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OMEGA...Of Course!

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• Load Cells & Pressure Gauges
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• Cartridge & Strip Heaters
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• Air, Soil & Water Meters
• Industrial Water & Wastewater Treatment
• pH, Conductivity & Dissolved Oxygen Instruments

DP24-T
Thermocouple Meter
3.4.8 Meter Dimensions

Figure 3.6 — Meter Dimensions
List of Figures

<table>
<thead>
<tr>
<th>Figure</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>5</td>
</tr>
<tr>
<td>1.3</td>
<td>7</td>
</tr>
<tr>
<td>1.8</td>
<td>9</td>
</tr>
<tr>
<td>3.1</td>
<td>21</td>
</tr>
<tr>
<td>3.2</td>
<td>22</td>
</tr>
<tr>
<td>3.3</td>
<td>25</td>
</tr>
<tr>
<td>3.4</td>
<td>25</td>
</tr>
<tr>
<td>3.5</td>
<td>27</td>
</tr>
<tr>
<td>3.6</td>
<td>30</td>
</tr>
</tbody>
</table>

List of Tables

<table>
<thead>
<tr>
<th>Table</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>8</td>
</tr>
<tr>
<td>2.1</td>
<td>11</td>
</tr>
<tr>
<td>2.2</td>
<td>12</td>
</tr>
<tr>
<td>3.1</td>
<td>23</td>
</tr>
<tr>
<td>3.2</td>
<td>26</td>
</tr>
</tbody>
</table>

### DEFAULTS & SPECIFICATIONS

#### 3.4.4 Resolution

- 0.1" or 1" resolution

#### 3.4.5 Power

- 115 or 230 Vac
- ±15% (2 Watt max.)
- Frequency: 50 or 60Hz
- Isolation: 354V peak per IEC spacing
  - NMR 60dB
  - CMR 120 dB

- DC voltage: 10-32Vdc isolated to 300Vp

#### 3.4.6 Environmental

- Operating temp: 0–60°C
- Storage temp: -40 to +35°C
- Relative humidity: 95% at 40°C (non-condensing)

#### 3.4.7 Case

- DIN 4886-100
- Panel cutout: 1.77 X 3.62 in (45 X 92mm)
- Depth behind bezel: 3.94 in (100mm)
- Material: 94V-0 UL-rated polycarbonate
3.4 Specifications

3.4.1 General Specifications

- Input type: Type J, K, T, E, N, R, S
- Max Error: ±1 deg C (±1.8 °F)
- Accuracy at 25°C: ±0.5 deg C (±0.8°C for DINJ)
- Cold-junction compensation tempco: 0.07°C/C

3.4.2 Display

- Type: 7 segments, red or green, 4 digit
- Height: 0.56 in (14.2 mm)

3.4.3 Thermocouple Types

<table>
<thead>
<tr>
<th>Type</th>
<th>Range</th>
<th>Deg C</th>
<th>DegF</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>-210</td>
<td>-345</td>
<td>-370</td>
</tr>
<tr>
<td></td>
<td>750</td>
<td>1400</td>
<td></td>
</tr>
<tr>
<td>DIN J</td>
<td>-200</td>
<td>-328</td>
<td>-352</td>
</tr>
<tr>
<td></td>
<td>900</td>
<td>1650</td>
<td></td>
</tr>
<tr>
<td>K</td>
<td>-270</td>
<td>-454</td>
<td>-496</td>
</tr>
<tr>
<td></td>
<td>1372</td>
<td>2500</td>
<td></td>
</tr>
<tr>
<td>T</td>
<td>-270</td>
<td>-454</td>
<td>-496</td>
</tr>
<tr>
<td></td>
<td>400</td>
<td>752</td>
<td></td>
</tr>
<tr>
<td>E</td>
<td>-270</td>
<td>-454</td>
<td>-496</td>
</tr>
<tr>
<td></td>
<td>1000</td>
<td>1832</td>
<td></td>
</tr>
<tr>
<td>R/S</td>
<td>-50</td>
<td>-58</td>
<td></td>
</tr>
<tr>
<td></td>
<td>1758</td>
<td>3214</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>-270</td>
<td>-454</td>
<td>-496</td>
</tr>
<tr>
<td></td>
<td>1300</td>
<td>2372</td>
<td></td>
</tr>
</tbody>
</table>
Setup

Warning!

Inspect the container and equipment for signs of damage as soon as you receive the shipment. Note any evidence of rough handling in transit. Immediately report any damage to the shipping agent. The carrier will not honor damage claims unless all shipping material is saved for inspection. After examining and removing the contents, save the packing material and carton in the event reshipment is necessary.

1.1.3 What You Will Need

In addition to the meter and connectors, you will need the following items to setup your unit:

- 115VAC three-prong power cord
- 1/8" flat head screwdriver

Figure 3.5 — S51-S4 Jumpers
### 3.3 S51, S4 Jumpers

The S51 Jumper is at the front of the meter near the digital display. The S4 Jumpers is on the side of the main board (see Figure 3.5). (Defaults are in bold and italic.)

1. Disconnect the main power from the meter.
2. Remove the front lens, if present.
3. Pull the meter forward, out of its case.

<table>
<thead>
<tr>
<th>Jumper</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>S51</td>
<td><strong>installed:</strong> front panel buttons locked out <strong>removed:</strong> all buttons operable. Jumper placed in storage position on one PIN only.</td>
</tr>
<tr>
<td>S4</td>
<td><strong>installed:</strong> calibration enabled <strong>removed:</strong> calibration disabled. Jumper placed in storage position on one PIN only.</td>
</tr>
</tbody>
</table>

*Table 3.2 — S51-S4 Jumpers*

### 1.2 Features and Options

#### 1.2.1 Basic Features

Your meter has several basic features, some of which are listed below. For more detailed information on specifications and factory defaults, see *Part 3: Defaults & Specifications*.

- 4 digit, 7 segment LED display with programmable decimal point
- Nonvolatile memory — no battery backup necessary
- 115Vac or 230Vac 50/60 Hz power source

#### 1.2.2 DP24-T Options

The DP24-T unit is available with an optional NEMA-4 front panel cover. Please contact Omega Customer Service for a list of additional products and accessories.
1.3 Safety Considerations

The DP24-T is protected in accordance with Class II of IEC 348 and VDE 0411. Remember that the unit has no power-on switch. It will be in operation as soon as you connect it to a power source.

**Warning!**

Do not expose the unit to rain or moisture. Do not operate your unit in flammable or explosive atmospheres. As with any electronic instrument, you may encounter high voltage exposure when installing, calibrating, or removing parts. Be careful when working near conductors carrying large currents. Use twisted-pair connections to the unit. Use magnetic shielding materials, or move the unit away from the current source to reduce magnetic field problems. Do not exceed power rating on label located on the top of the controller housing. **Failure to follow all instructions and warnings may result in injury!**

---

*Figure 3.3 — 115Vac Jumpers (Default)*

*Figure 3.4 — 230Vac Jumpers*
3.2 Main Board AC Power Jumpers

To check voltage jumpers, or to change from 115 V to 230 Vac:

1. Disconnect the AC power from the meter.
2. Remove the front lens, if present.
3. Pull the meter forward, out of its case.

1.4 Getting Started

Follow these steps to start using your unit right away:

- Mount the unit
- Connect Sensor Input
- Connect the AC power cord
- Turn on the unit

1.4.1 Mount the Unit

1. Remove the two nuts at the back of the unit, which hold the mounting sleeve. Remove the sleeve.

2. Cut a hole in your panel, as shown.

Figure 1.1 — Panel Cut-out Dimensions
3. Insert the unit into the hole. Be sure the front bezel is flush to your panel. Slide on the mounting sleeve from the rear of the panel and tighten the unit until snug, using the two nuts.

### Defaults & Specifications

<table>
<thead>
<tr>
<th>Connector</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>J1-1</td>
<td>AC high connection (NC on DC-powered units)</td>
</tr>
<tr>
<td>J1-2</td>
<td>AC low connection (+ input on DC-powered units)</td>
</tr>
<tr>
<td>J1-3</td>
<td>AC ground (DC-power return or DC-powered units)</td>
</tr>
<tr>
<td>J2-1</td>
<td>Display hold input (active low) — connect to J2-2 to hold meter reading. <strong>Peak and valley readings are continuously updated during display hold even though display is on hold.</strong></td>
</tr>
<tr>
<td>J2-2</td>
<td>Ground</td>
</tr>
<tr>
<td>J2-3</td>
<td>Display blank input (active low) — connect to J2-2 to blank meter display.</td>
</tr>
<tr>
<td>J4-1</td>
<td>+ TC input</td>
</tr>
<tr>
<td>J4-2</td>
<td>- TC input (red wire)</td>
</tr>
</tbody>
</table>

*Table 3.1 — Connector Descriptions*
3 DEFAULTS & SPECIFICATIONS

Figure 3.2 — Connectors (dc-powered)

1.4.2 Connect Sensor Input

Figure 1.3 — Thermocouple Input Connection
1  SETUP

1.4.3  Connect the AC Power Cord

1. Locate the connector pins. (see Figure 3.1)

Warning!

Do not connect AC power to your unit until all input and output connections have been properly established. Failure to do so may result in injury.

2. Insert the correct wire in each terminal and tighten the lockdown screw. See Table 1.1 for wire color definitions. Tug gently on the wires to verify that the connections are secure.

<table>
<thead>
<tr>
<th>Connection</th>
<th>Europe</th>
<th>USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC-High</td>
<td>Brown</td>
<td>Black</td>
</tr>
<tr>
<td>AC-Low</td>
<td>Blue</td>
<td>White</td>
</tr>
<tr>
<td>AC -Ground</td>
<td>Green/Yellow</td>
<td>Green</td>
</tr>
</tbody>
</table>

Table 1.1 — AC Power Wire Color & Connections

3  DEFAULTS & SPECIFICATIONS

3.1 Back of the Meter

Figures 3.1 and 3.2 show the connectors on the back of the meter for ac and dc models respectively. Table 3.1 gives a brief description of each connector at the back of the meter.

Figure 3.1 — Connectors (ac-powered)
5. Apply 75 mV to input terminals at J4. Let meter stabilize for 10 seconds then press MIN to accept. Meter will display:

$\emptyset \text{ In}$ (40 mV zero reading)

6. Apply 0 mV to input terminals at J4. Let meter stabilize for 10 seconds then press MIN to accept. Meter will display:

$40 \text{ In}$

7. Apply 40 mV to input terminals at J4. Let meter stabilize for 10 seconds then press MIN to accept.

8. Meter will briefly display $r 5k$ indicating the span calibration is saved in non-volatile memory.

---

1.4.4 Turn On the Unit

1. Plug the unit into a properly grounded 115V power supply. The unit will initialize, scrolling the following three messages on the front panel:

- $\text{IdE}$

- $\text{codE}$

- $r 01$

($r 01$ equals the revision code of the micro controller. Keep track of the revision code for future reference.)

2. The present value of the Thermocouple should be displayed. If a value is not displayed, follow these steps:
   - Unplug the unit
   - Verify the power and TC connections
   - Check your power source
   - Plug the unit in again
2.1 Introduction

The DP24-T has two different modes of operation. The first, Run Mode, is used to display process value and display or clear peak and valley values. The other mode, Configuration Mode, is used to navigate through the menu options and configure the meter.

The S51 jumper must be removed (which is the factory setting) and the S4 jumper must be installed (which is not the factory setting) for all menu configuration options to be available. (See page 34 for further jumper information.)

This part of the manual, Operation, will explain both the Run Mode and the Configuration Mode and is divided into the following sections:
- Meter Buttons
- Display Descriptions
- Menu Configurations

---

**Operation**

This menu item will allow you to adjust the SPAN calibration used by the meter.

1. Press MENU until meter flashes:

   \[ \text{CAL} \]

2. Press \( \uparrow / \text{MIN} \) button. Meter will now display:

   \[ \text{SP} \text{CAL} \]

   (Span Calibration)

3. Press \( \downarrow / \text{MAX} \) button. Meter will display:

   \[ \text{In} \]

4. Apply 0 mV to input terminals 1 and 2 of J4. Let meter stabilize for 10 seconds then press MIN to accept. Meter will display:

   \[ \text{75 In} \]
2.4.5 Calibration Menu

**Caution:** It is not necessary to calibrate a brand new meter, it arrives completely calibrated. Accessing the calibration menu will affect the meter’s calibration and should only be performed by qualified personnel with accurate test equipment.

2.4.5.1 Meter SPAN calibration procedure

This item will only be available if the S4 jumper, which enables the calibration configuration, is installed!

The Span calibration does not require any special compensated thermocouple wires at the input terminals. Standard copper wire hooked up to a mV calibration source is required.

## 2.2 Meter Buttons

<table>
<thead>
<tr>
<th>Button</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>RESET</td>
<td>Reset the peak and valley values</td>
</tr>
<tr>
<td>MENU</td>
<td>Enter Configuration (Menu) mode</td>
</tr>
<tr>
<td>▲/MIN</td>
<td>Display the valley value (flashing)</td>
</tr>
<tr>
<td>▲/MAX</td>
<td>Display the peak value (flashing)</td>
</tr>
<tr>
<td>C/F</td>
<td>Toggle display between °C and °F</td>
</tr>
</tbody>
</table>

*Table 2.1 — Button Functions*
2.3 Display Descriptions

<table>
<thead>
<tr>
<th>Display Message</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>uuuuu</td>
<td>Peak value to follow</td>
</tr>
<tr>
<td>uuuuu</td>
<td>Valley value to follow</td>
</tr>
<tr>
<td>dl</td>
<td>Open thermocouple input</td>
</tr>
<tr>
<td>rs</td>
<td>Peak/Valley Reset</td>
</tr>
</tbody>
</table>

Table 2.2 — Display Descriptions

2.4 Menu Configurations

2.4.1 Selecting the Input Thermocouple Type

The DP24-T is designed to handle up to eight different thermocouple types. To select the thermocouple type, follow these steps:

1. Press the M@NU button. The meter will momentarily displays:

2.4.4 Line Frequency Selection

This item will only be available if the S4 jumper, which enables the calibration configuration, is installed!

This menu item will allow you to select the local line frequency used by the meter.

1. Press M@NU until display displays:

   LinE

2. After a moment the display will indicate the currently selected line frequency.

3. Pressing the \MN button allows you to toggle between these choices:

   50H (50 Hz)

   60H (60 Hz)

4. Press the M@NU button to save and activate your selection.
This automatic cold junction calibration should be all that is necessary to calibrate the CJ offset, however if you want to additionally adjust the offset manually, the \(\text{\textup{\textgreater}}\text{/MIN}\) and \(\text{\textup{\textless}}\text{/MIN}\) buttons at this point can be used to manually increase (\(\text{\textup{\textgreater}}\text{/MAX}\)) or decrease (\(\text{\textup{\textless}}\text{/MIN}\)) the display 0.1\(^\circ\) each time \(\text{\textup{\textgreater}}\text{/MAX}\) or \(\text{\textup{\textless}}\text{/MIN}\) is pressed. After each press allow several seconds to let the display stabilize. Press MENU to save and activate the calibration. (Meter will briefly display \(\text{\textup{\textgreater}}\text{or}\text{/MIN}\).)

The following menu items will only be available with S4 installed.

- **CFG** \(cF=0\) DEFAULT
- **CFG** \(cF=1,2\) Functions not available
- **LINE** 50H 60H 60H DEFAULT
- **CAL** = For use only by qualified personal with accurate calibration equipment

---

### 2.4.2 Selecting the Decimal Point

The DP24-T can display temperatures in 1\(^\circ\) or 0.1\(^\circ\) resolution. **When using type R or S the meter will only be indicating with 1\(^\circ\) resolution. The \(\text{\textup{\textgreater}}\text{DEC}\) menu item will not be available for these two types of thermocouples.**

1. Press MENU until display displays: 

\[\text{\textup{\textless}}\text{DEC}\]
2. After a moment the display will indicate the currently selected decimal point (resolution) configuration.

3. \texttt{AUT} will be displaced if the meter is configured to display any temperature between -100° and 1000° with 0.1 resolution (meter will switch to 1° resolution above and below these temperatures automatically.)

4. \texttt{deg} will be displayed when the meter is configured for 1° resolution.

5. Pressing the \texttt{UP}/\texttt{MIN} button allows you to toggle between these choices:
   \[
   \begin{align*}
   \texttt{AUT} & \quad (0.1°/1°) \\
   \texttt{deg} & \quad (1°) \text{ resolution}
   \end{align*}
   \]

6. Press the \texttt{MENU} button to save and activate your selection.

---

2.4.3 Meter Cold-Junction Offset Calibration procedure

This menu item will allow you to adjust the cold junction offset calibration.

1. Press \texttt{MENU} until meter flashes:
   \[
   \texttt{c.j.} \quad 2 \quad \text{(cold junction zero)}
   \]

2. \textbf{Connect the proper thermocouple to the input at J4 and using a thermocouple calibrator apply 0.0°C.}

3. Press \texttt{UP}/\texttt{MAX} to display the cold-junction offset. (If the meter reading at this point is more than 5.0 recheck your Thermocouple connections and make sure 0.0°C is applied.)

4. The Cold-junction calibration on the DP24-T is semi-automatic. Press \texttt{UP}/\texttt{MENU} to activate the internal compensation. The display will begin to flash and automatically adjust the offset reading on the display to 0.0 (± 0.1)