50/60HZ(ALL WAVE) 45Hz to 1000Hz(SINE WAVE)
Batteries	Four "AAA" 1.5V batteries
Fuses	800mA 1000V (6.3 x 32mm) fast blow 10A 1000V (10 x 38mm) fast blow
Operating Environment	32°F to 104°F(0°C to 40°C) at <70% relative humidity
Storage Environment	14°F to 140°F(-10°C to 60°C) at <80% relative humidity
Operating Altitude	2000 meters maximum
Dimensions/Weight	6.7" x 3.0" x 1.9"/0.85lb(170 x 75 x 48mm/386g)
Safety	Complies with UL 61010-1 v.3 for measurement Category IV 600V and Category III 1000V, Pollution Degree 2

3-1. International Safety Symbols



Potential danger. Indicates the user must refer to the manual for important safety information.



Indicates hazardous voltages may be present.



Equipment is protected by double or reinforced insulation.



Indicates the terminal(s) so marked must not be connected to a circuit where the voltage with respect to earth ground exceeds the maximum safety rating of the meter.

3-2. Safety Category Ratings

Category Rating	Brief Description	Typical Applications
CAT II	Single phase receptacles and connected loads	-Household appliances, power tools -Outlets more than 30ft(10m) from a CAT III source -Outlets more than 60ft(20m) from a CAT IV source
CAT III	Three phase circuits and single phase lighting circuits in commercial buildings	-Equipment in fixed installations such as 3-phase motors, switchgear and distribution panels -Lighting circuits in commercial buildings -Feeder lines in industrial plants -Any device or branch circuit that is close to a CAT III source
CAT IV	Connection point to utility power and outdoor conductors	-Primary distribution panels -Overhead or underground lines to detached buildings -Incoming service entrance from utility -Outdoor pumps

The measurement category(CAT)rating and voltage rating is determined by a combination of the meter, test probes and any accessories connected to the meter and test probes. The combination rating is the LOWEST of any individual component.

WARNING: Operation is limited to CAT II applications when the insulated tips are removed from one or both test probes. Refer to Input Limits section in this manual for maximum voltage ratings.

3-3.Maintenance

This Multimeter is designed to provide years of dependable service, if the following care instructions are performed:

- KEEP THE METER DRY. If it gets wet, wipe it off.
- USE AND STORE THE METER IN NORMAL TEMPERATURES. Temperature extremes can shorten the life of the electronic parts and distort or melt plastic parts.
- HANDLE THE METER GENTLY AND CAREFULLY. Dropping it can damage the electronic parts or the case.
- KEEP THE METER CLEAN. Wipe the case occasionally with a damp cloth. DO NOT use chemicals, cleaning solvents, or detergents.
- USE ONLY FRESH BATTERIES OF THE RECOMMENDED SIZE AND TYPE. Remove old or weak batteries so they do not leak and damage the unit.
- IF THE METER IS TO BE STORED FOR A LONG PERIOD OF TIME, the batteries should be removed to prevent damage to the unit.

4-Meter Description

- 1-LCD display
- 2-REL button
- 3-RANGE button
- 4-MODE button
- 5-Rotary function switch
- 6-10A input jack
- 7- μ A, mA input jack
- 8-COM input jack
- 9-V/ Ω /Hz%/ $^{\circ}$ C/ $^{\circ}$ F input jack
- 10-Backlight/HOLD button
- 11-PEAK/Flashlight button
- 12-MAX/MIN/AVG button
- 13-Auto backlight
- 14-Flashlight



4-1.Symbols Used on LCD Display



V	Volts
A	Amperes
~	Alternating current
≡	Direct current
-	Minus sign
Ω	Ohms
•••	Continuity
→	Diode test
F	Farads(capacitance)
Hz	Hertz(frequency)
%	Percent(duty ratio)
°F	Degrees Fahrenheit
°C	Degree Celsius

n	nano(10^{-9})
μ	micro(10^{-6})
m	milli(10^{-3})
k	kilo(10^3)
M	mega(10^6)
OL	Overload
⏻	Auto Power Off
🔋	Low battery
AUTO	Autoranging
HOLD	Display hold
MAX/MIN/AVG	Maximum/Minimum/Average
Peak	Peak hold
REL	Relative

5-Operation

5-1.RANGE Button

The Autorange mode automatically selects the proper range for the measurement being made and is generally the best mode for most applications. For measurement situations requiring that a range be manually selected, perform the following:

- Momentarily press the RANGE button. The “AUTO” indicator will no longer be shown on the LCD display.
- Momentarily press the RANGE button to step through the available ranges until the desired range is selected.
- To exit the Manual Ranging mode, press and hold the RANGE button until the “AUTO” indicator reappears.

NOTE: The range button does not work on Frequency, Duty Cycle, Capacitance or Temperature.

5-2.MODE Button

Used to select AC or DC, Frequency or Duty Cycle, Resistance, Continuity or Diode Test, and °C or °F.

5-3.REL Button

The RELATIVE function zeros out the reading on the display and stores it as a reference. Subsequent readings will be displayed as the relative difference between the actual measurement and the stored reference value. To activate, press the REL button. The “REL” indicator will appear on the LCD display along with the relative reading. Press the REL button again to return to normal operation.

NOTE: The meter does not Autorange when the Relative mode is active. The display will read OL if the difference exceeds the range. When this occurs, exit REL and use the RANGE button to select a higher range. REL does not work on Frequency, Duty Cycle, Temperature, or Low Z.

5-4.MAX/MIN/AVG Button



- Momentarily press the MAX/MIN/AVG button to activate the MAX/MIN mode. The “MAX” indicator will appear on the LCD display. The meter will display and hold the maximum reading and will update when a higher “MAX” occurs.

- Momentarily press the MAX/MIN/AVG button to view the lowest reading. The “MIN” indicator will appear on the LCD display. The meter will display and hold the minimum reading and will update when a lower “min” occurs.
- Momentarily press the MAX/MIN/AVG button again to view the average reading. The “AVG” symbol will appear on the LCD display. The meter will display the running average and will update when the average value changes.
- Press and hold the MAX/MIN/AVG button to end MAX/MIN and return to normal operation.

NOTE: MAX/MIN does not work on Frequency, Duty Cycle, Capacitance or Temperature.

5-5.Backlight/HOLD Button

To freeze the reading on the LCD display, momentarily press the HOLD  button. The “HOLD” indicator will be displayed while the reading is being held. Momentarily press the HOLD  button again to exit HOLD and return to normal operation.

To turn the backlight on, press and hold the HOLD  button until the backlight turns on. To turn the backlight off, press and hold the HOLD  button until the backlight turns off.



AUTO Backlight



When the meter is in the darkness, the backlight can be automatically opened, not controlled by the button.

5-6.Flashlight/PEAK Button

Momentarily press the PEAK button to turn the flashlight on and off.

The PEAK function is accessible when measuring AC Voltage or Current. It captures and displays the highest positive peak and the highest negative peak of the AC waveform.



- Press and hold the  PEAK button until “Peak MAX” appears on the LCD display. The meter will display the highest reading and will update the reading when a higher positive peak occurs.
- To view highest negative peak, press the  PEAK button for approximately one second. “Peak MIN” will appear on the LCD display and the meter will display and hold the highest reading. The meter will update the reading when a higher negative peak occurs.

- Press the  PEAK button for approximately one second to switch between Peak MAX and Peak MIN readings.
- Press and hold the  PEAK button to exit PEAK and return to normal operation.

NOTE: The meter does not Autorange when the Peak mode is active. The display will read OL if the range is exceeded. When this occurs, exit Peak and use the RANGE button to select a higher range. Peak does not work on DCV, DCA, Frequency, Duty Cycle, Capacitance or Low Z.


5-7.AC/DC Voltage Measurements

WARNING: Observe all safety precautions when working on live voltages.

- Set the rotatory function switch to the V  ~ HZ% position.
- Momentarily press the MODE button to select AC or DC voltage. The AC “~” or DC “ ” symbol will appear on the LCD display.
- Insert the black test lead into the COM input jack and the red test lead into the V input jack.
- Touch the test lead probes to the circuit under test. If measuring DC voltage, touch the red test lead to the positive side of the circuit and the black test lead to the negative side of the circuit.
- Read the voltage on the LCD display.

5-8.Frequency and % Duty Cycle Measurements

WARNING: Observe all safety precautions when working on live live voltages.

- Set the rotary function switch to the V  ~ HZ % position.
- To select Frequency, press and hold the MODE button until the “Hz” symbol appears on the LCD display. To select % Duty Cycle, press and hold the MODE button a second time until the “%” appears on the LCD display.
- Insert the black test lead into the COM input jack and the red test lead into the V input jack.
- Touch the test lead probes to the circuit under test.
- Read the frequency or % duty cycle on the LCD display.
- To return to AC voltage, press and hold the MODE button a third time until the “~” symbol appears on the LCD display.

NOTE: The Frequency function can only be accessed when the meter is set to AC voltage.

5-9. Low Z Voltage

WARNING: Observe all safety precautions when working on live voltages. Do not connect to circuits that exceed 600V AC/DC when the meter is set to Low Z.

Low Z is used when there is a suspicion of a “ghost” voltage. Ghost voltages are present when non-powered wires are in close proximity to wires powered by AC voltage. Capacitive coupling between wires make it appear that non-powered wires are connected to a real source of voltage. The Low Z setting places a load on the circuit, which dissipates and greatly reduces ghost voltage.

- Set the rotary function switch to the Low Z position.
- Momentarily press the MODE button to select AC or DC voltage. The AC “~” or DC “—” symbol will appear on the LCD display.
- Insert the black test lead into the COM input jack and the red test lead into the V input jack. If measuring DC voltage, touch the red test lead to the positive side of the circuit and the black test lead to the negative side of the circuit.
- Touch the test leads to the circuit under test.
- Read the voltage on the LCD display.

5-10. AC/DC Current Measurements

WARNINGS: Observe all safety precautions when working on live circuits. Do not measure current on circuits that exceed 1000V. Measurements in the 10A range should be limited to 30 seconds maximum every 15 minutes.

- Insert the black test lead into the negative COM input jack.
- For current measurements up to 10A, set the rotary function switch to the 10A position and insert the red test lead into the 10A input jack.
- For current measurements up to 600mA, set the rotary function switch to the mA position and insert the red test lead into the μ A mA input jack.
- For current measurements up to 6000 μ A, set the rotary function switch to the μ A position and insert the red test lead into the μ A mA input jack.
- Momentarily press the MODE button to select AC or DC current. The AC “~” or DC “—” symbol will appear on the LCD display.
- Remove power from the circuit under test, then open up the circuit at the point where you wish to measure current.
- Touch the test lead probes in series with the circuit being measured. For DC current, touch the red probe to the positive side of the circuit and touch the black probe to the negative side of the circuit.
- Apply power to the circuit.
- Read the current on the LCD display.

5-11. Resistance Measurements

WARNING: Never test resistance on a live circuit.

- Set the rotary function switch to the Ω \rightarrow \rightarrow position.
- Press the MODE button until the “ Ω ” symbol appears on the LCD display.
- Insert the black test lead into the COM input jack and the red test lead into the Ω input jack.
- Touch the test lead probes to the component under test. If the component is installed in a circuit, it is best to disconnect one side before testing to eliminate interference with other devices.
- Read the resistance in on the LCD display.

5-12. Continuity Test

WARNING: Never test continuity on a live circuit.

- Set the rotary function switch to the Ω \rightarrow \rightarrow position.
- Press the MODE button until the “ \rightarrow ” symbol appears on the LCD display.
- Insert the black test lead into the COM input jack and the red test lead into the Ω input jack.
- Touch the test lead probes to the device or wire under test.
- A beeper will sound if the resistance is approximately $50 \pm 5\Omega$ or less and the resistance value will be shown on the LCD display.

5-13. Diode Test

WARNING: Never test diodes in a live circuit.

- Set the rotary function switch to the Ω \rightarrow \rightarrow position.
- Press the MODE button until the “ \rightarrow ” symbol appears on the LCD display.
- Insert the black test lead into the COM input jack and the red test lead into the Ω input jack.
- Touch the test lead probes to the diode under test.
- Forward voltage will indicate 0.4 to 0.7 on the display. Reverse voltage will indicate “OL”. Shorted devices will indicate near 0 and an open device will indicate “OL” in both polarities.



Insert drawing showing position of rotary function switch.

5-14. Capacitance Measurements

WARNING: Safely discharge capacitors before taking capacitance measurements.

- Set the rotary function switch to the CAP position.
- Insert the black test lead into the COM input jack and the red test lead into the CAP input jack.
- Touch the test lead probes to the capacitor under test.
- Read the capacitance value on the LCD display. It may take up to a minute to get a stable reading on large capacitors.

5-15. Temperature Measurements

WARNING: Do not touch the temperature probe to live circuits.

- Set the rotary function switch to the °F °C position.
- Press the MODE button to select readings in °F or °C.
- Connect the Temperature Probe to the Banana Plug Adapter. Note the – and + markings on the adapter. Connect the adapter to the meter, making sure the – side goes into the COM input jack and the + side goes into the °C °F input jack.
- Touch the tip of the Temperature Probe to the object being measured. Keep the probe touching the object until the reading stabilizes (about 30 sec).
- Read the temperature on the LCD display.

5-16. Battery Replacement

WARNING: To avoid electric shock, remove the test leads from the meter before removing the battery/fuse cover.

- Lift up the tilt stand.
- Loosen the one Phillips screw on the battery/fuse cover.
- Remove the battery/fuse cover.
- Replace the batteries with four AAA batteries.
- Observe polarity as shown inside battery compartment.
- Install the battery/fuse cover and tighten the screw.

WARNING: To avoid electric shock, do not operate meter until the battery/fuse cover is securely fastened to the meter.

5-17. Fuse Replacement

WARNING: To avoid electric shock, remove the test leads from the meter before removing the battery/fuse cover.

- Loosen the one Phillips screw on the batter/fuse cover.
- Remove the battery/fuse cover.
- Gently remove fuse and install new fuse into the holder.
- Always use a UL recognized fuse of the proper size and value: 800mA/1000V (6.3 x 32mm) fast blow for the μ A/mA ranges and 10A/1000V(10 x 38mm) fast blow for the 10A range.
- Install the back cover and tighten the screw.

WARNING: To avoid electric shock, do not operate meter until the battery/fuse cover is securely fastened to the meter.

6-Specifications

Accuracy is stated at 65°F to 83°F(18°C to 28°C), less than 70% relative humidity

Function	Range	Resolution	Accuracy \pm (% of reading + digits)
AC Voltage	6.000V	1mV	$\pm(0.8\% + 8)$
	60.00V	10mV	
	600.0V	0.1V	
	1000V	1V	$\pm(1.0\% + 3)$
Input Protection: 1000V AC RMS or 1000V DC			
AC voltage accuracy bandwidth: 50/60HZ(ALL WAVE) 45Hz to 1000Hz(SINE WAVE)			
Low Z AC Voltage	6.000V	1mV	$\pm(3.0\% + 40)$
	60.00V	10mV	
	600.0V	0.1V	
Input Protection: 600V AC RMS or 600V DC			
Input Impedance: Approx. 3k Ω			
DC Voltage	600.0mV	0.1mV	$\pm(0.5\% + 8)$
	6.000V	1mV	$\pm(0.5\% + 5)$
	60.00V	10mV	
	600.0V	0.1V	
	1000V	1V	$\pm(0.8\% + 3)$
Input Protection: 1000V AC RMS or 1000V DC			

Function	Range	Resolution	Accuracy \pm (% of reading + digits)
Low Z DC Voltage	600.0mV	0.1mV	\pm (3.0% + 40)
	6.000V	1mV	
	60.00V	10mV	
	600.0V	0.1V	
Input Protection: 600V AC RMS or 600V DC Input Impedance: Approx. 3k Ω			
Frequency (electrical)	9.999Hz	0.001Hz	\pm (1.0% + 5)
	99.99Hz	0.01Hz	
	999.9Hz	0.1Hz	
	9.999kHz	1Hz	
Input Protection: 600V AC RMS or 600V DC Sensitivity: <8V RMS			
Duty Cycle	20.0% to 80.0%	0.1%	\pm (1.2% + 2)
Input Protection: 600V AC RMS or 600V DC Pulse Width: 0.1 to 100mS Frequency Range: 5Hz to 10kHz Sensitivity: >8V RMS			
AC Current	600.0 μ A	0.1 μ A	\pm (1.5% + 3)
	6000 μ A	1 μ A	
	60.00mA	10 μ A	
	600.0mA	0.1mA	
	10.00A	10mA	\pm (2.0% + 5)
Overload Protection: μ A, mA ranges: 800mA/1000V Fuse 10A range: 10A/1000V Fuse AC current bandwidth: 50 to 60Hz			

Function	Range	Resolution	Accuracy \pm (% of reading + digits)	
DC Current	600.0 μ A	0.1 μ A	\pm (1.0% + 3)	
	6000 μ A	1 μ A		
	60.00mA	10 μ A		
	600.0mA	0.1mA		
		10.00A	10mA	\pm (1.5% + 5)
Overload Protection: μ A, mA ranges: 800mA/1000V Fuse 10A range: 10A/1000V Fuse				
Resistance	600.0 Ω	0.1 Ω	\pm (1.5% + 5)	
	6.000k Ω	1 Ω		
	60.00k Ω	10 Ω		
	600.0k Ω	100 Ω		
		6.000M Ω	1k Ω	\pm (2.0% + 10)
		60.00M Ω	10k Ω	
Input Protection: 600V AC RMS or 600V DC				
Capacitance	60.00nF	10pF	\pm (5.0% + 35)	
	600.0nF	100pF	\pm (3.0% + 5)	
	6.000 μ F	0.001 μ F		
	60.00 μ F	0.01 μ F		
	600.0 μ F	0.1 μ F		
		6000 μ F	1 μ F	\pm (5.0% + 5)
Input Protection: 600V AC RMS or 600V DC				
Temperature	-4°F to 1400°F	0.1°F	\pm (2.0% + 9°F)	
	-20°C to 760°C	0.1°C	\pm (2.0% + 5°C)	
Input Protection: 600V AC RMS or 600V DC				

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