



# 193A True-RMS Auto Ranging Automotive DMM

## LCD Display

40000 count with 42 segment bar graph.

## REC (Record Mode)

Store minimum, maximum, and average readings over a measurement period.

## RANGE

Manually select the appropriate range

## AC/DC

Manually select AC or DC measurement function.

## FUNCTION

Toggle between functions on Ohm, TEMP, and IG modes

## Hz (Frequency)

Measure the frequency of sensors and signals.

## $\Omega$ (Ohms, Resistance)

Measure the resistance of spark plug wires, coils, sensors, and continuity of wiring.

## ACmV and DCmV Ranges

Additional 40 millivolt DC range with 0.01mV resolution for improved accuracy when performing low voltage measurements.

## DCV, ACV (DC Volts, AC Volts)

Measure the voltage of circuits and sensors. Measure the voltage of ABS wheel sensors.

## REL (Relative Mode)

Factor out lead resistance for improved low ohm measurements or compare readings to a known standard. Can also be used for differential measurements.

## CYL (Cylinder)

Selects the number of cylinders in IG mode.

## HOLD

Lock the reading on the display for hard to read locations or future reference.

## PEAK-H (Peak Hold)

Capture signals spikes as fast as 1mS to diagnose intermittent events.

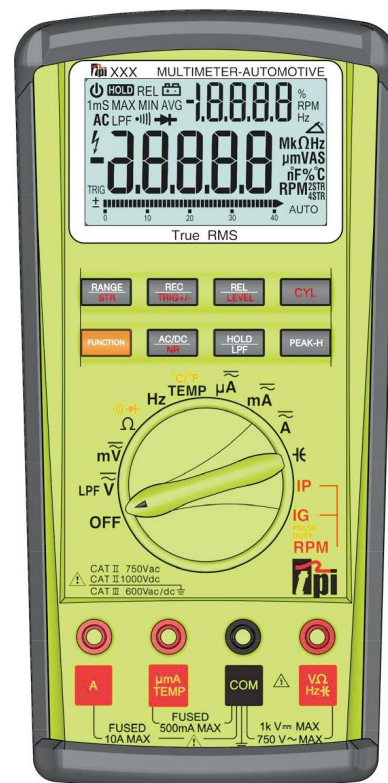
## TEMP (Temperature)

Measure temperature with included temperature probe.

## AC/DC Current Functions

Measure the parasitic draw from the battery.

# True-RMS Auto Ranging Automotive DMM



## $\mu F$ (Capacitance)

Measure the capacitance of condensers or capacitors found in today's hybrid automobiles.

## IP, IG (Automotive Functions)

Measure RPM, Duty, Dwell, mS pulse width, Frequency.

## Built in Tilt Stand

The tilt stand is built into the instrument housing adding strength and integrity to the design.

## Quickly Test Condition of Internal Fuses

You can determine the status of the internal fuses before you open the battery/fuse compartment. Simply set the instrument to the diode test function, plug the black test lead into the "V $\Omega$ " input jack and touch the prod end of the black lead to the metal inside the "A" or "UAmA" input lack. If the meter reads "OL", the fuse is blown. If there is a reading on the LCD besides "OL", the fuse is good.

## Separate Fuse/Battery Compartment

Easily replace fuses and batteries in this separate compartment. Fuses are clearly labeled with replacement part number.



UL61010-1



CAT II-1000V, CAT III-600V  
POLLUTION DEGREE 2

Safety!

cULus 61010-1 Listed  
Meets CE and IEC61010-1  
safety standards.

Function	Range	Resolution	Accuracy	Impedance
DC Volts	40mV	0.001V	$\pm(0.1\% + 5 \text{ digits})$	10M ohm
	400mV	0.01mV		
	4V	0.0001V		
	40V	0.001V		
	400V	0.01V		
	1000V	1V		
AC Volts (45Hz to 2KHz)	400mV	0.01mV	$\pm(0.75\% + 40 \text{ digit})$	10M ohm
	4V	0.0001V		
	40V	0.001V		
	400V	0.01V		
	750V	1V		
Function	Range	Resolution	Accuracy	Overload Protection
DC Amps	400uA	0.01uA	$\pm(0.3\% + 10 \text{ digits})$	Fuse*(fast blow) F600V, .5A, 31CM
	4000uA	0.1uA		
	40mA	0.001mA		
	400mA	0.01mA		
	4A	0.0001A		
	10A	0.001A		
AC Amps	400uA	0.01uA	$\pm(0.75\% + 10 \text{ digits})$	Fuse*(fast blow) F600V, .5A, 31CM
	4000uA	0.1uA		
	40mA	0.001mA		
	400mA	0.01mA		
	4A	0.0001A		
	10A	0.001A		
OHM	400	0.01	$\pm(0.1\% + 5 \text{ digits})$	600V DC or AC Peak
	4k	0.0001k		
	40k	0.001k		
	400k	0.01k		
	4M	0.0001M		
	40M	0.001M		
Capacitance	40nF	0.01nF	$\pm(3.0\% + 10 \text{ digits})$	600V DC or Peak AC
	400nF	0.1nF		
	4uF	0.001uF		
	40uF	0.01uF		
	400uF	0.1uF		
	4mF	0.001mF		
Frequency	10mF	0.01mF	$\pm(5.0\% + 10 \text{ digits})$	600V DC or Peak AC
	40Hz	0.001Hz		
	400Hz	0.01Hz		
	4kHz	0.0001kHz		
	40kHz	0.001kHz		
	400kHz	0.01kHz		
Temperature	-40° to 2,462°F	1°F	$\pm(3°F + 1 \text{ digit})$ (-4° to 572°F) $\pm 3\%$ of reading rest of range	600 V DC or Peak AC
	-40° to 1,350°C	1°C		
Diode Test	3V Test Voltage	Approx. 1.0mA Max Test Current		
Continuity	3V Test Voltage	< 70 ohms		
IG				
RPM	60 to 12,000	1 RPM	$\pm 2 \text{ RPM}$	
Duty Cycle	0.0 to 99.9%	0.1%	$\pm 2\%$ per kHz, $\pm 0.1\%$ (pulse width > 0.5mS)	
Dwell	0.0 to 356.4° (30 to 19999 RPM)	0.1°	pulse width > 0.5mS	
Pulse Width	0.2 to 199.9mS (30 to 19999 RPM)	0.1mS	$\pm 2\%$ per kHz, $\pm 0.1\%$ $\pm 1 \text{ digit}$ (pulse width > 2uS)	
Frequency	1Hz to 1999.9Hz	0.1Hz	$\pm 0.05\%$ of reading, $\pm 2 \text{ digits}$	
IP				
RPM	60 to 12,000RPM	1 RPM	$\pm 2 \text{ RPM}$	

## General Specifications

Max. Volt. between any Input and Ground	1000V
Fuse Protection	mA: 0.5Amp/600VAC; A: 10Amp/600VAC
Display Type, Digital:	40,000 Count, 4x per second update
Analog:	2x41 segments, 20x per sec. update
Operating Temp.	-0° to 45°C (32° to 113°F)
Storage Temp.	-40° to 60°C (-40° to 140°F)
Relative Humidity	0% to 80%: (0° - 35°C/32° - 95°F) 0% to 70%: (35° - 55°C/95° - 131°F)
Temp. Coefficient	0.1 x (Specified Accuracy) per °C for temperature <18°C to >28°C
Power Supply	9 Volt Battery
Battery Life	100 hrs. Alkaline
Size (H x W x L)	61mm x 97mm x 203mm (2.4in x 3.8in x 8.0in)
Weight	680g (24oz)

