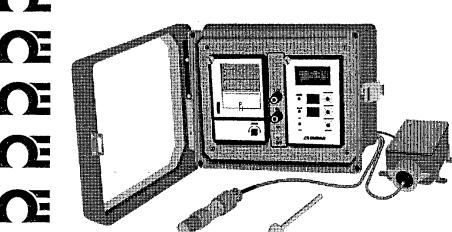
PHCN-50, PHCN-51, PHCN-52, PHCN-53, and PHCN-54

pH Controllers/Recorders







SHEED HOUR BOUND HER CONSTRUCTION OF THE WARRANTY IN THE SHEED HOUR BOUND HER CONTROL OF THE SHEED HOUR BOUND HOUR BOUND

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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- 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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- 2. Model and serial number of product, and
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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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Unpacking Instructions



Remove the Packing List and verify that you have received all equipment, including the following (quantities in parentheses):

PHCN-50 Series Unit (1)

NEMA-4X enclosure (1)

Appropriate number of pH transmitters

K-79 pocket thermometer (1)

Roll of 30 day chart paper shipped with the recorder only (1)

Operator's Manual (1)

If you have any questions about the shipment, please call the OMEGA Customer Service Department.

When you receive the 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.



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

TABLE OF CONTENTS

PHCN-50, PHCN-51, PHCN-52, PHCN-53, PHCN-54 pH Controller/Recorders

Chapter 1	Introduction 1-1
1.1	General Description1-1
1.2	Features1-2
1.3	Available Models1-2
1.4	Optional Ranges1-2
Chapter 2	Installation2-1
2.1	pH Electrode Considerations2-1
2.2	Mounting2-2
2.3	Wiring
2.3.1	Wiring for PHCN-502-2
2.3.2	Wiring for PHCN-51 and PHCN-522-4
2.3.3	Wiring for PHCN-53
2.3.4	Wiring for PHCN-542-9
2.4	Wiring to the Remote Display2-11
2.5	Chart Recorder Paper Installation2-12
Chapter 3	Operating the Controller/Recorder3-1
3.1	Controls and Indicators
3.1.1	PHCN-50
3.1.2	PHCN-51
3.1.3	PHCN-52 3-3
3.1.4	PHCN-53 3-3
3.1.5	PHCN-54
3.2	Operating Procedure
3.2.1	Standardizing the Probe using the Transmitter 3-4
3.2.2	Setting Control Limits (PHCN-51, 52, 53, 54) 3-5
3.2.3	Adjusting the Deadband (PHCN-51, 52, 53, 54) 3-5
3.2.4	Timer Adjustment
Chapter 4	Troubleshooting4-1
4.1	Troubleshooting Guide 4-1
4.2	Inductive Loads
Chapter 5	
· 1	Accessories
6.1	Replacement Accessories

1

Introduction

1.1 General Description

The OMEGA® PHCN-50 Series of pH Controllers and Recorders provides a versatile and economical means of measuring, controlling, and recording pH levels of waste water, pools, chemical process streams, and other effluent conditions common to the industrial sector. The extensive list of standard features includes a digital display of the measured pH value, digital pushwheel switches for the two limit alarm set points, remote or integral mounting of the pH transmitter, automatic temperature compensation when used with a combination pH electrode with PT 1000 Option, 10 amp relay contacts for pump/alarm actuation, and front panel deadband pots adjustable from 1 to 50% of span.

Depending on your specific application, you can choose from several configurations: recorder only; controller only; recorder/controller combination; recorder/controller with two separate electrode inputs; dual controller. Units are housed in a standard NEMA-4X enclosure. The standard pH input range is 2 to 12. A 0 to 1000mV scale is used in conjunction with an ORP electrode for chrome reduction or cyanide destruction. The controller is intended to turn power on or off to pump whenever the pH of the solution being monitored exceeds a set limit. Power outputs are available to turn on with either increasing or decreasing pH. The master on/off power switch is located on the front panel. The 10 amp fuse is for pumps and alarm; the 1/2 amp fuse is for the rest. The calibration adjustment is an offset adjustment for the recorder.

1.2 Features

- Measures, Controls and Records pH
- Range of 2 to 12 pH
- NEMA-4X Wall Mount Enclosure Standard
- Includes 2-wire 4 to 20 mA transmitter
- Optional ORP Controller

1.3 Available Models

Part Number	Description
PHCN-50	pH recorder accepts pH electrode directly
PHCN-51	Single input pH controller
PHCN-52	Single input pH controller/recorder
PHCN-53	Dual input pH controller/recorder
PHCN-54	Dual input pH controller
PHCN-55	Battery powered pH recorder

1.4 Optional Ranges

Part Number	Description
-ORP	ORP controller; 0 to 1000mV range
-14	0 to 14 pH display range

Installation

2

2.1 pH Electrode Considerations

The pH electrode is the most sensitive and crucial part of the system, as the PHCN-50 relies on a correct input from the electrode. Important factors to consider before installation are:

- Electrode location The pH electrode should always be mounted in a vertical position near but downstream from where the reagent will be added. This location should be representative of the whole process solution. The electrode must remain wet at all times. (Ensure proper mixing of the process solution).
- Maintenance To ensure the validity of the pH input, the electrode must be cleaned and calibrated periodically. In every application, the pH electrode may become coated with the process residue. Each time the electrode is cleaned or replaced, it must be recalibrated to the PHCN-50 Series.
- The glass may also be attacked by high alkaline solutions (particularly at high temperatures) which damage the glass or cause sodium ion error. Very acidic solutions which contain fluorides may dissolve the glass membrane. Consult OMEGA Sales Department for special electrodes.
- Temperature not only affects the pH measurement, but also the normal life expectancy of the pH electrode. Maximum life is achieved at ambient temperatures, although special electrodes are available that are more durable at higher temperatures.
- Chemical composition of the process solution may not only affect the glass pH electrode, but also the assembly housing. In these cases Kynar or stainless steel housings may be required.

Stray currents in the solution will cause the pH
electrode to report incorrect information to the
PHCN-50. The output from the pH electrode is only a
few millivolts. If stray currents are present, they may
be picked up by the pH electrode and transmitted to
the controller. It is necessary to eliminate the current
either by finding the leakage or by adding a ground
to the solution.

2.2 Mounting

The PHCN-50 NEMA-4X enclosure can be mounted to any flat surface through the 4 mounting holes in its base.

2.3 Wiring

The front panels are factory prewired from the terminal strip on the controller circuit board to the switch and fuses. The recorder and transmitters are also prewired. It is necessary to wire input power, output to the pumps, output to the timer alarm, and input from the pH, ORP and temperature electrodes, where applicable.

2.3.1 Wiring for PHCN-50 (Refer to Figure 2-1)

- 1. Pull the wires through the side of the NEMA-4X enclosure.
- 2. Fasten the panel in place, loosen the display panel captive thumbscrew in the upper left-hand corner of the sub-panel, and hinge the sub-panel all the way down.
- 3. With the circuit breaker for the input power OFF, connect the input power to the terminal strip: a black wire for 117V to terminal 14, a white wire for neutral to terminal 15. Use #18 gauge or larger wire. Terminal #1 is nearest to the panel hinge; the numbers increase toward the top of the panel.
- 4. Connect the pH probe to the BNC connector.
- 5. Connect the Automatic Temperature Compensation probe (refer to Section 2.3.2, Step 7).
- 6. For manual temperature compensation, refer to Section 2.3.2, Step 7.

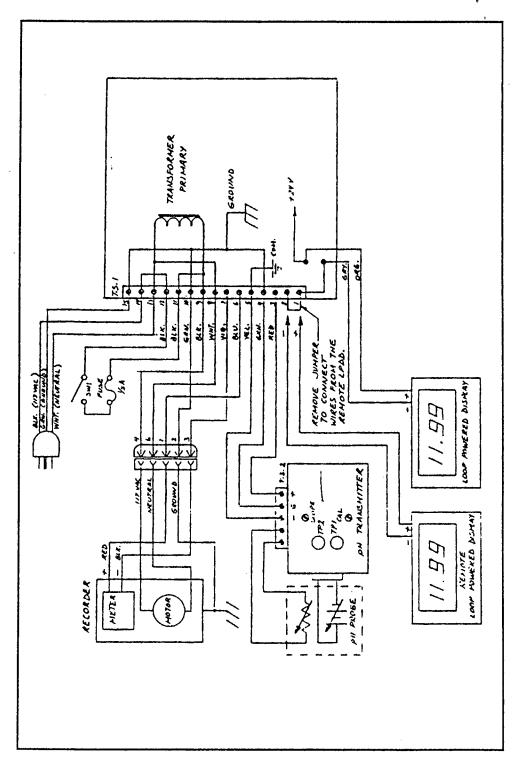


Figure 2-1. Wiring Diagram (PHCN-50)

2.3.2 Wiring for PHCN-51 and PHCN-52

For PHCN-51, see Figure 2-2; for PHCN-52, refer to Figure 2-3.

- 1. Pull the wires through the side of the NEMA-4X enclosure.
- 2. Fasten the panel in place, loosen the controller captive thumb screw in the upper left-hand corner of the controller sub-panel, and hinge the sub-panel all the way down.
- 3. Connect the pump wires as shown in the wiring diagram: use black wire for the switched 117V connection and white wire for the return to neutral. The switched 117V power is labeled "N.O Relay". The wire gauge should be #18 or larger. Pump #1 uses terminals 1 and 2; pump #2 uses terminals 4 and 5; timer alarm uses terminals 13 and 14. Terminal #1 is nearest to the panel hinge; the numbers increase toward the top of the panel. Check the contact rating from the Specifications section for inductive load.
- 4. With the circuit breaker for the input power OFF, connect the input power to the terminal strip: a black wire for 117V to terminal 9, a white wire for neutral to terminal 7, and a green wire for ground to terminal 8. Use #18 gauge or larger.
- 5. Connect the pH probe BNC connector to the transmitter.
- 6. Manual Temperature Compensation requires a fixed resistor at the terminals marked with a resistor symbol. See Table 5-1 for the proper value vs. temperature. The transmitter is shipped with a resistor for 25°C. Remove when using Automatic Temperature Compensation.
- 7. Connect the Automatic Temperature Compensation probe wires to the screw terminals on the transmitter with a resistor symbol. There is no polarity, so either wire can go in either place.

8. Remote wiring requires the extension of the wires from the P.C. board to the remote location. Use wire nuts to make the connections and extend the red wire to the "+" terminal, green wire to the ground terminal, and yellow wire to the "-" terminal of the transmitter. The wire size should be #22 to #18 gauge; the length can be several hundred feet, if necessary.

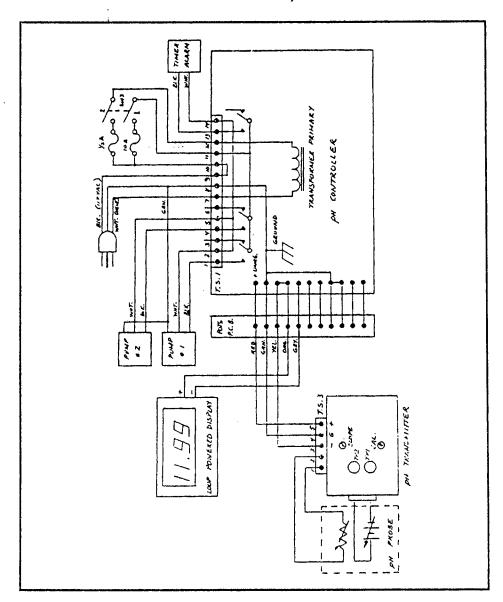


Figure 2-2. Wiring Diagram (PHCN-51)

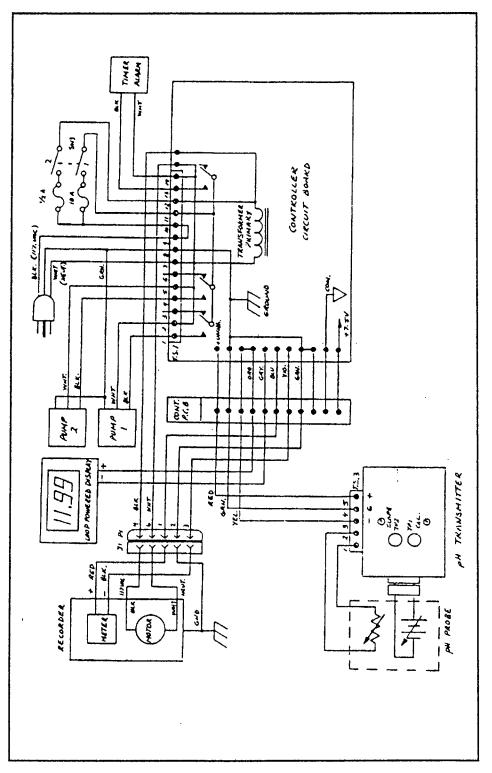


Figure 2-3. Wiring Diagram (PHCN-52)

2.3.3 Wiring for PHCN-53 (Refer to Figure 2-4)

The PHCN-53 has two pH or ORP probes as inputs and two transmitters; one for the controller, and one for the recorder. The recorder transmitter is located internally.

- Pull the wires through the side of the NEMA-4X enclosure.
- Fasten the panel in place; loosen the controller and recorder captive thumb screws, and hinge both panels all the way down.
- 3. To connect the pump wires, the input power, the controller pH probe, automatic temperature compensation, remote transmitter wiring and remote display wiring, refer to Section 2.3.2, Steps 3 through 8. This wiring is identical to the wiring for the PHCN-52.
- 4. To connect the pH probe to the recorder transmitter, the female BNC connector is located on the adapter board on the controller. This connector is labeled "recorder".
- Recorder input Automatic Temperature Compensation wires are connected to the terminal strip of the recorder transmitter mounted on the recorder. The terminals are marked with a resistor symbol. For remote mounting, the terminal strip is on the adapter board attached to the recorder transmitter.
- 6. Recorder manual temperature compensation is the same as for the controller; refer to Section 2.3.2, Step 6.

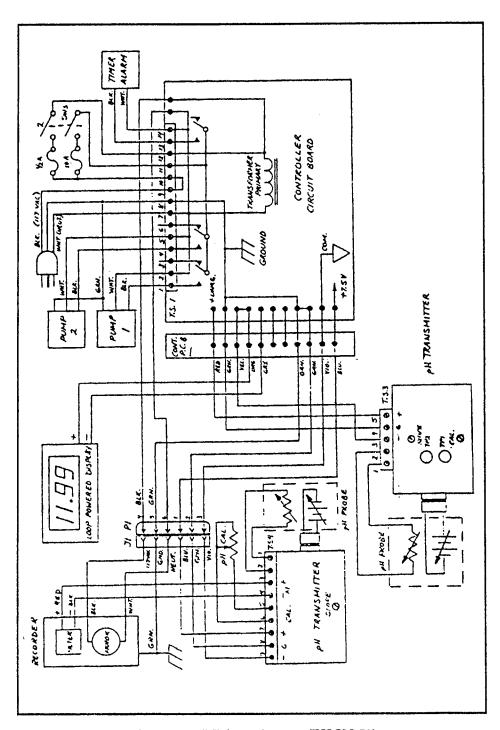


Figure 2-4. Wiring Diagram (PHCN-53)

2.3.4 Wiring for PHCN-54 (Refer to Figure 2-5)

The PHCN-54 consists of two controllers mounted on the same panel. They both may be pH; one may be pH, the other ORP; or both ORP controllers. Each controller has its own transmitter. The input power wiring is connected to only one controller. Do NOT wire power to both controllers. The two controllers use the same on/off switch and fuses, so the power must go to the left side controller. The right side controller is prewired for power from the fused side of the power-on switch.

- 1. Pull the wires through the side of the NEMA-4X enclosure.
- 2. Fasten the panel in place; loosen both controller captive thumb screws, and hinge both controller sub-panels all the way down.
- 3. Connect the pump wires as described in Section 2.3.2, Step 3. Repeat the wiring for both controllers.
- 4. With the circuit breaker for the input power OFF, connect the input power to the terminal strip of the left side controller. (The right side is prewired from the fuse and switch). Connect the black wire for 117V to terminal 9; a white wire for neutral to terminal 7; and a green wire for ground to terminal 8. Use #18 gauge wire or larger. Terminal 1 is nearest the hinge and the numbers increase toward the top of the panel.
- 5. The remainder of the wiring is the same as described in Section 2.3.2, Steps 5 through 8, except that the wiring is repeated for each controller.

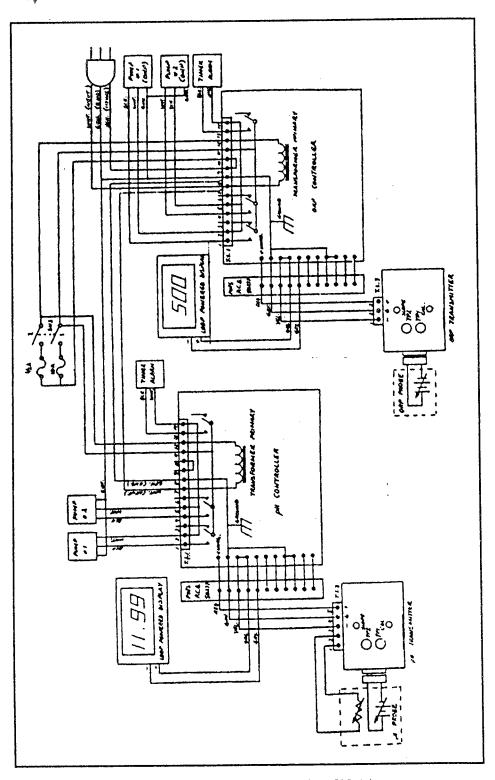


Figure 2-5. Wiring Diagram (PHCN-54)

2.4 Wiring to the Remote Display

Refer to Figure 2-6.

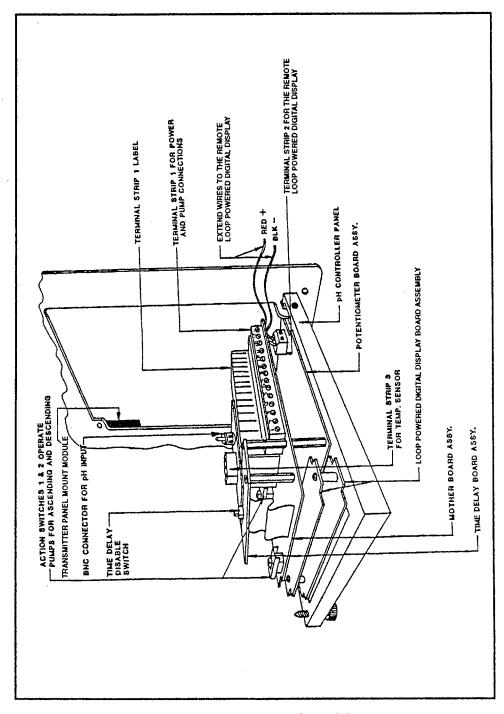


Figure 2-6. Remote Display Wiring

2.5 Chart Recorder Paper Installation

Refer to Figure 2-7. A warning to "renew chart" appears on the last three feet of each roll of paper. To install:

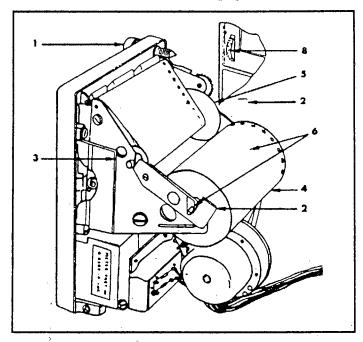


Figure 2-7. Installing the Chart Paper

- 1. Turn power off before loading chart paper.
- 2. Open recorder by loosening thumb screw (1).
- 3. Unlatch retaining clips (2).
- 4. Open panel to chassis latch (3) on side plate.
- 5. Remove supply and take-up roller. If paper is still attached to the supply roller, carefully slide the paper from between the front panel and chart drive. Do not pull the paper backward through the recorder because of the danger of snagging the pointer.
- 6. Insert the supply roller into the new roll of chart paper.
 The perforated end of the paper is nearest to the roller shoulder.

- 7. Unroll about a foot of paper. Slide the paper between the panel and side plate, sprocket holes first. Keep the paper taut and close to the drive drum to prevent snagging the pointer.
- 8. Engage the supply roller shaft in both seating notches (6) and check to be sure that the paper sprocket holes engage the time drum sprockets.
- 9. Slide the cardboard sleeve all the way on the take-up roller against the disc.
- 10. But the paper against the disc and tape the paper to the sleeve, printed side out. Wrap a few turns of the paper to be sure paper is started true.
- 11. Continue rolling paper and place roller shaft into notches. (Lower notch left-hand side).
- 12. Close clips (2), latch (3) and recorder front panel; tighten thumb screw (1).
- 13. Advance paper with the chart advance wheel (8) to assure that the paper moves through the recorder. Set to time.

3

Operating the Controller/Recorder

3.1 Controls and Indicators

Refer to Figure 3-1.

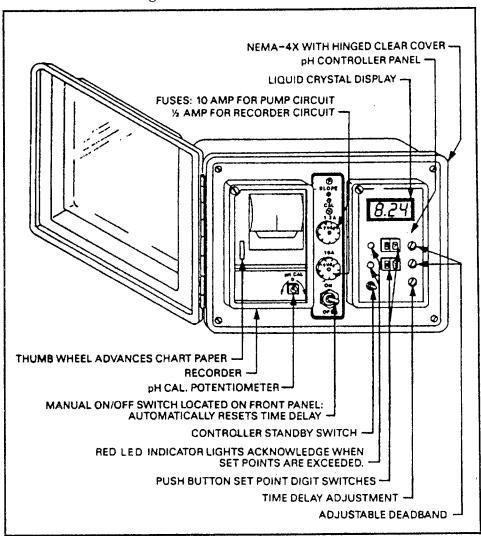


Figure 3-1. PHCN-50 Series Front Panel

3.1.1 PHCN-50

PHCN-50 has three operating controls and two indicators. There are two screwdriver adjustment pots on the front panel (on the transmitter for remotely mounted) "Slope" and "Cal"; these are to standardize the probe using buffer solutions. There is a front panel Calibration adjustment knob to set the recorder at 7.0 pH when the probe is in the 7.0 buffer. One indicator is an LPDD (loop-powered digital display) and is mounted in the front panel and reads out directly in pH units. The other indicator is the recorder.

3.1.2 PHCN-51

The PHCN-51 has the following controls and indicators:

- SLOPE and CAL screwdriver adjustments on the front panel (on the transmitter for remotely mounted) to standardize the probe using buffer solution.
- 2. Two (2) front panel switches to set the control limits; 2.0 to 11.9 pH in 0.1 pH increments; (0 to 99% for 0 to 1000mV ORP scale in 10mV increments).
- 3. Two (2) front panel "deadband" adjustments: one for each control set point, adjustable from 1 to 50% of span.
- 4. Two (2) slide switches on the main PC board: one for each set point limit. These switches energize control relays for Acid or Base addition. Position "A" is for acid; "B" is for base.
- 5. Two (2) red LED indicators: one for each set point. They light up when the relay is energized.
- 6. One (1) front panel timer adjustment (adjustable from 1 to 11 minutes). This control sets the maximum time for the pH correction to take place. If, after either set point control relay has been energized, and the timer alarm has expired, the timer alarm relay will energize and the set point control relay will de-energize.

If the pH level returns within the set point limits, the timer will reset, or it can be reset manually, by turning the power on and off.

- 7. One (1) front panel digital display for the pH reading. This indicator provides a readout of the pH as measured by the probe The input is provided by the 4 to 20 mA loop current of the transmitter. As an option, an additional LPDD may be mounted remotely by extending two wires to the remote location.
- 8. One (1) slide switch on the timer PC board. This switch allows you to disable the timer circuit.
- 9. One (1) standby switch for de-energizing both control relays.

3.1.3 PHCN-52

The PHCN-52 has the same operating controls and indicators as the PHCN-51, with the following additions:

- 1. A recorder front panel calibration adjustment is used to set the recorder at 7.0 pH when the probe is in a 7.0 buffer.
- 2. A strip chart recorder that is driven by the circuitry in the controller. It indicates and records from 2 to 12 pH. Chart speed is 1 inch per hour. One roll of chart paper is included and will last an estimated 30 days.

3.1.4 PHCN-53

The PHCN-53 has the same operating controls and indicators as the PHCN-52, with the following differences:

The transmitter is mounted on the recorder chassis. It is powered from the controller and has separate pH, ORP and temperature probes for its input. It has a screwdriver "Slope" adjustment and a "Cal" adjustment on the recorder panel to set the recorder to 7.0 pH when the recorder probe is in a 7.0 buffer. For remote mounting, the "Cal" adjustment is on the adapter attached to the transmitter. The adapter board has a pair of test points to monitor when standardizing the recorder probe.

3.1.5 PHCN-54

The PHCN-54 is the same as the PHCN-51, except that there are two separate controllers.

The ORP Control Option has the following differences in control and indicator operations:

- The front panel digital switches are settable from 0 to 99% of full scale in 1% increments (10 mV per increment for 0 to +1000 mV).
- 2. The front panel digital display provides readouts from 000 to 1000 mV.

3.2 Operating Procedure

- 1. Make sure electrodes are connected.
- 2. Turn on the power switch.
- 3. Set set point #1 to control Pump 1 (set A-B for acid or base).
- 4. Set set point #2.
- 5. Adjust deadband for each set point.
- 6. Adjust time delay to desired setting or disengage if not used.
- 7. Switch "STBY" to "RUN" mode and begin normal operation.

3.2.1 Standardizing the Probe Using the Transmitter

The transmitter has a pair of test points to monitor the loop current for remote installation. Connect a 3-1/2 digit voltmeter to test points on the transmitter. Place the probe in a 7.0 buffer solution and adjust the "Cal" potentiometer for the 7.0 voltage on the label of the transmitter. If the operating range is below 7 pH, place the probe in a 4.0 buffer and adjust the "Slope" potentiometer. Repeat these adjustments until both are correct, because there is some interaction between "Slope" and "Cal".

3.2.2 Setting Control Limits (PHCN-51, PHCN-52, PHCN-53, PHCN-54)

The control limit digit switches provide readouts directly in pH units from 2.0 to 11.9 pH. To set the limit for pump #1, adjust the upper set point switch. Pump #2 is adjusted with the lower set point switch. If the upper limit (pump #1)is to control acid addition, set the slide switch nearest the top of the panel on the controller circuit board to position "A"; if it is to control base addition, set the switch to position "B". The acid/base slide switch for the lower limit (Pump #2) is located near the center of the controller circuit board.

If the controller uses the ORP option, the set point switches are in percent of span, i.e. 0 to 99%.

3.2.3 Adjusting the Deadband (PHCN-51, PHCN-52, PHCN-53, PHCN-54)

The deadband adjustment potentiometers for the set points are located next to the digit switch, and are adjustable from approximately 1 to 50% of span. If a deadband of 1 pH unit is required, set the potentiometer to 10%. This means that the set point will energize when the pH level goes above it (slide switch set for Acid), and will de-energize 1 pH unit less than the set point. The opposite will happen if the slide switch is in the Base position.

3.2.4 Timer Adjustment

The timer adjustment is continuous from 1 minute to 11 minutes from the front panel. Set the potentiometer to the maximum time it should take to correct the pH level.



Operating the Controller/Recorder

Notes			
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Troubleshooting

4.1 Troubleshooting Guide

Symptom	Possible Cause	Solution	
- Symptom	I OSSIDIE COOSE	Joiotton	
No reading on digital display	No power to unit	Check input wiring	
атэргау	Blown fuse	Replace fuse	
	Loop wiring open	Check loop wiring between transmitter and display	
	Defective transmitter	Return unit to factory	
	Transmitter wires reversed	Return unit to factory	
Reading on display is high or low	Out of calibration	Recalibrate	
	Bad probe	Change probe	
	Defective transmitter	Replace transmitter or return to factory	
	Stray currents	See Section 2.1	
Reading on display is negative	Display out of calibration	Return to factory	
	Defective transmitter	Return to factory	
	Display wires reversed	Return to factory	
Reading on display is over range	Display out of calibration	Return to factory	
	Defective transmitter	Return to factory	
Reading high in 10 buffer or low in 4 buffer	100Ω temperature Replace with correct sensor instead of temperature sensor 1000Ω		

Troubleshooting

Symptom	Possible Cause	Solution		
Set point indicators will not turn on	Time delay has actuated	Reset time delay by turning front panel power switch off and on		
		OR Disable time delay with time delay switch		
	Standby switch not in "RUN" mode	Put standby switch in "RUN" mode		
	Defective controller	Return to factory		
Set point indicators will not turn off	Defective controller	Return to factory		
Display readings unstable	Stray currents	See Section 2.1		
	Defective probe	Replace probe		
	Defective transmitter	Return to factory		
	Temperature sensor open or loose connection	Check wires, replace probe or temperature element		
	No fixed temperature compensation resistor or loose connection	Tighten connections or install resistor		
	Defective controller	Return to factory		
Unit calibrates in buffer solutions, but does not read correctly in process effluent	Stray currents	See Section 2.1		
Display has extra segments or decimal points	Moisture and contaminants on display circuit board	Place unit in dry heat oven at 120°F for 1/2 hour		
	Humid or contaminated environment	Use NEMA-4X enclosure		

Symptom	Possible Cause	Solution
Unit will not calibrate in buffer solution	Defective probe	Replace probe
	Protective cap on electrode	Remove cap
	Open temperature sensor or loose wires	Check wires, replace probe or temperature element
	No fixed temperature compensation resistor or loose connection	Tighten connections or install resistor
	Probe not in solution	Put probe in solution
	Electrode bulb has dried out	Soak probe in 5% HCl for five minutes then soak one to two hours in KCl
One or both set point indicators operate in the reverse mode	A/B switches in wrong position	Put switch in correct position
One or both relays operate in the reverse mode	Load wired to incorrect relay contact	Wire to N.O. relay contact
Set point indicator turns on but relay does not actuate OR Set point indicators turn off but relay stays on	Defective controller	Return to factory
Relay chatter	Noise generated by inductive load	Required damping network across load, see Section 4.2
	Deadband too small	Increase deadband adjustment
	Power line fluctuating	Provide adequate power for controller

Symptom	Possible Cause	Solution
Blows fuse when set point actuates	Load fuse too small or fuses reversed	Check fuses
	Load current too high	Check load

4.2 Inductive Loads

The relays in the controllers are rated at 10A at 120Vac for resistive loads. The rating for inductive loads is 3A with a power factor of 0.4 at 120Vac. Inductive loads will cause arcing at the contacts and usually make the contacts fail and the relay remains on all the time. Since this power factor is difficult to determine, it is a good idea to install a damping network across the load to absorb some of inductive effects of the load. The damping network consists of a 0.1 μ F capacitor @ 600V rating in series with a 1K Ω (2W minimum) resistor. Connect it as shown in Figure 4-1. This will prolong the life of the contacts and reduce electrical noise generated when the contacts open or close. Note: Relays require a minimum load of 200 mA.

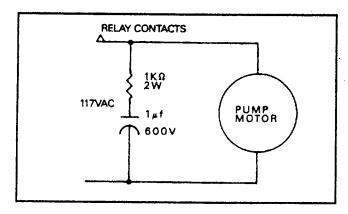


Figure 4-1. Relay Contacts

5

Specifications

Recorder

Display:

None

Range:

2 to 12 pH

Resolution:

0.2 pH/lateral chart deviation

Accuracy:

±0.2 pH

Repeatability:

±0.2 pH

Temperature Compensation:

Manual supplied with 1093Ω

resistor; Automatic 1000Ω platimum

RTD

Response Time:

1 second

Chart Speed:

1 inch per hour

Power Requirements:

120Vac 50/60 Hz

pH Controller

Display:

1/2" (12.7mm); 3-1/2 digit LCD

Range:

2 to 12 pH

Resolution:

0.1 pH

Accuracy:

±0.02 pH

Repeatability:

±0.02 pH

Temperature Compensation:

Manual supplied with 1093Ω

resistor; Automatic 1000Ω platimum

RTD ·

Power Requirements:

120Vac 50/60 Hz (230Vac

optional)

Contact:

Two, 6A SSR, requires 200mA

miniumum load

Deadband Adjustment:

0% to 50% of setpoint

Safety Time Delay:

Adjustable, 1 to 11 minutes

Time Delay Relay:

6 amp SPDT

Temperature:

K-79-7 six inch stem pocket

thermometer range of -10 to 110°C

Optional ORP Controller

Display: 0.5" (12.7 mm), 3-1/2 digit LCD

Range: 0 to 1000mV

Resolution: 1 mV

Accuracy: ±1mV Repeatability: ±1mV

Power Requirements: 120Vac 50/60 Hz

Contact: Two, 6A SSR, requires 200mA

miniumum load

Deadband Adjustment: 0% to 50% of setpoint

Safety Time Delay: Adjustable, 1 to 11 minutes

Time Delay Relay: 6 amp SPST

Weight for all units approx. 10 pounds (4.5 kg) except PHCN-55:

Weight (PHCN-55): approx 16 pounds (7.3 kg)
Dimensions (H x W x D): 11.25" x 9.25" x 5.50"

(285.75 x 234.95 x 139.7 mm)

Table 5-1. Resistor Values

TEMP	0°C	25°C	40°C	50°C	70°C	90°C	100°C
R _{τc} (Ω)	1000.0	1094.9	1151.4	1189.0	1263.8	1338.0	1375.0
pH							
pri	mV	mV	mV	mV	mV	mV	mV
0	+379.3	+414.0	+434.9	+448.8	+478.6	+504.4	+518.2
1	+325.1	+354.9	+372.8	+384.7	+408.5	+432.3	+444.2
2	+270.1	+295.8	+310.7	+320.6	+340.5	+360.3	+370.2
3	+216.8	+236.6	+248.5	+256.5	+272.4	+288.2	+296.1
4	+162.6	+177.5	+186.4	+192.4	+204.3	+216.2	+222.1
5	+108.4	+118.3	+124.2	+128.2	+136.2	+144.1	+148.1
6	+ 54.19	+59.15	+62.13	+64.12	+68.09	+72.05	+74.03
7	0	0	0	0	0	0	0
8	~54.19	-59.15	-62.13	-64.12	-68.09	-72.05	-74.03
9	~108.4	-118.3	-124.2	~128.2	-136.2	-144.1	-148.1
10	-162.6	-177.5	~186.4	-192.4	-204.3	-216.2	- 222.1
11	- 216.8	-236.6	-248.5	-256.5	-272.4	-288.2	-296.1
12	~270.1	~295.8	-310.7	~320.6	~340.5	-360.3	-370.2
13	-325.1	-354.9	-372.8	-384.7	-408.5	~432.3	-444.2
14	-379.3	-414.0	-434.9	-448.8	-476.6	-504.4	-518.2



Accessories

6.1 Replacement Accessories

Part Number	Description
PHCN-45-CHART	One 30-day chart
PHCN-55-BATT	PHCN-55 replacement 6V battery
PHTM-1	Replacement 4-20mA pH Transmitter



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