



**255**

**Digital Clamp-on  
Meter Instruction Manual**



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## **A. INTRODUCTION**

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### **1. Congratulations!!**

Thank you for purchasing TPI products. The 255 is easy to use and is built to last. It is backed by a 3 year limited warranty. Please remember to complete and return your product warranty registration card.

### **2. Product Description**

The pocket-size 255 is a hand-held, autoranging clamp-on DMM. Extra large numerals, min/max, and data hold are features of the 255. An affordable choice, the 255 offers measurements in all basic electrical functions.

The 255 comes complete with the following accessories:

**Carrying Pouch**  
**Test Lead Set**  
**Instruction Manual**  
**Battery**

### 3. EC Declaration of Conformity

This is to certify that TPI Model 255 conforms to the protection requirements of the council directive 89/336/EEC, in the approximation of laws of the member states relating to Electromagnetic compatibility and 73/23/EEC. The Low Voltage Directive by application of the following standards:


EN 50081-1	1992 Emissions Standard
EN 50082-1	1992 Immunity Standard
EN 61010-1	1993 Safety Standard
EN 61010-2-031	1995 Safety Standard
EN 61010-2-032	1995 Safety Standard

To ensure conformity with these standard, this instrument must be operated in accordance with the instructions and specifications given in this manual.

**CAUTION:** *Even though this instrument complies with the immunity standards, it's accuracy can be affected by strong radio emissions not covered in the above standards. Sources such as hand-held radio transceivers, radio and TV transmitters, vehicle radios and cellular phones generate electromagnetic radiation that could be induced into the test leads of this instrument. Care should be taken to avoid such situations or alternatively, check to make sure that the instrument is not being influence by these emissions.*

**CAUTION:** *Please follow manufacturers test procedures whenever possible. Do not attempt to measure unknown voltages or components until a complete understanding of the circuit is obtained.*

### B. SAFETY CONSIDERATIONS

 **WARNING:** *Please follow manufacturers test procedures whenever possible. Do not attempt to measure unknown voltages or components until a complete understanding of the circuit is obtained.*

#### GENERAL GUIDELINES








##### ***ALWAYS***

- Test the 255 before using it to make sure it is operating properly.
- Inspect the test leads before using to make sure there are no breaks or shorts.
- Double check all connections before testing.
- Have someone check on you periodically if working alone.
- Have a complete understanding of the circuit being measured.
- Disconnect power to circuit, then connect test leads to the 255, then to circuit being measured.

##### ***NEVER***

- Attempt to measure unknown high voltages.
- Attempt to measure current with the meter in parallel to the circuit.
- Connect the test leads to a live circuit before setting up the instrument.
- Touch any exposed metal part of the test lead assembly.

## INTERNATIONAL SYMBOLS

-  **CAUTION: RISK OF ELECTRIC SHOCK**
-  **AC (Alternation Current)**
-  **DC (Direct Current)**
-  **REFER TO INSTRUCTION MANUAL**
-  **GROUND**
-  **DOUBLE INSULATION**
-  **EITHER DC OR AC**

## C. TECHNICAL DATA

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### 1. Features and Benefits

- Agency** UL Listed to U.S. and Canadian Safety Standards. Meets CE and IEC 1010.
- 4000 Count** Improves the resolution on all functions and ranges.
- Data Hold** Maintains the reading on the display for hard to reads areas.
- Autorange** Set the 255 to correct function, connect meter and it automatically finds correct range.
- 500 mSec Conversion** Captures inrush (peak) current of motors, relays and solenoids.
- Min/Max** Records Min/Max readings for all functions and ranges.
- Auto Off** Automatically powers off after 34 minutes of inactivity.

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### 2. Product Applications

Perform the following tests and/or measurements with the 255 and the appropriate function:

#### HVAC/R

- ACA** • Heat anticipator current in thermostats.
- ACV** • Line voltage.
- ACV or DCV** • Control circuit voltage.
- OHMS** • Heating element resistance (continuity).
- OHMS** • Compressor winding resistance.
- OHMS** • Contactor and relay coil resistance.
- ACA** • Motor and compressor start up current.
- OHMS** • Continuity of wiring.
- REC** • Record min/max voltage of controls and line voltages.
- ALL** • Bar graph to indicate rapid fluctuations.

#### ELECTRICAL


- ACV** • Measure line voltage.
- ACA** • Measure line current.
- OHMS** • Continuity of circuit breakers.
- DCV** • Voltage of direct drive DC motors.
- ACA** • Start up current of motors, relays, contactors and transformers.

#### ELECTRONIC

- ACV** • Measure power supply voltage.
- ACA** • Measure power supply current.
- OHMS** • Continuity of circuit breakers and fuses.

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### 3. Specifications



**IEC 1010 Over Voltage:**  
 CAT II - 1000V  
 CAT III - 600V  
 Pollution Degree 2



a. DCV			
Range	Resolution	Accuracy	Impedance
4V	0.001V	±0.3% of reading,	10MΩ
40V	0.01V	±2 digits	
400V	0.1V		
600V	1V		

b. ACV			
Range	Resolution	Accuracy	Impedance
4V	0.001V	±0.8% of reading,	10MΩ
40V	0.01V	±3 digits	
400V	0.1V	±1.2% of reading,	
600V	1V	±3 digits	


c. ACA			
Range	Res.	Accuracy	Freq. Response
40A	0.01A	±2% of reading,	40 to 450 Hz
400A	1A	±5 digits	


**\*Warning:** Test Leads. Use only correct type and overvoltage category rating.

e. OHM (Resistance, Ω)			
Range	Res.	Accuracy	Overload Protection
400Ω	0.1Ω	±1% of reading, ±2 digits	600V DC or AC Peak
4kΩ	0.001kΩ		
40kΩ	0.01kΩ		
400kΩ	0.1kΩ		
4MΩ	0.001MΩ	±1% of reading, ±2 digits	
40MΩ	0.01MΩ		

f. Continuity Buzzer		
Test Voltage	Threshold	Over Load Protection
3V	< 50Ω (100 digits)	600 V DC or Peak AC

h. General Specifications	
<b>Power Supply</b>	2 ea. 1.5 Volt "AA" Batteries
<b>Battery Life</b>	200 hrs. typical
<b>Size (H x L x W)</b>	40mm x 190mm x 65mm (1.5in x 7.25in x 2.5in)
<b>Weight</b>	303g (11.1oz)


**\*Warning:** Test Leads. Use only correct type and overvoltage category rating.

## **D. MEASUREMENT TECHNIQUES**

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### **1. Controls and Functions:**

#### ***Push Buttons***

- REC** Activates the Record function.
- HOLD** Holds the reading on the display until the button is pushed a second time.

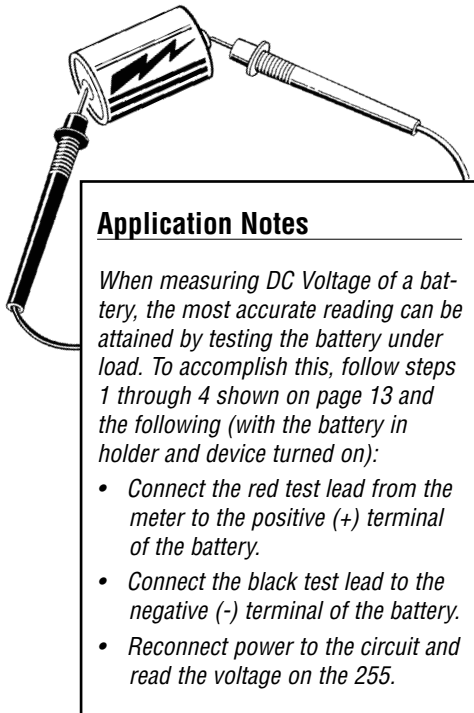
#### ***Rotary Switch***

- OFF** Turns the 255 completely off.
- $\overline{\text{V}}$  Used to measure DC volts.
- $\hat{\text{V}}$  Used to measure AC volts.
- $\Omega$  Used to measure resistance and use the continuity buzzer.
- $\hat{\text{A}}$  Used to measure AC amps.

### **1. Controls and Functions: (cont.)**

#### ***Input Jacks***

- COM** Black test lead connection for ACV, DCV,  $\Omega$ , Continuity Buzzer and Diode Test functions.
- V/ $\Omega$**  Red test lead connection for all ACV, DCV,  $\Omega$ , Continuity Buzzer and Diode Test functions.



### Application Notes

When measuring DC Voltage of a battery, the most accurate reading can be attained by testing the battery under load. To accomplish this, follow steps 1 through 4 shown on page 13 and the following (with the battery in holder and device turned on):

- Connect the red test lead from the meter to the positive (+) terminal of the battery.
- Connect the black test lead to the negative (-) terminal of the battery.
- Reconnect power to the circuit and read the voltage on the 255.

## 2. Step by Step Procedures:

### a. Measuring DC Volts

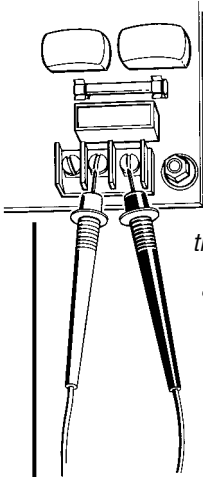
**⚠ WARNING!**

Do not attempt to make a voltage measurement of more than 600V or of a voltage level that is unknown.

Instrument set-up:				
FUNC.	BLACK TEST LEAD	RED TEST LEAD	MIN READING	MAXI READING
$\overline{\text{V}}$	COM	V/ $\Omega$	0.001V	600V

#### Measurement Procedure:

1. Disconnect power to circuit to be measured.
2. Plug black test lead into the **COM** input jack.
3. Plug red test lead into the **V/ $\Omega$**  input jack.
4. Set rotary switch to the appropriate  $\overline{\text{V}}$  range.
5. Connect test leads to circuit to be measured.
6. Reconnect power to circuit to be measured.
7. Read the voltage on the 255.



### Application Notes

Disconnect power from the terminal block, find the fuse or circuit breaker that controls the block and turn it off.

Set up the meter following the steps under "Measurement Procedure" on page 15. Then proceed with the following:

- Connect the red test lead to the hot side of the block and the black lead to the neutral side of the block. Reconnect power to the block and read the voltage on the meter. The reading should be approximately 110V to 130V.
- Disconnect power from the block and move the red wire to ground. Reconnect power to the block and read the voltage on the meter. Typically less than 20V should exist from neutral to ground. If 110V or above exists, the block may be wired incorrectly.

### b. Measuring AC Volts

#### **⚠ WARNING!**

Do not attempt to make a voltage measurement of more than 600V or of a voltage level that is unknown.

#### Instrument set-up:

FUNC.	BLACK TEST LEAD	RED TEST LEAD	MIN READING	MAX READING
$\tilde{V}$	COM	V/ $\Omega$	0.001V	600V

#### Measurement Procedure:

1. Disconnect power to circuit to be measured.
2. Plug black test lead into **COM** input jack.
3. Plug red test lead into **V/ $\Omega$**  input jack.
4. Set the rotary switch to the appropriate  $\tilde{V}$  function.
5. Connect test leads to circuit to be measured.
6. Reconnect power to circuit to be measured.
7. Read the voltage on the 255.



### c. Measuring AC Amps

**CAUTION!**

Do not attempt to make a current measurement with the test leads. The 255 measures the current by clamping the jaw around one conductor (wire). Clamping around more than one wire will result in erroneous readings.

Instrument set-up:				
FUNC.	BLACK TEST LEAD	RED TEST LEAD	MIN READING	MAX READING
$\tilde{A}$	NOT USED	NOT USED	0.01A	400A

**Measurement Procedure:**

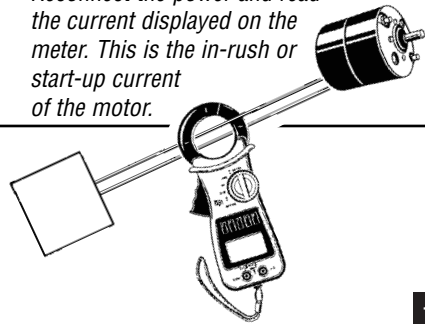
1. Disconnect power to circuit to be measured.
2. Set rotary switch to  $\tilde{A}$  function.
3. Clamp the jaws around one conductor of the circuit to be measured.
4. Reconnect power to circuit to be measured.
5. Read the current on the 255.

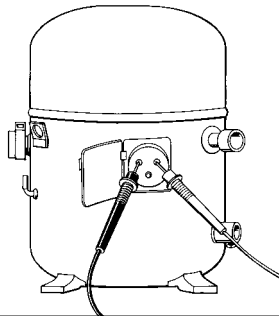
### Application Notes

When measuring AC Amps of a motor there are two types of measurements that can be made, running current and in-rush or start-up current. Start-up current will usually be much higher than running current.

Set up the meter following the steps under "Measurement Procedure" on page 16, and then proceed with the following:

- Clamp the meter around a single wire and reconnect power to the device. Read the current displayed on the meter. This is the running current of the motor.
- Disconnect power to the motor and put the meter in PEAK HOLD mode. Reconnect the power and read the current displayed on the meter. This is the in-rush or start-up current of the motor.





### Application Notes (Resistance)

When measuring resistance of a motor, make sure the power is disconnected prior to testing.

Set up meter following steps under "Measurement Procedure" on page 19, and proceed with the following:

- Connect the red test lead to one power input line of the motor and the black test lead to the other power input line of the motor. In most applications if the reading is *OFL*, the motor winding is open.
- Connect the red test lead to the frame of the motor and the black test lead to the winding. In most applications if a reading of 0 Ohms is displayed, the winding is shorted to the motor frame (ground).

### d. Measuring Resistance

#### ⚠ WARNING!

Do not attempt to make resistance measurements with circuit energized. For best results, remove the resistor completely from circuit before attempting to measure it.

#### NOTE:

To make accurate low ohm measurements, short the ends of the test leads together and record the resistance reading. Deduct this value from actual readings.

#### Instrument set-up:

FUNC.	BLACK TEST LEAD	RED TEST LEAD	MIN READING	MAX READING
$\Omega$	COM	V/ $\Omega$	0.1 $\Omega$	40.00M $\Omega$

#### Measurement Procedure:

1. Disconnect power to circuit to be measured.
2. Plug black test lead into the **COM** input jack.
3. Plug red test lead into **V/ $\Omega$**  input jack.
4. Set the rotary switch to the **400  $\Omega$**  function.
5. Connect test leads to circuit to be measured.
6. Read the resistance value on the 255.

#### Optional Modes


- **HOLD:** Freezes the reading on the LCD.

### e. Continuity Buzzer


**⚠ WARNING!**

*Do not attempt to make continuity measurements with circuit energized.*

**Instrument set-up:**

FUNC.	BLACK TEST LEAD	RED TEST LEAD
	COM	V/Ω

**Measurement Procedure:**

1. Disconnect power to circuit to be measured.
2. Plug black test lead into the **COM** input jack.
3. Plug red test lead into **V/Ω** input jack.
4. Set the rotary switch to the  position.
5. Connect test leads to circuit to be measured.
6. Listen for the buzzer to confirm continuity.

### f. Data Hold

Press the **HOLD** button at any time on any function to freeze the reading on the LCD display. This function is very useful when measuring in locations where the display is difficult to read.

### g. Record

Press the **RECORD** button at any time on any function to start recording Minimum and Maximum values for a specified time period. To view stored Min and Max values press the **REC** button (a confirmation beep will be heard) and observe which value is being displayed on the LCD. To disable the function, hold in the **REC** button for approx. 3 seconds.

## E. ACCESSORIES\*

Standard Accessories	Part No.
9 Volt Alkaline Battery	A009A
Test Lead Set	A040
Soft Carrying Pouch	A200

Optional Accessories	Part No.
Deluxe Test Lead Set	SDK1C
IEC 1010 Deluxe Test Lead Kit	TLS2000B
Hard Carrying Case	A201

\*These accessories have not been evaluated by UL and are not considered as part of the UL Listing of this product.

## F. MAINTENANCE

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1. **Battery Replacement:** The 255 will display a battery symbol when the internal “AA” 1.5 Volt batteries needs replacement. The batteries are replaced as follows:
  - a. Disconnect and remove all test leads from live circuits and from the 255.
  - b. Loosen the screw from the back of the 255 battery cover.
  - c. Remove the battery compartment cover.
  - d. Remove old battery and replace with new battery, observing the correct polarity.
  - e. Reassemble the instrument in reverse order from above.
2. **Cleaning your 255:**

Use a mild detergent and slightly damp cloth to clean the surfaces of the 255.

## WARRANTY

Please refer to product warranty card for warranty statement.

## G. TROUBLE SHOOTING GUIDE

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### Problem

### Probable Causes

#### *Does not power up*

- Dead or defective battery
- Broken wire from battery snap to PCB

#### *Won't display current readings*

- Open fuse
- Open test lead
- Improperly connected to circuit under test

#### *All functions except ohms read high*

- Very weak battery that will not turn on the low battery indicator on the LCD

#### *AC Volts do not read*

- Very weak battery that will not turn on the low battery indicator on the LCD

## 255 SPECIFICATIONS

**±0.3% Basic DCV Accuracy (also see pages 8-9)**

<u>Func.</u>	<u>Range</u>	<u>Res.</u>
DCV	4V	0.001V
	40V	0.01V
	400V	0.1V
	600V	1V
ACV	4V	0.001V
	40V	0.01V
	400V	0.1V
	750V	1V
ACA	40A	0.1A
	400A	1A
OHM	400Ω	0.1Ω
	4kΩ	0.001kΩ
	40kΩ	0.01kΩ
	400kΩ	0.1kΩ
	4MΩ	0.001MΩ
	40MΩ	0.01MΩ
Continuity	<u>Test Voltage</u>	<u>Max Test Current</u>
	3V	< 50Ω (100 digits)



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