LAKEWOOD INSTRUMENTS

pH AND ORP NODE (NpH)

INSTALLATION & OPERATION MANUAL

SERIAL #:_______________

Lakewood Instruments
7838 North Faulkner Road, Milwaukee, Wisconsin 53224 USA
Phone (800) 228-0839 • Fax (414) 355-3508
http://www.lakewoodinstruments.com
Lakewood Instruments

We thank you for your selection and purchase of a Lakewood Instruments product.

With proper care and maintenance, this device should give you many years of trouble-free service. Please take the time to read and understand this Installation and Operation Manual, paying special attention to the sections on OPERATION and MAINTENANCE.

If, in the future, any parts or repairs are required, we strongly recommend that only original replacement parts be used. Our Customer Service Department is happy to assist you with your parts or service requests.

Lakewood Instruments Customer Service and Technical Support Departments can be reached by calling (800) 228-0839 or faxing (414) 355-3508, Monday through Friday, 7:30 a.m. - 5:00 p.m. CST.

Mail should be sent to:

Lakewood Instruments
7838 North Faulkner Road
Milwaukee, WI 53224 USA
# pH AND ORP NODE (NPH)

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NPH

The Model NPH pH and ORP Node is a LONWORKS®-compatible node that uses twisted pair communications. The NPH works with several different temperature compensation inputs and with pH or ORP sensors. These multiple-sensor input options allow for various sensors to be used. Temperature compensation is adjustable by pH per Celsius for use with various processes. Up to four NpH nodes may be installed on the 2000 series controller.

NOTE: To use the NpH with a 2000 series controller it must have the NIN option and contain Rel 98 Firmware. All controllers shipped after 1 June 98 will have Rel 98 firmware.

 Relay configuration and datalogging

After a NpH is installed, not only will you be able to view additional inputs you will also be able to datalog information and control relays based on the external device.
Specifications

Sensor Connections
BNC   Sensor BNC
Pin 1  none
Pin 2  none
Pin 3  Reference
Pin 4  none
Pin 5  Solution Ground and Temperature Compensator
Pin 6  Temperature Compensator

Range
pH Range   0-14 (with proper pH sensor)
ORP Range  -2000 to +2000 (with proper ORP sensor)

Temperature
Compensation Inputs  None   100 PTC
                     500 NTC  1K PTC
                     4K NTC  3K PTC
                     10K NTC 10K PTC
Compensation is adjustable by pH per °C (pH only)

Power  24 VDC
INSTALLATION

Checking

Inspect the shipping carton for obvious external damage. Note on the carrier's bill-of-lading the extent of the damage, if any, and notify the carrier. Save the shipping carton until your Node is started up.

⚠ If shipping damage has occurred, call the Lakewood Instruments Customer Service Department at (800) 228-0839 and return the controller to the factory in the original carton.

Connections

The NIN option is required on the 2000 series controller for the NPH to operate. The NIN option provides power and two way communications to the NPH. Refer to the drawings in the back of this manual for wiring details.

Service Light

The service light is used for installation of the node and for troubleshooting. Below is a chart of what the service light might indicate during operation.

<table>
<thead>
<tr>
<th>Behavior</th>
<th>Description</th>
<th>Resolution</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bad Node</td>
<td>Replace Node</td>
</tr>
<tr>
<td>2</td>
<td>Node is un-configured</td>
<td>Install Node</td>
</tr>
<tr>
<td>3</td>
<td>Node is running normally</td>
<td>none</td>
</tr>
<tr>
<td>3</td>
<td>Node does not have power</td>
<td>Check power supply</td>
</tr>
</tbody>
</table>

Light will also be on while the service button is pressed.
Operation with 2000 Series Controllers

Before it can be used, the NPH must be installed into the software of the controller.

Under the Main Menu,

```
MAIN MENU
================
3  FEED SCHEDULE
4  ALARMS
5  WATER METERS
6  4-20 MA OUTPUTS
7  SYSTEM SETUP
8  CLOCK
```

Highlight SYSTEM SETUP, then press ENT. You should see the following screen:

```
SYSTEM SETUP
================
1  PROCESS PARAMETERS
2  INITIALIZATION
3  DIGITAL INPUTS
4  FIRMWARE VERSIONS
5  SECURITY
6  DIAGNOSTICS
7  COMMUNICATIONS
8  NODE INSTALLATION
```

Highlight NODE INSTALLATION, then press ENT. You should see the following screen:

```
NODE INSTALLATION
====================
1  INSTALL A NEW NODE
2  DE-INSTALL A NODE
```
Highlight **INSTALL A NEW NODE**, then press **ENT**. You should see the following screen:

```
INSTALL A NEW NODE
================
1 RELAYS 5-8
2 RELAYS 9-12
3 MAKEUP COND
4 REMOTE SENSOR
5 REMOTE SENSOR
6 REMOTE SENSOR
7 REMOTE SENSOR
8 ANOLOG INPUTS (4)
9 ANOLOG INPUTS (4)
10 DIGITAL INPUTS (4)
11 DIGITAL INPUTS (4)
```

**NOTE: YOU MUST ASSIGN YOUR NPH TO REMOTE SENSOR. THEN YOU MAY SELECT pH OR ORP (DEPENDING ON SENSOR BEING USED).**

Select which node to install.

```
WHICH PROCESS?
================
1 CONDUCTIVITY
2 pH
3 ORP
```

The following screen should appear:

```
PRESS SERVICE PIN
PRESS ANY KEY
```

Momentarily press the Service Pin on the node to be installed. The Service Light should turn on while the Service Pin is pressed. After the Service pin is released press any key on the key pad and the node will be installed.
CONFIGURATION

Configuration of Node with Sensors

For the NPH to work properly with different sensors it must be configured properly.

Under the Main Menu,

```
MAIN MENU
============
3 BIO SCHEDULE
4 ALARMS
5 WATER METERS
6 4-20 MA OUTPUTS
7 SYSTEM SETUP
8 CLOCK
```

highlight SYSTEM SETUP, then press ENT. You should see the following screen:

```
SYSTEM SETUP
==============
1 PROCESS PARAMETERS
2 INITIALIZATION
3 DIGITAL INPUTS
4 FIRMWARE VERSIONS
5 SECURITY
6 DIAGNOSTICS
7 COMMUNICATIONS
8 NODE INSTALLATION
```

Highlight PROCESS PARAMETERS, then press ENT. You should see the following screen (screen will vary depending on which other nodes are installed):

```
WHICH PROCESS
==============
1 pH
2 COND
3 pH-1
```

Select which node to set up. pH and COND are not nodes. Highlight the appropriate node and press ENT. You should see the following screen:
See the Sensor Configuration Chart to configure selections 2-5 above.

<table>
<thead>
<tr>
<th>Sensor</th>
<th>Sensor Shield</th>
<th>Temp Comp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1167153 and 1167154</td>
<td>GND</td>
<td>NONE</td>
</tr>
<tr>
<td>1167155</td>
<td>REF</td>
<td>NONE</td>
</tr>
<tr>
<td>1169065</td>
<td>REF</td>
<td>NONE</td>
</tr>
<tr>
<td>520 Series</td>
<td>GND</td>
<td>10K PTC</td>
</tr>
<tr>
<td>521 Series</td>
<td>REF</td>
<td>Varies</td>
</tr>
<tr>
<td>530 Series</td>
<td>GND</td>
<td>10K PTC</td>
</tr>
</tbody>
</table>

If you are not familiar with Damping or Percent/°C the values should be left at .5 sec for damping and 0.00 pH for pH per °C.

All other pH and ORP sensors not manufactured by Lakewood Instruments will use REF for SENSOR SHIELD. Temperature input will vary by manufacturer.
Configuration of Node with Relays

The N420I can be used to control relays in the 2000 series controller or the NRLY node.

Under the Main Menu,

```
MAIN MENU
=================
1 PROCESS
2 RELAYS
3 BIO SCHEDULE
4 ALARMS
5 WATER METERS
6 4-20 MA OUTPUTS
7 SYSTEM SETUP
8 CLOCK
```

highlight RELAYS, then press ENT. You should see the following screen:

```
WHICH RELAY?
=================
1 BLOW
2 RLY2
3 RLY3
4 RLY4
```

Highlight the appropriate relay, then press ENT. You should see the following screen:

```
RLY2
=================
1 DISABLE
2 SETPOINT
3 WATER METER
4 PERCENT BLOWDOWN
5 PERCENT OF TIME
6 FEED SCHEDULE
```

Highlight SETPOINT, then press ENT. You should see the following screen:
Highlight the appropriate Input, then press **ENT**. You should see the following screen:

![SETPOINT Menu](image)

Highlight **SETPOINT VALUES**, then press **ENT**. You should see the following screen:

**SETPOINT**

- **SETPOINT VALUES**
- **WHEN TO ACTIVATE**

Type in the appropriate setpoint and deadband for when the relay should be activated. Press **ENT** to save setpoint and deadband values.

**SETPOINT**

- **SETPOINT VALUES**
- **WHEN TO ACTIVATE**

Highlight the appropriate **WHEN TO ACTIVATE**, then press **ENT**. You should see the following screen:

**WHEN TO ACTIVATE**

- **ABOVE SETPOINT**
- **BELOW SETPOINT**

This screen configures the relay to turn on above or below the setpoint. Press 1 or 2 to make selection. * indicates current selection.
Maintenance and Technical Service

Technical Service

☎ Technical Support for Lakewood Instruments can be reached by calling (800) 228-0839 or faxing (414) 355-3508, Monday through Friday, 7:30 a.m. – 5:00 p.m. CST.

**NOTE:** IF YOU CALL FOR TROUBLESHOOTING HELP, PLEASE HAVE THE MODEL NUMBER, SERIAL NUMBER, AND ANY OPTIONS PERTAINING TO YOUR UNIT AVAILABLE FOR REFERENCE.

✉ Mail and returns should be sent to:

Lakewood Instruments  
7838 North Faulkner Road  
Milwaukee, WI 53224 USA

When any merchandise is to be returned to the factory, please call and obtain a Return Goods Authorization (RGA) number and have the following information available:

- Customer’s name, address, telephone and fax numbers (shipping and billing).
- A hard copy purchase order number for cases where repairs or parts are required that are not under warranty.
- A contact person’s name and telephone number to call if the equipment is beyond repair or to discuss any other warranty matter.
- Equipment model and serial numbers.
- Reason for return, e.g., repair, warranty, incorrect part, etc.

We will then fax to your attention an RGA form that must accompany the returned item.

**NOTE:** THE RGA NUMBER MUST BE CLEARLY WRITTEN ON THE OUTSIDE OF THE PACKAGE(S) BEING RETURNED.

ANY ITEMS SENT BACK TO THE FACTORY WITHOUT AN RGA NUMBER WILL BE REFUSED AND RETURNED TO SENDER.
## Troubleshooting

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>WHAT THIS MEANS</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screen Displays &quot;pH-1: LOW ALARM&quot;</td>
<td>The pH input is below the low alarm setting.</td>
<td>Refer to Alarms under the Main Menu in the 2000 series controller.</td>
</tr>
<tr>
<td>Screen Displays &quot;pH-1: HIGH ALARM&quot;</td>
<td>The pH input device is above the high alarm setting.</td>
<td>Refer to Alarms under the Main Menu in the 2000 series controller.</td>
</tr>
<tr>
<td>Service light flashes</td>
<td>Node is not installed</td>
<td>Install the node.</td>
</tr>
<tr>
<td>Values do not change</td>
<td>NpH is not seeing a change in the sensor.</td>
<td>The sensor may not be properly connected or configured.</td>
</tr>
<tr>
<td>Relay does not activate when set up for set point.</td>
<td>There may be no flow to the controller or deadband too large</td>
<td>Restore flow to the controller. Correct deadband if too large.</td>
</tr>
<tr>
<td>Screen Displays &quot;pH-1: HIGH-REF IMPEDANCE&quot;</td>
<td>pH or ORP sensor is not being properly read.</td>
<td>check wiring and configuration. pH sensor can be damaged if dried out.</td>
</tr>
<tr>
<td>Screen Displays &quot;pH-1: HIGH-REF VOLTAGE&quot;</td>
<td>pH or ORP sensor is not being properly read.</td>
<td>check wiring and configuration. pH sensor can be damaged if dried out.</td>
</tr>
<tr>
<td>Screen Displays &quot;pH-1: OPEN TC&quot;</td>
<td>Temperature sensor is not being properly read.</td>
<td>check wiring and configuration.</td>
</tr>
<tr>
<td>Screen Displays &quot;pH-1: SHORTED TC&quot;</td>
<td>Temperature sensor is not being properly read.</td>
<td>check wiring and configuration.</td>
</tr>
</tbody>
</table>
NOTES: UNLESS OTHERWISE SPECIFIED:

1. NIN OPTION PROVIDES +24 VDC TO ALL NODES.
   IF USING MORE THAN 3 NODES AN EXTERNAL
   +24 VDC POWER SUPPLY IN PARALLEL IS
   RECOMMENDED.
NOTES: UNLESS OTHERWISE SPECIFIED;

1. DATA TWISTED PAIR SPECIFICATIONS:
   - Belden 85102, Single twisted pair, stranded 26/28, unshielded, plenum.
   - Belden 7471, Single twisted pair, stranded 26/28, unshielded, nonplenum.
   - JY # STY 2 X 2 X 28, UL level V, 22 AWG, twisted pair, typically solid and unshielded.
   - Four wire helical twist, solid, shielded.

2. IF SHIELDED CABLE IS USED, THE SHIELD SHOULD BE CONNECTED TO EARTH GROUND VIA A 470 OHM, 25 WATT, METAL FILM RESISTOR TO PREVENT STATIC CHARGE BUILD-UP.

3. MAXIMUM POWER REQUIREMENT 23 MA @ 24 VDC.

NODE CONFIGURATION
TC 10KPTC
SOL GND ON SHIELD

520 pH SENSOR

TOP

BOTTOM

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NOTES: UNLESS OTHERWISE SPECIFIED:

1. DATA TWISTED PAIR SPECIFICATIONS:
   BELDON 85102. SINGLE TWISTED PAIR, STRANDED 2/28, UNSHIELDED, PLULUM.
   BELDON 8471. SINGLE TWISTED PAIR, STRANDED 2/28, UNSHIELDED, NONPLULUM.
   JY 5 (ST) Y 2 X 2 X .8. UL LEVEL V 22 AWG, TWISTED PAIR, TYPICALLY SOLID AND UNSHIELDED.
   FOUR WIRE HESICAL TWIST, SOLID, SHIELDED.

2. IF SHIELDED CABLE IS USED, THE SHIELD SHOULD BE CONNECTED TO EARTH
   GROUND VIA A 470K OHMS, 25 WATT, METAL FILM RESISTOR TO PREVENT
   STATIC CHARGE BUILD-UP.

3. MAXIMUM POWER REQUIREMENT 23 MA @ 24 VDC.
NOTES: UNLESS OTHERWISE SPECIFIED:

1. DATA TWISTED PAIR SPECIFICATIONS:
   BELDIN B5102. SINGLE TWISTED PAIR, STRANDED 6/28, UNSHIELDED, PLENUM.
   BELDIN R471. SINGLE TWISTED PAIR, STRANDED 6/28, UNSHIELDED, NONPLENUM.
   JY #STY Y 2 X 2 X .8, UL LEVEL V 22 AWG, TWISTED PAIR, TYPICALLY SOLID AND UNSHIELDED.
   FOUR WIRE HELICAL TWIST, SOLID, SHIELDED.

2. IF SHIELDED CABLE IS USED, THE SHIELD SHOULD BE CONNECTED TO EARTH GROUND VIA A 470K OHMS, 25 WATT, METAL FILM RESISTOR TO PREVENT STATIC CHARGE BUILD-UP.

3. MAXIMUM POWER REQUIREMENT 23 MA @ 24 VDC.

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**REVISION HISTORY**

<table>
<thead>
<tr>
<th>REV</th>
<th>DESCRIPTION</th>
<th>ECO</th>
<th>OWN</th>
<th>DATE</th>
<th>APVD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RELEASE</td>
<td>O975</td>
<td>EV</td>
<td>8/21/97</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>ADD JUMPER AND NOTE</td>
<td>TJM</td>
<td>012400</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

**COMPONENT ASSEMBLY**

WIRING, pH TO pH SENSOR
NOTES: UNLESS OTHERWISE SPECIFIED:
1. DATA TWISTED PAIR SPECIFICATIONS:
   Belden 85102, Single Twisted Pair, Stranded 8/28, Unshielded, Plenum.
   Belden 8471, Single Twisted Pair, Stranded 8/28, Unshielded, Nonplenum.
   JY #37) Y 2 X 2 X 8, UL Level V 22 AWG, Twisted Pair, Typically Solid and Unshielded.
   Four wire helical twist, solid, shielded.
2. IF SHIELDED CABLE IS USED, THE SHIELD SHOULD BE CONNECTED TO EARTH
   USING VIA A 470K OHMS, 25 WATT, METAL FILM RESISTOR TO PREVENT
   STATIC CHARGE BUILD-UP.
3. MAXIMUM POWER REQUIREMENT 23 MA @ 24 VDC.

NODE CONFIGURATION
TC 10KPTC
SOL GND ON SHIELD

530 ORP SENSOR

TOP
SERVICE
GREEN
WHITE
RED
BLACK
COAX

BOTTOM

Lakewood
INSTRUMENTS

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NOTES: UNLESS OTHERWISE SPECIFIED:

1. DATA TWISTED PAIR SPECIFICATIONS:
   Belden 87102, Single Twisted Pair, Stranded 24/26, Unshielded, Plenum.
   Belden 8741, Single Twisted Pair, Stranded 24/26, Unshielded, Nonplenum.
   24/26 STY 2 X 2 X .008, UL Level V 20 AWG, Twisted Pair, Typically Solid and Unshielded.
   Four Wire Helical Twist, Solid, Shielded.

2. IF SHIELDED CABLE IS USED, THE SHIELD SHOULD BE CONNECTED TO EARTH
   GROUND VIA A 470K OHMS, 25 WATT, METAL FILM RESISTOR TO PREVENT
   STATIC CHARGE BUILD-UP.

3. MAXIMUM POWER REQUIREMENT 23 MA @ 24 VDC.

REV 0975 EV 8/21/97

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NOTES: UNLESS OTHERWISE SPECIFIED:

1. DATA TWISTED PAIR SPECIFICATIONS:
   JY #ST Y 2 x 2 x 8. UL level IV 22 AWG, twisted pair, typically solid and unshielded.
   Four wire internal twist, solid, shielded.

   TOP
   SERVICE
   NODE CONFIGURATION
   NO T.C.
   REFERENCE ON SHIELD

   BOTTOM
   Lakewood
   INSTRUMENTS
   TO NETWORK

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   MATERIAL
   TRAC DECIMALS ANGLES
   X 2.1 ± .03 ± .5
   .041/16 XXX ± .010 ± .5°

   ORDER NO.
   DATE 10-7-09
   CUSTOMER
   CUSTOMER LOC.
   APVC DATE
   DO NOT SCALE
   DATE
   SCALE NONE FILE TYPE DWG SHEET 1 OF 1

   REV
   DESCRIPTION
   ECO
   OWN
   DATE
   APVC

   1
   RELEASE 10116 PSG 0-7-09
Lakewood Instruments

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