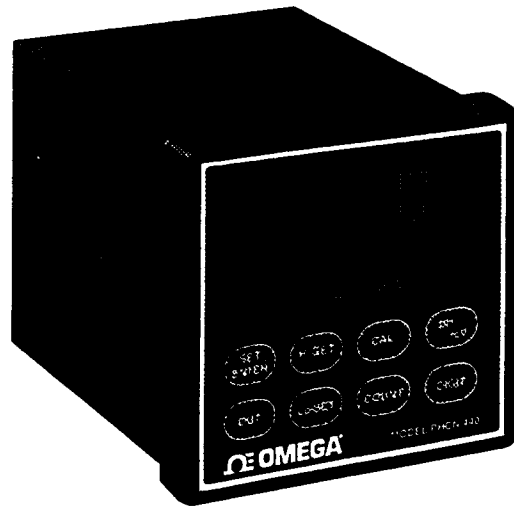


Ω PHCN-430/435/440/445

Ω pH Controller



Operator's Manual

An OMEGA Technologies Company



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

1. P.O. 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.

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1.1 Unpacking the Controller

Remove the Packing List and verify that you have received all equipment. If you have questions about the shipment, please call the OMEGA Customer Service Department.

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

NOTE

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

1.2 Controller Description

The OMEGA® PHCN-430/435 and PHCN-440/445 pH/ORP controllers are microprocessor-based controllers with two time-proportional relay contacts and a 3-digit LED display. Each model has unique output functions for a variety of different application requirements. All units have automatic temperature compensation.

The PHCN-430 and PHCN-435 simultaneously display pH and temperature. The PHCN-430 has two mechanical time delay SPDT mechanical relays.

The PHCN-440 and PHCN-445 feature two time proportioning relay outputs for acid and base additions. The PHCN-440 also includes a proportional 4-20 mA output. The PHCN-445 has a 0-1 V output.

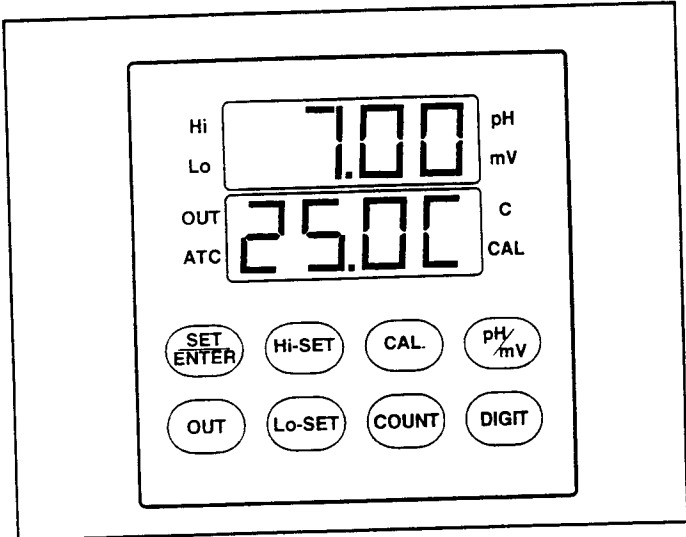


Figure 1-1. Front Panel Display

1.3 Keypad Description

These units feature eight keypads for entering all set-up parameters and performing calibration (refer to Figure 1-1).

Use This Key:	To:
pH/mV	Select pH or mV (for ORP or checking pH electrode offset)
CAL	Initiate calibration procedure using standard pH buffers 7.00, 4.01, 10.01
DIGIT	Select numerical position from right to left
COUNT	Select number from 0-9
SET/ENTER	Set selected value into memory
Hi-SET	Set HI alarm relay value
Lo-SET	Set LOW alarm relay value
OUT	Activate controller outputs

1.4 Front Panel Displays

This Display:	Indicates:
pH	Controller in pH mode
mV	Controller in mV mode
°C	Temperature in °C
CAL	pH calibration mode; display shows 7.00, 4.01, and 10.01; CAL annunciator off when calibration complete
Hi	High alarm relay activated
Lo	Low alarm relay activated
OUT	Control outputs activated
ATC	Controller in ATC mode

1.5 General Information

We recommend that you bench test all equipment prior to installation. This requires wiring the equipment and checking relay and output functions as well as pH input (see section 2.2). This is also a good time to initially calibrate the pH electrode to the meter (see section 3).

2.1 Mounting the Controller

Refer to Figures 2-1 and 2-2 for panel cutout and controller dimensions.

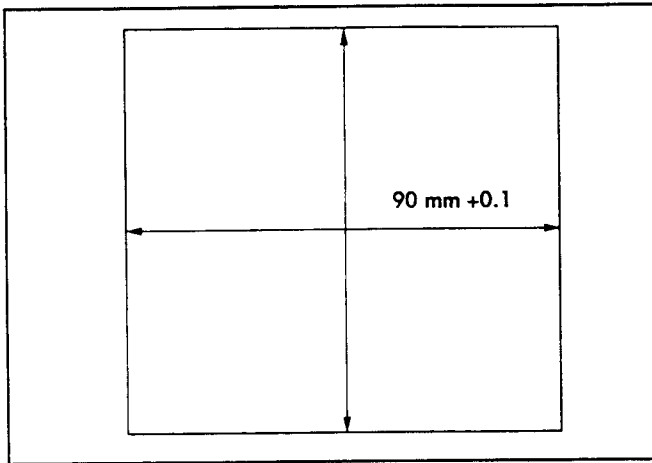


Figure 2-1. Panel Cutout Dimensions

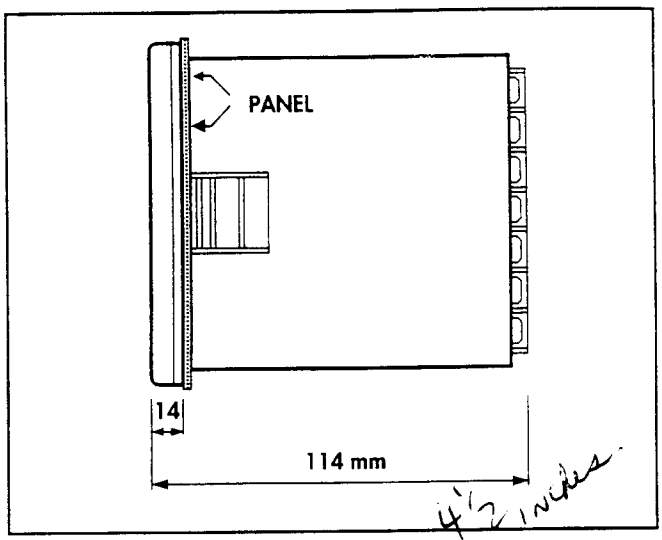


Figure 2-2. Meter Dimensions

2.2 Wiring the Controller

2.2.1 Connect ac Power

Connect ac power to the proper terminals (refer to Fig. 2-3). "D3" is hot, "D2" is neutral, and "D1" is ground. For 220 Vac operation, "D4" is hot, "D2" is neutral, and "D1" is ground.

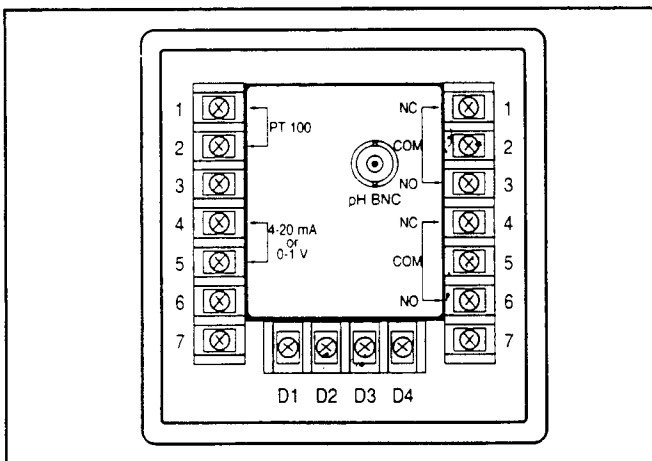


Figure 2-3. Rear Panel Connections

2.2.2 Making Input Connections

Using a pH Electrode

1. Connect the pH combination electrode to the BNC connector on the back of the unit.
2. If using automatic temperature compensation (ATC) connect the 100 ohm Pt RTD leads of the temperature probe to Terminals 1 and 2 (no polarity -see Figure 2-3).

The 100 ohm Pt RTD temperature probe can be separate from the pH electrode, built into the body of the pH electrode or (in selected models) built into the mounting assembly of the pH electrode.

If an ATC input is not provided to the meter, the temperature reading will default to 25 °C. If the process temperature is constant, but not 25 °C, a precision resistor can be used to simulate the appropriate temperature value to the unit. For example, if the control process runs at 0 °C, a resistor with a value of 100 ohms can be wired to terminals 1 and 2. The temperature display will show approximately 0 °C. For a complete temperature versus resistance table, consult the OMEGA Temperature Measurement Handbook and Encyclopedia[®].

Using an ORP Electrode

1. Connect the ORP electrode to the BNC connector on the back of the unit.
2. Apply power to the controller and press the "pH/mV" keypad to enter into the mV operating mode.

The unit should display the mV value and the temperature value simultaneously. The temperature display will default to 25 °C since ORP does not require temperature compensation.

2.2.3 Making Output Connections

Connect the proper load to the NO and COM terminals or the NC and COM terminals.

When the load is connected to the NO and COM, the relay is open until the setpoint is reached. When the load is connected to the NC and COM, the relay is closed until the setpoint is reached. The wiring configuration is application dependent.

NOTE

The relays do not have a setpoint hysteresis. Instead, the relays on the PHCN-430/435 and PHCN-440/445 have internal time delays built in.

The PHCN-430 has a fixed 4-20 mA recorder output. The PHCN-440 has a proportional 4-20 mA control output. The 4-20mA output is internally powered and can be transmitted to a 500 Ω maximum load. This means the 4-20 mA output will be proportional between the HIGH and LOW setpoints. This output can be interfaced with a 4-20 mA input metering pump for proportional control. The PHCN-435/445 both have a 0-1 V recorder output.

3.1 Calibrating the pH Electrode

Calibration of the electrode to the pH meter is essential for accurate pH measurement. It is also necessary to recalibrate the electrode periodically. The frequency of recalibration is system dependent.

The pH calibration procedure is as follows:

1. Connect the combination pH electrode and temperature compensation probe (if using ATC) to the meter (refer to Fig. 2-3).
2. Apply power to the instrument.
3. Remove the electrode protector from the end of the pH electrode; rinse the electrode with distilled water, and place the electrode in standard pH buffer 7.00 solution. Press the CAL Key.

At this time the "CAL" annunciator light will appear. When the light goes off, the first point is calibrated. If "7-E" appears in the display, this means the pH buffer 7.00 was not used or the pH electrode has failed.

4. Remove the pH electrode from the pH buffer 7.00. Rinse the electrode with distilled water and place the electrode in standard pH buffer 4.01 or 10.01. Press the CAL Key. At this time the "CAL" annunciator light will appear. When the light goes off, the slope is calibrated.

3.2 Calibrating the ORP Electrode

The ORP measurement is not calibrated. The only calibration procedure that you can follow is to check the electrode in a known mV standard solution. The discrepancy between the known mV standard and the ORP electrode reading is referred to as the "electrode offset." You must take this offset into account when setting High and Low setpoint values.

4.1 If You Have a PHCN-430/435**4.1.1 Entering Hi/Lo Setpoint Values:**

To enter the Hi setpoint value:

1. press the Hi-SET key.
The "HI" annunciator lights on the front panel.
2. Use the DIGIT and COUNT keys to change the displayed value to the desired value.
3. When the desired value is showing in the display, press the SET/ENTER key to store this value into memory.

To enter the Lo setpoint value:

1. Press the Lo-SET key.
The "LO" annunciator lights on the front panel.
2. Use the DIGIT and COUNT keys to change the displayed value to the desired value.
3. When the desired value is showing in the display, press the SET/ENTER keypad to store this value into memory.

4.1.2 Entering the Time Delay

After you've entered the high and low setpoints:

1. Press the SET/ENTER key.

The front panel displays "00/P1"

2. Use the DIGIT and COUNT keys to set this value.

You can enter a value from 1 to 99. The higher the value of P1 the longer the delay time. The maximum delay (P1=99) is 15 seconds. This delay time prevents the relay from changing state as soon as the setpoint value (either High or Low) is reached.

The value you select for P1 depends on your application; you may need to experiment with different P1 values to find the ideal delay time for your application.

4.2 If You Have a PHCN-440/445

4.2.1 Entering Hi/Lo Setpoint Values

To enter the high and low setpoints into the microprocessor memory, follow the procedure in section 4.1.1.

4.2.2 Entering Time Delay and Control Value

In addition to the high and low setpoints, you must enter a time delay sequence and a control value into the memory of the microprocessor. **P1** is the cycle time, and **P2** is the control value. This control value is target pH value for the process control system.

To enter P1:

1. Press the SET/ENTER key.

The front panel displays "00/P1".

2. Use the DIGIT and COUNT keys to set this value.

You can enter a value from 1-99. The greater the value of **P1**, the longer the time proportioning relays will operate.

The value set for **P1** depends on your application. We recommend starting with **P1** equal to "1" and progress from there if fine tuning the system is required.

The cycle time is in multiples of 24 seconds, where 1 equals 24 seconds, 2 equals 48 seconds, and so on.

To enter P2:

1. Press the SET/ENTER key again.

The front panel displays "00/P2".

2. Select the control pH setpoint using the DIGIT and COUNT keys.

You may enter a value between 0.00 pH - 14.00 pH.

To briefly describe how these control parameters function, we will use the High set value of 8.00 pH, a Low set value of 6.00 pH, P1 equal to 1, and P2 equal to 7.00 pH as control parameters.

Since P1 is equal to 1, a single cycle will last 24 seconds. The cycle time does not begin until the pH of the process stream falls within the high and low setpoints. Once the pH falls within the setpoints, the acid or base pump will operate for a total cycle time of 24 seconds. The pump will continue to operate for a second complete cycle, if the value of P2 (7.00 pH) is not reached during the first cycle. This may result in an overshoot of P2. If this occurs, the other pump will operate for a complete cycle. The pumps will operate back and forth until control is tightly achieved around P2 setpoint of 7.00 pH. When the process value is close to P2, the cycle time will split between on time and off time.

For example, if the process value is 6.7 pH, the base pump will operate for perhaps 5 seconds of the cycle and shut off for the remaining 19 seconds.

4.3 Error Messages

7-E - The calibration standard 7.00 pH was not used or the pH electrode has failed.

--E - The pH/mV value is over range.

Notes

5.1 If You Have a PHCN-430/435**5.1.1 Entering Hi/Lo Setpoint Values**

The procedure for entering high and low setpoint values in ORP mode is the same as for pH Mode (see page 4-1), with the exception that you must set the polarity of the setpoint.

5.1.2 Setting the Polarity of the Setpoint

To set the polarity of the setpoint:

1. Press the DIGIT key until the fourth count on the display (your extreme left on the display) flashes. (If there is nothing displayed in the fourth count when you begin this procedure, simply press the DIGIT key once more after the third count on the display is flashing.)
2. Press the COUNT key until the controller displays properly for your setup (refer to the following table)

To display:	Press the COUNT key
no change	Once
1	Twice
-	Three times
-1	Four times

5.1.3 Entering the Time Delay

The procedures for entering the time delay in ORP Mode are the same as those for pH Mode. Refer to section 4.1.2.

5.2 If You Have a PHCN-440/445

The procedures for entering setpoint values, time delay and control value in ORP Mode are the same as those for pH Mode. Refer to section 4.2.

Range:	0.00 to 14.00 pH
pH Resolution:	±0.01 pH
Accuracy:	±0.01 pH
mV Range:	±1999 mV
mV Resolution:	1 mV
Relative Accuracy:	±1 mV
Temperature:	0.0 to 100.0 °C
Temperature Resolution:	0.1 °C
Display:	Dual, indicates both pH and temperature or setpoint value, 0.56" (14.2mm)
Control:	Dual relays, time proportional, rated 12 A at 120 Vac
Contact:	Two 12 Amp 120 Vac SPDT Mechanical Relays for High and Low Setpoint
Temperature Compensation:	100 Ohm Pt RTD for ATC, or Manual
Time Delay:	Multiples of 24 seconds up to 40 minutes
Operating Temperature:	41 to 122°F (5 to 50 °C)
Power:	110/220 Vac ,50/60 Hz
Dimensions:	1/4 DIN

Weight:	1.98 lbs. (0.9 Kg.)
Recorder Output:	4-20 mA , full scale or adjustable
Memory Features:	Autocalibration, built-in diagnostics, back-up of last calibration.

Notes

WARRANTY

OMEGA warrants this unit to be free of defects in materials and workmanship and to give satisfactory service for a period of **13 months** from date of purchase. OMEGA 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. If the unit should malfunction, 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. However, this WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of being 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 or which are damaged by misuse are not warranted. These include contact points, fuses, and triacs.

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