2000

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User's Guide

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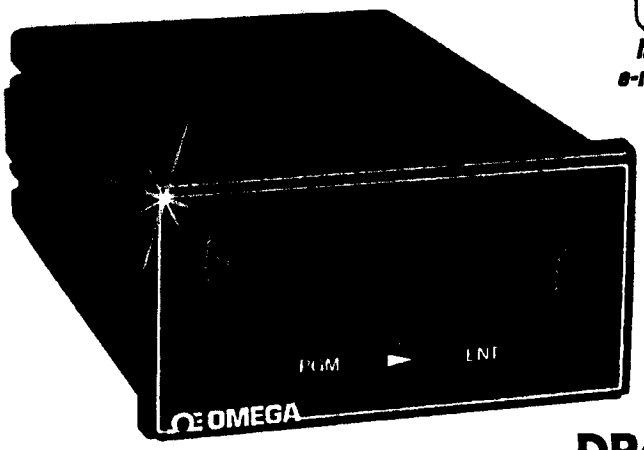

DP470 Series
Digital Indicator, Scanner and Datalogger

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Chapter 1
Description

The DP470 is designed as a fully programmable digital temperature indicator and datalogger. The displays are 0.56" high red LEDs. The menu driven display prompts and 14-segment alphanumeric characters make programming simple. Front panel programming is accomplished through three front panel keys. Degrees F or degrees C are indicated by a green, .4" high seven segment LED located to the right of the main display. Resolution is selectable for either 1° or 0.1°. A single dash (-) displayed at the left of the readout indicates a negative temperature. Overload is indicated by an 'OL' on the display. Plus OL (+OL) indicates a positive over range condition or an open thermocouple. Negative (-OL) indicates a negative over range condition. The DP470 Series is powered by a 100-240 Vac, 50-400Hz source and uses a switching power supply for maximum input power flexibility. The unit will accept, depending upon the model, J, K, E, T, R and S thermocouples or 3/4-wire 100 ohm Platinum RTD's, either .00385 or .00392.

Serial communications is standard RS-232. This bi-directional serial port allows the user complete program set-up, programming and operational capability. All controls and features are selectable through the front panel. The front panel lens may be removed to install or remove the program lockout jumper or adjust the analog output if necessary. Power and serial connections to the meter are made to the rear of the instrument via a removable Euro-style terminal

block. Sensor connections are made by screw terminals also on the rear of the instrument.

Minimum and Maximum values are always available for viewing. On the Basic model (no options), the information is accessible through the front panel menu system. Configuration settings are stored in on-board memory and are not affected by power loss. Available models and options:

RS-232 Models	RS-485 Models	Description
DP470-(*)-C2	DP470-(*)-C4	Base Meter
DP471-(*)-C2	DP471-(*)-C4	Meter with Dual Alarms
DP472-(*)-C2	DP472-(*)-C4	Mult-channel Input Meter
DP473-(*)-C2	DP473-(*)-C4	Analog Out Voltage Meter
DP474-(*)-C2	DP474-(*)-C4	Analog Out Current Meter

* Insert "T" for thermocouple or "RTD" for RTD.

Power Options	Description
-12VDC	8 to 15 Vdc
-24VDC	20 to 28 Vdc
-24VAC	20 to 28 Vac

Multiple Input and Output Boards for Base Units

DP470-206	six channel thermocouple or three channel 3-4- wire RTD input board
DP470-AOV	Analog voltage output board
DP470-AOC	Analog current output board
DP470-AL2	Dual alarm output board
DP470-C2-SOFT	RS-232 configuration and datalogging software
DP470-C2-CABLE	Configuration cables includes: RS-232 cable and power cable pre-wired to a DP470 connector
DP470-PROTOCOL	Protocol manual for RS-485

Chapter 2
Installation

Panel Installation

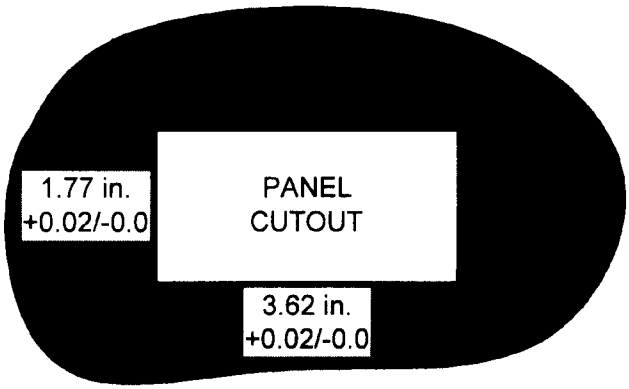
1. Prepare a mounting panel cutout by cutting a rectangular hole (3.62" +0.02/-0.0" X 1.77"+ 0.02/-0.0") in the desired location (see Figure following page). The maximum panel thickness is 3/8 inches.

2. Remove the mounting bracket from the instrument housing by removing the two screws on the rear of the indicator..

3. Remove the pluggable terminal block located at the rear of the unit and wire the input power and RS-232 wires. If an option board is installed in the indicator, remove the connector and make the appropriate connections (refer to diagrams).

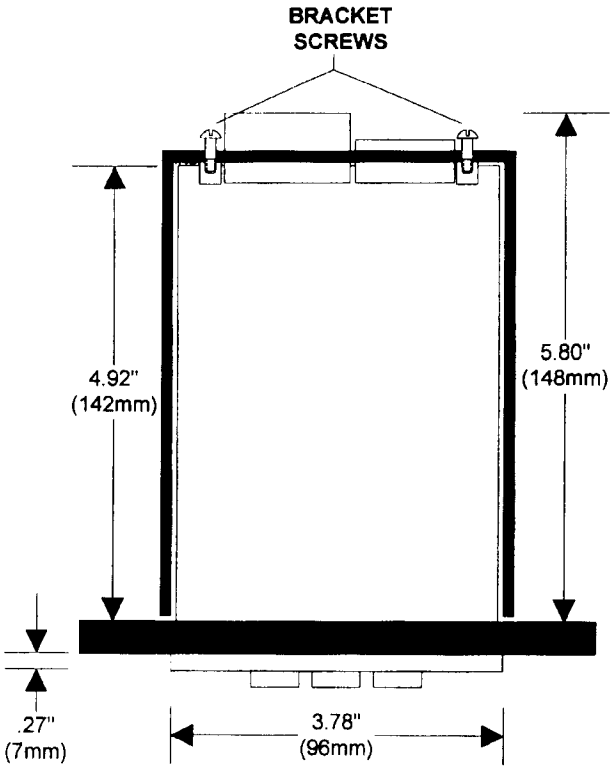
WARNING!

Dangerous voltages are exposed at the screw terminals. Always remove power before working in this area for rewiring, disassembly, and all other activities that involve proximity to electrical circuitry. Allow at least 10 minutes prior to working on the unit.



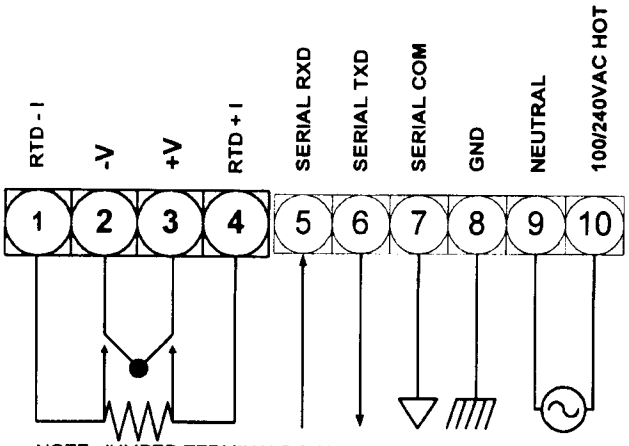
4. Install the indicator in the panel cutout from the front side of the panel. Be sure the instrument is right-side-up. See figure on following page.

5. Reinstall the mounting bracket on the indicator. Tighten the bracket screws to achieve a snug fit against the panel. Avoid distorting or cracking the housing by not over- tightening the bracket screws.


BRACKET
SCREWS
4.92"
(142mm)
5.80"
(148mm)
.27"
(7mm)
3.78"
(96mm)

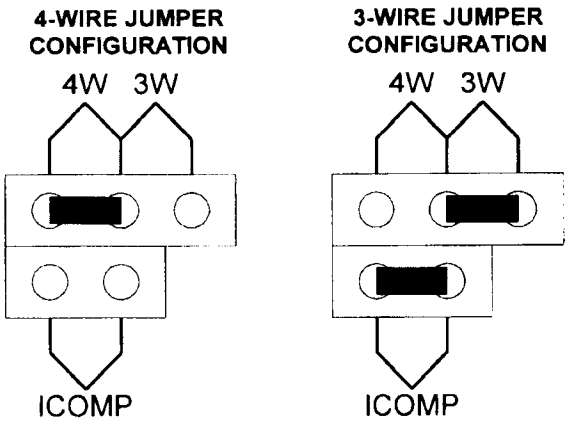
Single Channel Wiring

For easy installation, remove the pluggable terminal block located at the rear of the unit.



NOTE: JUMPER TERMINALS 3 AND 4 FOR 3-WIRE RTD.
ATTACH LEADS TO TERMINALS 1,2 AND 3.

Connect the input power and RS-232 wires to the wire entry locations beneath and perpendicular to the plug-in direction according to figure above.



Four Wire RTDs

Note: All RTD units are shipped from the factory configured for 3-wire RTDs. To enable the unit to measure 4-wire RTDs, remove the electronics assembly from the housing and complete the following steps. If an option card is installed, remove the top and bottom screws and carefully lift the option card from the main board assembly.

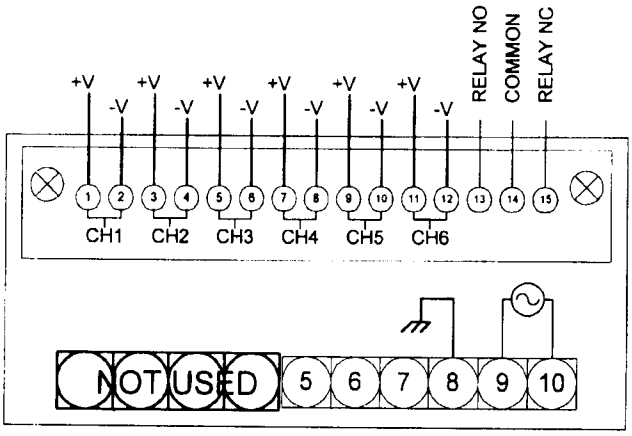
Step 1. Remove the jumper located on the topside on the main board from across pins labeled 3W and install it across the pins labeled 4W.

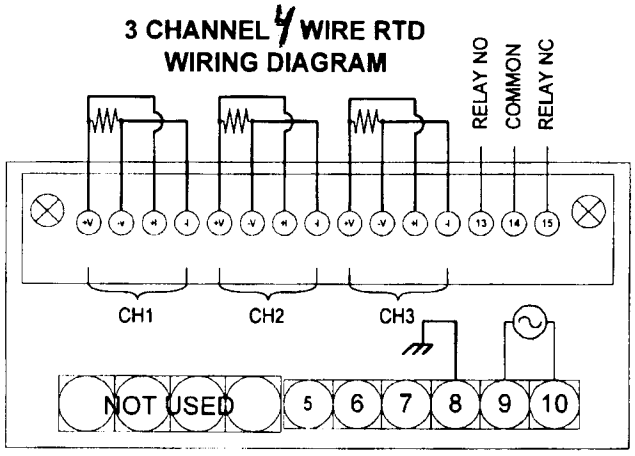
Step 2. Remove jumper provided across the header labeled ICOMP. This completes the configuration from 3-wire RTD to 4-wire RTD.

Multiple Input-Wiring

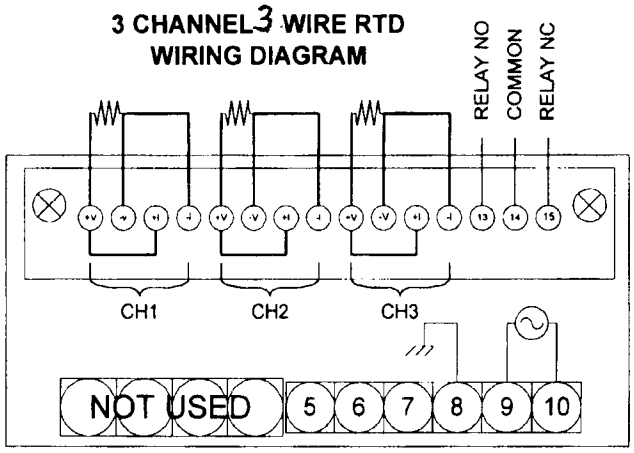
The Multiple Input Option uses a quick disconnect terminal block to facilitate wire installation and servicing. The terminal block engages the printed circuit board (PCB) fingers of the Multiple Input board which fits through the upper slot located at the rear of the unit. The method of attachment is the same as a PCB edge connector: push on/ pull off. If desired, you can use the two screws (that are provided) for securing the connector to the instrument case. Note that terminal numbers 13, 14 and 15 are provided for limit relay contact access.

6 CHANNEL THERMOCOUPLE MULTIPLE INPUT WIRING DIAGRAM

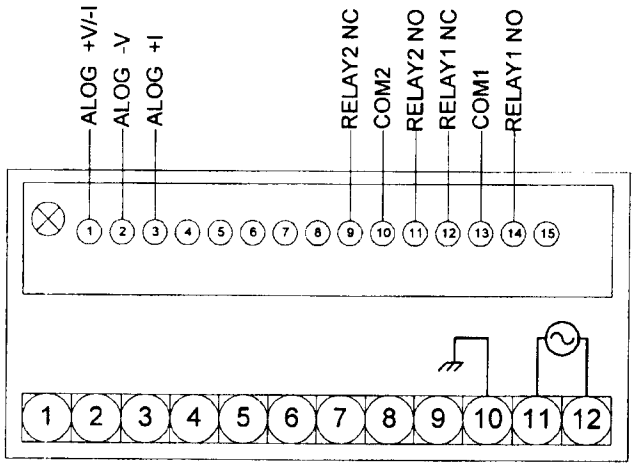



3 CHANNEL 4 WIRE RTD
WIRING DIAGRAM
RELAY NO
COMMON
RELAY NC
CH1
CH2
CH3
NOT USED
5
6
7
8
9
10

3 CHANNEL 3 WIRE RTD WIRING DIAGRAM



Analog Output/Dual Alarm Wiring



Chapter 3

Operation

The DP470 is programmed by a series of menu driven displays that are operated by three front panel pushbuttons; Program-PGM, Arrow-Δ, and Enter-ENT.

PROGRAM ARROW ENTER

Addressing the main menu items configures the indicator. The indicator has a program lockout jumper located behind the front panel lens. Removing the jumper will prevent any front panel programming changes. The indicator may still be programmed via the computer interface. When using the DP470 software, the front panel keyboard is automatically disabled. The basic unit has three main menu items that define the configuration of the indicator and one calibration menu.

1. **INPT:** Sets up sensor type, °F/°C, and 1°/0.1°resolution.

2. **MATH:** Selection enables viewing of either minimum or maximum value.

3. **CAL:** Used for calibration

The following menu items are displayed only when the appropriate option is installed-

5. **ALM1/ALM2:** Sets relay trip points to a programmed value as well as other alarm related parameters

6. **AOUT:** Programs the indicator to translate the display to a proportional analog output signal

7. **MULT:** Configures indicator for multiple same type input sensors

Pressing the PGM key allows you to access any of the menus listed above by placing the indicator in program mode, indicated by a 'P' lit to the right of the display. Placing the indicator in PGM mode will prevent the indicator from performing measurements. Any alarm monitoring will be disabled.

If the PGM key is pressed anywhere within a menu, the menu reverts to the previous menu level. Repeatedly pressing the PGM key will return the indicator to the display mode. Choices within a menu are viewed by pressing the ARROW key. A menu item is selected by pressing the ENT key for selection, or edited by pressing the ARROW key. Generally, the ARROW key allows you to scroll horizontally through a selection of choices while the ENT key enables you to make selections and move down vertically to the next menu item.

If the alarm option is installed and the alarm relays are set to unlatch manually ('MAN'), relay #1 may be unlatched by pressing and holding the ARROW key while pressing the PGM key. Pressing and holding the ARROW key while pressing ENT key will unlatch relay #2.

Sensor Setup

To select sensor type, temperature units, and resolution .

Program example: Select °F, Type K thermocouple and 0.1° resolution.

STEP 1. Press the **PGM** button. PGM will appear on the display. The °F/°C LED will change to **P** (for 'Program Mode).

STEP 2. Press the **ARROW** key until **INPT** appears on the display. Open the Input Menu for programming by pressing the **ENT** key. One of the seven thermocouple types and two RTD types will appear on the display (J,K,E,T,R,S,392,385). Scroll through the various sensor types by pressing the Arrow key until a "K" appears on the display. Press the **ENT** key to select K type thermocouple.

STEP 3. An **F** or **C** will appear. Pressing the **ARROW** key repeatedly will cause C and F to alternate on the display. With F on the display, select degrees F by pressing the **ENT**

key. **DCPT** will appear. The **Arrow** key allows you to toggle back and forth between **0.1** and **1.0** degree resolutions.

STEP 4. To select **0.1°** resolution, with **0.1** on the display press the **ENT** key.
At this point the display will show the **MATH** menu item*. To open the **MATH** menu for programming, press the **ENT** key. To go back to the mode, press **PGM** key. In order to scroll through the various menu items press the **Arrow** key.

**For DP472 multi-channel models, MATH functions can only be programmed through the Omega DP470 Software.*

MATH:

Note: A running record is kept of the minimum, and maximum values of temperature. You can display the Minimum or Maximum value by following the steps below.
Program example: View the maximum temperature value recorded.

STEP 1. With the **MATH** menu on the display, open this menu item by pressing the **ENT** key. **MIN** is on the display.

STEP 2. Press the Arrow key to toggle between **MIN** and **MAX**. When the display shows **MAX**, press the **ENT** key and the display will now indicate the maximum value. The

MIN/MAX memory may be reset at this point by pressing the **Arrow** key. With **CLR** (CLEAR) on the display, press **ENT**. His will restart the recording process. To go back to the current temperature display, press the **PGM** button and the display will indicate the current temperature reading.

Multiple Input (DP470-206)

The multiple input option will enable the user to monitor up to 6 same type thermocouple inputs, or 3 three-wire/four-wire RTDs. Any number of channels can be selected manually or scanned automatically. Alarm limits may be assigned to individual channels. One NO/NC 5 amp 115Vac relay contact is available for high or low alarm limit programming.

Two modes are selectable for the multiple input option-manual (MAN), and automatic (AUTO). MAN mode allows the user to view a selected channel. Pressing the arrow key advances the display to the next active channel. The channel number is indicated by a .4" green LED located in the upper left-hand corner of the display. To begin scanning, select AUTO. The scan rate is selectable in one-second increments between 5 and 20 seconds. The display readout will then sequentially show the temperature of the active channels. Any number of channels may be selected for scanning.

If an alarm limit is exceeded on any displayed channel, the display will flash, and the relay contact will latch. The relay will remain latched until the alarm condition clears. In scanning mode the display will flash on the alarm channel as it scans.

By using the Omega DP470 Software, the DP470 can log and send multiple channel data through the serial port making it a miniature datalogger.

Dual Alarm (DP470-AL2)

The alarm card has two 5 amp/115 Vac relays for high, low or deviation setpoints. The alarm card is available by itself or with analog output (either voltage or current). Relay setpoints are programmed through the front panel menu or via the serial port and DP470-SOFT. An alarm limit may be disabled within the alarm menu by selecting OFF at the first menu prompt. If OFF is selected the display will return to the next main menu item for further programming. If ON is selected the menu proceeds down through the alarm menu for further setpoint programming.

AUTO: Non-latching Alarm Mode

MAN: Latching Alarm Mode-requires manual reset

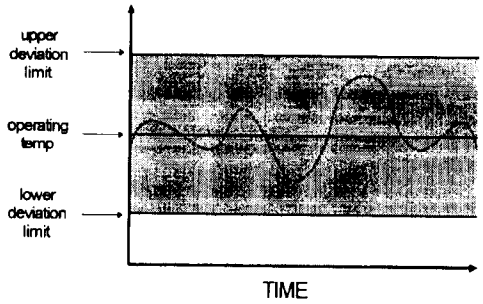
- Pressing and holding the Arrow key and pressing the PGM key resets Relay 1 (ALM1).
- Pressing and holding the Arrow key and pressing the ENT key resets Relay 2 (ALM2)

Note: When the DP470 Software is being used, the front panel keys are disabled. Relays must therefore be reset using the Unlatch buttons on the Viewer control panel.

When HIGH is selected, a temperature greater than or equal to the limit value will cause an alarm. When LOW is selected, a temperature less than or equal to the limit value will cause an alarm.

Using Deviation –HI/LOW Alarms

Deviation allows the user to assign alarm limits above and below the normal operating points of a process. If the temperature remains within the high and low deviation setpoints no alarm occurs. If the temperature equals or exceeds either the high or low deviation limits an alarm occurs. Hysteresis and delay are also programmable for deviation setpoints (see following explanations). Deviation



allows the user to assign two setpoints per alarm relay for a total of four alarm setpoints per alarm option. This could be useful for indicating a warning condition with one relay and an emergency condition for the other relay.

Hysteresis

Hysteresis or deadband is used to delay the unlatching of a tripped relay. Hysteresis may be selected within the alarm menu as either ON or OFF. Hysteresis is selectable from 0 to 99° in 1° increments. For example, a high limit with a hysteresis value of 5 assigned to it means that the display value must return 5° below the alarm setpoint before the alarm condition is cleared (the relay resets). Hysteresis

assumes negative values for HIGH limits and positive values for LOW limits.

Delay

Programming the meter for alarm delay prevents an alarm trip for a specified period of time (0 to 9 seconds). An alarm delay would be used whenever an unstable or noisy input signal is present. By filtering out short duration alarm conditions, alarm delay prevents unnecessary alarms from occurring.

Analog Output-(DP470-AOV or DP470-AOC)

The analog output option translates the indicators' display reading to a proportional analog output signal. There are two versions of the analog output option, either 0 to 10 Vdc or 4 to 20mA. Both voltage and current outputs are scaleable within their ranges and are similarly programmed. Note that the analog output is active only in the display mode. As soon as the indicator is put in the program mode, indicated by a **P** in

the lower right hand corner of the display, the output goes to its zero output value. The display reading can be scaled from -999 to +9999, which enables the user to use only a portion of the full scale if necessary.

Analog Output Setup

Program Example 1: Program the indicator to output 4.0 mA at 32.0° F and 20.0 mA at 500° F.

STEP 1. Press the **PGM** button. **PGM** will appear on the display. The °F/°C LED will change to **P** (for 'Program Mode).

STEP 2. Press the **ARROW** key until **ALOG** appears on the display. Open the ALOG Menu for programming by pressing the **ENT** key.

STEP 3. A **LOW** or **HIGH** will appear. Pressing the **Arrow** key repeatedly will cause LOW and HIGH to alternate on the display. With LOW on the display, select LOW by pressing the **ENT** key. The digits **0000** will appear with the left most digit flashing. With the **ARROW** key select the number 0. Press **ENT**. The second digit will flash. Enter **0** again with the **ARROW** key. Continue on until **0032** is on the display with the 2 flashing. Press **ENT**.

STEP 4. **HIGH** will appear on the display. Press **ENT**. Set the first digit to **0** by using the **ARROW** button. Set the second digit to **5** and so on until **0500** is on the display. With the farthest digit to the right flashing, press **ENT**. The next menu item appears.

Program Example 2: Program the indicator to output 0.0 Vdc at 0°F and 5Vdc at 1000°F.

Note: The analog output may be scaled to output various voltages such as 0 to 2Vdc, 1 to 5Vdc etc.

STEP 1. Press the **PGM** button. **PGM** will appear on the display. The **°F/°C** LED will change to **P** (for 'Program Mode).

STEP 2. Press the **ARROW** key until **ALOG** appears on the display. Open the ALOG Menu for programming by pressing the ENT key.

STEP 3. A **LOW** or **HIGH** will appear. Pressing the **ARROW** key repeatedly will cause **LOW** and **HIGH** to alternate on the display. With **LOW** on the display, select **LOW** by pressing the **ENT** key. The digits **0000** will appear with the left most digit flashing. With the **ARROW** key select the number **0**. Press **ENT**. The second digit will flash. Enter **0** again with the **ARROW** key. Continue on until **0000** is on the display with the **0** flashing. Press **ENT**.

STEP 4. **HIGH** will appear on the display. Press **ENT**. Set the first digit to **2** by using the **ARROW** button. Set the second digit to **0** and so on until **2000** is on the display. With the farthest digit to the right flashing, press **ENT**. The next menu item appears.

Chapter 4

Omega DP470-C2-SOFT

The DP470 Series indicators interface to PC compatible computers through the RS-232 port. Configuration of RS-232 is accomplished simply by selection of COM port. Baud rate and communications parameters are automatically configured. All DP470 series features (Alarm Status, Input Identification, Min/Max Indication, Time Tagged Readings) are presented with a simulated LED display in an on-screen control panel format.

The internal indicator clock is automatically set to your computers time and date each time you launch the DP470 Viewer Software. The Omega DP470-C2-SOFT enhances the DP470 series indicators by adding large volume data logging capability. Data is logged to formatted ASCII text files that are compatible with most modern spreadsheet applications. Data can be logged in increments from 1 minute to 24 hours.

Minimum PC requirements

486 Processor minimum (Pentium processor recommended)
Windows 95/NT
16 Mb RAM (32 recommended)
Mouse
3.5 inch disk drive
9 or 25 pin Serial Communications Port

File Formats

Space delimited ASCII text
DATE TIME AM/PM CHAN TEMP °F/°C

Installation

1. Connect a communications cable between your PC and the meter according to the diagram next page.

2. Start Windows 95.

3. Insert disk into drive A or (B).

4. In Windows 95 chose RUN from the Start menu.

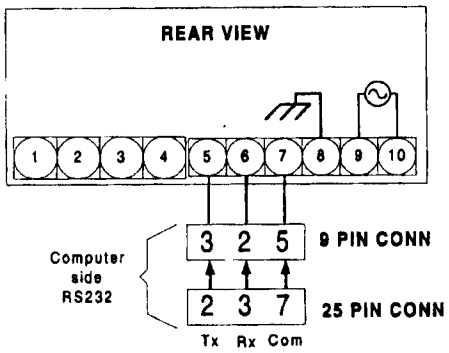
5. Type A:\setup (or B:\setup) and click OK.

The Installation Wizard will guide you through the remainder of the installation procedure.

After launching the program, your instrument and PC should communicate. **If your unit is not communicating ensure the serial communications cable is wired correctly and the proper COM port is selected.**

Note: Once communications is established, the PC has control of the instrument and the front panel keys become non-functional. In order to regain control of the front panel, the software program

must be closed. If the configuration of the unit has changed(e.g. thermocouple type), the software will read and reconfigure itself to match the instrument.



Operation

Alarms- A small box located to the left of the alarm box indicates alarm status. An **L** inside the box indicates a low alarm limit and an **H** indicates a high alarm limit. A grey box with no letter indicates an inactive alarm.

- A green box indicates an active alarm not in an alarm condition
- A flashing red box indicates that the channel is in an alarm condition

If an alarm condition occurs while the Viewer window is minimized, the window will reopen automatically to alert the user that an alarm limit has been exceeded.

Multiple Input Models

- When in MANUAL mode, the instrument can only monitor the selected channel. The selected channel and its' ID is displayed under the simulated display
- The next ***active*** channel may be viewed by pressing the NEXT button located beneath and to the left of the simulated display
- If a selected channel alarms and the next channel is selected, the flashing red indicator turns yellow. This indicates that this channel was in an alarm condition when last viewed.

Logging data

To create a file of logged data, open the preference menu by clicking the Preferences button located in the upper right hand corner of the Viewer window. Open the LOG menu by clicking the LOG button. You may name your file any acceptable Windows 95 name. The default file extension is .dat. The path for your log file will be shown on the main control panel window. Select the interval (between 0-24 hours at 1 minute increments.) at which logs will be taken. Close the log preference window. To begin logging, click the button on the main control panel labeled OFF. The button will change to ON and the unit will now begin logging.

Chapter 5

General Electrical Specifications

Repeatability +/- 1 Count (single channel only)

Stability with temperature
Zero: 1uV/° C
Span: .01%

Thermocouple Reference Junction
Internal, automatic, 0.03 °C/°C, 5 °C to 45 °C.

Break Detection Upscale ≈ 50nA unit displays OL.

Noise Rejection
NMRR: 60dB @ 50/60 Hz
CMRR: 120dB @ 50/60 Hz (+/-0.1Hz with 250Ω unbalance)

Overload Protection
Power leads to ground: (1500Vdc or VAC RMS)
Across inputs, for one minute:
T/C up to 250Vdc or Vac, V+ to V-

Input Impedance
Thermocouple: 20MΩ, exclusive of break detect current effects
RTD: 16.9kΩ, V+ input to I input

RTD Lead Wire Error

At 150uA excitation current: 40mΩ/Ω of equal resistance in V+ and V- leads, 1Ω of imbalance in V+ or V- leads

Point Update Rate

2 per second nominal (1° readings)
1 per second nominal (.1° readings)

Display

4 Digit, 14-segment red or green .56" in. height LED plus one .4" green °F/°C LED

Environmental Ranges

Operating: 0°C to 50°C
Storage: -40°C to +65°C
Humidity: ≤80%RH non-condensing

Multi-input Option Accuracy

Add ±1.0°C/2°F @23°C to instrument accuracy specification

Alarm Relay Contact Rating

5A@ 120Vac (non-inductive load) Form C

Power

100 to 240 Vac (±10%), 50 to 400Hz, switching power supply

Analog Output (Option)

0 to 10 Vdc (load current 2ma maximum)
4 to 20mAdc (load resistance 300Ω maximum)
Accuracy: ±0.25% full scale of display value

Resolution: Approximately .0125 Full scale
Isolation: Isolated between input and internal circuit to 500Vac.

Accuracy Specification ± 1 digit

INPUT TYPE	1° Resolution	0.1° Resolution
J,K,T,E thermocouples	1° plus 0.03% rdg	0.5°C or 0.9°F
R and S thermocouples	1° plus 0.03% rdg	N/A
PT100alpha .00385, PT100alpha .00392 RTD	1° plus 0.03% rdg	0.5°C or 0.9°F

*Accuracy percentage of reading ±1 digit

RS-232 Serial Communications (-C2)
Type: full-duplex voltage, isolated from ground to 500Vac. Complete configuration set-up and message display capability, programmable to transmit current display, set 1°/0.1°resolution, thermocouple type, F°/C° plus alarm status and scanning channel indication in ASCI II code. 9600 bps 8 bits no parity 1 stop bit. Isolation: Isolated between input and internal circuit to 500Vac

RS-485 Serial Communications (-C4)
Type: Two-wire connection. Half-duplex, bi-directional voltage isolated from ground to 500Vac. Communications uses MODBUS-RTU protocol with selectable baud rate from 1200-19.2K baud. Addressable up to 99. Transmit of RS-485 interface is connected to terminal 6 of the DP470. Receive is connected to terminal 5 of DP470.

INPUT TYPE	RANGE (0.1 resolution)	RANGE (1.0 resolution)
J THERMOCOUPLE	-99.9 to 761.8 C -99.9 to 999.9 F	-205 to 762 C -337 to 1403 F
K THERMOCOUPLE	-99.9 to 999.9 C -99.9 to 999.9 F	-202 to 1377 C -331 to 2510 F
T THERMOCOUPLE	-99.9 to 401.4 C -99.9 to 754.6 F	-210 to 401 C -346 to 755 F
E THERMOCOUPLE	-99.9 to 999.9 C -99.9 to 999.9 F	-205 to 1002 C -338 to 1835 F
S THERMOCOUPLE	NA	0 to 1770 C 32 to 3218 F
R THERMOCOUPLE	NA	0 to 1769 C 32 to 3216 F
PT100, RTD .00385	-99.9 to 862.6 C -99.9 to 999.9 F	-200 to 863 C -329 to 1585 F
PT100, RTD .00392	-99.9 to 850.8 C -99.9 to 999.9 F	-202 to 851 C -332 to 1563 F

Chapter 6
Calibration

Thermocouple Type

Equipment Required:

1. Precision voltage source with a resolution to 1uV and an accuracy of ±0.01% or ±2.0uV.

2. Interconnecting copper wire from the DC source to the indicator.

3. Trimmer adjusting tool.

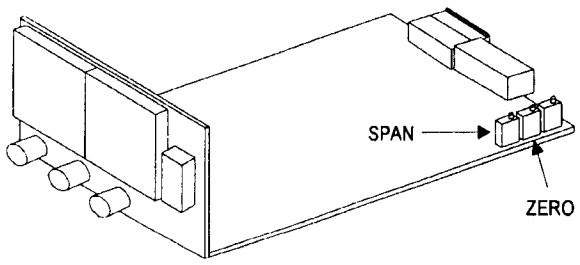
WARNING!-Dangerous voltages exist on charged capacitors even after unit is de-energized. Allow 10 minutes of discharge time before removing unit from case.

STEP 1. Remove power and snap off the front panel lens. Leave the keypad attached to the display board, as it will be required to enter the calibration menu. Remove the rear pluggable connector from the rear of the indicator and slide the main board electronics out of the case from the front. (Gently lift the display board above the catch located on the

bottom of the inside of the plastic housing while pushing on the rear male connector on the rear of the main board assembly.)

STEP 2. Observing polarity, connect the DC voltage source to the thermocouple inputs according to the wiring diagram located on the plastic housing. With the power **OFF,** plug in the wiring connector to the rear of the main board. Turn power on and allow at least a 10-minute warm-up.

STEP 3. Enter the program mode by pressing the PGM key and then the ENT key. The INPT menu appears. Press the Arrow key until the CAL menu appears. Press ENT. Input 0.00 mV and adjust the ZERO potentiometer RV201 (see figure below) for a display of 0.0 ± 0.1.



NOTE: Display readings take up to 10 seconds to respond to changes in the zero and span pots.

STEP 4. Adjust the voltage source output to 39.000 mV. Adjust the SPAN potentiometer RV203 for a display reading of 560.0 ±0.1. Press PGM to exit the calibration mode. Turn the indicator power OFF.

RTD Type:

Equipment Required:

1. Precision resistance decade box with a resolution of 0.01Ω and an accuracy of ±0.02%.

2. Interconnecting copper wire from the resistance source to the indicator.

3. Trimmer adjusting tool.

WARNING!-dangerous voltages exist on charged capacitors even after unit is de-energized. Allow 10 minutes of discharge time before removing unit from case.

STEP 1. Remove power and snap off the front panel lens. Leave the keypad attached to the display board as it will be require to enter the calibration menu. Remove the rear pluggable connector from the rear of the indicator and slide the main board electronics out of the case from the front.

(Gently lift the display board above the catch located on the bottom of the inside of the plastic housing while pushing on the rear male connector on the rear of the main board assembly.)

STEP 2. Observing polarity, connect the decade box to the RTD input (+V, -V, +I, -I) to the pluggable connector RTD inputs according to the wiring diagram located on the plastic housing. With the power **OFF,** plug in the wiring connector to the rear of the main board. Turn power on and allow at least a 10-minute warm-up.

STEP 3. Enter the program mode by pressing the PGM key and then the ENT key. Press the ARROW key to scroll through to the CAL menu. Press ENT. Adjust the zero potentiometer RV201 (see FIG 4.1) for a display of 0.0 ± 0.1.

NOTE: Display readings take up to 10 seconds to respond to changes in the zero and span pots.

STEP 5. Adjust the decade box to 265.00Ω. Adjust the SPAN pot potentiometer RV203 for a display reading of 543.8 ±0.1. Press PGM to exit the calibration mode. Turn the indicator power OFF, re-install the main board back into the case. Apply power to the instrument and reset the input type to the desired sensor.

Analog Output Current :

NOTE: Warning, this is not a scaling procedure. For scaling the indicator, see Analog Output setup on page 21.

Equipment Required:

1. Precision current meter with 0.1% accuracy and 10uA resolution.

2. Interconnecting copper wire from the DC current source to the indicator, +I to terminal 3 and –I to terminal 1 of the 15 position terminal block located at the rear of the unit..

3. Trimmer adjusting tool.

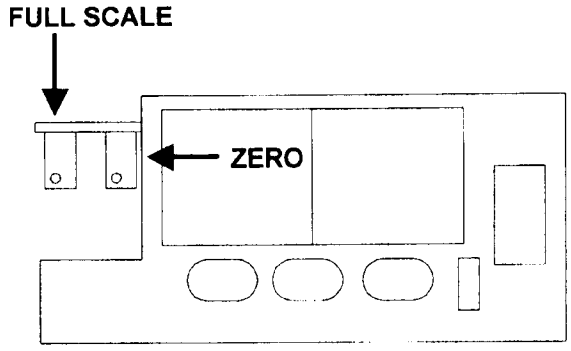
4. Thermocouple simulator for Thermocouple units or Precision resistance decade box with a resolution of 0.01Ω and an accuracy of ±0.02%.

STEP 1. Remove power and snap off the front panel lens. Leave the keypad attached to the display board as it will be required to enter the programming menu.

STEP 2. Apply power to the unit and allow at least a 10 minute warm-up. Program the unit for the appropriate sensor type.

STEP 3. With the input set to correspond with the LOW input, adjust the zero pot to read 4.00mA on the DC Ammeter.

STEP 4. With the input set to correspond with the HIGH or full scale input, adjust the full scale potentiometer to read 20.00mA on the DC Ammeter.



Analog Output Voltage:

NOTE: Warning, this is not a scaling procedure. For scaling the indicator, see Analog Output setup on page 21.

Equipment Required:

1. Precision voltage meter with 0.1% accuracy and 10mVdc resolution.

2. Interconnecting copper wire from the DC current source to the indicator, -V to terminal 3 and +V to terminal 1 of the 15 position terminal block located at the rear of the unit..

3. Trimmer adjusting tool.

4. Thermocouple simulator for Thermocouple units or Precision resistance decade box with a resolution of 0.01Ω and an accuracy of ±0.02%.

STEP 1. Remove power and snap off the front panel lens. Leave the keypad attached to the display board as it will be required to enter the programming menu.

STEP 2. Apply power to the unit and allow at least a 10 minute warm-up. Program the unit for the appropriate sensor type.

STEP 3. With the input set to correspond with the LOW input, adjust the zero pot to read 0.00Vdc on the DC voltmeter.

STEP 4. With the input set to correspond with the HIGH or full scale input, adjust the full scale potentiometer to read 10.00Vdc on the DC Voltmeter.

NOTES:

WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **25 months** from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal **two (2) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear are not warranted, including but not limited to contact points, fuses, and triacs.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by it will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESS OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

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RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

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

FOR **WARRANTY** RETURNS, please have the following information available BEFORE contacting OMEGA:

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.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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- Infrared Pyrometers

PRESSURE, STRAIN AND FORCE

- Transducers & Strain Gauges
- Load Cells & Pressure Gauges
- Displacement Transducers
- Instrumentation & Accessories

FLOW/LEVEL

- Rotameters, Gas Mass Flowmeters & Flow Computers
- Air Velocity Indicators
- Turbine/Paddlewheel Systems
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pH/CONDUCTIVITY

- pH Electrodes, Testers & Accessories
- Benchtop/Laboratory Meters
- Controllers, Calibrators, Simulators & Pumps
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- Cartridge & Strip Heaters
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- Air, Soil & Water Monitors
- Industrial Water & Wastewater Treatment
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