# **Controls / Functions / International Symbols**

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### **Controls and Functions**

 $\Omega$  •3)

#### Push Buttons

COMP

REL%

Range

HOLD

ON/OFF

FDIT

Activates back light for LCD (automatically turns off after approx. 70 sec.) Activates the Min/Max/Ave mode Activates the Compare mode Activates the REL% mode

Activates manual ranging Activates the EDIT mode for Compare and Relative% functions Activates two-hold data-hold mode

Activates special dual functions on LCD. (Min/MAx time references) Turns DMM on and off Activates the data hold function

#### Rotary Switch

Selects the DCV function. Select the best range for the voltage to be measured Selects the ACV function. Select the best range for the voltage to be measured Selects the DCA function. Select the best range for the current to be measured Selects the ACA function. Select the best range for current to be measured Selects resistance, diode, or continuity function

Selects the DC mV function Selects the DCV function Selects the ACV function (Push the yellow button to display frequency of measured voltage on lower display

AC (ALTERNATION CURRENT)

- - DC (DIRECT CURRENT)

Distributed By:

CAUTION: RISK OF ELECTRICAL SHOCK

REFER TO INSTRUCTION MANUAL

Turns the instrument off

#### Rotary Switch cont'd

Selects the diode test function Selects resistance function. (Push the vellow button to activate continuity buzzer) Selects the DC mA function Selects the DCA function (10A max.) Selects the ACA function (10A max.) Selects the AC mA function

#### Input Jacks

**International Symbols** 

Red test lead connection for current measurements on the 2 and 10 ACA and DCA functions

Selects the Capacitance function

Selects the Frequency function

Red test lead connection for current measurement on the mA and A DCA and ACA functions

Black test lead connection for all functions Red test lead connection for all OHM.

DOUBLE INSULATION

EITHER DC OR AC

FIJSE

DCV, and ACV functions

# 1. Is there a way to measure

TPI DMMs (except the 120 and 126) AC/DC. Optional adapters are the current range. Our shunt adapters are available to increase

#### 2. What other adapters are available for TPI DMMs?

Various adapters including carbon monoxide (A771), pressure (A620/630), and clamp-on low current (A254) are available. Contact TPI for additional information.

### 3. Which of the TPI DMMs will measure temperature?

All TPI DMMs can measure temperature by using the optional A301 K-Type thermocouple temperature adapter.

### measure DC millivolts?

All TPI DMMs measure millivolts. Models are available with 1 or 0.1 millivolt resolution

#### 5. Which TPI DMMs can measure DC microamps?

The TPI 126, 133, 135, 153, 163, 183, capability.

# 6. Which TPI DMMs will

The TPI 135, 183, 190, 192, 194, and 440 all have this capability.

#### 7. What is continuity?

on wires and circuits to see if a break(open) exhists. If the wire or circuit is continuous, the resistance reading will be at or near zero. The continuity range on a meter provides audible indication of a continuous circuit, allowing quicker tests without having to take your eyes off the circuit or wire under



### higher current with a TPI DMM?

have the capacity to read up to 10A available for all models to increase the range up to 1,000A AC/DC.

### 4. Which TPI DMMs can

190, 194, 196, and 440 all have this

# measure capacitance?

Continuity refers to a test performed



# **DMM Selection Guide**

**Palm Size** 120, 122, 126

**Full Size** 133, 135, 153, 163, 183, 190, 192, 194, 196

> True Rms 183, 190, 192, 194, 440

50,000 Count High Resolution 190, 192, 194, 196

**Wave Form Display** 440

> **Process Loop Calibration** 196

**True RMS Plus Waveform** 440



- 1. Determine the maximum over voltage installation category (CAT I ~ CAT IV) the multimeter will be used in and narrow your choice to those meters meeting the requirement. The Category rating for each meter is listed on page 2 in the specifications table.
- 2. Narrow your choice by selecting meters with the features required for your intended applications. For example, if your applications require a CAT III meter with true RMS, frequency, and RS232 output capabilities, the TPI 183 or TPI190 would be good choices. See applications listed below.
- 3. Finally, select a meter with enough range, accuracy, and resolution for the tests you will perform. For example: the TPI 183 and the TPI 190 meet your application needs, but you require precision high-resolution measurements. Then the 50,000 count TPI 190 would be the better choice.

### APPLICATIONS

Application	HVACR	Marke	t Electronic	Industrial	Function	120	122	126	133	135	153	163	183	190	192	194	196	440
Thermocouples in furnaces and gas appliances		Electrical	Electionic	illuusulai	DCmV	•	•	•	•	•	•	•	•	•	•	•	•	•
Heat anticipator current in thermostats	•				ACA				•	•	•	•	•	•	•	•	•	<u> </u>
Line voltages	•	•	•	•	ACV	•	•	•	•	•	•	•	•	•	•	•	•	•
Control voltages	•	•	•	•	ACV/DCV	•	•	•	•	•	•	•	•	•	•	•	•	•
Flame safety control current	•				DCuA			•	•	•	•	•	•	•	•	•	•	•
Heating element resistance	•				Ohms	•	•	•	•	•	•	•	•	•	•	•	•	•
Compressor winding resistance	•				Ohms	•	•	•	•	•	•	•	•	•	•	•	•	•
Contactor and relay coil resistance	•	•		•	Ohms	•	•	•	•	•	•	•	•	•	•	•	•	•
Motor run and start capacitors	•	•			CAP					•			•	•		•		•
Use bar graph to indicate rapid fluctuations	•	•	•	•	ALL							•	•	•	•	•	•	
Continuity of wiring	•	•	•	•	Ohms	•	•	•	•	•	•	•	•	•	•	•	•	•
Measure frequency on control and line voltage	•	•	•	•	Hz								•	•	•	•		•
Record minimum and maximum of measurements	•	•	•	•	REC			•			•		•	•	•	•	•	•
Measure temperature*	•	•	•	•	DCV	●*	⊚*	⊚*	⊚*	⊚*	⊚*	⊚*	⊚*	⊚*	⊚*	⊚*	⊚*	⊚*
Measure True RMS of distorted or non-linear signals	s •	•	•	•	ACV/ACA								•	•	•	•		•
Measure line current up to 10 amps	•	•		•	ACA				•	•	•	•	•	•	•	•	•	•
Test continuity of circuit breakers and fuses		•	•	•	Ohms	⊚	⊚	•	⊚	•	•	⊚	⊚	⊚	⊚	•	⊚	•
Measure voltage of direct drive DC motors		•		•	DCV	•	•	⊚	⊚	•	⊚	⊚	⊚	⊚	⊚	⊚	•	•
Measure power supply voltage			•		ACV/DCV	•	•	•	•	•	•	•	•	•	•	•	•	•
Measure power supply current			•		ACA/DCA			•	⊚	•	•	⊚	⊚	⊚	⊚	•	⊚	•
High resolution, high accuracy	•	•		•	ALL												•	•
High resolution, high accuracy			•		ALL										⊚			
Category IV tests	•	•		•	ACV/DCV											•		
Process loop calibration				•	mA Out												•	
Power Quality		•	•	•	ACV/ACA													•
Audio			•		ACV/ACA													•
Video			•		ACV													•
Logic Tests			•		LOGIC													•
Waveform Display		•	•	•	AC+DCV+A													•

and features \*Requires A301 adapter

See page 3 inside for

ranges, specifications

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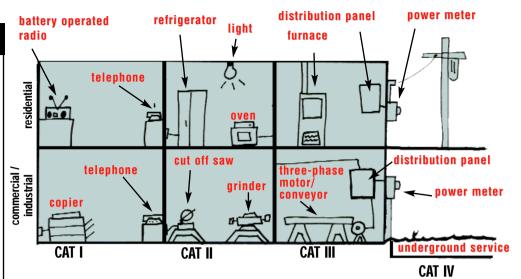
## To learn about the entire line of TPI products visit:

TPI DIGITAL MULTIMETER TERMINOLOGY

TPI DIGITAL MULTIMETER SPECIFICATIONS

### CATEGORY RATINGS

- >> Category I: Usually electronic equipment or equipment where measures have been taken to limit transient over voltages.
- >> Category II: Single phase loads like appliance personal computers, television sets, and other household loads. Outlets located more than 30 feet from a CAT III source or more than 60 feet from a CAT IV source.
- >> Category III: Distribution level fixed installations like distribution panel devices, short branch and feeder circuits, three phase loads, and single phase commercial lighting.
- >> Category IV: Equipment and lines located on the power line side of a service panel or where a low voltage connection is made to utility power



## **Terminology**

- >> Agency Approval: Test equipment with the CE or UL mark have passed through tests and are designed with operators safety in mind.
- >> Record Mode: Record and display the minimum and maximum readings measured. This feature is useful when looking for trends over a long period of time.
- >> Auto Range: Meter automatically selects the appropriate range after the function has been selected.
- >> Backlight: Feature allowing the display to be illuminated for easier viewing in low light conditions.
- >> Basic DC Accuracy: Important specification affecting the overall accuracy of all functions on a DMM.
- >> Resolution: A measurement of how small of a signal a meter can display. This specification must be taken into account with accuracy to determine the overall capability of a DMM.
- >> True RMS: Allows accurate measurement of non-sinusoidal AC voltage and current found in many control and switching power supply circuits.
- >> Analog Bar Graph: Provides the ability to see rapidly changing signals too fast for the digital display to see.
- >> Triple Display Simultaneosly display more than one reading at the same time. This feature is useful when measuring AC volts beacuse the frequency can be displayed at the same time without having to switch ranges
- >> Sleep/Auto Off: Automatically powers instrument down after 30 minutes of inactivity to preserve battery life. Meters with sleep mode will still acquire data during this time
- >> Data Hold: Freezes the reading on the display. This feature is useful when recording readings on paper or when in hard to see locations. Triple display meters can hold two readings on the display at the same time.
- >> Input Impedance: Total resistance of the meter as measured at the input terminals. Meters with high impedance,  $10M\Omega$  or more, cause negligible loading of the circuit under test. This is important because circuit loading can adversely influence the displayed reading and can cause damage to the circuit under test.

- >> Record Mode: Record and display the minimum and maximum readings measured. This feature is useful when looking for trends over a long period of time.
- >> Relative Mode: Displays measured value as a percentage of the stored value. This feature is useful for component checking.
- >> Compare Mode: Compares measured value with stored value. This feature is useful when component matching.
- >> Audible Continuity: Audible beep indicating a complete circuit connection
- >> RS-232 Output: Transfer data directly to a PC while performing tests
- >> Process Output: Supply 0 ~ 24mADC for testing current loops and current loop devices
- >> Waveform Display: The ability to see the actual waveform under test. This feature is useful for determining the quality of the input signal.
- >> **Duty Cycle:** The total "on" time of the device under test. This feature is useful in preventing component overheating
- >> Pulse Width: Measurement of the duration of a pulse. This feature is useful when testing pulse width modulation drive motors.
- >> Logic Test: Measurement transitions of logic circuits. This feature is useful when testing CMOS and TTL logic circuits.
- >> Two Hold System: Meters with this feature can hold two readings on the display at the same time
- >> Digits: Total number of digits that can be displayed. For example, a 3½ digit meter can display a maximum of 1,999. A 3¾ digit meter can display a maximum of 3,999. This means the 3¾ digit meter has beter resolution capability.
- >> Counts: Total number of display steps a meter has. This is determined by adding one to the maximum display value. For example, a 3½ digit meter can display a maximum of 1,999 and therefore has 2,000 count capability. Both digits and counts must be taken into account when determining resolution. In general, the more counts a meter has the higher the resolution will be.

### **DMM Model Part Number**

	120 122 126 133 135 153 163 183 190 192 194 196 440												
Range Selection	120	122	126	133	135	153	163	183	190	192	194	196	440
Manual	•			•	•								
Auto/Manual		•	•			•	•	•	•	•	•	•	•
Display Specifications													
2,000 Count	•	•		•									
3,260 Count							•						
4,000 Count			•		•	•							
4,000 Count w/								•					
Triple Display													
4,000 Count w/													•
Waveform Display													
50,000 Count									•	•	•	•	
Triple display													
Analog Bar Graph							•	•	•	•	•	•	
Backlight								•	•	•	•	•	•
Basis Features													
AC Volts	•	•	•	•	•	•	•	•	•	•	•	•	•
DC Volts	•	•	•	•	•	•	•	•	•	•	•	•	•
AC Amps			•	•	•	•	•	•	•	•	•	•	•
DC Amps			•	•	•	•	•	•	•	•	•	•	•
Resistance	•	•	•	•	•	•	•	•	•	•	•	•	•
Diode Test			•	•	•	•	•	•	•	•	•	•	•
Audible Continuity	•	•	•	•	•	•	•	•	•	•	•	•	•
Additional Features													
True RMS								•	•	•	•		•
Frequency								•	•	•	•		•
Capacitance					•			•	•	•	•		•
Inductance										•			
Data Hold	•	•	•	•	•	•	•	•	•	•	•	•	•
Two Hold System								•	•	•	•	•	
Min/Max Record			•			•		•	•	•	•	•	•
Relative Mode								•	•	•	•	•	•
Compare Mode								•	•	•	•	•	•
RS-232 Output								•	•	•	•	•	•
Oscilloscope Functions													•
Duty Cycle													•
Pulse Width													•
Logic Test													•
Process Output (0~24mA)												•	
Sleep Mode/Auto Off			•			•	•	•	•	•	•	•	•
Range & Resolution	2 = 2/	2 = 2/		2 - 2/	2 = 2/	2.20/	2 = 2/	2.20/	2.254		2 2 2 2 4	2.254	2.254
Basic DC Accuracy	0.5%	0.5%	0.3%	0.5%	0.5%	0.3%	0.5%	0.3%	0.05%	0.05%	0.05%	0.05%	0.05%
DC Voltage (maximum)	600V	600V	600V	1,000V	1,000V	1,000V	1,000V	1,000V	1,000V	1,000V	1,000V	1,000V	1,000V
Input Impedance	10ΜΩ	10ΜΩ	10ΜΩ	10ΜΩ	10ΜΩ	10ΜΩ	10ΜΩ	10ΜΩ	10ΜΩ	10ΜΩ	10ΜΩ	10ΜΩ	10ΜΩ
Resolution (maximum)	1mV	1mV	0.1mV	0.1mV	0.1mV	0.1mV	0.1mV				0.001mV		
AC Voltage (maximum)	600V	600V	600V	750V	750V	750V	750V	750V	750V	750V	750V	750V	1,000V
Input Impedance	10MΩ	10MΩ	10MΩ	10MΩ	10MΩ	10MΩ	10MΩ	10MΩ	10ΜΩ	10ΜΩ	10ΜΩ	10ΜΩ	1.11MΩ
Resolution (maximum)	100mV	1mV	1mV	0.1mV	0.1mV	1mV	1mV	1mV	100μV	100μV	100μV	100μV	1mV
DC Amps (maximum)	-	-	400mA	10A	10A	10A	10A	10A	10A	10A	10A	10A	10A
Resolution (maximum)	-	-	0.1mA	0.1μA	0.01µA	0.1µA	0.1µA	0.1µA	0.01µA	0.01µA	0.01µA	0.01µA	0.1µA
AC Amps (maximum)	-	-	400mA	10A	10A	10A	10A	10A	10A	10A	10A	10A	10A
Resolution (maximum)	- 240	- 240	0.1mA	0.1μΑ	0.01µA	0.1μA	0.1µa	0.1μA	0.01µA	0.01µA	0.01µA	0.01µA	0.1μa
Resistance (maximum)	2ΚΩ	2ΚΩ	40MΩ	20ΜΩ	40MΩ	40MΩ	32.6MΩ	40MΩ	50MΩ	50MΩ	50MΩ	50MΩ	40MΩ
Resolution (maximum)	1Ω	1Ω	0.1Ω -	0.1Ω	0.1Ω	0.1Ω	0.1Ω	0.1Ω	0.01Ω 500KHz	0.01Ω	0.01Ω	0.01Ω	0.1Ω 2MHz
Frequency (maximum)	<del>                                     </del>	<b>-</b>			-			200KHz 0.01Hz	0.001Hz	500KHz 0.001Hz	500KHz 0.001Hz		0.01Hz
Resolution (maximum)	-	-	-	-	- 20,000μF	-	-	0.01H2 10,000μF	0.001H2 20,000μF	0.001H2 100μF	20,000μF	-	0.01H2 400μF
Capacitance (maximum)	-	<del>-</del>	<del>-</del>	-		-	-					-	
Resolution (maximum)	-	-	-		0.1μF			0.01μF	0.001μF	0.1nF	0.001μF		100pF
Inductance (maximum)	-	-	-	-	-	-	-	-	-	500mH	-	-	-
Resolution (maximum)	_	_	-	-	-	-	-	-	-	0.01mH	-	-	-
Agency Approval	CAT III	CATIII	CATIII	CATII	CATII	CATII	CATII	CATII	CATII	CATII	CATIII	CATII	CATII
CE IEC 1010	CAT III 600V	CAT III	CAT III	CAT II	CAT II	CAT II	CAT III	CAT II	CAT II				
	i DUUIV	600V	600V	1,000V /	1,000V /	1,000V /	1,000V /	1,000V /	1,000V /				
	10001	""			CATIII	CATIII	CATIII	CATIII	CATIII	CATIII	CAT IV	CAT 111	
	0000			CAT III 600V	CAT III 600V	CAT III 600V	CAT IV 600V	CAT III 600V	CAT III 600V				