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User's Guide

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This device is marked with the international caution symbol. It is important to read the Setup Guide before installing or commissioning this device as the guide contains important information relating to safety and EMC.

⚠ This device is marked with the international caution symbol. It is important to read the Setup Guide before installing or commissioning this device as the guide contains important information relating to safety and EMC.

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PREFACE

Manual Objectives: This manual shows you how to set up and use the Panel Thermometer.

This meter is an economical Miniature Temperature Panel Thermometer featuring a large display with a linearized analog output that is supplied as a standard feature.

Each of the models* can be converted by the user to display in degrees Fahrenheit or Celsius. ***However, due to the internal design of the meter, the input type and resolution CANNOT be changed on any J, K, T, or E unit.***

The meter is available in many different styles. All of the Thermocouple models listed in Table 1-1 come standard with red LEDs, and can be ordered with a green LED display as an option. The part numbers would then end with “-GR”.

Example: DP116-JF1-GR

Also, these thermocouple meters can be ordered with different power configurations. Refer to Table 1-3 for available choices.

*Refer to Table 1-1 for the complete listing of models available.

SECTION 6 GLOSSARY

COMMON MODE REJECTION (CMR) - a measure of the affect of a voltage on the indicated display. It is the ratio of the common mode voltage to the measured voltage due to a common mode voltage.

COMMON MODE VOLTAGE (CMV) - the average of the voltage applied to both wires of a two wire or differential input.

NORMAL MODE REJECTION (NMR) - a measure of the rejection of unwanted signal due to a voltage applied between the wires of a two wire or differential input (shown as normal mode voltage). NMR is the ratio of the normal mode voltage to the measured voltage due to the normal mode voltage.

TEMPCO - abbreviation for temperature coefficient. It is the effect of changes in ambient temperature on a particular parameter, such as zero or span settings.

TABLE 1-1

TC MODELS AVAILABLE

The following 3-1/2 digit mini thermocouple panel thermometers are discussed in this operator's manual.

MODEL	TYPE	°C or °F	RESOLUTION
DP116-JF1	J	F	1.0°F
DP116-JF2	J	F	0.1°F
DP116-JC1	J	C	1.0°C
DP116-JC2	J	C	0.1°C
DP116-KF1	K	F	1.0°F
DP116-KF2	K	F	0.1°F
DP116-KC1	K	C	1.0°C
DP116-KC2	K	C	0.1°C
DP116-TF1	T	F	1.0°F
DP116-TF2	T	F	0.1°F
DP116-TC1	T	C	1.0°C
DP116-TC2	T	C	0.1°C
DP116-EF1	E	F	1.0°F
DP116-EF2	E	F	0.1°F
DP116-EC1	E	C	1.0°C
DP116-EC2	E	C	0.1°C

Note The accuracies and ranges are listed in Section 5.

Table 1-2

Other Models Available

The following 3-1/2 digit mini RTD panel meters are available and discussed in a separate RTD Operator's Manual.			
MODEL	**TYPE**	**°C or °F**	**RESOLUTION**
DP116-MF1	RTD	F	1.0°F
DP116-MF2	RTD	F	0.1°F
DP116-MC1	RTD	C	1.0°C
DP116-MC2	RTD	C	0.1°C

Table 1-3

Power Options Available

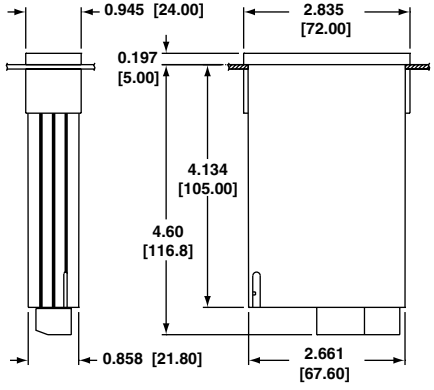
MODEL	POWER
DP116-TC type	115 Vac ±15%, 50/60 Hz
DP116-TC type-230	230 Vac ±15%, 50/60 Hz
DP116-TC type-9/26	9-26 Vdc @ 110mA max, non-isolated. Use ungrounded Thermocouples to avoid ground loops.
DP116-TC type-100	100 Vac ±15%, 50/60 Hz
DP116-TC type-24	24 Vac ±15%, 50/60 Hz

TABLE 5-1

ACCURACY/RANGE TABLE

MODEL OPTION	MAXIMUM ERROR	RANGE	RESOLUTION
*-JF1	2.7°F	-346 to +1400°F	1.0°F
*-JF2	1.8°F	-199.9 to +199.9°F	0.1°F
*-JC1	1.5°C	-210 to +760°C	1.0°C
*-JC2	1.0°C	-199.9 to +199.9°C	0.1°C
*-KF1	2.7°F	-157 to +1999°F	1.0°F
*-KF2	1.8°F	-199.9 to +199.9°F	0.1°F
*-KC1	1.5°C	-105 to +1372°C	1.0°C
*-KC2	1.0°C	-199.9 to +199.9°C	0.1°C
*-TF1	2.7°F	-157 to +752°F	1.0°F
*-TF2	1.8°F	-199.9 to +199.9°F	0.1°F
*-TC1	1.5°C	-105 to +400°C	1.0°C
*-TC2	1.0°C	-199.9 to +199.9°C	0.1°C
*-EF1	2.7°F	-157 to +1832°F	1.0°F
*-EF2	1.8°F	-199.9 to+199.9°F	0.1°F
*-EC1	1.5°C	-105 to +1000°C	1.0°C
*-EC2	1.0°C	-199.9 to+199.9°C	0.1°C

* Look at Table 1-1, for complete models (preface section).



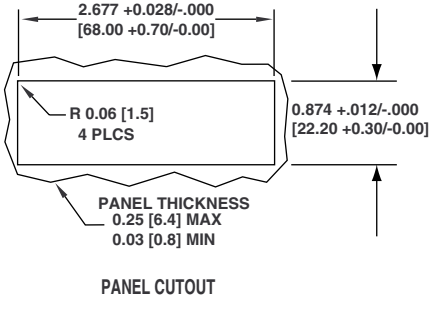


Figure 5-1 Dimensions

NOTES, WARNINGS and CAUTIONS

Information that is especially important to note is identified by these labels:

NOTE: provides you with information that is important to successfully setup and use the Programmable Digital Meter.

CAUTION or WARNING: tells you about the risk of electric shock.

CAUTION, WARNING or IMPORTANT: tells you of circumstances or practices that can effect the meter's functionality and must refer to accompanying documents.

DISPLAY

Type: ..... 7-segment, LED
Height: ..... 0.56" (14.2 mm)
Symbols: ..... -1.8.8.8
Overrange Indication: ..... Three least-significant digits blank
Colors: ..... Red - standard
Green - optional

DIGITAL INPUTS

$\overline{\text{Hold}}$: ..... TTL or 5V CMOS compatible

ENVIRONMENTAL

Operating Temperature: ..... 0° to 60°C(32° to 140°F)
Storage Temperature: ..... -40° to 85°C (-40° to 185°F)
Relative Humidity: ..... 95% at 40°C (non-condensing)

MECHANICAL DIMENSIONS

Bezel: ..... 0.94" x 2.83" (24 x 72 mm)
Depth Behind the Bezel: ..... 4.72" (120 mm) w/ connectors
Panel Cutout: ..... 0.87"H x 2.68" W (22.2 x 68 mm)
Weight: ..... 7 ounces (200 grams)
Panel Thickness ..... minimum: 0.03" (0.76mm)
maximum: 0.25" (6.25mm)
Case Material: ..... 94V-1 UL-rated thermoplastic

POWER

AC Frequency: ..... 50/60 Hz
Max. Power: ..... 2.4 watts max.
AC Voltage: ..... 115Vac ±15% 25mA max.
230Vac ±15% 14mA max.
100Vac ±15% 30mA max.
24Vac ±15% 127mA max.
DC Voltage: ..... 9-26 Vdc @ 110mA

External Fuse Protection needed: 32mA, 115Vac/230Vac
UL Slow-blow (per single unit) 40mA, 100Vac
160mA, 24Vac
125mA, 9-26Vdc

Installation Category: ..... I per EN61010
Equipment Class: ..... I per EN61010
Pollution Degree: ..... 2 per EN61010

† Refer to the Glossary in Section 6.

SECTION 5 SPECIFICATIONS

INPUT TYPE:

Thermocouple: .....J,K,T, or E (Chromel-Constantan)
Calibration:.....IEC 584-1 (IPTS-68)
Configuration: .....Single-ended (-TC lead connected to Analog Return)
Polarity:.....Bipolar
Cold-junction Tempco: .....±0.1 deg/deg
Sensor-wire resistance effect per conductor:
Type E: 50 µdeg/deg/Ω, up to 2000Ω
Sensor-break Current:.....333 nA
Sensor-break Indication:.....Meter displays positive overrange (upscale)

NOISE REJECTION

NMR†, SIG HI to SIG LO: .....70 dB, 50/60 Hz
CMR†, Analog RTN to PWR GND: .....120 dB, DC to 60 Hz
CMV†, Analog RTN to PWR GND: .....Dielectric strength to 1500 V transient per 260 Volt rms or DC working voltage.

ACCURACY at 25°C

Range for rated accuracy
Thermocouple Type: .....Refer to Table 5-1
Maximum Error: .....Refer to Table 5-1
Resolution: .....Refer to Table 5-1
Span Tempco: .....±0.02% of reading/°C
Full-Scale Step Response: ..... 1 s
Warmup to Rated Accuracy:..... 30 min.

ANALOG OUTPUT (linearized)

Voltage:.....1mV/count
Calibration Error:..... ±1% of reading ± 1.0mV on °C, ± 1.8mV on °F
Source Resistance:.....100Ω

ANALOG TO DIGITAL CONVERSION

Technique:.....Dual-slope, average value
Signal Integration Period: .....100 ms
Read Rate:.....2.5/s

SECTION 1 INTRODUCTION

1.1 UNPACKING

Remove the Packing List and verify that all equipment has been received. If there are any questions about the shipment, use the phone numbers listed on the back cover to contact the Customer Service Department nearest you.

Upon receipt of shipment, inspect the container and equipment for any signs of damage. Take particular note of any evidence of rough handling in transit. Immediately report any damage to the shipping agent.

Note: The carrier will not honor any claims unless all shipping material is saved for their examination. After examining and removing contents, save packing material and carton in the event reshipment is necessary.

Verify that you received the following items in the shipping box:

QTY	DESCRIPTION
1	Panel Thermometer with 3 small connectors plugged into the rear of the meter.
1	Operator's Manual

1.2 SAFETY CONSIDERATIONS

This device is marked with the international Caution symbol. It is important to read this manual before installing or commissioning this device as it contains important information relating to Safety and EMC (Electromagnetic Compatibility).

Unpacking & Inspection

Unpack the instrument and inspect for obvious shipping damage. Do not attempt to operate the unit if damage is found.

This instrument is a panel mount device protected in accordance with Class I of EN 61010 (115/230 AC power connections). Installation of this instrument should be done by Qualified personnel. In order to ensure safe operation, the following instructions should be followed.

This instrument has no power-on switch. An external switch or circuit-breaker shall be included in the building installation as a disconnecting device. It shall be marked to indicate this function, and it shall be in close proximity to the equipment within easy reach of the operator. The switch or circuit-breaker shall not interrupt the Protective Conductor (Earth wire), and it shall meet the relevant requirements of IEC 947–1 and IEC 947-3 (International Electrotechnical Commission). The switch shall not be incorporated in the mains supply cord.

Furthermore, to provide protection against excessive energy being drawn from the mains supply in case of a fault in the equipment, an overcurrent protection device shall be installed.

- The **Protective Conductor** must be connected for safety reasons. Check that the power cable has the proper Earth wire, and it is properly connected. It is not safe to operate this unit without the Protective Conductor Terminal connected.

- Do not exceed voltage rating on the label located on the top of the instrument housing.
- Always disconnect power before changing signal and power connections.
- Do not use this instrument on a work bench without its case for safety reasons.
- Do not operate this instrument in flammable or explosive atmospheres.
- Do not expose this instrument to rain or moisture.
- Unit mounting should allow for adequate ventilation to ensure instrument does not exceed operating temperature rating.
- Use electrical wires with adequate size to handle mechanical strain and power requirements. Install without exposing bare wire outside the connector to minimize electrical shock hazards.

EMC Considerations

- Whenever EMC is an issue, always use shielded cables.
- Never run signal and power wires in the same conduit.
- Use signal wire connections with twisted-pair cables.
- Install Ferrite Bead(s) on signal wires close to the instrument if EMC problems persist.

TABLE 4-2 (Cont'd)

MODEL OPTION	MILLIVOLT VALUE FROM MILLIVOLT SOURCE	METER DISPLAY	POT TO ADJUST
*-TF1	0.0 19.638	31°F † 716°F	Zero Span
*-TF2	0.0 3.584	32.0°F 185.0°F	Zero Span
*-TC1	0.0 19.638	0°C 380°C	Zero Span
*-TC2	0.0 8.495	0.0°C 185.0°C	Zero Span
*-EF1	0.0 73.727	31°F † 1769°F	Zero Span
*-EF2	0.0 5.130	33.0°F † 180.0°F	Zero Span
*-EC1	0.0 73.727	0°C 965°C	Zero Span
*-EC2	0.0 12.314	0.5°C † 185.0°C	Zero Span

† The best MID-RANGE accuracy is obtained when the meter is calibrated to the exact values shown in column 3, even though a small error may occur at 32°F (0°C).

* Look at Table 1-1, for complete models (preface section).

TABLE 4-2

CALIBRATION VALUES
WHEN USING A MILLIVOLT SOURCE

MODEL OPTION	MILLIVOLT VALUE FROM MILLIVOLT SOURCE	METER DISPLAY	POT TO ADJUST
*-JF1	0.0 41.013	32°F 1346°F	Zero Span
*-JF2	0.0 3.917	31.6°F † 167.0°F	Zero Span
*-JC1	0.0 41.013	0°C 730°C	Zero Span
*-JC2	0.0 9.113	-0.2°C † 170.0°C	Zero Span
*-KF1	0.0 40.449	31°F † 1794°F	Zero Span
*-KF2	0.0 2.896	32.0°F 160.0°F	Zero Span
*-KC1	0.0 53.611	0°C 1335°C	Zero Span
*-KC2	0.0 7.737	0.0°C 190.0°C	Zero Span

† Look at the end of Table 4-2, for the explanation of †.
* Look at Table 1-1, for complete models (preface section).

SECTION 2 ABOUT THE METER

2.1 Front of the Meter

Figure 2-1 shows the panel thermometer.



Figure 2-1. Panel Thermometer

Features:

Display: 3 1/2 Digit, 7-Segment Red or Green LED
Full-size 14.2 mm (0.56") LED Display
Analog Output Standard
3/64 DIN Standard Panel Cutout
Removable Screw-Clamp Cable Connector
Display Hold Capability

2.2 Back of the Meter

Figure 2-2 illustrates the rear of the meter.

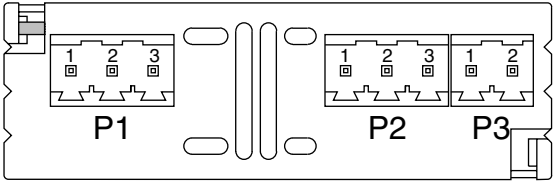


Figure 2-2. Rear View Showing P1, P2, P3 Connectors

2.3 Connector Description

Connector Description	Connector	PIN #
(AC) Earth Ground	P1	1
(AC) Neutral	P1	2
(AC) Line	P1	3
(DC) -DC Return	P1	1
(DC) +DC	P1	2
(DC) No Connection (Not used)	P1	3
Display Hold (Active Low)	P2	1
Return	P2	2
Analog Output	P2	3
-TC (Neg. Lead) †	P3	1
+TC (Pos. Lead) †	P3	2

† For wire colors, refer to Table 3-1

3. **Connect the power to the meter.** Refer to the appropriate model number in Table 4-2 for the proper calibration points for your particular meter.
4. Adjust the millivolt source to output the millivolt value shown on the first line of column 2. Check to see that the meter displays the temperature indicated in column 3. If not, adjust the zero potentiometer until it reads that simulated value. For example, if the meter has a "-JC2" in the model number, set the millivolt source for 0.0 and the meter display should show 0°C.
5. Adjust the millivolt source to output the millivolt value shown on the second line of column 2. Check to see that the meter displays that same value. If not adjust the span pot until it reads that simulated value. For example, if the meter has a "-JC1" in the model number, set the millivolt source for 41.013 and the meter display should show 730°C.

4.2.2 Calibrating using a Millivolt Source

1. **Disconnect the power from the meter.** Remove the front lens. Notice the the zero potentiometer is located to the left of the display and the span potentiometer is located to the right of the display.

   Refer to **Figure 4-1** for the location of the calibration pots.

2. Connect the millivolt source to the MCJ Electronic Ice Point or ice bath which in turn connects to the thermocouple input connector P3 as shown in Figure 4-3. Connect the negative (red) thermocouple wire to connector P3, Pin 1. Connect the positive thermocouple wire to connector P3, Pin 2. Be sure to observe polarity and use the correct thermocouple wire (Type J wire for Type J meter).

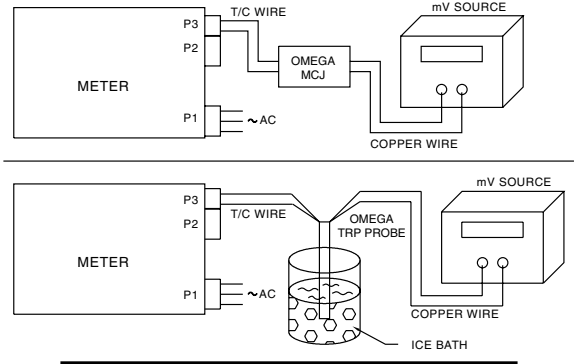


Figure 4-3. Calibration with a Millivolt Source

SECTION 3 GETTING STARTED

3.1 Main Board Power Jumpers

Caution: The meter has no power-on switch, so it will be in operation as soon you apply power.

The meter can be configured to operate on 115 Vac or 230 Vac by the proper combination of the soldered wire jumpers that are located on the printed circuit board. The meter is set at the factory to be powered by the voltage specified at the time of ordering. The same transformer is used for either configuration, so all you need to do is to select the jumpers as described in this section.

Important: These changes must be performed by a qualified technician.

To change the Factory preset jumpers, do the following steps:

Note Disconnect the power from the unit before proceeding.

1. Remove the main board from the case. Refer to Disassembly/Assembly Section 3.8.
2. Locate the solder jumpers W1, W2, and W3 (located near the edge of the main board alongside the transformer).
3. If your power requirement is 115 Vac, solder jumpers W1 and W3 should be wired, but jumper W2 should not. If your power requirement is 230 Vac, solder jumper W2 should be wired, but jumpers W1 and W3 should not.

Voltage Jumper Pin Settings

AC VOLTAGE	INSTALL	REMOVE
115 Vac	W1, W3	W2
230 Vac	W2	W1, W3

Figure 3-1 shows the location of solder jumpers W1 through W3.

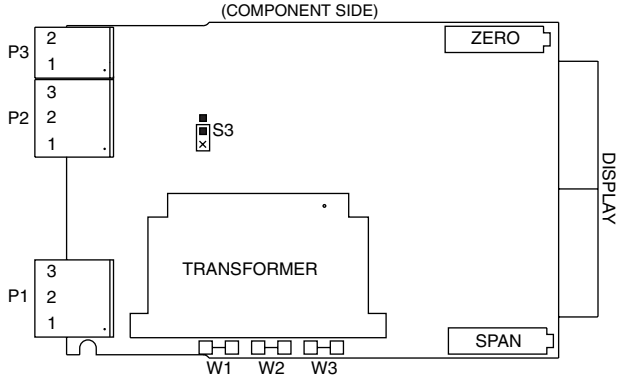


Figure 3-1. PC Board Jumper Locations

TABLE 4-1 (Cont'd)

MODEL OPTION	T/C CALIBRATOR DISPLAY	METER ADJUST	POT TO DISPLAY
*-TF1	32°F 716°F	31°F † 716°F	Zero Span
*-TF2	32.0°F 185.0°F	32.0°F 185.0°F	Zero Span
*-TC1	0°C 380°C	0°C 380°C	Zero Span
*-TC2	0.0°C 185.0°C	0.0°C 185.0°C	Zero Span
*-EF1	32°F 1769°F	31°F † 1769°F	Zero Span
*-EF2	32.0°F 180.0°F	33.0°F † 180.0°F	Zero Span
*-EC1	0°C 965°C	0°C 965°C	Zero Span
*-EC2	0°C 185.0°C	0.5°C † 185.0°C	Zero Span

† The best MID-RANGE accuracy is obtained when the meter is calibrated to the exact values shown in column 3, even though a small error may occur at 32°F (0°C).

* Look at Table 1-1, for complete models (preface section).

TABLE 4-1

CALIBRATION VALUES WHEN USING THERMOCOUPLE CALIBRATOR

MODEL OPTION	T/C CALIBRATOR DISPLAY	METER DISPLAY	POT TO ADJUST
*-JF1	32°F 1346°F	32°F 1346°F	Zero Span
*-JF2	32.0°F 167.0°F	31.6°F † 167.0°F	Zero Span
*-JC1	0°C 730°C	0°C 730°C	Zero Span
*-JC2	0.0°C 170.0°C	-0.2°C † 170.0°C	Zero Span
*-KF1	32°F 1794°F	31°F † 1794°F	Zero Span
*-KF2	32.0°F 160.0°F	32.0°F 160.0°F	Zero Span
*-KC1	0°C 1335°C	0°C 1335°C	Zero Span
*-KC2	0.0°C 190.0°C	0.0°C 190.0°C	Zero Span

† Look at the end of Table 4-1 for the explanation of †.

* Look at Table 1-1, for complete models (preface section).

3.2 Converting °F to °C (vice versa)

You must remove the printed circuit board from the case in order to change from the Fahrenheit to Celsius (or vice versa). This change must be performed by a qualified technician in order to avoid damage to the unit. Disconnect the power from the unit before proceeding.

Degrees Fahrenheit and degrees Celsius are selectable parameters. All you need to do is change the location of the shorting jumper at S3, using needle-nose pliers.

1. Disconnect all wires and move the unit from the panel (if installed).
2. Remove the printed circuit board from the case as described in **Section 3-8**.

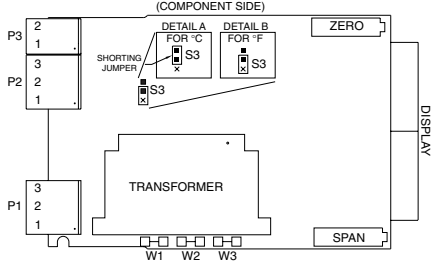


Figure 3-2. S3 Jumper

3. Follow the instructions to convert to:

Celsius:

The unit will display degrees Celsius when the shorting jumper is connected to both pins at S3. Refer to **Figure 3-2**, Detail A.

Fahrenheit:

The unit will display degrees Fahrenheit if the shorting jumper at S3 is NOT connecting the 2 pins. Refer to **Figure 3-2**, Detail B. By keeping the shorting jumper on one pin, you are keeping it handy in case you want to change the display back to degrees C.

Section 3.3 Installation and Panel Mounting

Figure 3-3 shows the panel cutout dimensions, the dimensions for the panel thickness, and the mounting clamp for mounting the unit in a panel. **Connections will be done after mounting the unit**.

1. Remove the lens by inserting a paper clip or a small flat blade screwdriver into the rounded corner of the lens and lift out.
2. Remove the two mounting screws from both sides of the display. Pry both sides of the mounting clamp out and down to remove it from the meter case.
3. Insert the meter into the panel cutout and reinstall the mounting clamp to the bottom of the meter case from the rear of the panel.
4. Re-install the mounting screws to secure the meter in the panel. Do not over-tighten the screws.
5. Pop the lens back in, making sure the dull side of the lens faces towards you.

4. Set the thermocouple calibrator to match the thermocouple type of your meter. Adjust the thermocouple calibrator to output the temperature shown in the first line of column 2. Check to see that the unit displays the temperature shown in column 3. If not, adjust the zero potentiometer until it reads that simulated value. For example, if the meter has a "-JC2" in the model number, set the calibrator for 0.0°C and the unit display should show -0.2°C.
5. Adjust the thermocouple calibrator to output the temperature shown in the second line of column 2. Check to see that the unit displays the temperature shown in column 2. If not, adjust the span pot until it reads that simulated value. For example, if the meter has a "-JC2" in the model number, set the calibrator for 170.0°C and the meter display should show 170.0°C.
6. After adjusting the pots, go back and verify both temperature readings. Repeat steps 4 and 5 as required.

2. Connect the thermocouple calibrator output signal to the thermocouple input connector P3 as shown in Figure 4-2. Connect the negative (red) thermocouple wire to connector P3, Pin 1. Connect the positive thermocouple wire to connector P3, Pin 2. Be sure to observe polarity and use the correct thermocouple wire (Type J wire for Type J meter).

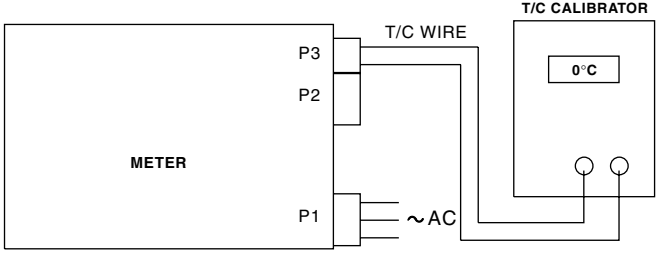
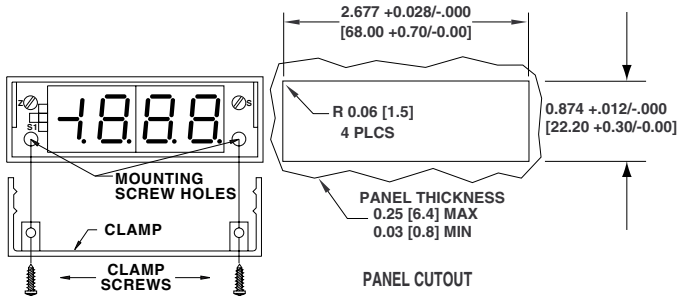


Figure 4-2. Calibration a Thermocouple Calibrate

3. Connect the power to the meter. Allow 30 minute warm up before calibration of 0.1° resolution meters. Refer to the appropriate model number in **Table 4-1** for the proper calibration points for your particular meter.



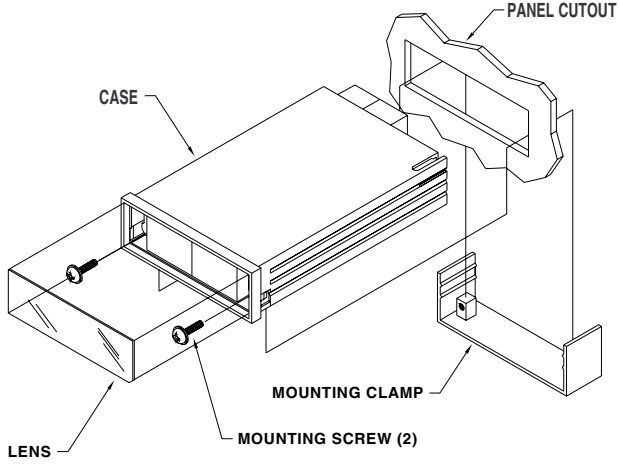


Figure 3-3. Installation Information

3.4 Sensor Input Connections

Table 3-1. AMERICAN (USA) THERMOCOUPLE WIRE COLORS

T/C TYPE	"+" LEAD WIRE ALLOY/WIRE COLOR	"-" LEAD WIRE ALLOY/WIRE COLOR
J	Iron (white)	Constantan (red)
K	Chromel (yellow)	Alumel (red)
T	Copper (blue)	Constantan (red)
E	Chromel (purple)	Constantan (red)

The meter is configured at the factory for the desired thermocouple type (J, K, T, E) and the desired units of measure (°C or °F), as defined by the customer at the time of purchase.

The meter configuration is defined in the part number. For example, a Type T meter that reads in degrees Fahrenheit would have a "-TF2" in the part number. The “1” at the end of the part number indicates a 1 degree resolution and “2” at the end of the part number indicates a 0.1 degree resolution. See **Table 1-1** for model number listing.

Note: Once the meter is configured for a particular thermocouple type, it CANNOT be changed to accept any other input type. It becomes dedicated to that thermocouple type as ordered.

Note: Meter calibration must be performed using a thermocouple calibrator. If a millivolt source is used instead, be sure to connect the output of the millivolt source to an Omega MCJ Electronic Ice Point (or equivalent) of the appropriate thermocouple type (or an ice bath). Doing this will compensate for the cold junction errors.

4.2 CALIBRATION PROCEDURE

Refer to Section 4.2.1 for details on how to calibrate the meter using the Thermocouple Calibrator. Refer to Section 4.2.2 for details on how to calibrate the meter using the Millivolt Source.

4.2.1 Thermocouple Calibrating

1. **Disconnect the power from the meter.** Remove the front lens. Notice the the zero potentiometer (pot) is located to the left of the display and the span potentiometer is located to the right of the display.

   Refer to **Figure 4-1** for the location of the calibration pots.

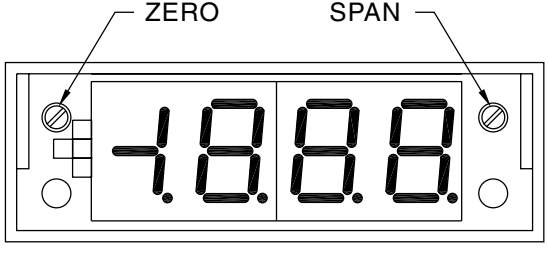


Figure 4-1. Calibration Potentiometers

SECTION 4 OPERATION AND CALIBRATION

Important: These changes must be performed by a qualified technician.

WARNING: Do not connect ac power to your meter until you have completed all input and output connections. Failure to do so may result in injury!

1. Wire the meter according to the wiring section. This includes power, thermocouple and analog signal connections.
2. Apply power to the meter and the display will show the temperature of the probe.

The meter is shipped from the factory calibrated to the accuracy as specified. No re-calibration is necessary. In the event that there is a desire to check the calibration, the following procedure is given.

4.1 EQUIPMENT REQUIRED

- Meter
- Extension grade thermocouple wire
- a small screwdriver
- a precision Thermocouple Calibrator

OR

- a precision Millivolt Source (0.001 resolution) used in conjunction with an Electronic Ice Point
- copper wire

OR

- a precision Millivolt Source (0.001 resolution) used in conjunction with an ice bath
- copper wire

3.4 Sensor Input Connections (Continued)

To connect the input to the unit, attach the thermocouple probe to the 2-pin female connector that is supplied with the unit. Refer to **Figure 3-4** for wiring instructions and **Table 2-1** for wire colors.

Plug the female connector into the P3 male connector at the rear of the meter.

Figure 2-2 shows the location of the P3 connector on the meter.

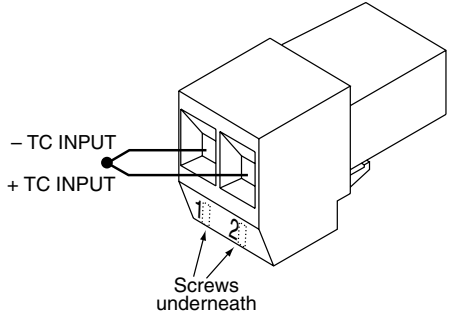


Figure 3-4. Thermocouple Connector Wiring (P3)

3.5 Analog Output Connections

The analog output is a linearized millivolt signal that is equivalent to the displayed temperature. It comes as a standard feature with every unit. The resolution of the analog output is no greater than the resolution of the display.

Note The analog output is a non-isolated signal, therefore, it is recommended that an ungrounded thermocouple probe be used to prevent ground loop problems.

To access the analog signal, attach copper wire to the 3-pin female connector that is supplied with the meter. Refer to **Figure 3-5** for wiring instructions. Plug the female connector into the P2 (male) connector at the rear of the meter.

Figure 2-2 shows the location of the P2 connector on the meter. Note that this connector shares a common return with the “Display Hold” function.

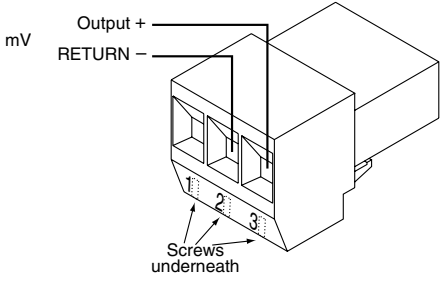


Figure 3-5. Analog Output Connections (P2)

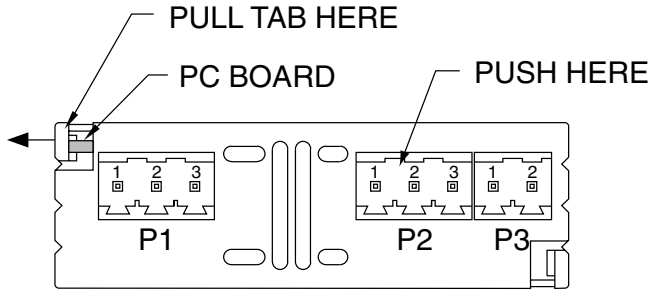


Figure 3-9. Removing the PC Board from the Case

When re-installing the printed circuit board:

1. Hold the case (with the two mounting holes facing upwards and to the right side of the case) in the left hand.
2. Hold the printed circuit board with the components showing (soldered side down) in the right hand.
3. Slip the component board into the case and slide in as far as it will go. You will also have to release the tab at the rear on the other side of the case (turn case over) to allow the board to fit all the way inside the case.
4. Go through steps 3 thru 5 in Section 3.3 in order to re-install the mounting clamp, screws, and lens.

3.8 Disassembly/Assembly

Note

You must go through the following steps in order to remove the printed circuit board from the case if you want to change from 115 Vac to 230 Vac (or vice versa) or to change from Fahrenheit to Celsius (or vice versa). These changes must be performed by a qualified technician in order to avoid damage to the unit.

WARNING: Do not connect ac power to your meter until you have completed all input and output connections. Failure to do so may result in injury!

1. Remove power and all wire connections from the unit.
2. Unplug the three connectors (P1, P2, and P3) from the back of the meter. Grasp them firmly on the top and bottom of the connector and pull. **Figure 3-9** shows the location of the three connectors.
3. Remove the lens, mounting screws, and mounting clamp from the unit as described in steps 1 and 2 in Section 3. Slide the unit out of the panel (if it is installed in a panel).
4. The printed circuit board is held in place by a tab and notch system located next to the P1 connector, pin 1 (refer to **Figure 3-9**). The tab is on the case and the notch is on the edge of the PC Board. Hold the meter with the display facing away from you. Gently pry the tab (on the back corner of the case) out with the edge of your finger, while pushing the back of the PC Board out through the front of the meter. The PC Board will slide out the front, free from the case.

3.6 Display Hold Connections

The “Display Hold” function can be used to freeze the display. Connect a single pole, single throw (SPST) switch between pins 1 and 2 on the P2 connector. The display will stop updating when this switch is on. When this switch is off, the display will update itself 2.5 times per second.

To access the “Display Hold” function, attach copper wire to the 3-pin female connector that is supplied with the meter. Refer to **Figure 3-6** for wiring instructions. This connector shares a common return with the Analog Output. Plug the female connector into the P2 connector at the rear of the meter. **Figure 2-2** shows the location of the P2 connector on the meter.

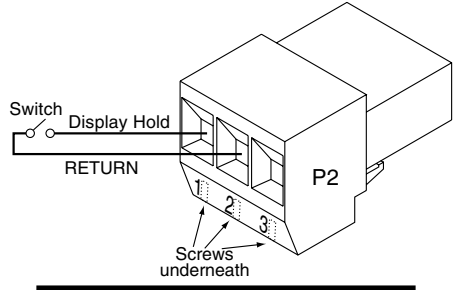


Figure 3-6. Display Hold Connections

3.7 Main Power Connections

Connect the ac main power connections as shown below.

WARNING: Do not connect ac power to your meter until you have completed all input and output connections. Failure to do so may result in injury! This device must only be installed electrically by specially trained electrician with corresponding qualifications. The main power input to the unit as well as the AC input signal to be measured must agree with the wiring instruction.

The meter is factory set to the power specified by the customer at the time of ordering. The voltage is printed on the Label under Input power.

Note Refer to **Section 3-2** to convert from one configuration to another.

To connect power to the unit, attach wires from the ~AC power cord to the orange 3-pin female connector that is supplied with the meter. Refer to **Figure 3-7** for wiring instructions. Plug the female connector into the orange P1 (male) connector at the rear of the meter. **Figure 2–2** shows the location of P1 on the meter.

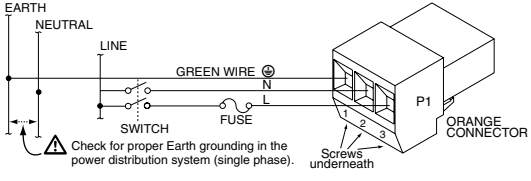


Figure 3-7. ∿AC Connector Wiring (P1)

DC WIRING

The meter can be configured at the factory to operate on a 9–26 Vdc non-isolated power. The DC voltage option is specified at the time of ordering. See **Table 1-3** for model number listing. An AC powered meter cannot be converted to a DC powered meter or vice versa.

To connect power to the unit, attach the DC power wires to the orange 3-pin female connector that is supplied with the meter. Refer to **Figure 3-8** for wiring instructions. Plug the female connector into the orange P1 (male) connector at the rear of the meter. **Figure 2-2** shows the location of P1 on the meter.

Note -TC input (P3-1) is internally connected to 9–26 Vdc –DC Return (P1-1), therefore, it is recommended that an ungrounded thermocouple probe be used to prevent ground problems.

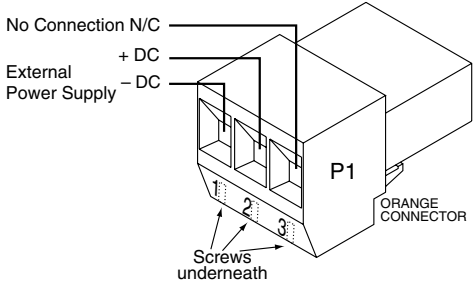


Figure 3-8. =DC Power Connector Wiring (P1)

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