



285 Clamp on Meter Instruction Manual



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Introduction

Thank you for purchasing TPI products. The 285 is easy to use and built to last. It is backed by a three year limited warranty.

Product Description

The slim design 285 is a hand-held, auto ranging clamp-on DMM with Bluetooth output for use with the TPI View app. Backlit dual display, True RMS response, Frequency with Duty Cycle, Min/Max/Avg, Temperature, Inrush Current measurement, Capacitance, DC microamps, and Non-Contact Voltage detection are just a few of the features of the 285.

The TPI View app can be used in conjunction with the 285 to store measurements to jobs, create and email test reports, view live readings from a safe distance, or print measurements to the optional A711BT printer.

Contents

The 285 comes complete with the following accessories:

Carrying Pouch
Test Lead Set
Temperature Probe
Instruction Manual
Battery & Fuse

TPI View App

The TPI View app is available for Android and iOS devices. Visit the Play Store or the App Store to download and use the View app on your smart device.

Use the QR code below to find the TPI View app:



Safety



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.



Veillez suivre les procédures de test des fabricants dans la mesure du possible. N'essayez pas de mesurer des tensions ou des composants inconnus jusqu'à ce qu'une compréhension complète du circuit soit obtenue.



Read instructions before operating:

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



If test 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 285 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 285, then to circuit being measured.

NEVER

- Attempt to measure unknown high voltages.
- Attempt to measure DC microamps 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.

CONTENTS

- 285 Instrument
- Test Lead Set
- Temperature Probe (K-type) and input adapter
- Instruction Manual

Specifications

ACV (45Hz ~ 450Hz)

Range	Res.	Accuracy	Impedance
6V	0.001V	+/- (1.2% + 3 digits)	10MΩ
60V	0.01V		
600V	0.1V	+/- (1.5% + 3 digits)	
750V	1V		

DCV

Range	Res.	Accuracy	Impedance
6V	0.001V	+/- (0.5% + 2 digits)	10MΩ
60V	0.01V		
600V	0.1V		
1000V	1V		

ACA (Measured with Clamp) (45Hz ~ 450Hz)

Range	Res.	Accuracy	Protection
60A	0.01A	+/- (3% + 10 digits)	600A AC Max
600A	0.1A	+/- (3% + 5 digits)	
Accuracy is with conductor centered in jaw within +/- 5% of center			

DCuA (DC Microamps measured with test leads)

Range	Res.	Accuracy	Protection
60uA	0.01uA	+/- (1% + 2 digits)	1.2kΩ / PTC protected (self-resettable)
600uA	0.1uA		

Resistance (Ω)

Range	Res.	Accuracy	Protection
600Ω	0.1Ω	+/- (1.0% + 5 digits)	600VDC / 600VAC Peak
6kΩ	0.001kΩ	+/- (1.0% + 2 digits)	
60kΩ	0.01kΩ		
600kΩ	0.1kΩ		
6MΩ	0.001MΩ	+/- (3.0% + 5 digits)	
60MΩ	0.01MΩ	+/- (3.0% + 10 digits)	

Diode

Test Voltage	Test Current	Description	Protection
≈ 2.6V	≈ 1mA	Measures approximate forward bias of diode. Also beeps when shorted.	600V Peak

Continuity

Threshold to audible beep	Protection
Approximately < 7Ω	600V Peak

Capacitance

Range	Res.	Accuracy	Protection
6nF	0.001nF	+/- (5.0% + 20 digits)	600VDC / 600VAC Peak
60nF	0.01nF	+/- (3.0% + 5 digits)	
600nF	0.1nF		
6uF	0.001uF		
60uF	0.01uF		
600uF	0.1uF	+/- (7.0% + 10 digits)	
6mF	0.001mF		
60mF	0.01mF	+/- (10.0% + 20 digits)	

Frequency

Range	Res.	Accuracy	Protection
60Hz	0.01Hz	+/- (0.5% + 2 digits)	600VDC / 600VAC Peak
600Hz	0.1Hz		
6kHz	0.001kHz		
60kHz	0.01kHz		
600kHz	0.1kHz		
6MHz	0.001MHz		

Duty Cycle

Range	Res.	Accuracy	Protection
5% to 95% (<600Hz)	0.1%	+/- (1.0% + 2 digits)	600VDC / 600VAC Peak
10% to 90% (600 to 6kHz)			
20% to 80% (6kHz to 60kHz)			

Temperature

Range	Res.	Accuracy	Protection
-49.9 to -0.1°C	0.1°C	+/- (2.0% + 3°C)	600VDC / 600VAC Peak
0.0 to 99.9°C		+/- (1.0% + 1°C)	
100°C to 999°C		+/- (1.0% + 2°C)	
-57.9 to 31.9°F	0.1°F	+/- (2.0% + 5.4°F)	
32.0 to 211.9°F		+/- (1.0% + 1.8°F)	
212 to 1830°F		+/- (1.0% + 4°F)	

Non-Contact Voltage

Detects AC voltage greater than 50V. Audible and visual indication.

General Specifications

Display	6000 count dual display LCD with backlight
Max Voltage between input terminal and ground	1000VDC / 750VAC
Operating Temperature	32°F to 113°F (0°C to 40°C)
Storage Temperature	-4°F to 140°F (-20°C to 60°C)
Relative Humidity	80% non-condensing
Altitude	6,562 feet maximum (2,000 meters maximum)
IP Rating	IPX0 per IEC 60529
Battery Type	9V Alkaline (NEDA 1604)
Battery Life	Approximately 90hrs (no backlight or Bluetooth)
Size	9.9" x 2.5" x 1.4" (252mm x 64mm x 36mm)
Weight	0.79 lb (358g)
Bluetooth LE	4.2

International Symbols

- ⚠ : Dangerous Voltage
- : DC (Direct Current)
- ~ : AC (Alternating Current)
- ⚠ : Warning
- ⏏ : Ground
- : Double Insulation
- ~ : Either DC or AC

Agency



FCC ID: QOQBGM113

IC (Industry Canada) ID: 5123A-BGM113



209-J00204

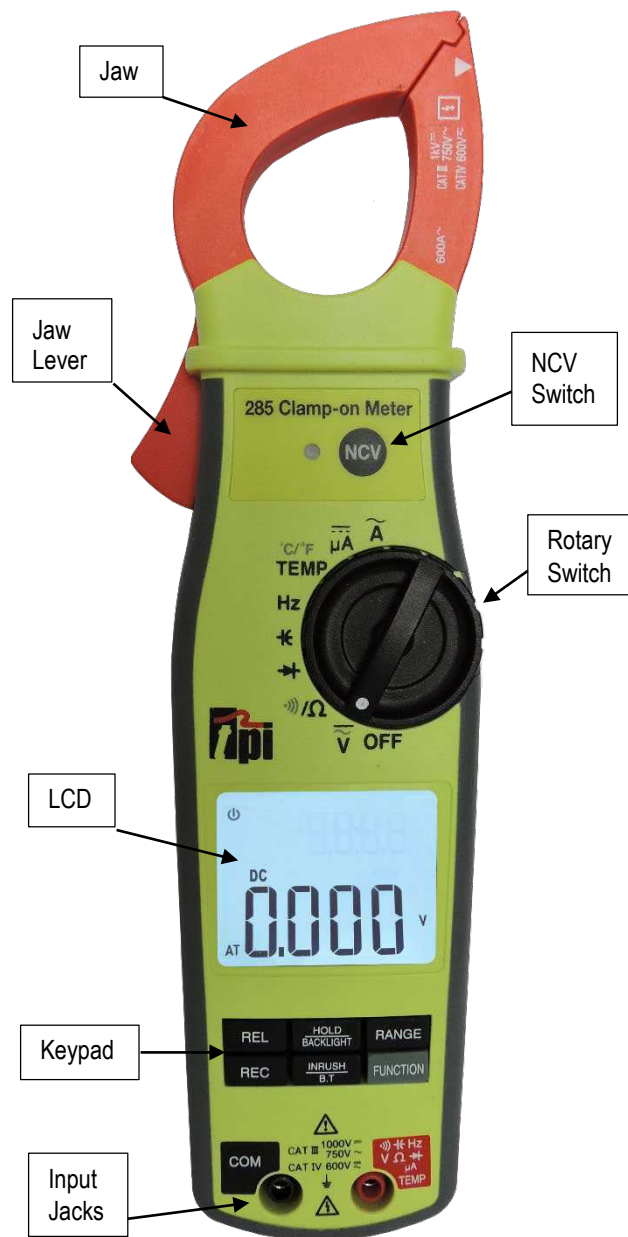


IEC 61010-1 Over voltage:
CAT III 750Vac/1000Vdc
CAT IV 600Vac/dc
Pollution Degree 2



UL 61010-1
CAT III 750Vac/1000Vdc
CAT IV 600Vac/dc

Controls and Functions



Jaw – Used to measure AC Amperage. Place single current carrying wire in the middle of the jaw.

Jaw Lever – Used to open the jaw.

LCD – Measured readings display

Keypad – Used to select different modes of operation.

Input Jacks – Test lead connection points.

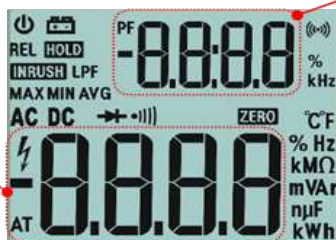
Rotary Switch – Used to select the measurement function.

NCV Switch – Used to activate non-contact voltage detection.

LCD Display

Main Display:

Measured Values display area



Sub Display:

Secondary measured values display for some functions

Not all icons shown are used with the 285

Unique Icons

	Auto Power Off is active. Instrument powers off after 15 minutes of inactivity. This feature can be disabled. Please refer to page 15.
	Low battery indicator. When on, battery should be changed. If battery voltage drops too low, operation will be affected.
	Indicates a voltage over 30V AC or DC is being measured. Extra caution should be taken when measuring higher voltages or injury may occur.
	Blinks when Bluetooth is on and ready for pairing to the View app. Indicator stay on continuously when connected to smart device.

Keypad Push Buttons

	Relative – Once pressed, the reading on the display is stored and used as reference in the main display. Subsequent readings are in the sub display and relative to this stored value.
	Hold/Backlight – Press to freeze/unfreeze the display. Press and hold to activate the backlight.
	Range – Toggles between manual and auto range. Press to switch to manual range then press repeatedly to select the range. Press and hold to return to Auto Range (AT in lower left of display).
	Record – Activates record mode. Repeatedly pressing REC cycles through maximum, minimum, and average readings (shown in main display). Sub display shows current reading. Press and hold to disable Record mode.
	Inrush/BT – Press to turn Inrush Current capture on and off. Press and hold to turn Bluetooth on and off.
	Function – Use to select the gray functions on the rotary switch. Also used to set default temperature units and to enable or disable auto power off. See page 15.

Rotary Switch

Measurement function selector



	DC / AC Voltage
	Continuity Buzzer / Resistance
	Diode
	Capacitance
	Frequency
	Temperature
	Microamps DC using test leads
	AC Amperage using the jaw

Input Jacks



Test Lead Connections

	Black test lead connection for measuring AC/DC volts, Continuity Buzzer, Resistance, Diode Test, Capacitance, Frequency, Temperature, and DC Microamps.
	Red test lead connection for measuring AC/DC volts, Continuity Buzzer, Resistance, Diode Test, Capacitance, Frequency, Temperature, and DC Microamps.

Measuring DC Volts

Range: 0 to 1000VDC

Warning!

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

Rotary Switch Position



Test Lead Connection

COM – Black Test Lead
VΩHz – Red Test Lead



Optional Functions

REL	Relative – Displays measured value as difference of referenced value.
HOLD BACKLIGHT	Hold/Backlight – Press to freeze/unfreeze the display. Press and hold to activate the backlight.
RANGE	Range – Toggles between manual and auto range. Press to switch to manual range then press repeatedly to select the range. Press and hold to return to Auto Range (AT in lower left of display).
REC	Record – Activates record mode. Repeatedly pressing REC cycles through maximum, minimum, and average readings (shown in main display). Sub display shows current reading. Press and hold to disable Record mode.
INRUSH B.T	Inrush/BT –Press and hold to turn Bluetooth on and off.

Measuring AC Voltage

Range: 0 to 750VAC

Warning!

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

Rotary Switch Position



Test Lead Connection

COM – Black Test Lead
VΩHz – Red Test Lead



Selecting AC Mode

FUNCTION	Press the function key to select AC Volts. The ACV annunciator will illuminate and Frequency will be seen in the sub display.
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Optional Functions

REL	Relative – Displays measured value as difference of referenced value.
HOLD BACKLIGHT	Hold/Backlight – Press to freeze/unfreeze the display. Press and hold to activate the backlight.
RANGE	Range – Toggles between manual and auto range. Press to switch to manual range then press repeatedly to select the range. Press and hold to return to Auto Range (AT in lower left of display).
REC	Record – Activates record mode. Repeatedly pressing REC cycles through maximum, minimum, and average readings (shown in main display). Sub display shows current reading. Press and hold to disable Record mode.
INRUSH B.T	Inrush/BT –Press and hold to turn Bluetooth on and off.

Measuring Resistance (Ohms)

Range: 0 to 60M Ω

Warning!

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

Rotary Switch Position



Test Lead Connection

COM – Black Test Lead
V Ω Hz – Red Test Lead



Note: To make accurate low resistance measurements, short the leads together and press the REL key. This value, the test lead resistance, will be deducted from measured readings.

Optional Functions

REL	Relative – Displays measured value as difference of referenced value.
HOLD BACKLIGHT	Hold/Backlight – Press to freeze/unfreeze the display. Press and hold to activate the backlight.
RANGE	Range – Toggles between manual and auto range. Press to switch to manual range then press repeatedly to select the range. Press and hold to return to Auto Range (AT in lower left of display).
INRUSH B.T	Inrush/BT – Press and hold to turn Bluetooth on and off.

Measuring Continuity

Range: Buzzer sounds at <7 Ω

Warning!

Do not attempt to make a continuity measurement with the circuit energized.

Rotary Switch Position



Test Lead Connection

COM – Black Test Lead
V Ω Hz – Red Test Lead



FUNCTION

Function - Press the function key to select Continuity mode. The continuity annunciator will illuminate in the display.

Optional Functions

REL	Relative – Displays measured value as difference of referenced value.
HOLD BACKLIGHT	Hold/Backlight – Press to freeze/unfreeze the display. Press and hold to activate the backlight.
INRUSH B.T	Inrush/BT – Press and hold to turn Bluetooth on and off.

Measuring Diodes

Range: Approximate forward bias voltage of diode

Warning!

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

Rotary Switch Position



Test Lead Connection

COM – Black Test Lead
VΩHz – Red Test Lead



Note: Continuity buzzer will sound if a resistance under approximately 7 Ohms is measured.

Optional Functions

REL	Relative – Displays measured value as difference of referenced value.
HOLD BACKLIGHT	Hold/Backlight – Press to freeze/unfreeze the display. Press and hold to activate the backlight.
INRUSH B.T	Inrush/BT – Press and hold to turn Bluetooth on and off.

Measuring Capacitance

Range: 0 to 60mF

Warning!

Do not attempt to make capacitance measurements with the circuit energized. Remove the capacitor from the circuit and make sure it is de-energized before making a measurement.

Rotary Switch Position



Test Lead Connection

COM – Black Test Lead
VΩHz – Red Test Lead



Optional Functions

REL	Relative – Displays measured value as difference of referenced value.
HOLD BACKLIGHT	Hold/Backlight – Press to freeze/unfreeze the display. Press and hold to activate the backlight.
RANGE	Range – Toggles between manual and auto range. Press to switch to manual range then press repeatedly to select the range. Press and hold to return to Auto Range (AT in lower left of display).
REC	Record – Activates record mode. Repeatedly pressing REC cycles through maximum, minimum, and average readings (shown in main display). Sub display shows current reading. Press and hold to disable Record mode.
INRUSH B.T	Inrush/BT – Press and hold to turn Bluetooth on and off.

Measuring Frequency

Range: 0 to 6MHz

Warning!

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

Note: When measuring frequency, the duty cycle will be displayed in the sub display. The minimum frequency measurement is measured from 4.0 Hz.

Rotary Switch Position



Test Lead Connection

COM – Black Test Lead
VΩHz – Red Test Lead



Optional Functions

REL	Relative – Displays measured value as difference of referenced value.
HOLD BACKLIGHT	Hold/Backlight – Press to freeze/unfreeze the display. Press and hold to activate the backlight.
RANGE	Range – Toggles between manual and auto range. Press to switch to manual range then press repeatedly to select the range. Press and hold to return to Auto Range (AT in lower left of display).
REC	Record – Activates record mode. Repeatedly pressing REC cycles through maximum, minimum, and average readings (shown in main display). Sub display shows current reading. Press and hold to disable Record mode.
INRUSH B.T	Inrush/BT – Press and hold to turn Bluetooth on and off.

Measuring Temperature

Range: -57.9°F to 1830°F (-49.9°C to 999°C)

Note: Temperature measurements require use of the K-Type thermocouple adapter and a K-Type thermocouple probe.

Rotary Switch Position



K-Type Thermocouple Adapter Connection

COM – (-) Banana Plug
of Adapter
VΩHz – (+) Banana Plug
of Adapter



Optional Functions

REL	Relative – Displays measured value as difference of referenced value. Can be used to measure temperature differential. See page 15.
HOLD BACKLIGHT	Hold/Backlight – Press to freeze/unfreeze the display. Press and hold to activate the backlight.
RANGE	Range – Toggles between manual and auto range. Press to switch to manual range then press repeatedly to select the range. Press and hold to return to Auto Range (AT in lower left of display).
REC	Record – Activates record mode. Repeatedly pressing REC cycles through maximum, minimum, and average readings (shown in main display). Sub display shows current reading. Press and hold to disable Record mode.
INRUSH B.T	Inrush/BT – Press and hold to turn Bluetooth on and off.
FUNCTION	Function – Press to toggle between °F and °C units of measure.

Measuring DC Microamps

Range: 0 to 600 μ A

Warning!

Do not attempt to make a DC Microamp measurement with the test leads connected in parallel with the circuit. Do not attempt to make a current measurement of circuits with more than 600V present.

Rotary Switch Position



Test Lead Connection

COM – Black Test Lead
VΩHz – Red Test Lead



Optional Functions

REL	Relative – Displays measured value as difference of referenced value.
HOLD BACKLIGHT	Hold/Backlight – Press to freeze/unfreeze the display. Press and hold to activate the backlight.
RANGE	Range – Toggles between manual and auto range. Press to switch to manual range then press repeatedly to select the range. Press and hold to return to Auto Range (AT in lower left of display).
REC	Record – Activates record mode. Repeatedly pressing REC cycles through maximum, minimum, and average readings (shown in main display). Sub display shows current reading. Press and hold to disable Record mode.
INRUSH B.T	Inrush/BT – Press and hold to turn Bluetooth on and off.

Measuring AC Amperage

Range: 0 to 600A AC

Warning!

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

Rotary Switch Position



Test Lead Connection

Test leads are not used for this measurement. AC amperage measurements are made using the jaw. Open the jaw and clamp around a single current carrying wire. Keep the wire in the center of the jaw for the most accurate reading.

Optional Functions

REL	Relative – Displays measured value as difference of referenced value.
HOLD BACKLIGHT	Hold/Backlight – Press to freeze/unfreeze the display. Press and hold to activate the backlight.
RANGE	Range – Toggles between manual and auto range. Press to switch to manual range then press repeatedly to select the range. Press and hold to return to Auto Range (AT in lower left of display).
REC	Record – Activates record mode. Repeatedly pressing REC cycles through maximum, minimum, and average readings (shown in main display). Sub display shows current reading. Press and hold to disable Record mode.
INRUSH B.T	Inrush/BT – Press to activate inrush current capture mode. Press and hold to turn Bluetooth on and off.
FUNCTION	Function – Press to toggle the sub display to show the frequency of the amperage being measured.

Non Contact Voltage Detection (NCV)

Range: Detects voltages of 50VAC or more without making contact with the conductor.

Warning: Never rely on the non-contact voltage function only. If a voltage is not detected, confirm there is no voltage by performing a voltage measurement with the test leads. Failure to do this could result in injury. The non-contact voltage feature works best when testing single wires.

Rotary Switch Position

The NCV function can be used from any rotary switch position including the OFF position.

Test Lead Connection

The test leads are not used with the NCV function.

Press and hold the NCV key:



Touch the fixed side of the jaw with the arrow to the wire under test.



The arrow indicates where the non-contact voltage sensor is.

The 285 will beep and the LED next to the NCV key will illuminate to indicate the presence of voltage.

Record Mode (REC)

Record mode allows you to see the minimum (MIN), maximum (MAX), and average (AVG) values measured for a series of readings over time.

Activate the function as follows:

1. Using the RANGE button, manually range the meter to the desired range. Once REC is active, auto range is deactivated.
2. Depress the REC button.
3. The 285 will start to record MIN/MAX/AVG values. The MAX reading will be seen in the main display and the "live" reading will be seen in the sub display.
4. Press the REC button a second time and the MIN reading will be displayed.
5. Press the REC button a third time and the AVG reading will be displayed.
6. To terminate record mode and return to normal operation, press and hold the REC button down for approximately 3 seconds or turn the rotary switch to a different function.

Relative Mode (REL)

Relative mode allows the user to set a reference value to compare to and displays the difference. This can be useful for performing low resistance measurements or temperature differential measurements.

1. Using the RANGE button, manually range the meter to the desired range. Once REL is active, auto range is deactivated.
2. Measure a point that you want to use as the reference value.
3. Press the REL button. The reference value will be shown in the sub display and the difference will be in the main display.
4. Measure the point that you want to know the difference of.
5. The difference will be shown in the main display and the reading without the reference factored in will be shown in the sub display.
6. Press REL to return to normal operation.

In-Rush Current Mode (In-Rush)

In-Rush mode is used on the AC Amps range to capture motor start up current. When a motor starts there can be a momentary high current in-rush before the motor comes down to running current. This in-rush current usually happens very quickly and cannot be seen with a standard clamp meter.

Activate the function as follows:

1. Using the RANGE button, manually range the meter to the desired range. Once In-Rush is activated, auto range is deactivated.
2. Depress the INRUSH button.
3. Clamp around the wire of the device under test.
4. Start the motor and read the in-rush current on the display.
5. Press the INRUSH button to return to normal operation.

Range

The RANGE button is used to manually select the range of the clamp meter.

The clamp meter defaults to auto range. For example, when a voltage is measured the meter will automatically change ranges as needed based on the level of the input signal.

The RANGE button is used when other modes like REC, REL, and INRUSH are being used. Manually selecting the proper range also enables measurements to be performed slightly faster.

Function

The FUNCTION button is used to select the “gray” functions on the selector. For example, use the FUNCTION button to select the continuity function when the meter is set to resistance or toggle between °F and °C units of measure when taking temperature measurements.

Bluetooth

Note: To use the Bluetooth function, download the TPI View app on your smart device.

To activate Bluetooth, press and hold the INRUSH/BT key down until a beep is heard and the Bluetooth indicator is flashing in the display.

Tap on “Tap To Start Scanning For TPI Smart Instruments” in the View app and select the clamp meter,

The View app allows you to save readings to jobs and has a Meter View which displays the clamp meter on your smart device as if you are holding the meter in your hand.

Hold

The HOLD/BACKLIGHT button activates the data hold feature. This enables a measurement to be frozen on the display. When a measurement is on the display, pressing the HOLD/BACKLIGHT button will freeze that measurement in the main display. The sub-display will still show the measured reading as it changes.

To disable the hold feature and return to normal operation, press the HOLD/BACKLIGHT button.

Backlight

The HOLD/BACKLIGHT button is used to activate the display backlight. This is useful when taking measurements in low light conditions. Pressing and holding the HOLD/BACKLIGHT button for approximately 2 seconds activates the backlight for 1 minute. To turn the backlight off before the 1 minute auto off, press and hold the HOLD/BACKLIGHT key again for approximately 2 seconds.

Temperature Differential Measurement

The 285 can be used to measure temperature differential using the temperature function and Relative Mode.

1. As outlined on page 11, set the 285 up to make a temperature measurement.
2. Measure the temperature of point A on the device under test.
3. Once the temperature reading is stable, press the REL button.
4. Measure the temperature of point B on the device under test.
5. The difference between point A and point B will be displayed on the main display.

Disabling or Enabling Auto Power Off

Note: The 285 has an auto power off feature that turns the meter off after 15 minutes. The 285 comes with the auto power off feature enabled. Follow the steps below to disable (or re-enable) this feature.

1. With the meter off, press and hold the FUNCTION button while turning the meter on. A double beep will be heard, and the top display will display "tnP".
2. Press the REL button. The top display will display "P of" and the bottom display will be "En" to indicate auto power off is enabled or "dIS" to indicate auto power off is disabled.
3. Press the HOLD button to toggle the bottom display to "dIS" to disable auto power off or "En" to enable auto power off.
4. Press and hold the FUNCTION key until the 285 beeps to confirm the selection and return to normal operation.

Setting Default Temperature Unit of Measure

The default temperature unit of measure for the 285 is set to °F. If needed, the default unit of measure can be set to °C. (Note: when measuring temperature, the unit of measure can be changed by pressing the FUNCTION button. The default unit of measure sets which unit is seen at start up.)

Follow the steps below to change the default unit of measure for temperature:

1. With the meter off, press and hold the FUNCTION button while turning the meter on. A double beep will be heard, and the top display will be "tnP".
2. The bottom display will read "dF" to indicate the default temperature unit of measure is °F.
3. Press the HOLD button to toggle to "dC" to set the default unit of measure to °C.
4. Press and hold the FUNCTION key until the 285 beeps to confirm the selection and return to normal operation.

Battery Replacement

The 285 will display a battery symbol when the 9V battery need replacement.

1. Disconnect and remove the test leads from live circuits and the 285.
2. Loosen the two Phillips head screws located in the battery cover on the back of the 285.
3. Lift up on the screws to remove the battery cover from the back.
4. Remove the 9V battery from the battery holder.
5. Observing polarity, insert a new 9V battery. For best results, use a 9V Alkaline battery.

Cleaning & Storage

Use mild detergent and a slightly damp cloth to clean the surfaces of the 285. Do not use abrasives or solvents.

If the 285 is going to be stored for an extended time, remove the battery to prevent the possibility of battery acid leakage.