

**INSTRUCTION  
MANUAL**

**PRESTO - TEK CORPORATION**

**pH/ORP RECORDER**

***MODELS***

***PHR - 212***

***PHR - 212 - ORP***

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## ABOUT THIS MANUAL

This manual introduces you to Presto-Tek's 212 series pH/orp recorder. Use it to understand how your model works, what its functions are, and how to easily install and maintain your pH/orp system. This manual tells you:

- About the 212 series in general
  - Specific features, functions and options about the model you have chosen
  - Special consideration prior to installation of a pH/ORP system
  - Step-by-step installation
  - Step-by-step calibration
  - Chart paper replacement
  - Operation
  - Warranty information
- 

## I INTRODUCTION

You have just received the PHR-212, a member of our new 212 family of instruments designed to monitor and record levels of pH and oxidation reduction potential. If you have used traditional pH and ORP instrumentation, you will quickly appreciate the ease with which your PHR-212 is installed, calibrated and serviced.

If this is the first system you have installed, this manual provides an easy to follow step-by-step procedure to ensure correct installation and proper operation.

If you are familiar with pH and ORP installations, read Section III to familiarize yourself with 212 series features and functions prior to installation. This section thoroughly describes these functions and shows their physical location on the instrument itself.

## II

### UNDERSTANDING THE PHR-212 FUNCTIONS

The PHR-212 is really two instruments:  
A pH(ORP) recorder and a pH(ORP) monitor. It accepts  
as its input a single pH or ORP electrode. This input is  
digitally displayed and continuously recorded via the  
strip chart recorder.

The strip chart recorder continuously records the input  
from the pH(ORP) electrode. The pH scale is 2 to 12 with  
each large division being one pH unit. The ORP scale is 0  
to +1000 mV with each large division being 100 mV.

The chart speed is normally 1" per hour. At this speed,  
one roll of chart paper will last approximately 30 days.  
The sliding door on the recorder allows the date and time  
to be marked.

## III

### FEATURES

The PHR-212 has many standard features including:  
(See Drawing A-194 )

- Compact design
- Front panel control
- Hinged fold down panels for convenient wiring  
and electrode connecting
- 3-1/2 digit 1/2" high LCD display

## IV

### OPTIONS

Some options you may have chosen include:

- Remote mounting of PHTM module for  
applications where electrode is located more  
than 10 feet from the controller
- Benchtop or NEMA 4X enclosure
- $\Delta$  The benchtop enclosure is particularly  
useful when the PHR-212 will be moved

from one place to another. Plug-in power and electrode connections are located on the back panel.

- Δ The NEMA 4X enclosure is rated for wet corrosive environments. It is easily wall mounted, has a clear lexan cover and a locking hasp.

V

SPECIAL  
CONSIDERATIONS  
PH

The pH electrode is the most sensitive and crucial portion of your system as the PHR-212 relies on a correct input from the electrode. Proper adjustment and a correct record are completely dependent on the measurement reliability of the pH electrode. Some important factors to consider are:

- ELECTRODE LOCATION - The pH electrode should always be mounted in a vertical position in a location near but down stream 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. Consult the electrode manufacturers recommendations for cleaning, or contact Presto-Tek for recommendations. Each time the electrode is cleaned or replaced, it must be recalibrated to the PHR-212. Make sure that a regularly scheduled maintenance program is enacted. Your particular application will determine the frequency with which the electrode should be checked.
- THIS 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 flourides may dissolve the glass

membrane. Special electrodes are available. Consult the factory for details.

- TEMPERATURE also affects the pH measurement. The PHR-212 has automatic temperature compensation capabilities, but an ATC element must also be inserted in the process stream. The 212 series uses a 1000 ohm platinum resistance device as its ATC and it may be mounted in the pH electrode or in its own separate housing.
- 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.
- THE CHEMICAL COMPOSITION of the process solution may not only affect the glass pH electrode but also the electrode 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 PHR-212. 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 PHR-212. It is necessary to eliminate the current either by finding the leakage or by adding an earth ground to the solution. Some pH electrode assemblies may incorporate a solution ground (which can be tied to an external earth ground) to eliminate this problem.

VI  
INSTALLATION  
(1) UNPACKING

- After unpacking the PHR-212, remove the 4 panel screws from the 4 panel screws from the front panel.

Remove the panel from the the enclosure and inspect for possible shipping damage.

## (2) MOUNTING

- Panel mount enclosure (see BROCHURE ADVERTISEMENT for panel cut-out dimensions). The panel mount enclosure has two (2) counter sunk holes in the front lip of the enclosures back cover. Remove the PHR-212's front panel. Insert the back cover through the cut-out. Fasten it to the panel with 6-12 x 1/2" flathead screws and nuts provided.
- NEMA 4X enclosure -  
The NEMA 4X enclosure can be mounted to any flat surface using the four (4) mounting holes in its base.
- Bench Top -  
The bench top PHR-212 version is designed to move where it's needed. Included is a convenient carrying handle. Power and electrode connections are made on the back panel via plug-in connectors.

## (3) WIRING

The front panels are factory prewired from the terminal strip on the monitor circuit board to the switch and fuses. The recorder and pHTM are also prewired unless you have ordered the remote pHTM module (see remote pHTM installation). It is necessary to wire-  
(Drwg. 20005 )

1. pH(ORP) electrodes
2. Temperature electrode (if applicable)
3. Remote pHTM wiring
4. Input power

- Pull wires through the holes in the rear of the panel mount box, or through the side of the NEMA 4X enclosure.
- Make sure the instrument panel is fastened securely using the (4) 6-32 Phillips head screws. Loosen the monitor's captive thumb screw in the upper left hand corner of the monitor sub-panel, and hinge the sub-panel all the way down.
- (4) TERMINAL STRIP NUMBERING  Find the terminal strip on the right hand side of the sub-panel. The terminal strip is numbered from right to left as you face it. Terminal #1 is nearest the panel hinge and numbers increase to the left to the top of the panel.
- (5) pH(ORP) ELECTRODES  Locate the BNC connector on top of the sub-panel. Connect the pH electrode to the BNC connector. Dual input unit accept 2 electrodes.
- (6) TEMPERATURE ELECTRODE FOR ATC  The PHR-212 will automatically compensate for temperature variations if a 1000 ohm platinum RTD is connected. If ATC is required, locate the terminal strip next to the BNC connector (labeled with a resistor symbol) on top of the sub-panel. Remove the fixed resistor that is shipped with the instrument. Connect the RTD sensor to the terminal strip. If the temperature of the solution remains within 10 degrees of a point, a fixed resistor may be used in lieu of ATC. See page 16 for RESISTANCE VS. TEMPERATURE CHART.
- (7) REMOTE PHTM WIRING  If the pH(ORP) electrode will be mounted more than 10 feet from the PHR-212, a remote PHTM-1 transmitter should be installed.
- (8) INPUT POWER  Now connect the 117V line current. Make sure the input power circuit breaker and the front panel ON/OFF switch are off. Use #18

gauge wire or larger. Connect a white wire for neutral to \*13, a green wire to \*15 for ground, and a blk wire 117 VAC to \*14. Your PHR-212 is now wired and ready for service.

## VII CALIBRATION

Now that the 212 is wired, follow the steps below to calibrate the pH or ORP electrode: (Skip to section 2 if calibrating an ORP electrode)

### (1) pH

- Close the sub-panel and securely fasten the captive thumb screw.
- Turn the PHR-212 front panel ON/OFF switch to ON.
- Remove the protective plastic shipping cap from the pH electrode and rinse with pure water.
- Place the pH electrode and temperature probe (if ATC is required) into a \*7 buffer solution.
- Using the CAL potentiometer on the front panel, adjust the display to read 7.00.
- Next, adjust the pH CAL knob on the recorder until the indicator on the recorder also reads 7
- Rinse the pH electrode and temperature probe and immerse in a \*10 or \*4 buffer. Choose a buffer which is close to actual solution to be measured.
- Adjust the slope potentiometer on the panel until the digital display reads the value for the buffer chosen.
- Check to see that the recorder indicator needle also reads the correct buffer value.
- Rinse the pH and temperature electrodes and install in the solution to be measured. Calibration is now complete.

(2) ORP

Your instrument has been precalibrated at the factory with use of a mV calibrator. The "CAL" pot has been adjusted for 0 mV. The "SLOPE" pot has been adjusted at 1000 mV.

- ORP electrodes cannot be calibrated, only tested.
- To test your ORP system, use the following procedure:
  - △ Close the sub-panel and securely fasten the captive thumb screw.
  - △ Turn the PHR-212 front panel ON/OFF switch to ON.
  - △ Prepare a pH buffer for testing. Use approximately one gram quinhydrone to 250 ml of your electrode buffer. The table on the following page shows the theoretical millivolts to be expected between a platinum ORP electrode and the saturated calomel reference or the 4 molar silver/silver chloride reference when they are immersed in buffers saturated with quinhydrone. Note that the actual measurements will probably differ in absolute value from these because of a number of factors relating to the chemistry, but the difference values between the various solutions will hold within a few millivolts.

QH<sub>2</sub> VS.

<u>PH (25°C)</u>	<u>4M AG/AgCl</u>	<u>Sat. Calomel</u>	<u>Difference</u>
0	+499 mV	+455 mV	---
4.01	+262 mV	+218 mV	237 mV
6.86	+ 93 mV	+ 49 mV	169 mV
9.18	- 44 mV	- 88 mV	137 mV

(3) REMOTE  
PHTM  
CALI-  
BRATION

Remote pHTM calibrations follow the same procedures as pH described above with the exception that the CAL and SLOPE adjustments are located on the pHTM module. (If it not possible to view the PHR-212's display during calibration, a digital voltmeter will be required.)

- Connect the digital voltmeter to the two test points on the pHTM module.
- Make sure the pH electrode and temperature probe (if applicable) are connected.
- Now follow the same standardizing procedures as described above.
- The readings on the digital voltmeter for the various buffers are as follows:

pH  
 \*10 \_\_\_\_\_  
 \*7 \_\_\_\_\_  
 \*4 \_\_\_\_\_

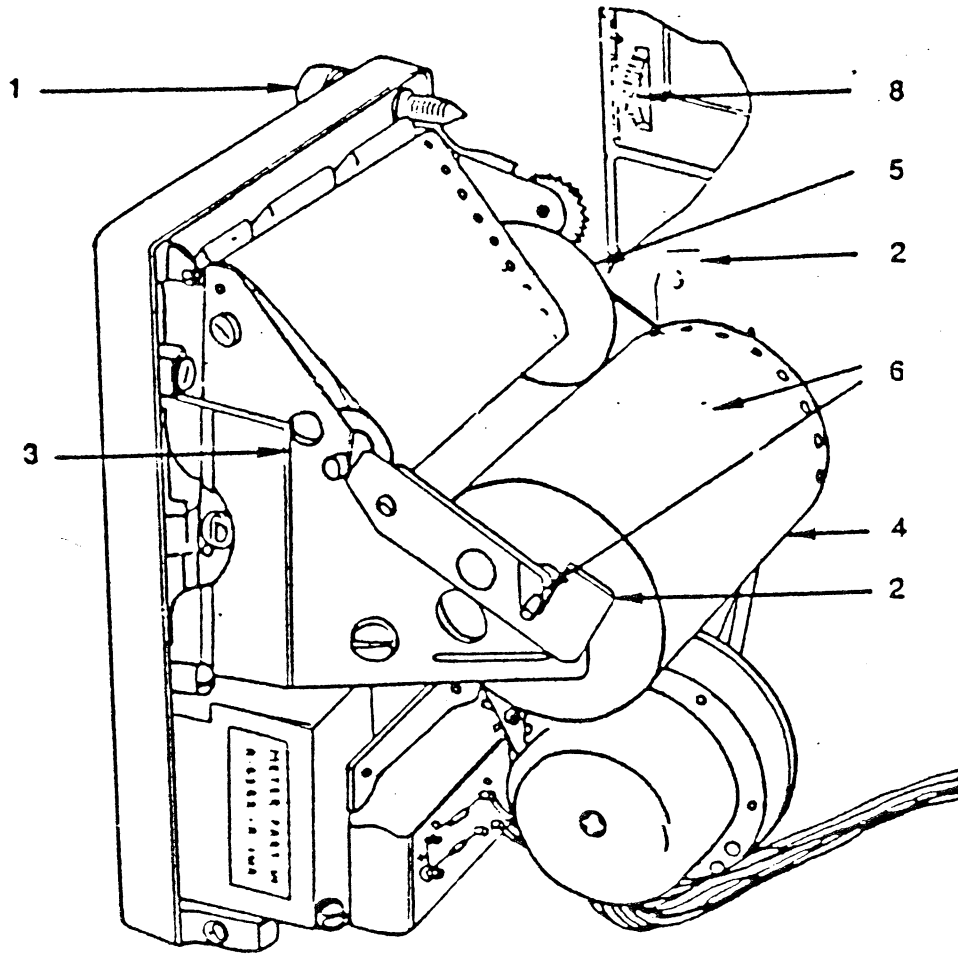
- Once calibrated, place the pH (ORP) electrode back in the \*7 buffer and go back to unit.
- Check to see that the digital display and recorder both indicate 7 pH Adjust the recorder pH CAL pot if necessary.

VIII  
CHART  
RECORDER  
PAPER  
INSTALLATION

A Warning to "renew chart" appears on the last three feet of each roll of paper. Do not use partial rolls of paper in re-roll mode. Refer to diagram on next page.

- Turn power off before loading chart paper
- Open recorder by loosening thumb screw (1).
- Unlatch paper retaining clips (2).
- Open panel to chassis latch (3) RH side plate.

- Remove supply (4) and take up roller (5). If paper is still attached to 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.
- Insert the supply roller into the new roll of chart paper. The perforated end of the paper is nearest to the roller shoulder.
- Unroll about a foot of paper. Slide the paper between the panel and side plate, sprocket holes first. Keep paper taut and close to the drive drum to prevent snagging the pointer.
- 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.
- Slide cardboard sleeve all the way on the take up roller against the disc.
- Butt paper against 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.
- Continue rolling paper and place roller shaft into notches. (Lower notch LH side).
- Close clips (2), latch (3) and recorder front panel Tighten thumb screw (1).
- Advance paper with the chart advance wheel (8), to assure that paper moves through the recorder. Set to time.



### SERIES 200 REROLL

#### IX OPERATION

(1) INDICATORS The PHR-212 has both a digital display and a continuous chart record of the pH (ORP) value.

- Use the digital display for intermittent checks of the pH (ORP) value and during calibration and maintenance.

#### SCALE

pH.....2 to 12

ORP.....0 to +1000 mV

- Use the chart paper as a permanent record of the pH (ORP) value for any given time period (usually 30 days). The chart recorder travels at 1" per hour. The plastic sliding door may be lowered to mark date and time on the chart paper.

SCALE

pH.....2 to 12

ORP.....0 to 1000 mV

- Use a remote indicator when display of the pH value is required in a control room or office separate from where the PHR-212 is mounted. Two (2) ordinary copper wires may be connected to the small terminal strip mounted on the sub-panel near the panel hinge and directly below the main terminal strip. These wires may be run up to 1,000 feet from the PHR-212 to a loop powered indicator (contact the factory for details).

SCALE

pH.....2 to 12

ORP.....0 to 1000 mV

X

STEP-BY-STEP  
OPERATING  
INSTRUCTIONS

Now that you understand your PHR-212's functions, follow these procedures to begin normal operations:

- Make sure electrodes are connected
- Turn on power switch
- Begin normal operation

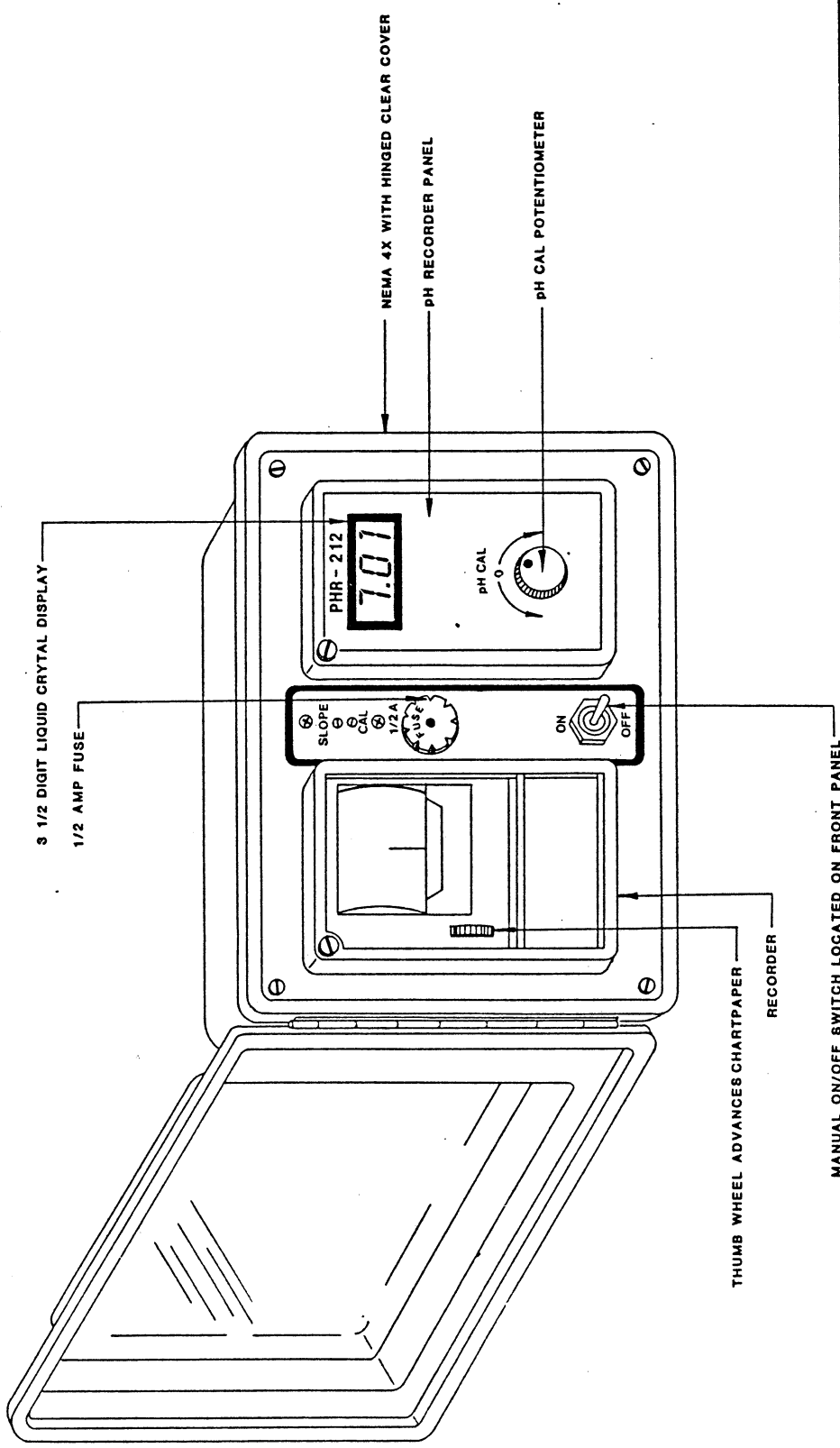
### WARRANTY

ALL EQUIPMENT IS FULLY WARRANTED FOR A PERIOD OF ONE YEAR AS TO DEFECTS IN MATERIALS OR WORKMANSHIP. EQUIPMENT RETURNED IS PREPAID TO THE FACTORY. IF, IN THE OPINION OF THE FACTORY, FAILURE WAS DUE TO MATERIALS OR WORKMANSHIP, REPAIR OR REPLACEMENT WILL BE MADE WITHOUT CHARGE. AND RETURNED AT NO CHARGE, A NORMAL SERVICE CHARGE WILL BE MADE FOR REPAIRS MADE DUE TO MISTREATMENT, NORMAL WEAR, OR MADE ON EQUIPMENT OUT OF WARRANTY --- IN WHICH CASE, EQUIPMENT IS RETURNED FRIGHT COLLECT.

PH/ORP ELECTRODES CARRY A LIMITED 30 DAY WARRANTY DUE TO THE FRAGILE NATURE OF THIS COMPONENT.

WE ARE GLAD TO OFFER SUGGESTIONS ON THE USE OF OUR VARIOUS PRODUCTS. NEVERTHELESS, THERE ARE NO WARRANTIES GIVEN EXCEPT SUCH EXPRESSED WARRANTIES OFFERED IN CONNECTION WITH THE SALE OF A PARTICULAR PRODUCT. THERE ARE NO IMPLIED WARRANTIES OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE GIVEN IN CONNECTION WITH THE SALE OF ANY GOODS. IN NO EVENT SHALL **PRESTO-TEK CORPORATION** BE LIABLE FOR CONSEQUENTIAL, INCIDENTAL OR SPECIAL DAMAGES. THE BUYER'S SOLE AND EXCLUSIVE REMEDY AND THE LIMIT OF **PRESTO-TEK CORPORATION'S** LIABILITY FOR ANY LOSS WHATSOEVER, SHALL NOT EXCEED THE PURCHASE PRICE PAID BY THE PURCHASER FOR THE UNIT OR UNITS OR EQUIPMENT TO WHICH A CLAIM IS MADE.

REVISIONS		
LTR	DESCRIPTION	DATE



APPROVALS	DATE
DRAWN	11-11-81
TECH'L HCCU	
CHECKED	
SCALE	DRAWING NO.
	B A 194
	DO NOT SCALE DRAWING SHEET

**PRESTO-TEK CORP.**

**MODEL PHR-212**

**OUTLINE SALES DWG.**



**RESISTANCE VS. TEMPERATURE CHART**

<b>°C</b>	0	10	20	25	30	40	50	60	70	80	90	100
<b>°F</b>	32	50	68	77	86	104	122	140	158	176	194	212
<b>Ω</b>	1000	1039	1078	1097	1117	1155	1194	1232	1271	1309	1347	1385