User’s Guide

DP63000A-T
DP63000B-T
Digital Panel Meter
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It is the policy of OMEGA Engineering, Inc. to comply with all worldwide safety and EMC/EMI regulations that apply. OMEGA is constantly pursuing certification of its products to the European New Approach Directives. OMEGA will add the CE mark to every appropriate device upon certification.

The information contained in this document is believed to be correct, but OMEGA accepts no liability for any errors it contains, and reserves the right to alter specifications without notice.

WARNING: These products are not designed for use in, and should not be used for, human applications.
GENERAL DESCRIPTION
The DP63000 provides the user the ultimate in flexibility, from its complete user programming to the optional setpoint control and communication capability. This unit accepts a thermocouple input and provides a temperature display in Celsius or Fahrenheit. The meter also features minimum and maximum display capture, display offset, °F or °C indicator, and programmable user input. The display can be toggled either manually or automatically between the selected displays.
The DP63000 display has 0.48" (12.2 mm) high digits. The LCD is available in two versions, reflective and red/green backlight. The backlight version is user selectable for the desired color and also has variable display intensity.
The capability of the DP63000 can be easily expanded with the addition of option modules. Setpoint capability is field installable with the addition of the setpoint output modules. Serial communications capability for RS232 or RS485 is added with a serial option module.
The DP63000 can be powered from an optional Power Supply (Model Number DP6-MLPS1), that attaches directly to the back of a DP63000. The DP6-MLPS1 is powered from 85 to 250 VAC and provides up to 400 mA to drive the unit and sensors.

SAFETY SUMMARY
All safety related regulations, local codes and instructions that appear in this literature or on equipment must be observed to ensure personal safety and to prevent damage to either the instrument or equipment connected to it. If equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.
Do not use this meter to directly command motors, valves, or other actuators not equipped with safeguards. To do so can be potentially harmful to persons or equipment in the event of a fault to the meter.

CAUTION: Risk of Danger.
Read complete instructions prior to installation and operation of the unit.

CAUTION: Risk of electric shock.

DIMENSIONS In inches (mm)
Note: Recommended minimum clearance (behind the panel) for mounting clip installation is 2.15" (54.6) H x 3.00" (76.2) W.

PART NUMBER INFORMATION

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>PART NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermocouple Input Meter with reflective display</td>
<td>DP63000A-T</td>
</tr>
<tr>
<td>Thermocouple Input Meter with backlight display</td>
<td>DP63000B-T</td>
</tr>
<tr>
<td>Single Relay Output Card</td>
<td>DP6-RLY0</td>
</tr>
<tr>
<td>Dual Sinking Open Collector Output card</td>
<td>DP6-SNK0</td>
</tr>
<tr>
<td>RS485 Serial Communications Card</td>
<td>DP6-COM1</td>
</tr>
<tr>
<td>RS232 Serial Communications Card</td>
<td>DP6-COM2</td>
</tr>
<tr>
<td>Micro-Line Power Supply, 85 to 250 VAC</td>
<td>DP6-MLPS1</td>
</tr>
<tr>
<td>RS232 Programming Cable (DB9-RJ11)</td>
<td>DP6-232-CABLE</td>
</tr>
<tr>
<td>RS485 Programming Cable (DB9-RJ11)</td>
<td>DP6-485-CABLE</td>
</tr>
<tr>
<td>PC Configuration Software for Windows 98, ME, 2000, XP *</td>
<td>DP6-SOFT</td>
</tr>
</tbody>
</table>
GENERAL METER SPECIFICATIONS

1. DISPLAY: 5 digit LCD 0.48” (12.2 mm) high digits
DP63000A-T: Reflective LCD with full viewing angle
DP63000B-T: Transmissive LCD with selectable red or green LED backlight, viewing angle optimized. Display color change capability with output state when using an output module.

2. POWER: Input voltage range is +9 to +28 VDC with short circuit and input polarity protection. Must use a DP6-MLPS1 or an NEC Class 2 or SELV rated power supply.

<table>
<thead>
<tr>
<th>MODEL NO.</th>
<th>DISPLAY COLOR</th>
<th>INPUT CURRENT @ 9 VDC WITHOUT DP6-RLY0</th>
<th>INPUT CURRENT @ 9 VDC WITH DP6-RLY0</th>
</tr>
</thead>
<tbody>
<tr>
<td>DP63000A-T</td>
<td>---</td>
<td>10 mA</td>
<td>40 mA</td>
</tr>
<tr>
<td>DP63000B-T</td>
<td>Red (max intensity)</td>
<td>85 mA</td>
<td>115 mA</td>
</tr>
<tr>
<td>DP63000B-B-T</td>
<td>Green (max intensity)</td>
<td>95 mA</td>
<td>125 mA</td>
</tr>
</tbody>
</table>

3. READOUT:
Resolution: 1 or 0.1 degrees
Scale: °F or °C
Offset Range: -999 to 9999 display units

4. THERMOCOUPLE INPUTS:
Isolation: TC+ and TC- terminals are not electrically isolated from the power supply or optional comms cards.
Response Time: 500 msec.
Open Sensor Display: OPEN
Overrange/Underrange Input: DLUL/ULUL
Overrange/Underrange Display: ”...”/”...”
Maximum Input Voltage: 30 VDC, TC+ to TC-
Maximum Input Voltage TC+: 3 VDC max. with respect to common

<table>
<thead>
<tr>
<th>TC TYPE</th>
<th>RANGE</th>
<th>ACCURACY @ 23°C °C</th>
<th>ACCURACY @ -35 to 75°C °C</th>
<th>WIRE COLOR</th>
</tr>
</thead>
<tbody>
<tr>
<td>T</td>
<td>-200 to 400°C -328 to 752°F</td>
<td>2.3</td>
<td>5.8</td>
<td>(+) blue (-) red (+) white (-) blue</td>
</tr>
<tr>
<td>E</td>
<td>-200 to 871°C -328 to 1600°F</td>
<td>2.7</td>
<td>4.9</td>
<td>(+) purple (-) red (+) brown (-) blue</td>
</tr>
<tr>
<td>J</td>
<td>-200 to 780°C -328 to 1400°F</td>
<td>1.9</td>
<td>4.3</td>
<td>(+) white (-) red (+) yellow (-) blue</td>
</tr>
<tr>
<td>K</td>
<td>-200 to 1372°C -328 to 2502°F</td>
<td>2.3</td>
<td>5.8</td>
<td>(+) yellow (-) red (+) brown (-) blue</td>
</tr>
<tr>
<td>R</td>
<td>-50 to 1768°C -58 to 3214°F</td>
<td>4.5</td>
<td>15.0</td>
<td>no standard (+) white (-) blue</td>
</tr>
<tr>
<td>S</td>
<td>-50 to 1768°C -58 to 3214°F</td>
<td>4.5</td>
<td>15.0</td>
<td>no standard (+) white (-) blue</td>
</tr>
<tr>
<td>B</td>
<td>200 to 1820°C 392 to 3308°F</td>
<td>9.1 to 540°C 4.5 to 540°C 42.6 to 540°C</td>
<td>no standard no standard no standard</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>-200 to 1300°C -328 to 2372°F</td>
<td>2.8</td>
<td>8.1</td>
<td>(+) orange (-) red (+) orange (-) blue</td>
</tr>
<tr>
<td>mV</td>
<td>-10.00 to 65.00</td>
<td>0.02 mV</td>
<td>0.08 mV</td>
<td>no standard no standard no standard</td>
</tr>
</tbody>
</table>

*After 20 min. warm-up. Accuracy is specified in two ways: Accuracy at 23°C and 15 to 75% RH environment; and Accuracy over a -35 to 75°C and 0 to 85% RH (non condensing) environment. Accuracy specified over the -35 to 75°C operating range includes meter tempco and cold junction tracking effects. The specification includes the A/D conversion errors, linearization conformity, and thermocouple cold junction compensation. Total system accuracy is the sum of meter and probe errors. Accuracy may be improved by field calibrating the meter readout at the temperature of interest.

5. USER INPUT (USR): Programmable input. Connect terminal to common (USR COMM) to activate function. Internal 10kΩ pull-up resistor to +9 to 28 VDC.
Threshold Levels: VIL = 1.0 V max; VIH = 2.4 V min; VMAX = 28 VDC
Response Time: 5 msec typ.; 50 msec debounce (activation and release)

6. CERTIFICATIONS AND COMPLIANCEs:
 SAFETY
UL Recognized Component, File #E313607, UL61010A-1, CSA C22.2 No. 61010-1
Recognized to U.S. and Canadian requirements under the Component Recognition Program of Underwriters Laboratories, Inc.
UL Listed, File # E313547, UL508, CSA C22.2 No. 14-M95
LISTED by Und. Lab. Inc. to U.S. and Canadian safety standards
Type 4X Indoor Enclosure rating (Face only), UL50

IEC 61010-1, EN 61010-1: Safety requirements for electrical equipment for measurement, control, and laboratory use, Part 1.
IP65 Enclosure rating (Face only), IEC 529

ELECTROMAGNETIC COMPATIBILITY
Emissions and Immunity to EN 61326: Electrical Equipment for Measurement, Control and Laboratory use.

Immunity to Industrial Locations:
- Electrostatic discharge EN 61000-4-2 Criterion A 4 kV contact discharge
- Electromagnetic RF fields EN 61000-4-3 Criterion A 8 kV air discharge
- Fast transients (burst) EN 61000-4-4 Criterion A 10 V/m
- Surge EN 61000-4-5 Criterion A 2 kV power
- RF conducted interference EN 61000-4-6 Criterion A 1 kV L-L,
- Power frequency magnetic fields EN 61000-4-8 Criterion A 2 kV L&N-E power
- Emissions: EN 55011 Class A

Note:
2. MEMORY: Nonvolatile E2PROM memory retains all programming parameters and max/min values when power is removed.
3. CONNECTIONS: Wire clamping screw terminals
- Wire Strip Length: 0.3” (7.5 mm)
- Wire Gage: 30-14 AWG copper wire
- Torque: 5 inch-lbs (0.565 N-m) max.
4. ENVIRONMENTAL CONDITIONS:
- Operating Temperature Range for DP63000B-T depends on display color and intensity level as per below:

<table>
<thead>
<tr>
<th>INTENSITY LEVEL</th>
<th>TEMPERATURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Red Display</td>
<td>1 &amp; 2</td>
</tr>
<tr>
<td></td>
<td>-35 to 75°C</td>
</tr>
<tr>
<td></td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>-35 to 70°C</td>
</tr>
<tr>
<td></td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>-35 to 60°C</td>
</tr>
<tr>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>-35 to 50°C</td>
</tr>
<tr>
<td></td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>-35 to 55°C</td>
</tr>
</tbody>
</table>

- Green Display
|                | 1 & 2       |
|                | -35 to 75°C |
|                | 3           |
|                | -35 to 70°C |
|                | 4           |
|                | -35 to 60°C |
|                | 5           |
|                | -35 to 50°C |

Storage Temperature: -35 to 85°C
Operating and Storage Humidity: 0 to 85% max. relative humidity (non-condensing)

Altitude: Up to 2000 meters
10. CONSTRUCTION: This unit is rated for NEMA 4X/IP65 requirements for indoor use. Installation Category I, Pollution Degree 2. High impact plastic case with clear viewing window. Panel gasket and mounting clip included.
11. WEIGHT: 3.2 oz (100 g)
### Optional Plug-in Cards

#### Adding Option Cards
The DP63000 meters can be fitted with optional output cards and/or serial communications cards. The details for the plug-in cards can be reviewed in the specification section below. The plug-in cards, that are sold separately, can be installed initially or at a later date.

**WARNING:** Disconnect all power to the unit before installing Plug-in card.

#### Single Relay Card
- **Type:** Single FORM-C relay
- **Isolation To Sensor & User Input Commons:** 1400 Vrms for 1 min.
- **Working Voltage:** 150 Vrms
- **Contact Rating:** 1 amp @ 30 VDC resistive; 0.3 amp @ 125 VAC resistive
- **Life Expectancy:** 100,000 minimum operations
- **Response Time:**
  - Turn On Time: 4 msec max.
  - Turn Off Time: 4 msec max.

#### Dual Sinking Output Card
- **Type:** Non-isolated switched DC, N Channel open drain MOSFET
- **Current Rating:** 100 mA max.
- **$V_{DS\,ON}$:** 0.7 V @ 100 mA
- **$V_{DS\,MAX}$:** 30 VDC
- **Offstate Leakage Current:** 0.5 mA max.

#### RS485 Serial Communications Card
- **Type:** RS485 multi-point balanced interface (non-isolated)
- **Note:** Non-grounded (isolated) thermocouple probes must be used when multiple units are connected in an RS485 network, or measurement errors will occur.
- **Baud Rate:** 300 to 38.4k
- **Data Format:** 7/8 bits; odd, even, or no parity
- **Bus Address:** 0 to 99; max 32 meters per line
- **Transmit Delay:** Selectable (refer to DP6-COM bulletin)

#### RS232 Serial Communications Card
- **Type:** RS232 half duplex (non-isolated)
- **Baud Rate:** 300 to 38.4k
- **Data Format:** 7/8 bits; odd, even, or no parity

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### 1.0 Installing the Meter

#### Installation
The meter meets NEMA 4X/IP65 requirements when properly installed. The unit is intended to be mounted into an enclosed panel. Prepare the panel cutout to the dimensions shown. Remove the panel latch from the unit. Slide the panel gasket over the rear of the unit to the back of the bezel. The unit should be installed fully assembled. Insert the unit into the panel cutout.

While holding the unit in place, push the panel latch over the rear of the unit so that the tabs of the panel latch engage in the slots on the case. The panel latch should be engaged in the farthest forward slot possible. To achieve a proper seal, tighten the latch screws evenly until the unit is snug in the panel (Torque to approx. 28 to 36 in-oz [0.202 to 0.26 N-m]). Do not over-tighten the screws.

#### Installation Environment
The unit should be installed in a location that does not exceed the operating temperature and provides good air circulation. Placing the unit near devices that generate excessive heat should be avoided.

The bezel should only be cleaned with a soft cloth and neutral soap product. Do NOT use solvents. Continuous exposure to direct sunlight may accelerate the aging process of the bezel.

Do not use tools of any kind (screwdrivers, pens, pencils, etc.) to operate the keypad of the unit.
WIRING OVERVIEW
Electrical connections are made via screw-clamp terminals located on the back of the meter. All conductors should conform to the meter’s voltage and current ratings. All cabling should conform to appropriate standards of good installation, local codes and regulations. It is recommended that the power supplied to the meter (DC or AC) be protected by a fuse or circuit breaker.

Strip the wire, leaving approximately 0.3” (7.5 mm) bare lead exposed (stranded wires should be tinned with solder.) Insert the lead under the correct screw-clamp terminal and tighten until the wire is secure. (Pull wire to verify tightness.) Each terminal can accept up to one #14 AWG (2.55 mm), two #18 AWG (1.02 mm), or four #20 AWG (0.61 mm).

EMC INSTALLATION GUIDELINES
Although this meter is designed with a high degree of immunity to Electro-Magnetic Interference (EMI), proper installation and wiring methods must be followed to ensure compatibility in each application. The type of the electrical noise, source or coupling method into the meter may be different for various installations. The meter becomes more immune to EMI with fewer I/O connections. Cable length, routing, and shield termination are very important and can mean the difference between a successful or troublesome installation.

1. The meter should be mounted in a metal enclosure, which is properly connected to protective earth.
2. Use shielded (screened) cables for all Signal and Control inputs. The shield (screen) pigtail connection should be made as short as possible. The connection point for the shield depends somewhat upon the application. Listed below are the recommended methods of connecting the shield, in order of their effectiveness.
   a. Connect the shield only at the panel where the unit is mounted to earth ground (protective earth).
   b. Connect the shield to earth ground at both ends of the cable, usually when the noise source frequency is above 1 MHz.
   c. Connect the shield to common of the meter and leave the other end of the shield unconnected and insulated from earth ground.
3. Never run Signal or Control cables in the same conduit or raceway with AC power lines, conductors feeding motors, solenoids, SCR controls, and heaters, etc. The cables should be run in metal conduit that is properly grounded. This is especially useful in applications where cable runs are long and portable two-way radios are used in close proximity or if the installation is near a commercial radio transmitter.
4. Signal or Control cables within an enclosure should be routed as far as possible from contactors, control relays, transformers, and other noisy components.
5. In extremely high EMI environments, the use of external EMI suppression devices, such as ferrite suppression cores, is effective. Install them on Signal and Control cables as close to the unit as possible. Loop the cable through the core several times or use multiple cores on each cable for additional protection. Install line filters on the power input cable to the unit to suppress power line interference. Install them near the power entry point of the enclosure. The following EMI suppression devices (or equivalent) are recommended:
   a. Ferrite Suppression Cores for signal and control cables:
      - Fair-Rite # 0443167251
      - TDK # ZCAT3035-1330A
      - Steward # 28B2029-0A0
   b. Line Filters for input power cables:
      - Schaffner # FN610-1/07
      - Schaffner # FN670-1.8/07
      - Corcom # 1 VR3
   Note: Reference manufacturer’s instructions when installing a line filter.
6. Long cable runs are more susceptible to EMI pickup than short cable runs. Therefore, keep cable runs as short as possible.
7. Switching of inductive loads produces high EMI. Use of snubbers across inductive loads suppresses EMI.

3.0 WIRING THE METER

WARNING: Exposed line voltage exists on the circuit boards. Remove all power to the meter and load circuits before accessing inside of the meter.

CAUTION: The Plug-in cards and main circuit board contain static sensitive components. Before handling the cards, discharge static charges from your body by touching a grounded bare metal object. Ideally, handle the cards at a static controlled clean workstation. Also, only handle the cards by the edges. Dirt, oil or other contaminants that may contact the cards can adversely affect circuit operation.

REMOVING THE REAR COVER
To remove the rear cover, locate the cover locking tab below the 2nd and 3rd input terminals. To release the tab, insert a small, flat blade screwdriver between the tab and the plastic wall below the terminals. Inserting the screwdriver will provide enough pressure to release the tab locks. To replace the cover, align the cover with the input terminals and press down until the cover snaps into place.

The Plug-in cards are separately purchased option cards that perform specific functions. The cards plug into the main circuit board of the meter.
3.1 POWER WIRING

DC Power
+9 to +28 VDC: +VDC
Power Common: -VDC

3.2 USER INPUT WIRING

Sinking Logic
USR COMM Connect external switching device between the USR User Input terminal and User Input Common.

The user input of the meter is internally pulled up to +9 to +28 V with 10 K resistance. The input is active when it is pulled low (<0.7 V).

3.3 INPUT WIRING

Thermocouple

CAUTION: Power input common and sensor input common are NOT isolated from user input common. In order to preserve the safety of the meter application, the power input common and the sensor input common must be suitably isolated from hazardous live earth referenced voltages; or input common must be at protective earth ground potential. If not, hazardous live voltage may be present at the User Inputs and User Input Common terminals. Appropriate considerations must then be given to the potential of the user input common with respect to earth common; and the common of the isolated plug-in cards with respect to input common.

3.4 SETPOINT (OUTPUT) WIRING

SINGLE SETPOINT RELAY PLUG-IN CARD

DUAL SETPOINT N-FET OPEN DRAIN PLUG-IN CARD

ELECTRICAL CONNECTIONS

3.5 SERIAL COMMUNICATION WIRING

SERIAL COMMUNICATIONS PLUG-IN CARD

RJ11 CONNECTOR PIN OUTS
4.0 REVIEWING THE FRONT BUTTONS AND DISPLAY

It is recommended that all programming changes be made off line, or before installation. The meter normally operates in the Display Mode. No parameters can be programmed in this mode. The Programming Mode is entered by pressing and holding the SEL button. If it is not accessible then it is locked by either a security code, or a hardware lock.

OPERATING MODE DISPLAY DESIGNATORS
MAX - Maximum display capture value
MIN - Minimum display capture value

Pressing the SEL button toggles the meter through the selected displays. If display scroll is enabled, the display will toggle automatically every four seconds between the enabled display values.

5.0 PROGRAMMING THE METER

PROGRAMMING THE METER

OVERVIEW

PROGRAMMING MENU

PROGRAMMING MODE ENTRY (SEL BUTTON)

It is recommended that all programming changes be made off line, or before installation. The meter normally operates in the Display Mode. No parameters can be programmed in this mode. The Programming Mode is entered by pressing and holding the SEL button. If it is not accessible then it is locked by either a security code, or a hardware lock.

MODULE ENTRY (SEL & RST BUTTONS)
The Programming Menu is organized into separate modules. These modules group together parameters that are related in function. The display will alternate between the present parameter and the selections/value for that parameter. The SEL button is used to select the desired module. The displayed module is entered by pressing the SEL button.

MODULE MENU (SEL BUTTON)
Each module has a separate module menu (which is shown at the start of each module discussion). The SEL button is pressed to advance to a particular parameter to be changed, without changing the programming of preceding parameters. After completing a module, the display will return to Pr0 NO. Programming may continue by accessing additional modules.

SELECTION / VALUE ENTRY
For each parameter, the display alternates between the present parameter and the selections/value for that parameter. The RST button is used to move through the selections/values for that parameter. Pressing the SEL button, stores and activates the displayed selection/value. This also advances the meter to the next parameter.

For numeric values, press the RST button to access the value. The right hand most digit will begin to flash. Pressing the RST button again increments the digit by one or the user can hold the RST button and the digit will automatically scroll. The SEL button will advance to the next digit. Pressing and holding the SEL button will enter the value and move to the next parameter.

PROGRAMMING MODE EXIT (SEL BUTTON)
The Programming Mode is exited by pressing the SEL button with Pr0 NO displayed. This will commit any stored parameter changes to memory and return the meter to the Display Mode. (If power loss occurs before returning to the Display Mode, verify recent parameter changes.)

PROGRAMMING TIPS
It is recommended to start with Module 1 and proceed through each module in sequence. When programming is complete, it is recommended to record the parameter programming and lock out parameter programming with the user input or programming security code.

FACTORY SETTINGS
Factory Settings may be completely restored in Module 2. This is useful when encountering programming problems.

Pressing both the SEL and the RST button on power-up will also load the factory settings and display rESEt. This allows operation in the event of a memory failure or corrupted data.

ALTERNATING SELECTION DISPLAY
In the explanation of the modules, the following dual display with arrows will appear. This is used to illustrate the display alternating between the parameter on top and the parameter’s Factory Setting on the bottom. In most cases, selections and values for the parameter will be listed on the right.

Indicates Program Mode Alternating Display

Parameter
Factory Settings are shown.
5.1 MODULE 1 - SIGNAL INPUT PARAMETERS (I-IMP)

PARAMETER MENU

<table>
<thead>
<tr>
<th>TYPE</th>
<th>Cold Junction Compensation</th>
<th>SCALE</th>
<th>dECPl</th>
<th>OFSEl</th>
<th>FIlTr</th>
<th>bRNd</th>
<th>USR IN</th>
<th>U-ASN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tc-J</td>
<td>Tc-J</td>
<td>°F</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

**THERMOCOUPLE TYPE**

- **TYPE**: Selection TC TYPE
- **SELECTION**: TC TYPE
  - Tc-T: T
  - Tc-J: J
  - Tc-E: E
  - Tc-K: K
  - Tc-R: R
  - Tc-L: L
  - Tc-V: V

Select the thermocouple type used for the application. The appropriate curve will be automatically loaded for the selected type.

**COLD JUNCTION COMPENSATION**

- **CJC**: YES
- **SHOW**: NO

This parameter enables or disables internal cold junction compensation. For most applications, cold junction compensation should be enabled (YES). This parameter does not appear if TYPE = VOLt.

**TEMPERATURE SCALE**

- **SCALE**: °F °C

Select the temperature scale. This selection applies for the Input, MAX and MIN displays. This parameter does not appear if TYPE = VOLt.

**DISPLAY DECIMAL POINT**

- **dECPl**: 0 0 0

Select the decimal point location for the desired display resolution. This selection applies for the Input, MAX and MIN displays. This parameter does not appear if TYPE = VOLt or for types R, S or B thermocouples which have a fixed 1 degree resolution.

**DISPLAY OFFSET VALUE**

- **OFSEl**: -999 to 9999

The temperature display can be corrected with an offset value. This can be used to compensate for probe errors, errors due to variances in probe placement or adjusting the readout to a reference thermometer.

**FILTER SETTING**

- **FIlTr**: 0 1 2 3

Filter values represent no filtering (0), up to heavy filtering (3). A value of 1 for the filter uses 1/4 of the new input and 3/4 of the previous display to generate the new display. A filter value of 2 uses 1/8 new and 7/8 previous. A filter value of 3 uses 1/16 new and 15/16 previous.

**FILTER BAND**

- **bRNd**: 00 to 99 display units

The filter will adapt to variations in the input signal. When the variation exceeds the input filter band value, the filter disengages. When the variation becomes less than the band value, the filter engages again. This allows for a stable readout, but permits the display to settle rapidly after a large process change.

**USER INPUT FUNCTION**

- **USR IN**: NO

**DISPLAY MODE**

- **NO**: No Function
- **P-Loc**: Program Mode Lock-out
- **rFSEl**: Reset (Edge triggered)
- **d-SEL**: Display Select (Edge Triggered)
- **d-LEU**: Display Intensity Level (Edge Triggered)
- **CLOr**:
  - Pr: Print Request
  - Pr-St: Print and Reset
  - Pr-St-1: Setpoint 1 Reset
  - Pr-St-2: Setpoint 2 Reset
  - Pr-St-12: Setpoint 1 and 2 Reset

**USER INPUT ASSIGNMENT**

- **USR IN**: HI HI-LO
- **dSP**: LO dSP

Select the value(s) to which the User Input Function is assigned. The User Input Assignment only applies if a selection of reset, display hold, or print and reset is selected in the User Input Function menu.
5.2 MODULE 2 - SECONDARY FUNCTION PARAMETERS (2-SEC)

MAX DISPLAY ENABLE

<table>
<thead>
<tr>
<th>MAX Display Enable</th>
<th>NO</th>
<th>YES</th>
</tr>
</thead>
</table>

Enables the Maximum Display Capture capability.

MAX CAPTURE DELAY TIME

<table>
<thead>
<tr>
<th>MAX Capture Delay Time</th>
<th>00 to 9999 sec.</th>
</tr>
</thead>
</table>

When the Input Display is above the present MAX value for the entered delay time, the meter will capture that display value as the new MAX reading. A delay time helps to avoid false captures of sudden short spikes.

MIN DISPLAY ENABLE

<table>
<thead>
<tr>
<th>MIN Display Enable</th>
<th>NO</th>
<th>YES</th>
</tr>
</thead>
</table>

Enables the Minimum Display Capture capability.

MIN CAPTURE DELAY TIME

<table>
<thead>
<tr>
<th>MIN Capture Delay Time</th>
<th>00 to 9999 sec.</th>
</tr>
</thead>
</table>

When the Input Display is below the present MIN value for the entered delay time, the meter will capture that display value as the new MIN reading. A delay time helps to avoid false captures of sudden short spikes.

FACTORY SERVICE OPERATIONS

<table>
<thead>
<tr>
<th>Factory Service Operations</th>
<th>NO</th>
<th>YES</th>
</tr>
</thead>
</table>

Select YES to perform either of the Factory Service Operations shown below.

CALIBRATION

The unit uses stored voltage calibration and cold junction temperature values to provide accurate temperature and voltage measurements. Over time, the electrical characteristics of the components inside the meter could slowly change. The result is that the stored calibration values may no longer accurately define the input circuit. For most applications, recalibration every 1 to 2 years should be sufficient.

Calibration of the unit involves a voltage calibration and a cold junction calibration. It is recommended that both calibrations be performed. The voltage calibration MUST precede the cold junction calibration. Allow 30 minute warm up before performing any calibration related procedure. The following procedures should be performed at an ambient temperature of 15 to 35 °C (59 to 95 °F).

Calibration should only be performed by individuals experienced in calibrating electronic equipment.

CAUTION: The accuracy of the calibration equipment will directly affect the accuracy of the unit.

Input Voltage Calibration
1. Connect a precision DC voltage source with an accuracy of 0.01% or better to the TC+ (positive) and the TC- (negative) terminals of the unit. Set the output of the voltage source to zero.
2. With the display at Cal, press and hold the SEL button for 2 seconds. Unit will display CAL NO.
3. Press the RST button to select YES.
4. Press the SEL button. Display reads CAL NO.
5. With the voltage source set to zero, press SEL. Display reads CAL NO for about eight seconds.
6. When display reads CAL NO, apply 60.000 mV input signal. Press SEL. Display reads CAL NO for about eight seconds.
7. When display reads CAL NO, press SEL twice to exit Module 2 and return to the normal display mode.
8. Proceed to Cold Junction Calibration.

Cold Junction Calibration
1. Install all option cards needed for your application and the rear cover, or invalid results will occur.
2. The ambient temperature must be within 20°C to 30°C.
3. Connect a thermocouple (types T, E, J, K, or N only) with an accuracy of 1°C or better to the meter.
4. Enter programming mode and verify the following settings in Module 1:
   $\text{Thermocouple type connected to the unit}$
   \[ $\text{Thermocouple type connected to the unit}$ \]
   \[ $\text{Thermocouple type connected to the unit}$ \]
5. Place the thermocouple in close thermal contact to a reference thermometer probe. (Use a reference thermometer with an accuracy of 0.25°C or better.) The two probes should be shielded from air movement and allowed sufficient time to equalize in temperature. (A calibration bath of known temperature could be used in place of the thermometer.)
6. Compare the unit display with the reference temperature indicator (or calibration bath). If a difference of more than ±1.0 °C exists, note the difference (CJ error) and continue with cold junction calibration.
7. Compare the unit display with the reference temperature indicator (or calibration bath). If a difference of more than ±1.0 °C exists, note the difference (CJ error) and continue with cold junction calibration.
8. Enter programming mode. Step through Module 2 to the Service Access Code parameter and select YES or NO. Press and hold the SEL button until the unit displays CAL NO.
9. Press the RST button to select YES.
10. Press SEL. Display reads CAL NO followed by the current cold junction value. Calculate a new cold junction value as follows:
   \[ $\text{New cold junction = Current cold junction + CJ Error (noted above)}$ \]

RESTORE FACTORY DEFAULT SETTINGS

Entering Code 66 will overwrite all user settings with the factory settings. The meter will display rEOF and then return to EOF. Press SEL button to exit the module.

Pressing both the SEL and the RST button on power-up will also load the factory settings and display rEOF. This allows operation in the event of a memory failure or corrupted data.
The Security Code determines the programming mode and the accessibility of programming parameters. This code can be used along with the Program Mode Lock-out (P-Loc) in the User Input Function parameter (Module 1).

Two programming modes are available. Full Programming mode allows all parameters to be viewed and modified. Quick Programming mode permits only the Setpoint values to be modified, but allows direct access to these values without having to enter Full Programming mode.

Programming a Security Code other than 0, requires this code to be entered at the Code prompt in order to access Full Programming mode. Depending on the code value, Quick Programming may be accessible before the Code prompt appears (see chart).

5.3 MODULE 3 - DISPLAY AND FRONT PANEL BUTTON PARAMETERS (3-dSP)

**DISPLAY UPDATE TIME**

![dSP-t](image)

As 1 2 seconds

This parameter sets the display update time in seconds.

**FRONT PANEL DISPLAY SELECT ENABLE (SEL)**

![Sel](image)

The YES selection allows the SEL button to toggle through the enabled displays.

**FRONT PANEL RESET ENABLE (RST)**

![Rst](image)

This selection allows the RST button to reset the selected value(s).

**DISPLAY SCROLL ENABLE**

![Scroll](image)

The YES selection allows the display to automatically scroll through the enabled displays. The scroll rate is every 4 seconds.

**DISPLAY COLOR (BACKLIGHT UNIT ONLY)**

![Color](image)

Enter the desired display color, red or green. This parameter is active for backlight units only.

**PROGRAMMING SECURITY CODE**

![Code](image)

Enter the desired Display Intensity Level (1-5). The display will actively dim or brighten as levels are changed. This parameter is active for backlight units only.

**USER INPUT FUNCTION**

<table>
<thead>
<tr>
<th>USER INPUT STATE</th>
<th>SECURITY CODE</th>
<th>MODE WHEN &quot;SEL&quot; BUTTON IS Pressed</th>
<th>FULL PROGRAMMING MODE ACCESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>not P-Loc</td>
<td>0</td>
<td>Full Programming</td>
<td>Immediate Access</td>
</tr>
<tr>
<td></td>
<td>1-99</td>
<td>Quick Programming</td>
<td>After Quick Programming with correct code entry at Code prompt *</td>
</tr>
<tr>
<td></td>
<td>100-999</td>
<td>Code prompt</td>
<td>With correct code entry at Code prompt *</td>
</tr>
</tbody>
</table>

| P-Loc            | 0             | Programming Lock                     | No Access                   |
|                  | 1-99          | Quick Programming                    | No Access                   |
|                  | 100-999       | Code prompt                          | With correct code entry at Code prompt *                              |
| Not Active       | 0-999         | Full Programming                     | Immediate Access            |

* Entering Code 222 allows access regardless of security code.
The Setpoint Output Parameters are only active when an optional output module is installed in the meter.

**SETPOINT SELECT**

Enter the setpoint (output) to be programmed. The n in the following parameters will reflect the chosen setpoint number. After the chosen setpoint is completely programmed, the display will return to SPSEL. Repeat steps for each setpoint to be programmed. Select NO to exit the module. The number of setpoints available is setpoint output card dependent.

**SETPOINT 2 ENABLE**

Select YES to enable Setpoint 2 and access the setup parameters. If NO is selected, the unit returns to SPSEL and setpoint 2 is disabled.

**SETPOINT ACTION**

Enter the action for the selected setpoint (output). See Setpoint Output Figures for a visual detail of each action.

- HI-BL = High Acting, with balanced hysteresis
- LO-BL = Low Acting, with balanced hysteresis
- HI-UB = High Acting, with unbalanced hysteresis
- LO-UB = Low Acting, with unbalanced hysteresis

**HYSTERESIS VALUE**

Enter desired hysteresis value. See Setpoint Output Figures for visual explanation of how setpoint output actions (balanced and unbalanced) are affected by the hysteresis. When the setpoint is a control output, usually balanced hysteresis is used. For alarm applications, usually unbalanced hysteresis is used. For unbalanced hysteresis modes, the hysteresis functions on the low side for high acting setpoints and functions on the high side for low acting setpoints.

Note: Hysteresis eliminates output chatter at the switch point, while time delay can be used to prevent false triggering during process transient events.

**ON TIME DELAY**

Enter the time value in seconds that the output is delayed from turning on after the trigger point is reached. A value of 0.0 allows the meter to update the output status per the response time listed in the Specifications.

**OFF TIME DELAY**

Enter the time value in seconds that the output is delayed from turning off after the trigger point is reached. A value of 0.0 allows the meter to update the output status per the response time listed in the Specifications.

**OUTPUT RESET ACTION**

Enter the reset action of the output. See figure for details.

- Auto = Automatic action; This action allows the output to automatically reset off at the trigger points per the Setpoint Action shown in Setpoint Output Figures. The “on” output may be manually reset (off) immediately by the front panel RST button or user input. The output remains off until the trigger point is crossed again.
- Latch = Latch with immediate reset action; This action latches the output on at the trigger point per the Setpoint Action shown in Setpoint Output Figures. Latch means that the output can only be turned off by the front panel RST button or user input manual reset, serial reset command or meter power cycle.
When the user input or RST button is activated (momentary action), the corresponding “on” output is reset immediately and remains off until the trigger point is crossed again. (Previously latched alarms will be off if power up Display Value is lower than setpoint value.)

L-dLY = Latch with delay reset action; This action latches the output on at the trigger point per the Setpoint Action shown in Setpoint Output Figures. Latch means that the output can only be turned off by the front panel RST button or user input manual reset, serial reset command or meter power cycle. When the user input or RST button is activated (momentary action), the meter delays the event until the corresponding “on” output crosses the trigger off point. (Previously latched outputs are off if power up Display Value is lower than setpoint value. During a power cycle, the meter erases a previous L-dLY reset if it is not activated at power up.)

PROBE BURN-OUT ACTION

Enter the probe burn-out action. In the event of a temperature probe failure (open), the output can be programmed to be on or off.

CHANGE DISPLAY COLOR w/OUTPUT STATE

This parameter enables the backlight DP63000 to switch the backlight color when the output state changes. This parameter is only active for the backlight version.

OUTPUT RESET WITH DISPLAY RESET

This parameter enables the RST button or user input to reset the output when the display is reset.

Note: For this parameter to operate, the RST button or User Input being used must be set to dSP and the Input value must be displayed. If these conditions are not met, the output will not reset.

5.5 MODULE 5 - SERIAL SETUP PARAMETERS (S-5Er)

The Serial Setup Parameters are only active when the optional RS232 or RS485 serial communications module is installed in the meter. Refer to the DP6-COM bulletin for complete details on DP63000 serial communications.
Press and hold SEL button to enter Programming Mode.
OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal one (1) year product warranty to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

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The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

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1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

**FOR NON-WARRANTY REPAIRS**, consult **OMEGA** for current repair charges. Have the following information available BEFORE contacting **OMEGA**:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

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