



183A

Digital Multimeter
Instruction Manual



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A. INTRODUCTION

1. Congratulations!!

Thank you for purchasing TPI products. The meter 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 183A is a hand-held autoranging DMM. The 183A measures ACV, DCV, ACA, DCA, Resistance, Frequency, Duty Cycle, Diodes, Capacitance, Temperature and Continuity.

The 183A also features:

- **REC** Records Min/Max readings during specified measurement intervals.
- **RANGE** Allows the user to manually range the 183A instead of autoranging.
- **HOLD** Holds the reading on the display for easy viewing.
- **REL** Displays the value as a difference to a reference value
- **AUTO OFF** Preserves battery life.

The 183A comes complete with the following accessories:

183A Instrument
Zippered Vinyl Carrying Case
Rubber Boot
Test Lead Set
Instruction Manual

3. EC Declaration of Conformity

This is to certify that model 183A 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:

EN61326 : 1997 + A1 + A2 : 2001
EN61010-1 :2001 Safety Standard

To ensure conformity with these standards, 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, the 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 influenced by these emissions.

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.*



Read instructions before operating:

Be sure these instructions accompany the tool when passed from one user to a new or inexperienced user.



Equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

GENERAL GUIDELINES








ALWAYS

- Test the 183A 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 complete understanding of circuit being measured.
- Disconnect power to circuit then, connect test leads to the 183A, 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

	DANGEROUS VOLTAGE
	AC (ALTERNATING CURRENT)
	DC (DIRECT CURRENT)
	REFER TO INSTRUCTION MANUAL
	GROUND
	FUSE
	DOUBLE INSULATION

C. TECHNICAL DATA

1. Features and Benefits

Agency Approval	Meets CE and IEC 61010-1 requirements. UL Listed to U.S. and Canadian Safety Standards.
Auto Power OFF	Active when APO is on the left side of the LCD display. Instrument automatically powers off after 15 minutes of inactivity. You must return the rotary switch to the OFF position to restart the meter.
Record Mode	Records Min/Max values.
Relative Mode	Displays
Range	Allows you to either manual range or use auto range to select the appropriate range.
3 Year Warranty	Covered by a standard 3 year warranty.

2. Product Applications

Perform the following tests and/or measurements with the TPI 183A and the appropriate function:

HVAC/R

FUNCTION

DCmV	• Thermocouples in furnaces or gas applications.
ACA	• Heat anticipator current in thermostats.
ACV	• Line voltage.
ACV or DCV	• Control circuit voltage.
DCµA	• Flame safeguard control current.
OHMS	• Heating element resistance (continuity).
OHMS	• Compressor winding resistance.
OHMS	• Contactor and relay coil resistance.
OHMS	• Continuity of wiring.

ELECTRICAL

ACV	• Measure line voltage.
OHMS	• Continuity of circuit breaker.
DCV	• Voltage of direct drive DC motors.

AUTOMOTIVE

DCV	• Battery and circuit voltage.
OHMS	• Continuity of wires and fuses.
ACV	• ABS brake sensors.
DCmA	• Circuit current draw

3. Specifications



IEC 61010-1 Over Voltage:
CAT II - 1000V
CAT III - 600V
Pollution Degree 2

a. DCmV

Range	Resolution	Accuracy	Impedance
40mV	0.01mV	$\pm(0.5\% + 2 \text{ digits})$	10M Ω
400mV	0.1mV		

b. DCV

Range	Resolution	Accuracy	Impedance
400mV	0.1mV	$\pm(0.5\% + 2 \text{ digits})$	10M Ω
4V	0.001V		
40V	0.01V		
400V	0.1V		
1000V	1V		

c. ACmV (True-RMS, 40 - 400Hz)

Range	Resolution	Accuracy	Impedance
40mV	0.01mV	$\pm(1.5\% + 3 \text{ digits})$	10M Ω
400mV	0.1mV		

d. ACV (True-RMS, 40 - 400Hz)

Range	Resolution	Accuracy	Impedance
400mV	0.1mV	$\pm(1.5\% + 3 \text{ digits})$	10M Ω
4V	0.001V	$\pm(0.75\% + 3 \text{ digits})$	
40V	0.01V		
400V	0.1V		
750V	1V	$\pm(1.0\% + 5 \text{ digits})$	

e. ACV (True-RMS, 400Hz - 1kHz)

Range	Resolution	Accuracy	Impedance
4V	0.001V	$\pm(1.5\% + 5 \text{ digits})$	10M Ω
40V	0.01V		
400V	0.1V		
750V	1V	$\pm(2.0\% + 5 \text{ digits})$	

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f. ACV (True-RMS, 1kHz - 20kHz)

Range	Resolution	Accuracy	Impedance
4V	0.001V	$\pm(2.0\% + 3 \text{ digits})$	10M Ω
40V	0.01V		
400V	0.1V		
750V	1V	Unspecified	

g. DCA

Range	Resolution	Accuracy	Overload Protection
40μA	0.01μA	±(0.8% +2 digits)	Fuse 0.5Amp/600V
400μA	0.1μA	±(0.8% +5 digits)	
4000μA	1μA		
40mA	0.01mA		
400mA	0.1mA		
4A	0.001A	±(1.2% +5 digits)	Fuse
10A	0.01A		10Amp/600V

h. ACA (True-RMS)

Range	Resolution	Accuracy	Overload Protection
400 μ A	0.1 μ A	$\pm(1.2\% + 5 \text{ digits})$	Fuse 0.5Amp/600V
4000 μ A	1 μ A		
40mA	0.01mA		
400mA	0.1mA		
4A	0.001A	$\pm(1.5\% + 10 \text{ digits})$	Fuse 10Amp/600V
10A	0.01A		

***Warning:** Use only correct size, voltage and current rated fuses.
Test Leads: Use only correct type and overvoltage category rating.

i. OHM (Resistance, Ω)

Range	Resolution	Accuracy	Overload Protection
400Ω	0.1Ω	±(0.8% +5 digits)	600V DC or AC Peak
4kΩ	0.001kΩ	±(0.5% +3 digits)	
40kΩ	0.01kΩ		
400kΩ	0.1kΩ		
4MΩ	0.001MΩ	±(1.0% +5 digits)	
40MΩ	0.01MΩ	±(1.5% +10 digits)	

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j. Duty Cycle / Hz		
Range		
0.1 ~99.9%	(0.5Hz to 500kHz, Width > 2uS)	
Accuracy		
((0.1% + 0.05% / kHz) +1 Count		

k. Diode Test		
Test Voltage	Max Test Current	Over Load Protection
2.7V	Approx. 1mA	600 V DC or Peak AC

l. Continuity Buzzer		
Test Voltage	Threshold	Over Load Protection
0.6V	< 30Ω	600 V DC or Peak AC

m. Capacitance			
Range	Resolution	Accuracy	Overload Protection
40nF	0.01nF	±(3.0% +10 digits)	600V DC or AC Peak
400nF	0.1nF		
4uF	0.001nF		
40uF	0.01uF		
400uF	0.1uF		
4000uF	1uF	±(7.0% +10 digits)	

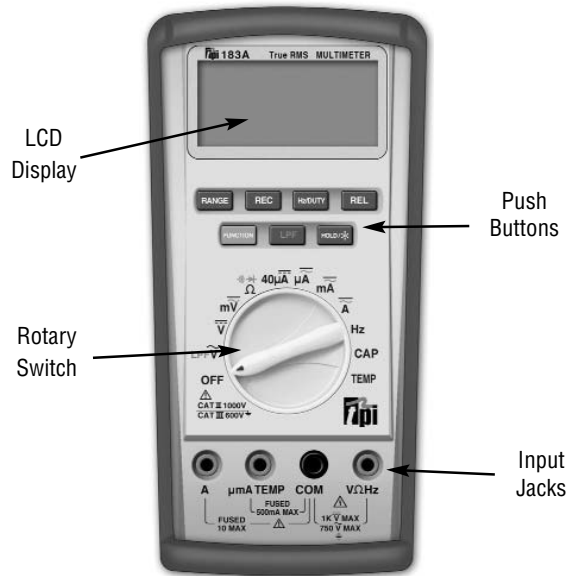
n. Frequency (Hz)			
Range	Resolution	Accuracy	Overload Protection
10Hz	0.01Hz	±(0.05% +3 digits)	600V DC or AC Peak
100Hz	0.1Hz		
1KHz	0.001KHz		
10KHz	0.01KHz		
100KHz	0.1KHz		
1MHz	0.001MHz		
10MHz	0.01MHz		

o. Temperature (K-Type)		
Range	Resolution	Accuracy
CENTIGRADE		
-40° to 10°C	0.1°	±(3.0% + 5°C)
10° to 200°C	0.1°	±(1.0% + 3°C)
200° to 400°C	0.1°	±(2.0% + 5°C)
400° to 1300°C	1°C	±(3.0% + 7°C)
FAHRENHEIT		
-40° to 50°F	0.1°	±(3.0% + 2.5°F)
50° to 392°F	0.1°	±(1.0% + 1.5°F)
392° to 752°F	0.1°	±(2.0% + 5°C)
752° to 2372°F	1°F	±(2.0% + 5°C)

p. General Specifications	
Max. Volt. between any Input and Ground	1000V
Fuse Protection	mA: 0.5Amp/600VAC A: 10Amp/600VAC
Display Type	4,000 Count, 2 times per second update
Operating Temp.	0° to 40°C (32° to 104°F)
Storage Temp.	-10° to 50°C (14° to 122°F)
Relative Humidity	0% to 80%
Power Supply	2 Each 1.5 Volt "AA" Batteries
Battery Life	200 hrs. Typical
Size (H x L x W)	33mm x 86mm x 187mm (1.3in x 3.4in x 7.4in)
Weight	340g (12oz)

D. MEASUREMENT TECHNIQUES

1. Controls and Functions:



a. Push Buttons

RANGE	Activates manual ranging. Hold in for 3 seconds to return to autorange.
REC	Activates the Min/Max mode.
Hz/DUTY	Toggles the ACV or ACA measurement mode to Hz or Duty Cycle mode.
REL	Displays value as a difference of reference value.
FUNCTION	Activates optional functions highlighted in orange around dial. APO (Auto Power Off) is disabled in this function. Hold in for 3 seconds to deactivate.
LPF	Activates Low Pass Filter.
HOLD	Holds the reading on the display until the button is pushed a second time.

b. Rotary Switch

OFF	Turns the 183A off.
$\sqrt{\sim}$	Function for measuring AC voltage (ACV).
$\overline{\sim}$	Function for measuring DC voltage (DCV).
$m\sqrt{\sim}$	Function for measuring AC/DC millivolts (mV).
Ω	Function for measuring resistance, diode testing and continuity buzzer
$40 \mu A$	Function for measuring up to 40 DC microamps (uA)
μA	Function for measuring up to 4000 AC/DC microamps.
mA	Function for measuring up to 400 AC/DC milliamps.
A	Function for measuring up to 10 AC/DC amps
Hz	Function for measuring Frequency
CAP	Function for measuring Capacitance

c. Input Jacks

VΩHz	Red test lead connection for all Volt, Ohm, Frequency and Capacitance functions.
COM	Black test lead connection for all functions.
uA mA	Red test lead connection for current measurements on the uA and mA functions.
A	Red test lead connection for current measurements on the A function.

d. Disable Auto Power Off (APO)

With the rotary switch in the OFF position Press and hold down the FUNCTION push button while turning the instrument on.

2. Step by Step Procedures:

a. MEASURING DC VOLTS



CAUTION!

Do not attempt to make a voltage measurement if a test lead is plugged in the A or μ A input jack. Instrument damage and/or personal injury may result.



WARNING!

Do not attempt to make a voltage measurement of more than 1000V or of a voltage level that is unknown.

Instrument set-up:

FUNCTION	BLACK TEST LEAD	RED TEST LEAD	MINIMUM READING	MAXIMUM READING
mV	COM	V Ω Hz	0.1mV	400.0mV
V	COM	V Ω Hz	0.001V	1000V

Measurement Procedure:

1. Disconnect power to the circuit to be measured.
2. Plug the black test lead into the **COM** input jack.
3. Plug red test lead into the **V Ω Hz** input jack.
4. Set rotary switch to either the \overline{mV} or \overline{V} range, depending on the voltage to be measured.
5. Connect the test leads to the circuit to be measured.
6. Reconnect power to the circuit to be measured.
7. Read the voltage on the 183A.

Optional Functions:

- RANGE** Manually select the appropriate range.
- REC** Activate MIN/MAX record mode (page 24).
- REL** Activate REL mode (page 24).
- HOLD** Freeze the reading on the LCD.

b. MEASURING AC VOLTS



CAUTION!

Do not attempt to make a voltage measurement if a test lead is plugged in the A or μ A input jack. Instrument damage and/or personal injury may result.



WARNING!

Do not attempt to make a voltage measurement of more than 750V or of a voltage level that is unknown.

Instrument set-up:

FUNCTION	BLACK TEST LEAD	RED TEST LEAD	MINIMUM READING	MAXIMUM READING
\checkmark	COM	V Ω Hz	0.001V	750V

Measurement Procedure:

1. Disconnect power to the circuit to be measured.
2. Plug the black test lead into the **COM** input jack.
3. Plug the red test lead into the **V Ω Hz** input jack.
4. Set the rotary switch to the \checkmark function depending on the voltage to be measured.
5. Connect the test leads to the circuit to be measured.
6. Reconnect power to the circuit to be measured.
7. Read the voltage on the 183A.

Optional Functions:

- RANGE** Manually select the appropriate range.
- REC** Activate MIN/MAX record mode (page 24).
- Hz/DUTY** Scroll between Hz, Duty, and Volts.
- REL** Activate REL mode (page 24).
- HOLD** Freeze the reading on the LCD.



c. MEASURING DC AMPS



CAUTION!

Do not attempt to make a current measurement with the test leads connected in parallel with circuit to be tested. Test leads must be connected in series with the circuit.



WARNING!

Do not attempt to make a current measurement of circuits with more than 600V present. Instrument damage and /or personal injury may result.

Instrument set-up:

FUNCTION	BLACK TEST LEAD	RED TEST LEAD	MINIMUM READING	MAXIMUM READING
40μA	COM	μAmA	0.01μA	40μA
μA	COM	μAmA	0.1μA	4000μA
mA	COM	μAmA	0.01mA	400mA
10A	COM	A	0.001A	10.00A

Measurement Procedure:

1. Disconnect power to circuit to be measured.
2. Plug the black test lead into the **COM** input jack.
3. Plug the red test lead into the **μAmA** or **A** input jack depending on the value of current to be measured.
4. Set the rotary switch to the **40μA**, **μA**, **mA**, or **A** function.
5. Connect test leads in series to circuit to be measured.
6. Reconnect power to the circuit to be measured.
7. Read the current on the 183A.

Optional Functions:

RANGE	Manually select the appropriate range.
REC	Activate MIN/MAX record mode (page 24).
REL	Activate REL mode (page 24).
HOLD	Freeze the reading on the LCD.

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d. MEASURING AC AMPS



CAUTION!

Do not attempt to make a current measurement with the test leads connected in parallel with the circuit to be tested. Test leads must be connected in series with the circuit.



WARNING!

Do not attempt to make a current measurement of circuits with more than 600V present. Instrument damage and /or personal injury may result.

Instrument set-up:

FUNCTION	BLACK TEST LEAD	RED TEST LEAD	MINIMUM READING	MAXIMUM READING
μA	COM	μAmA	0.1μA	4000μA
mA	COM	μAmA	0.01mA	400mA
10A	COM	A	0.001A	10.00A

Measurement Procedure:

1. Disconnect power to the circuit to be measured.
2. Plug the black test lead into the **COM** input jack.
3. Plug the red test lead into the **μAmA** or **A** input jack depending on the value of current to be measured..
4. Set the rotary switch to the **μA**, **mA** or **A** function.
5. Press the AC/DC pushbutton to set to AC mode.
6. Connect test leads in series to circuit to be measured.
7. Reconnect power to the circuit to be measured.
8. Read the current on the 183A.

Optional Functions:

RANGE	Manually select the appropriate range.
REC	Activate MIN/MAX record mode (page 24).
Hz/DUTY	Scroll between Hz, Duty, and Volts.
REL	Activate REL mode (page 24).
HOLD	Freeze the reading on the LCD.

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e. MEASURING RESISTANCE



WARNING!

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

NOTE:

To make accurate low ohm measurements, short the ends of the test leads together and press the REL pushbutton. This value will automatically be deducted from your reading.

Instrument set-up:

FUNCTION	BLACK TEST LEAD	RED TEST LEAD	MINIMUM READING	MAXIMUM READING
Ω	COM	V Ω Hz	0.1 Ω	40.00M Ω

Measurement Procedure:

1. Disconnect power to the circuit to be measured.
2. Plug the black test lead into the **COM** input jack.
3. Plug the red test lead into the **V Ω Hz** input jack.
4. Set the rotary switch on the 183A to the Ω function.
5. Connect the test leads to the circuit to be measured.
6. Read the resistance value on the 183A.

Optional Functions:

RANGE

Manually select the appropriate range.

REC

Activate MIN/MAX record mode (page 24).

REL

Activate REL mode (page 24).

HOLD

Freeze the reading on the LCD.

f. MEASURING DIODES

CAUTION!

Do not attempt to make diode measurements with circuit energized. The only way to accurately test a diode is to remove it completely from the circuit before attempting to measure it.

Instrument set-up:

FUNCTION	BLACK TEST LEAD	RED TEST LEAD	MINIMUM READING	MAXIMUM READING
	COM	V Ω Hz	0.001V	2.000V

Measurement Procedure:

1. Disconnect power to the circuit to be measured.
2. Plug the black test lead into the **COM** input jack.
3. Plug the red test lead into the **V Ω Hz** input jack.
4. Set the rotary switch to the function.
5. Connect black test lead to the banded end of the diode and the red test lead to the non-banded end of the diode.
6. Reading on the display should be between 0.5 and 0.8 volts.
7. Reverse test lead connections in 5 above.
8. Reading on the display should be OFL (Overload).

NOTE: *If diode reads 0 in both directions, diode is shorted. If diode reads OFL in both directions, diode is open*



g. CONTINUITY BUZZER


WARNING!

Do not attempt to make continuity measurements with circuit energized.

Instrument set-up:

FUNCTION	BLACK TEST LEAD	RED TEST LEAD
	COM	VΩHz

Measurement Procedure:

1. Disconnect power to the circuit to be measured.
2. Plug the black test lead into the **COM** input jack.
3. Plug the red test lead into the **VΩHz** input jack.
4. Set the rotary switch to the  function.
5. Press yellow push button to activate continuity buzzer.
6. Connect the test leads to the circuit to be measured.
7. Listen for the buzzer to confirm continuity.

h. MEASURING CAPACITANCE



CAUTION!

Disconnect power to the circuit(s) to be measured. Discharge the capacitor to be measured completely before attempting to measure.

Instrument set-up:

FUNCTION	BLACK TEST LEAD	RED TEST LEAD	MINIMUM READING	MAXIMUM READING
CAP	COM	VΩHz	0.01nF	4000uF

Measurement Procedure:

1. Disconnect power and discharge the capacitor to be measured.
2. Plug the black test lead into the **COM** input jack.
3. Plug the red test lead into the **VΩHz** input jack.
4. Set the rotary switch to the **CAP** function.
5. Connect the test leads to the capacitor to be measured.
6. Read the capacitance on the 183A.

Optional Functions:

REL

Activate REL mode (page 24).

HOLD

Freeze the reading on the LCD.

i. MEASURING FREQUENCY



CAUTION!

Do not attempt to make a frequency measurement if a test lead is plugged in the A or μ A input jack. Instrument damage and/or personal injury may result.



WARNING!

Never attempt a frequency measurement with a voltage source greater than 600V

Instrument set-up:

FUNCTION	BLACK TEST LEAD	RED TEST LEAD	MINIMUM READING	MAXIMUM READING
Hz	COM	V Ω Hz	0.001Hz	10MHz

Measurement Procedure:

1. Disconnect power to the circuit to be measured.
2. Plug the black test lead into the **COM** input jack.
3. Plug the red test lead into the **V Ω Hz** input jack.
4. Set the rotary switch to the **Hz** function.
5. Connect the test leads to the circuit to be measured.
6. Reconnect power to the circuit to be measured.
7. Read the frequency on the 183A.

Optional Functions:

- Hz/DUTY** Scroll between Hz and Duty %.
- HOLD** Freeze the reading on the LCD.

j. MEASURING TEMPERATURE

CAUTION!

Disconnect power to the circuit(s) to be measured. Discharge the capacitor to be measured completely before attempting to measure.

Instrument set-up:

FUNCTION	TEMP. INPUT ADPT.	TEMP. INPUT ADPT.	MINIMUM READING	MAXIMUM READING
TEMP	COM	μmATEMP	0.1°F 0.1°C	2462°F 1350°C

Measurement Procedure:

1. Remove test leads from the 183A.
2. Plug the “-” terminal of the temperature input adapter into the **COM** input jack.
3. Plug the “+” terminal of the temperature input adapter into the **μ mATEMP** input jack.
4. Set the rotary switch to the **TEMP** function.
5. Plug a K-type temperature probe into the temperature input adapter observing the correct polarity.
6. Read the temperature on the 183A.

Optional Functions:

- REC** Activate MIN/MAX record mode (page 24).
- REL** Activate REL mode (page 24).
- FUNCTION** Toggle between °C or °F.
- HOLD** HOLD the reading on the LCD.



k. RECORD MODE

The record mode saves minimum (MIN) and maximum (MAX) values measured for a series of reading. Activate the function as follows:

1. Depress the **REC** button on the 183A.
2. The 183A will immediately start to record MIN/MAX values. REC will be on the LCD to show record mode has been activated. The reading on the LCD will be the actual reading. The 183A will give a confirmation beep every time a new value is recorded.
3. Press the **REC** button a second time and the MIN reading will be displayed.
4. Press the **REC** button a third time and the MAX reading will be displayed on the LCD.
5. To terminate the record mode, hold the REC button down for approximately 2 seconds or turn the rotary switch to a different function.

l. RELATIVE MODE

The Relative mode compares readings to a known value and displays it as a difference to that value on the LCD.

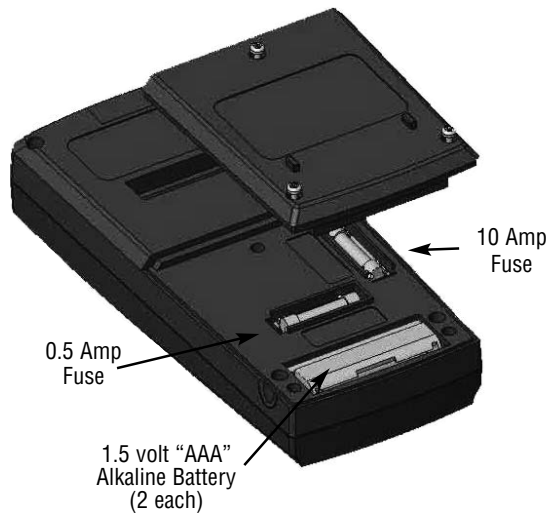
1. Measure the known value on the 183A and press the REL button, the LCD will display zero.
2. Measure next device for comparison.
3. The LCD will display the difference between the new device and the stored reference value.
5. To terminate the Relative mode, hold the REL button down for approximately 2 seconds or turn the rotary switch to a different function.

F. MAINTENANCE

1. **Testing Fuses In Circuit:** Both the A and mA μ A input jacks are fuse protected. The fuses can be tested without removing them from the instrument as follows:
 - a. Set the 183A to the diode test function.
 - b. Insert the red test lead into the V input jack.
 - c. Touch the tip of the red test lead into the A input jack making sure you contact the metal.
 - d. If the display reads any number, the fuse is good. If the display reads .OL, the fuse is open and must be replaced.
 - e. Repeat the same procedure for the uA mA input jack.
2. **Fuse Replacement:** Both the A and mA μ A input jacks are fuse protected. If either do not function, replace fuse as follows:
 - a. Disconnect and remove all test leads from live circuits and from the 183A.
 - b. Remove 183A from protective boot.
 - c. Remove the three screws from the lower back of housing holding the compartment cover in place.
 - d. Remove the compartment cover.
 - e. Remove the old fuse(s) and replace it with new fuse(s).
 - f. Reassemble the instrument in reverse order from above.

3. **Battery Replacement:** The 183A will display a battery symbol in the upper left corner of the LCD when the two internal 1.5 Volt "AAA" batteries need replacement. Batteries are replaced as follows:
- Disconnect and remove all test leads from live circuits and from the 183A.
 - Remove 183A from protective boot.
 - Remove the three screws from the lower back of housing holding the compartment cover in place.
 - Remove the compartment cover.
 - Remove old batteries and replace with new batteries.
 - Reassemble instrument in reverse order from above.

Battery/Fuse Compartment



3. **Cleaning Your Meter:** The 183A can be wiped clean with a damp cloth and mild detergent. Do not submerge in water.

G. TROUBLE SHOOTING GUIDE

<u>Problem</u>	<u>Probable Causes</u>
----------------	------------------------

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

