LAKEWOOD INSTRUMENTS

NexSys™

COLOR TOUCH SCREEN
CONTROL SYSTEM

INSTALLATION & OPERATION MANUAL
1. Attach the four (4) supplied mounting feet to the back of the controller enclosure either vertically or horizontally. Install the controller on a flat, non-vibrating surface. Do not mount the controller to a steel object that has a large temperature change (side of cooling tower, etc). This can cause water to condense inside the enclosure.

2. Install water meters, chemical pumps, plumbing assemblies, and sensors as per the suggested installation.

3. Install the provided strain reliefs with nuts, if necessary, by removing the attached black plugs and inserting the strain relief through the hole. If you are using an Ethernet connection install the RJ45 connector as per the instructions included with the connector.

4. Wire sensors, flow switches, water meters, 4-20 mA inputs to the appropriate node. Ensure wiring connections are correct or damage may occur.

5. If doing a conduit installation or using a motorized ball valve, remove receptacles and wire pumps and valves directly to the terminals. Otherwise, plug in chemical pumps and valves to controller.

6. Apply power and allow the NexSys™ Control System to boot up.

7. Test the relay outputs by manual operation and verify proper operation of the chemical pumps and valves.

8. Configure the sensor inputs, water meter inputs, and 4-20 mA inputs if necessary, under System Parameters, Process Parameters.

9. Change the names of component inputs and relays as desired.

10. Calibrate the sensor and 4-20 mA inputs.

11. Program the relay outputs, feed schedules, water meter inputs, 4-20 mA inputs and digital inputs.
IMPORTANT NOTICE

WARNING: CHEMICAL FEED

All electromechanical devices are subject to failure from a variety of causes. These include mechanical stress, component degradation, electromagnetic fields, mishandling, improper setup, physical abuse, chemical abuse, improper installation, improper power feeds, and exposure.

While every precaution is taken to insure proper functioning, extra precautions should be taken to limit the ability of over-feeding by limiting chemical quantities available, secondary shut-downs, alarms, and redundancy or other available methods.

CAUTION: POWER SOURCE AND WIRING

Low voltage wiring and high voltage (110 plus) should not be run in the same conduit. Always run separately. Even shielded low voltage is not a guarantee of isolation.

Every precaution should be taken to insure proper grounding and elimination of shorting or Electromagnetic field (EMF) interference.

WARNING: ELECTRICAL SHOCK

To reduce the risk of electrical shock, this equipment has a grounding-type plug that has a third (grounding) pin. This plug will only fit into a grounding-type outlet. If the plug does not fit into the outlet, contact a qualified electrician to install the proper outlet. **DO NOT** change the plug in any way.
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 (414) 355-2807, or faxing (414) 355-3508, or by emailing csd@lakewoodinstruments.com, Monday through Friday, 7:30 a.m. - 5:00 p.m. Central Time.*

*Mail should be sent to:*

Lakewood Instruments
7838 North Faulkner Road
Milwaukee, WI 53224 USA*
NexSys™ Control System

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October 2014
1.0 INTRODUCTION

The NexSys™ control system is the latest in a long line of reliable, easy to use controllers from Lakewood Instruments. The NexSys™ control system uses the latest in microprocessor technology with a 5.7” Color Touch Screen interface for a high level of application flexibility.

All features, parameters, settings, and functional requirements to operate, program, and monitor the NexSys™ control system are accessible from the touch screen and DO NOT require the use of an external input, PC or device to operate or access. The NexSys™ control system even includes On-Board Help Screens with wiring, programming, and maintenance instructions.

The NexSys™ control system comes standard with the following system interfaces and DMX outputs: LON EIA 709 FTT10, BACnet IP, and MODbus TCP. The unit comes from the factory ready to integrate readings into a BAS, including: The state of any installed relay (On/Off), water meter readings, conductivity readings, additional sensor readings (pH, ORP), sensor alarms, additional 4-20mA input readings, flow condition, and other digital inputs.

The NexSys™ control system comes standard with Ethernet capability through a browser (HTML5) interface that allows 100% access to all features and control parameters of the controller.
### NEMA 4X Enclosure

The enclosure is rated NEMA 4X and includes six receptacles, an eight foot power cord, four ¼" connectors for routing of sensor wiring. The power cord and receptacles are removable for conduit installation with ½" conduit. There are four ¼” connectors for sensor wiring. All connectors are designed to maintain NEMA 4X rating.

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### Color Touch Screen

The NexSys™ includes a 5.7” color touch screen that is easily removable for remote mounting in a wall or panel. There is a 15” color touch screen available as an option. Each NexSys™ is able to accept two displays for display and control.

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### LonWorks, Ethernet, MODbus, and BACnet

The NexSys™ includes LonWorks, Ethernet, Modbus and Bacnet as standard features. The Ethernet is via HTML 5.
2.1 FEATURES

The NexSys™ control system has an astounding array of built-in features such as:

- Color TFT Touch screen user interface
- LonWorks, MODbus, and BACnet communications interface
- Ethernet capability through an HTML 5 interface
- The capability to send E-service reports to a subscribed service
- Email notification of alarms when they occur and when they are acknowledged!
- The ability to display operating values with time and date stamps on color coded graphs with zoom and scroll features
- Ability to control two cooling towers on one controller
- Up to eight active sensor inputs: 2 tower cond, 2 M/U cond, 2 pH and 2 ORP
- Up to eight active 4-20 mA inputs
- Trace chemistry capable with user definable correction factors as part of the programming
- Two water meter inputs with field expansion capability to four
- Able to configure water meter 1 and water meter 2 to sum their totals for relay operation.
- Enclosure is NEMA 4X rated
- Two flow switch inputs configurable to any relay output to lockout the relays on a loss of flow
- Ability to add up to eight 4-20mA input readings
- Ability to add four digital inputs
- Ability to mount every sensor input up to 400 meters away from the controller via 4-wire twisted pair
- Ability to control the chemistry in two towers at the same time
- Six relay outputs expandable to ten relay outputs for user configurable operations such as:
  - Feed by Percent of Blowdown Time
  - Direct or Reverse Setpoint Control
  - By Cycles of Concentration Setpoint
  - Bleed by Volume
  - Trace Chemistry Control
  - By Water Meter Total
  - By Percent On-Time
  - By Scheduled Feed by Day and Time
- On-board Help Screens with wiring, programming, and maintenance instructions.
- Security lockout to prevent unauthorized access.
- The NexSys™ control system stores all setpoints, calibration values, and relay configurations in an EEPROM. An EEPROM does not require a battery to retain information, so if power is lost these values will be retained for years. The NexSys™ control system includes a rechargeable battery backup device to retain information such as water meter totals, and clock and calendar information. Battery life is approximately 3 months if no power is applied to the controller.
- The NexSys™ control system includes sensor diagnostics indicating fouled sensor, broken glass or open PT band, and temperature compensation alarms. The conductivity input includes fouling compensation.
2.2 BENEFITS

- Able to control up to two cooling towers with a single controller.
- Multiple control options in a single economical package.
- Very accurate control of chemical feed and cycles of concentration.
- Feeds chemical after blowdown.
- Very low maintenance.
- Tolerant to power surges and brownouts.
- Power cord, plug receptacles and detached plumbing make installation easy. There is plenty of protected room inside the enclosure for electrician wiring.
- Very accurate monitoring of the evaporated water.
- Able to add additional control, such as additional relay outputs, remote sensor inputs, digital inputs, and 4-20 mA inputs.
### 2.3 Specifications

**Conductivity range**
0-5000 µS

**Conductivity Accuracy**
± 40 µS

**Conductivity Resolution**
10 µS

**ORP range**
-1000 to + 1000 mV

**ORP Accuracy**
± 5.0 mV

**ORP Resolution**
1 mV

**pH range**
2-12 pH

**pH accuracy**
± 0.05 pH

**pH resolution**
0.01 pH

**Accuracy & Repeatability**
± 1.0% of scale

**Deadband/Setpoint**
User programmable

**Auto/Manual outputs**
Menu selectable

**Display**
Color TFT Touch screen

**Water meter inputs (2)**
Contact head, paddle wheel or turbine
Expandable to 4

**Timer**
Relay run time exceeded.

**Output relays**
6 selectable use
Expandable to 10

**Relay ratings**
3A each, 15A total

**Power**
120/240 VAC 50/60 Hz 6W

**Ambient temp**
-4° - 158°F (-20 - 70°C)

**Storage temp**
-22° - 176°F (-30 - 80°C)

**Max. Water temperature**
140°F

**Max. water pressure**
140 psi @ 100°F

**Enclosure**
NEMA 4X
2.4 Ordering Information
NexSys™ System Config (draft)

NXC

- Cooling Tower
- Systems (S=single D=Double)
- Main Conductivity (1-2)
- Main pH (1-2)
- Main ORP (1-2)
- Make-up Conductivity (1-2)
- Relays (S=6 or D=10)
- Flowswitch (1 or 2)
- Water Meter inputs (S=2, D=4)
- 4-20mA Input (4 or 8)
- 4-20mA Output (4 or 8)
- 2nd Remote Display (S=5.7" L=15")
- Mounting Plate (1 or 2)
- Custom Designator (-XX)

Price $ Type S or D 1, 2 or X 1, 2 or X 1, 2 or X S or D 1, 2 or X 5, D or X 5, L or X 4, 8 or X 4, 8 or X 5, L or X 1, 2 or X XX

X = No Option Needed
All items are code W except 2nd remote display which is a code D

Example
Single cooling tower controller with Conductivity and pH sensors, and plumbing with flowswitch

NXC S - 1 1 X X - S - 1 S - X X - X - X - XX
3.0 Unpacking, Mounting and Installation

3.1 Unpacking

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 NexSys™ controller 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.

3.2 Mounting the Enclosure

The NexSys™ controller is supplied with four mounting feet. The NexSys™ can be mounted to a panel or to a flat non-vibrating wall.

- Attach the four mounting feet to the back of the controller enclosure.
- Install on smooth surface to prevent stress on the mounting feet.
- Do not install on vibrating wall.
- If enclosure is installed in corrosive environments, consider purging.
- Dimensions indicated as inches (millimeters).
- The enclosure material is PVC.
- Use #10 mounting screws (4).
- Avoid drilling or punching additional holes in the controller enclosure. Damage incurred as a result of any alteration to the enclosure is not covered under the Lakewood Instruments product warranty.

The dimensions of the enclosure in inches are:

The NexSys™ has a shipping weight of approximately 12 lbs.
NOTE: EXCESSIVE HEAT AND/OR DIRECT SUNLIGHT EXPOSURE WILL DARKEN THE TOUCH SCREEN, MAKING IT DIFFICULT TO READ, AND MAY SHORTEN THE LIFE OF OTHER ELECTRONIC COMPONENTS.

3.3 Plumbing Installation

PLUMBING MATERIALS

- Inlet plumbing can be ¾ inch (1.9 cm) PVC, CPVC, or iron pipe.
- Provide at least 1 gpm (3.79 Lpm) to the sensor. A 4-psi (0.3 bar) differential pressure from take-off to injection is sufficient. If flow is marginal, consult your Lakewood Instruments Factory Representative. The maximum recommended flow is 5 gpm (18.93 Lpm).
- Outlet plumbing can be ¾ inch (1.9 cm) PVC, CPVC, or iron pipe. PVC, CPVC Schedule 80 is recommended for strength and sunlight protection.
- If iron pipe is used, install a PVC union to relieve the stress on the plumbing.
- Install the reed switch into the flow switch plumbing assembly before mounting plumbing assembly.
- The sample line inlet should be plumbed vertically downstream of the recirculation pump and upstream of the heat exchanger with flow in the upward direction. This line brings the sample water into the sensor plumbing for conductivity measurement. If the Lakewood Instruments flow switch plumbing assembly is used, this flow of water also pushes the flow switch float up to activate the relay outputs of the controller.

NOTE: FOR YOUR CONVENIENCE, INCLUDE A LAKewood INSTRUMENTS MODEL 9102 SAMPLE LINE SHUT-OFF VALVE AND A SAMPLE VALVE SPOUT (AS SHOWN) IN THE INLET FLOW PLUMBING.

Figure 1: Model 9102 Valve & Spout

- The sample line outlet flow (solution/sample line) should be plumbed to the tower return line or the tower basin, where you can insert your chemical feed system. Refer to the suggested installation drawing in the back of this manual for an example of a typical installation.
- Remember to install isolation and bypass valves so that maintenance can be performed.
3.3.1 Blowdown Valve Sizing

If you have a way to measure your blowdown flow rate and pressure range, you can use the chart below to determine the correct valve size. If not, consult your water treatment engineer.

Adjustable flow rate diaphragm valves require at least 10-psi (0.7 bar) differential pressure to close. If your water pressure is marginal, use a supply water pressure actuated diaphragm valve or a valve designed to work with zero differential pressure.

Extremely dirty cooling water will plug diaphragm valves. In such cases, use a motorized ball valve and a globe valve for flow control. A strainer ahead of the valve may be okay, but you must flush it regularly. If your flow lines are above 3 inch (for large systems), use a pneumatically operated butterfly valve.

- Be sure to provide isolation and bypass valves. Refer to drawings in the back of the manual for examples of typical installations. If your blowdown valve ever fails, you need to be able to bypass it in order to service it.
### BLOWDOWN VALVE SIZING CHART

<table>
<thead>
<tr>
<th>Pressure range (psi)</th>
<th>Flow range (gpm)</th>
<th>Flow range (Lpm)</th>
<th>Suggested Valve Size (inch)</th>
<th>Suggested Valve Size (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-50</td>
<td>1-5</td>
<td>3.8-18.9</td>
<td>¾ inch</td>
<td>1.9 cm</td>
</tr>
<tr>
<td>50-150</td>
<td>5-10</td>
<td>18.9-37.9</td>
<td>¾ inch</td>
<td>1.9 cm</td>
</tr>
<tr>
<td>10-50</td>
<td>5-10</td>
<td>18.9-37.9</td>
<td>1 inch</td>
<td>2.5 cm</td>
</tr>
<tr>
<td>50-150</td>
<td>10-15</td>
<td>37.9-56.8</td>
<td>1 inch</td>
<td>2.5 cm</td>
</tr>
<tr>
<td>10-50</td>
<td>10-15</td>
<td>37.9-56.8</td>
<td>1½ inch</td>
<td>3.8 cm</td>
</tr>
<tr>
<td>50-150</td>
<td>15-20</td>
<td>56.8-75.7</td>
<td>1½ inch</td>
<td>3.8 cm</td>
</tr>
<tr>
<td>10-50</td>
<td>15-20</td>
<td>56.8-75.7</td>
<td>2 inch</td>
<td>5.1 cm</td>
</tr>
<tr>
<td>50-150</td>
<td>20-30</td>
<td>75.7-113.6</td>
<td>2 inch</td>
<td>5.1 cm</td>
</tr>
<tr>
<td>10-50</td>
<td>30-100</td>
<td>113.6-378.5</td>
<td>3 inch</td>
<td>7.6 cm</td>
</tr>
<tr>
<td>10-50</td>
<td>100-300</td>
<td>378.5-1135.5</td>
<td>4 inch</td>
<td>10.2 cm</td>
</tr>
</tbody>
</table>

### 3.4 Electrical Installation

#### 3.4.1 Incoming Power 115/230 VAC

The NexSys™ can be powered from 115/230 VAC at 50/60 Hz. The NexSys™ controller comes with a power cord and receptacles. The power cord and receptacles are rated for 115VAC. For 230 VAC operation, the power cord and receptacles must be removed.

The incoming power is connected to terminal block P1 at the bottom left corner of the power supply board. There is a **Hot or Line** input (terminal 1), a **Neutral** input (terminal 2) and an **Earth Ground** input (terminal 3). The hot is fuse protected with a 15 amp fuse located next to the power terminal block P1.
3.4.2 Incoming Power 115/230 VAC to Optional Relay Node

The optional Relay Node board relays can be powered with 115/230 VAC at 50/60 Hz from the NexSys™. A small section of wire is used to connect the Relay Node to terminal block P2 located at the bottom left corner of the power supply board. It is labeled NRLY POWER. There is a Hot or Line input (terminal 1), a Neutral input (terminals 2) and an Earth Ground input (terminals 3). The hot is fuse protected with a 15 amp fuse located next to the power terminal block P1.

3.4.3 Relay Outputs

There are six (or 10 with optional Relay Node) user configurable relay outputs. The relay outputs are of the same voltage as the power input. Each relay is rated at 3 Amps. Ensure that the devices that are to be connected to the relay outputs are of the same voltage rating or damage will occur.

The relay outputs are wired to the receptacles. The receptacles are numbered with the receptacle on the far left as relay #1 and the receptacle on the far right as relay #6 (or #9 if the optional Relay Node is installed).

Relay #1 through #4 have both normally open and normally closed contacts. This is designed for use with motorized valves. The normally open (NO) contact is connected to the open connection of the valve and the normally closed (NC) contact is connected to the close connection of the valve. Relays #5 and #6 only have a normally open contact. Each relay output requires a neutral connection and an earth ground connection for proper operation.
WARNING! DO NOT PLUG IN CHEMICAL PUMPS THAT ARE LARGER THAN 1/6 HORSEPOWER. THE CONTROL RELAYS ARE INTENDED FOR ELECTRONIC OR SMALL MOTOR-DRIVEN CHEMICAL PUMPS. LARGER PUMPS REQUIRE AN INTERPOSING RELAY. CONTACT LAKEWOOD INSTRUMENTS FOR SPECIAL INSTRUCTIONS.

3.4.4 Flow Switch Wiring

The NexSys\textsuperscript{TM} Control System has two flow switch inputs standard with the option of two more with a Digital Input Node. The purpose of the flow switch input is to disable the relay outputs on a loss of flow in the system. The flow switch inputs require a digital contact. Any digital contact rated for 24 VDC and 500 mA may be used, such as a relay driven by the recirculation pump. Lakewood Instruments manufactures a flow switch plumbing assemblies for use with the NexSys\textsuperscript{TM} Control System. The user is able to select the flow switch input that will control the individual relays in the software.

The first two flow switches are wired to terminal block P7, which is the second terminal block down on the right hand side of the power supply board. Flow switch #1 (terminals 3 and 4) is labeled DIGI 3, and flow switch #2 (terminals 1 and 2) is labeled DIGI 4.

The second two flow switches are wired to a Digital Input Node. Flow switch #3 (terminals 4 and 7 on a digital input node) is labeled Input 3 and GND. Flow switch #4 (terminals 4 and 8 on a digital input node) is labeled Input 4 and GND.

Note: If a flow switch is not used then a jumper wire must be installed across the flow switch input terminals of any flow switch input that is tied to any of the relays.
3.4.5 Water Meters

The NexSys™ Control System will accept two water meter inputs with the option of adding two additional water meter inputs with a Digital Input Node. The relays can be configured to operate based on any of the water meter inputs and the sum of the first two water meter inputs can be used operate relays. This is useful when there are two different sources of makeup water. Blowdown by water meter is a special function and is explained in the blowdown section of this manual. Refer to the water meter manufacturer's manual for plumbing information.

The NexSys™ Control System will work directly with open collector output type water meters such as the following types of meters: dry contacting head meters, paddle wheel meters such as the Signet model 2536 and 2540, and the Autotrol 1 inch and 2 inch meters. Contact Lakewood Instruments for other types of water meters.

The first two water meters are wired to terminal block P8 which is the top terminal block on the on the right hand side of the power supply board inside the NexSys™ Control System. Water meter #1 uses terminals #4, 5, and 6. Water meter #2 uses terminals #1, 2, and 3.
The second two water meter inputs are wired to a Digital Input Node. Water meter #3 is wired to terminals #1, 2, and 3 on a Digital Input Node. Water meter #4 is wired to terminals #4, 5, and 6 on a Digital Input Node.
3.4.6 Node Wiring

Nodes (NpH, NCON, NRLY, NDIG, or N420I) must be wired to the controller before installation and programming can take place. These nodes can be located up to 400 meters away from the controller and can be daisy-chained.

Nodes require +24 VDC for operation and twisted pair wire for data transmission. The NexSys™ Control System can provide the +24 VDC for node operation. Nodes are wired directly to the power supply board inside the controller enclosure to any of terminal blocks P4, P5, and P6, which are the bottom three terminal blocks on the right hand side of the board. Terminal #1 is the +24VDC, terminal #2 is the GND, terminal #3 is DATA B, and terminal #4 is DATA A.

![Node Wiring Diagram](image)

Recommended twisted pair (min of 7 twists/ft) wire types for data specifications are:

- Beldon 85102, single twisted pair, stranded 9/29, unshielded, plenum.
- Beldon 8471, single twisted pair, stranded 9/29, unshielded, nonplenum.
- JY (ST) Y 2 X 2 X .8, UL Level IV 22 AWG, twisted pair, typically solid and unshielded.
- Four wire helical twist, solid, shielded. If shielded cable is used, the shield should be connected to earth ground via a 470K ohm, .25 watt, metal film resistor to prevent static charge buildup.
3.4.7 Sensor Wiring

The cooling tower sensors are wired to nodes. There is a conductivity node (NCON) and a pH node (NpH). The pH node is used for either pH or ORP.

**pH and ORP**
The pH and ORP cooling tower sensors have an SMB style connector and a White Solution Ground wire. The SMB connector is connected to the SMB connector on the NpH and the White wire is connected to the six-section terminal block, terminal #5 Sol. GND. There is a jumper wire attached to terminals #3 and #4 that should not be removed.

**Conductivity Sensor**
The conductivity Sensor has four electrodes and six wires, a Red, White, Green, and three Black wires. Two of the Black wires are tied together by a small piece of shrink tube to indicate that they are the Temperature Compensation wires. The third Black wire, along with the Red, White, and Green wires, are attached to one of the four electrodes.

The Green wire is connected to terminal #2, the White wire is connected to terminal #3, the Red wire is connected to terminal #4, and the single black wire is connected to terminal #5. The two Black wires that are shrink-tubed together are connected to terminals #6 and #7.
3.4.8 4-20 mA Input Wiring

The NexSys™ Control System will accept up to two 4-20 Input nodes (N420I). Each node has 4 channels of 4-20 mA input. Terminals #1 and 2 are the first channel of that node, Terminals #3 and 4 are the second channel, terminals #5 and 6 are the third channel, and terminals #7 and 8 are the fourth channel of that node.

Each input loop must be powered by +24 VDC. These inputs can be Internally Loop Powered, meaning that the +24 VDC to power the 4-20 mA loop comes from the 4-20 mA transmitter, or they can use an external +24 VDC power supply. Both methods of powering the loop are shown on the diagram below.
4.0 Functional Overview

4.1 Display

The NexSys™ Control System uses a 5.7” TFT, color touch screen display.

It has multiple lines and screens to display information such as the sensor readings, alarms, relay status, relay configuration, date/time, flow totals from the water meters, menu selections, 4-20 mA input readings, graphs, a system notes screen, and documentation screens.

A second display can be connected to the system for remote monitoring and control. The second display may be located up to 400 meters from the controller. A 15 inch display is available as an option.

4.2 Touch Screen Operation

The NexSys™ Control System uses a color touch screen for ease of operation. Buttons are used to navigate between the available screens and to enter values. To use these buttons, touch and hold for a moment until the screen responds.

UP arrow To change to the next screen.
DOWN arrow To change to the next screen.
LEFT arrow To switch between back up to the previous screen.
RIGHT arrow To switch to the next screen.
HOME button To return to the System screens.
Main Menu button To switch to the Main Menu screen.
MISC buttons To select that feature.

4.3 Help Screens

There are multiple help screens available to assist the operator located throughout the NexSys™ Control System. Touch the blue question mark to access the help screen for the menu screen currently displayed.
4.4 System Home Screens

The home screens consist of:
Two system screens for System 1 and System 2.
Two Alarm screens showing the status of all alarms.
Graphing screens for System 1 and System 2.
An All Sensor Inputs screen showing the current readings of all inputs
A System Notes screen

The different Home Screens are accessed by pressing the up or down arrow buttons on the Home Screens. To switch between the two System screens use the right and left arrow buttons.

4.5 Main Menu

The NexSys™ Control System makes use of multiple screens to view system parameters, program the controller, install/de-install nodes, calibrate the readings, set the alarms, and view documentation.

The main menu is reached by touching the Main Menu button on either of the two System screens. A security password can be enabled to prevent unauthorized access.

The main menu has buttons for:

- Relay Configuration
- Water Meter Configuration
- Node Install or De-install
- Set the Clock and Date
- Alarm Configuration
- Set System Parameters
- Documentation
- Calibration Screens
4.5.1 Relays

The Relay button in the Main Menu allows the operator to set up the relays for operation. The NexSys™ Control System includes 6 relays standard with an option for another 4 relays. All relays can be configured for each of the methods indicated with the exceptions that relay 1 cannot be configured as a Schedule feed relay and relays 1-4 and relay 7 have an additional option to be configured as BLOWDOWN relays because they physically have a normally open contact and a normally closed contact for operation of motorized ball valves.

To configure a relay for operation, a method is selected and the relay is then tied to a user selectable flow switch input. The NexSys™ Control System includes 2 flow switch inputs standard with an option for another 2 additional flow switch inputs.

The available methods of operation are: DISABLE, SETPOINT, FEED BY WATER METER, PERCENT BLOWDOWN, PERCENT TIME, and SCHEDULE FEED. Each of these methods is discussed later in this manual.

4.5.2 Water Meters

The Water Meters button in the Main Menu allows the operator to set up the water meters for operation. The NexSys™ Control System includes 2 water meter inputs standard with an option for another 2 water meter inputs.

Each of the water meter inputs can be configured for: Contacting Head, Paddle Wheel, Autotrol 1 Inch, and Autotrol 2 Inch. They can be configured for gallons or liters.
4.5.3 Node Install/De-Install

All sensor inputs to the NexSys™ Control System make use of nodes. Nodes are mini CPUs that have programming for specific functions, such as a pH, conductivity, or ORP sensor input, relay outputs, 4-20 mA inputs, or digital inputs.

The Node Install/De-Install button in the Main Menu allows the operator to install or de-install nodes in the system. The NexSys™ Control System includes the ability to add four conductivity input nodes, two pH input nodes, two ORP input nodes, two 4-20 mA input nodes with four channels of input each, one digital input node (used for two additional flow switch inputs and two additional water meter inputs), and one relay node with four additional relay outputs.

Nodes are installed in the system through an install procedure which basically consists of telling the controller which node you are installing, pressing the service pin on the node, and touching the display to complete the procedure.

Nodes are de-installed by touching a button to tell the controller to de-install the node.

4.5.4 Set the Clock and Date

The Clock-Date Settings button in the Main Menu allows the operator to set the date and time. A drop-down keypad appears when either the set time button or the set date button is touched.

4.5.5 Alarms

The Alarms button in the Main Menu allows the operator to view alarm history, and set alarm settings and notifications. The alarm functions can also be accessed through the Process Parameters button under System Parameters in the Main Menu.

The screen of the NexSys™ Control System will flash red and a beep sound will occur when an alarm occurs that has been set up in the notifications. The alarm will be displayed in a bar at the bottom of all screens. The screen will not flash, beep, or appear in the alarm bar if the alarm has not been selected in the alarm notification menu.

All selected alarms require operator acknowledgement to clear the alarm. The NexSys™ Control System will log when the select alarm occurs, when it acknowledged, and when the alarm clears.

Current un-acknowledged alarms are displayed in the bar at the bottom of all screens. The current status of all alarms is viewed in the two Alarm Home screens.

Email addresses for alarm notifications are set using the TouchMaker Lite software program.
4.5.6 System Parameters

The System Parameters button in the Main Menu allows the operator access to: Process parameters screens, Component name change, Set the number of days in the Bio Schedule, Reset the display, Change the password, Set up the Email Alarm Notifications, and View system usage information.

4.5.6.1 Process Parameters

The Process Parameters button in the System Parameters Menu allows the operator access to: Configure the sensor inputs including setting the sensor high and low alarm points, Configure the 4-20 mA inputs including setting the high and low alarm points and ranges, and Configure the water meter inputs.

4.5.6.2 Component Name Change

The Component Name Change button in the System Parameters Menu allows the operator access to: Change the name of the sensor inputs, digital inputs, 4-20 mA inputs, and the Relay outputs. The units of measure for the 4-20 mA inputs are set in this screen.

4.5.6.3 Bio/Schedule Setup

The Bio/Schedule Setup button in the System Parameters Menu allows the operator access to: Set the number of days in the Bio Schedule. This is limited to 28 days. This screen also shows the maximum number of Bio Schedules possible.

4.5.6.4 Reset Display

The Reset Display button in the System Parameters Menu allows the operator access to Reset the Display without resetting any user configurable parameters.

4.5.6.5 Change Password

Changing the password places the NexSys™ Control System into the security mode and will require the operator to enter the password to access the main menu. The Change Password button in the System Parameters Menu allows the operator access to Change the password and enable the security mode. The default password is 0000.

4.5.6.6 System Usage

The System Usage button in the System Parameters Menu allows the operator to view the System Usage information. The System Usage information includes items such as: communications information, CPU usage, Memory usage, Firmware Version, Mail State, and Mail Error code. The Mail State and Mail Error are diagnostic tools to troubleshoot email errors. As an email is being processed the Mail State will count up and when completed will reset to all zeros. If an error is encountered the Mail State will lock in on a number and the Mail Error will display a code.
4.5.7 Documentation

The Documentation button allows the operator to view information about the care and operation of the controller and sensor inputs. This includes sensor cleaning procedures, calibration procedures, system wiring, blue locking ring replacement procedures, and part numbers for replacement parts.

4.5.8 Calibration Screens

The Calibration Screens button allows the operator to calibrate the sensor inputs. This includes all sensor inputs including any 4-20 mA inputs that may be installed.

The calibration screens can be accessed either from the Main Menu by way of the CALIBRATION SCREENS button, or from the All Sensor Inputs screen by way of the Go To Calibrate button.

To calibrate the conductivity sensor inputs touch the CON CAL button, to calibrate the pH sensor inputs touch the pH CAL button, to calibrate the ORP inputs touch the ORP CAL button, and to access the 4-20 mA input calibrations touch the Down arrow at the bottom right of the screen and touch the 4-20 CAL button.

4.5.9 Security

The NexSys™ Control System has a security function to limit access to the Main Menu. The Change Password button in the System Parameters Menu allows the operator access to change the password. Changing the password places the NexSys™ Control System into the security mode and will require the operator to enter the password to access the main menu. When the password is entered, the operator will have access to the Main Menu for 300 seconds before returning to the security mode. The default password is 0000.

To disable the security mode, change the password back to 0000.

The security mode only prevents access to the Main Menu. The operator will still have access to the Home screens, the Calibration screens, and manual relay operation.

Note: When you change the password, the security mode will be enabled. Make sure you record your password and store it in a safe and secure place.
5.0 Starting Up the Controller

Once the physical installation is complete it is time to start up the controller.

Initiate sample flow to the controller by opening the sample line isolation valves. Check for leakage.

Power up the controller by either turning on the circuit breaker or plugging the power cord into a 120 VAC receptacle and toggle the on/off switch to on (-).

If applicable, install each node in the Install/De-install Nodes menu section 6.7.

Rename the inputs by following section 6.10.2.

Set the date and time by following section 6.9.

Set the high and low alarms for all inputs by following section 6.8.

Set the alarm notifications by following section 6.8.

Calibrate the inputs by following section 6.3

Configure the BLOWDOWN relays for operation by following section 6.5.2.2.

Configure the rest of the relays for operation by following section 6.5.

Enable the E-mail if applicable by following section 6.11.

Configure the Ethernet if applicable by following section 6.11.

Change the remote access password if applicable by following section 6.11.

Set up the security mode if applicable by following section 6.10.5.

Verify operation of the controller before leaving the area.
6.0 Operation of the Controller

6.1 Home Screens

The main Home screen is the System 1 screen. Touching the Home button will always return the NexSys™ Control System to the System 1 screen. Also, if the controller is in any other screen for more than about 5 minutes, the NexSys™ Control System will automatically return to the System 1 screen.

6.1.1 System Screens

The screens that are used the most in the NexSys™ Control System are the System Screens. There are two System Screens; System 1 and System 2. To switch between the System Screens, press the right arrow to switch from System 1 to System 2, or press the left arrow to switch from System 2 to System 1.

The System screens include information such as the Date/Day/Time, the sensor input readings, two channels of 4-20 mA input readings, water meter readings, flow switch status, the relay status, manual relay operation, and access to the Main Menu.

The System 1 Screen includes the first two conductivity sensor inputs, the first pH and ORP sensor inputs, the relay status and manual relay operation of relays 1-6, water meter inputs 1 and 2, status of flow switch inputs 1 and 2, and 4-20 mA inputs 1 and 2. The System 2 Screen includes the second two conductivity sensor inputs, the second pH and ORP sensor inputs, the relay status and manual relay operation of relays 7-10, status of flow switch inputs 3 and 4, and 4-20 mA inputs 3 and 4.

A System Screen looks like:
6.1.2 Graphing Screens

There are two graphing screens for each of the two systems. The first graphing screen shows the sensor inputs (pH, Conductivity, ORP, and MU Conductivity) over time. The second graphing screen shows the status of the relays over time.

To access the graphing screen for each of the two systems, the NexSys™ Control System must be in that particular System screen. The System screen number is identified in the upper left of the System screen. Use the right or left arrow buttons to switch between the two system screens.

6.1.3 All Sensor Inputs Screen

The All Sensor Inputs screen shows the current readings from all sensor inputs in one location. This includes all four conductivity inputs, both pH inputs, both ORP inputs, and all eight possible 4-20 mA inputs. From this screen it is also possible to access the Calibrations Screens by touching the Go To Calibrate button at the top right of the screen.
6.1.4 System Notes Screen

The System Notes screen provides a place for the operator to enter notes into the controller. There is space for four separate notes of 31 characters each. This is useful for reminders, or providing a telephone number to call for service. To enter a note, touch in one of the Blue areas and a keypad will appear. Enter your note and touch OK.

6.2 Manual Operation of the Relays

All six (ten with optional relay node) of the relays can be operated manually. Relays 1-6 are displayed on the System 1 screen. Relays 7-10 are displayed on the System 2 screen. To switch between the System 1 and the System 2 screens, touch the right or left arrow button in the top left of the System screen.

To manually operate the relays, simply touch the button for the desired relay.

Touch a relay button to manually change the state of that particular relay. If the relay is already on, touching that relay button will turn it off. A relay indicator that is green indicates that the relay is energized. A yellow indicator indicates that the relay is de-energized. The relay will remain in manual operation for five minutes unless that relay button is touched again. After five minutes has expired the relay will return to automatic control. A relay that is in manual control will stay in manual control until the five minutes expires even if this screen is exited. The five-minute timer helps to prevent damage to the system if a relay is left in manual.

**WARNING:** Manual control overrides everything including the flow switch input. Use care when operating relays manually with no flow in the system.
6.3 Calibration of Conductivity, ORP, and pH

6.3.1 CALIBRATION of CONDUCTIVITY

The conductivity requires periodic calibration. Calibration should always be performed with the sensor in the piping assembly with good flow past the sensor. It is necessary to have an accurate reading of the blowdown water to properly calibrate the controller. A hand-held conductivity meter that tests the sample works well for this purpose. If a meter that measures ppm is used, refer to the conductivity vs. ppm chart in section 6.3.3 and convert the ppm to an approximate conductivity value. Buffers can be used to check calibrations but should not be used for calibration purposes (see below).

The NexSys™ Control System uses a single point calibration.

- Ensure that the controller is operating with good flow past the sensor.
- Take a sample of the water and measure with a hand-held conductivity tester.
- From the Main Menu, touch the Calibration Screens button.

- Touch the CON CAL button.

- Ensure that all alarms are clear for the conductivity input. The node checks for a valid input for calibration. If there is an Open or Shorted Temperature compensator or a fouled sensor a good calibration cannot be achieved.

- Touch the Proceed to CON CAL button.

- Touch the Enter Span Value button for the desired sensor input.

- Use the touch pad to input the conductivity reading from the hand-held. Touch “OK” and touch the DONE button in the bottom right corner.

- Take another hand-held sample to verify calibration.
6.3.2 CALIBRATION CHECK OF CONDUCTIVITY IN BUFFER SOLUTIONS

To check the calibration of the sensor in buffer solutions, the sensor is placed in a container of the buffer solution. Ensure that the sensor tips are centered in the container away from the edges and the bottom of the container. The conductivity values displayed can vary depending on the position of the conductivity sensor in the container of buffer solution.

Perform the calibration check as follows:

- Shut the isolation valves to the controller plumbing assembly.
- Remove the Conductivity sensor and place it in the buffer solution.
- Verify calibrations in at least two different buffer solutions.
- Re-install the sensor into the plumbing. Ensure locking ring is locked.
- Restore flow to plumbing assembly.
- If the values are not tracking, clean the sensor and perform a calibration.

6.3.3 Conductivity vs. ppm

The NexSys™ Control System measures the conductivity of the water. The ppm of the water may be measured instead of conductivity. If ppm is measured, use the following chart for an approximation of the conductivity level and calibrate to the conductivity level that is closest to the ppm level that is measured. Remember this is just an approximation because the ions that make up the conductivity may be different than the particles that make up the ppm reading.

<table>
<thead>
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<th>ppm</th>
<th>µS/cm</th>
<th>ppm</th>
<th>µS/cm</th>
<th>ppm</th>
</tr>
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<td>530</td>
<td>10,000</td>
<td>7400</td>
</tr>
</tbody>
</table>
6.3.4 CALIBRATION OF ORP

The NexSys™ Control System reads ORP in millivolts. To control free bromine or free chlorine, pH and temperature must be maintained. 1 ppm of free chlorine at 7.5 pH and 25°C is equal to approximately 550-750 mV. This varies with different water quality.

When calibrating ORP keep in mind that it can be affected by several factors:
- pH
- Water quality
- Temperature

The NexSys™ Control System uses a single point calibration.

We recommend that the ORP calibrations only be performed with the ORP sensor mounted as it will be used in the system. Buffers can be used to check calibrations but should not be used for calibration purposes (see below).

It is necessary to have an accurate reading of the process water to properly calibrate the controller. A hand-held ORP meter that tests the sample is best. Once you have obtained a reading, immediately enter the value into the NexSys™ Control System.

- Ensure that the controller is operating with good flow past the sensor.
- Take a sample of the water and measure with a hand-held ORP tester.
- From the Main Menu, touch the Calibration Screens button.

- Touch the ORP CAL button.

- Ensure that all alarms are clear for the ORP input. The node checks for a valid input for calibration. If there is a High Reference Impedance, High Reference Voltage, Low Reference Voltage, or Open PT Band alarm a good calibration cannot be achieved.

- Touch the Proceed to ORP CAL button.
• Touch the Enter Span Value button for the desired ORP sensor input.

• Use the touch pad to input the ORP reading from the hand-held. Touch “OK” and touch the DONE button in the bottom right corner.

• Take another hand-held sample to verify calibration.

6.3.5 CALIBRATION CHECK OF ORP IN BUFFER SOLUTIONS

A calibration check can be performed in buffer solutions. Use two solutions that are at least 300 mV apart. Perform the calibration check as follows:

• Shut the isolation valves to the controller plumbing assembly.
• Remove the ORP sensor and place it in the buffer solution.
• Verify calibrations in at least two buffer solutions at least 300 mV apart.
• Re-install the sensor into the plumbing. Ensure locking ring is locked.
• Restore flow to plumbing assembly
• If the values are not tracking, clean the sensor and perform a calibration.

6.3.6 CALIBRATION OF pH

The NexSys™ Control System has the ability to perform a two-point calibration for pH, however, a two-point calibration is not normally necessary if using a Lakewood Instruments pH sensor because all Lakewood pH sensors have a slope of 59.14 mv per pH. If the slope has changed enough to require a two-point calibration then the sensor should be cleaned or replaced.

We recommend that the pH calibrations only be performed with the pH sensor mounted as it will be used in the system. Buffers can be used to check calibrations but should not be used for calibration purposes (see below), with the exception of performing a two-point calibration.
It is necessary to have an accurate reading of the process water to properly calibrate the controller. A hand-held pH meter that tests the sample is best. Once you have obtained a reading, immediately enter the value into the NexSys™ Control System.

- Ensure that the controller is operating with good flow past the sensor.
- Take a sample of the water and measure with a hand-held pH tester.
- From the Main Menu, touch the Calibration Screens button.

- Touch the pH CAL button.
- Ensure that all alarms are clear for the pH input. The node checks for a valid input for calibration. If there is a High Reference Impedance, High Reference Voltage, Low Reference Voltage, or Broken Glass, Open TC, or Shorted TC alarm a good calibration cannot be achieved.

- Touch the Proceed to pH CAL button.
- For a pH value greater than 6.0, touch the Enter SPAN Value button for the desired pH sensor input. For a pH value that is less than 6.0, touch the Enter ZERO value button for the desired sensor input.

**Note:** The NexSys™ Control System will not accept a calibration value that is greater than 1.5 pH away from the displayed value. Also, ZERO and SPAN calibrations must be performed at values that are greater than 2.0 pH apart. No message will be displayed but the controller will not accept the calibration.

- Use the touch pad to input the pH reading from the hand-held. Touch “OK” and touch the DONE button in the bottom right corner.
- Take another hand-held sample to verify calibration.
6.3.7 pH CALIBRATION ZERO or SPAN?

The NexSys™ Control System gives the operator a choice of entering a ZERO or a SPAN value for a pH calibration.

For **Single-point calibrations**, the SPAN value should be used for all pH values that are greater than 6.0 pH and the ZERO value should be used at all pH values that are less than 6.0 pH. A ZERO calibration shifts the calibration curve up or down while maintaining the same slope. A SPAN calibration changes the slope of the calibration curve and compensates for a dying or dirty sensor.

For **Two-point calibrations**, both the ZERO value and the SPAN values are used. The ZERO value should be performed at a 4.0 pH value and the SPAN value should be performed at a pH value that is greater than 6.0 pH. The ZERO and SPAN calibration values must be at least 2.0 pH apart.

6.3.8 pH CALIBRATION ERRORS

To perform a pH calibration, all alarms associated with that pH input must be clear or the NexSys™ Control System will not allow a pH calibration to occur. A value can be entered but the indicated value will not change to the entered value.

The NexSys™ Control System will not allow a pH calibration to occur if the Zero and Span values are within 2.0 pH of each other. **THE SPAN AND ZERO VALUES MUST BE AT LEAST TWO pH APART.** If a calibration is attempted where the ZERO value and the SPAN value are within 2.0 pH of each other, the indicated pH value will not change to the value that was entered during the calibration procedure. This is to prevent calibration points that are too close together to establish a good calibration curve. If this happens, it is recommended that a two-point calibration be performed.

The NexSys™ Control System will not allow a pH calibration to occur if the calibration value is greater than 1.5 pH away from the indicated pH value. **THE CALIBRATION VALUE MUST BE WITHIN 1.5 pH OF THE INDICATED pH VALUE.** This is to prevent a calibration from occurring when there is an incorrect signal from the pH probe when the probe has failed, is fouled, or when there is interference in the system. If you receive this message perform a calibration check using buffer solutions.

6.3.9 CALIBRATION CHECK OF pH IN BUFFER SOLUTIONS

A calibration check can be performed in buffer solutions. Use two solutions that are at least 2.0 pH apart. Perform the calibration check as follows:

- Shut the isolation valves to the controller plumbing assembly.
- Remove the pH sensor and place it in the buffer solution.
- Verify calibrations in at least two buffer solutions at least 2 pH apart.
- Re-install the sensor into the plumbing. Ensure locking ring is locked.
- Restore flow to plumbing assembly
- If the values are not tracking, clean the sensor and perform a calibration.
The MAIN MENU of the NexSys™ Control System is accessed by pressing the MAIN MENU button in either the SYSTEM 1 or SYSTEM 2 screen:

The main menu has buttons for:

- Relay Configuration
- Water Meter Configuration
- Node Install or De-install
- Set the Clock and Date
- Alarm Configuration
- Set System Parameters
- Documentation
- Calibration Screens

If the NexSys™ Control System is in the security mode, a password is required to access the Main Menu. A keypad will appear when the MAIN MENU button is touched. Enter the password and touch the OK button to access the Main Menu.

The Main Menu screen has buttons for: Relays, Water Meters, Node Install/De-Install, Clock-Date Settings, Alarms, System Parameters, Documentation, and Calibration Screens. Touch the appropriate button to enter a desired screen.

From anywhere in the menu, pressing the left arrow button labeled “Main Menu” will return you to the MAIN MENU. To return to the System screens touch the Home button.

Certain menu items are only visible if certain conditions apply, such as: nodes are installed, or other parameters are configured. If a menu item does not appear in the menu it most likely means that the option is not installed or configured.

Each of the MAIN MENU options is discussed in detail later in this manual.
6.5 Configuring the Relays

To access the relay configuration screens from the one of the two system screens, touch the Main Menu button. Then touch the RELAYS button. The following screen will appear.

The relay configuration screen is set up to show the current configurations of the first six relays on one screen and the current configurations of relays 7 through 10 on a second screen. To switch between relays 1 through 6 and relays 7 through 10 touch the arrow buttons located at the top right of the screen.

All of the possible configurations for each relay are shown in a vertical row under that relay number. The current configuration will be indicated by the green color of the button. To configure a relay touch the desired button for that relay and the configuration screen will appear.

The possible configurations are: Disabled, Setpoint, Feed by Water Meter, Percent of Blowdown, Percent of Time, and Schedule Feed.

Each of the relays can be configured for each of the methods shown. Relays 1-4 and relay 7 can be configured as blowdown relays and have additional methods of control in the setpoint screens.

All relays must be configured to operate with a flow switch input. That flow switch will override the relay function when there is no flow. All relays that are tied to the same flow switch input are considered a single system and will interact with each other for Blowdowns, Biocide Lockouts, Percent of Bleed, and Schedule Feeds.

NOTE: The BLOWDOWN relays must be configured before the other relays to establish the control systems for the other relays to operate. See section 6.5.2.2

Relays that are configured to operate based on setpoint must be configured to operate based on a sensor input as well as a flow switch input.

NOTE: It is recommended to disable a relay momentarily when changing the method of operation of that relay. This will clear the previously set parameters for that relay.
6.5.1 Disabled

The relay can be disabled. When a relay is disabled, it will not energize automatically, although it can still be operated manually.

- From the RELAY Configuration screen touch Disable to disable the relay. The DISABLE button will turn green indicating that the relay is disabled.

6.5.2 By Setpoint

Each of the relays can be configured to operate based on Setpoint control. The setpoint can be based on a sensor type or based on a 4-20 mA input.

When Setpoint is selected the following will appear on the screen. For relays 1-4 and 7 refer to section 6.5.2.2:

- Touch the appropriate button for the desired Sensor Type input.

The screen will display the available sensor inputs of that type. For example, if pH is selected, the screen will show something like this:

- Touch the button for the appropriate sensor.
- Touch the button for the desired flow switch input. MB IN 3 and MB IN 4 are located inside the NexSys™ Control System enclosure. NDIGI 3 and NDIGI 4 are located on the optional Digital Input Node.
NOTE: All relays **MUST** be tied to a flow switch input and programming cannot be continued until both a sensor input and a flow switch input are selected.

- Once a sensor input and a flow switch input are selected, touch the Continue button in the bottom right corner of the screen. The NexSys™ Control System will display the SETPOINT CONFIG screen.

### 6.5.2.1 Setpoint Config

In the SETPOINT CONFIG screen you will set the SETPOINT, the DEADBAND, the TIMEOUT alarm, the SETPOINT DIRECTION, and the BIOCIDELOCKOUT.

![Setpoint Config Screen](image)

- To accept any changes touch the DONE button or to reject the changes touch the Cancel button.

### 6.5.2.1.1 Setpoint

The **SETPOINT** is the Input value that you are trying to maintain.

Check with your water treatment engineer to determine the setpoint for your system needs.

- Touch the Change button next to the Setpoint value and use the keypad to enter the Setpoint value. Touch the OK button to accept.
6.5.2.1.2 Deadband

Due to continuous fluctuations in the Input level, it is necessary to have a DEADBAND range or stable readings will be difficult to maintain. "Deadband" refers to the difference between the ON point and the OFF point and it straddles the setpoint. The Deadband should be a small percentage of the setpoint. Half the deadband amount will be automatically put above the setpoint, and the other half below it.

For a relay configured to operate when the reading goes above the setpoint, the relay will turn on at the setpoint value plus ½ of the deadband value and turn off at the setpoint value minus ½ of the deadband value.

For example, a conductivity setpoint of 1000 µS with a deadband of 20 µS would result in the relay turning on at 1010 µS and turning off at 990 µS.

- Touch the Change button next to the Deadband value and use the keypad to enter the Deadband value. Touch the OK button to accept.

6.5.2.1.3 Timeout

The TIMEOUT alarm is designed to notify the operator of a problem in the chemical feed system such as, a pump has lost its prime or there is no chemical in the drum. It will also protect the system from overfeeding chemical when the indicated conductivity, ORP, pH, or other input does not display a change in actual value of that input. The timeout function will display a visual alarm on the display and it will turn off the relay. This time is displayed in Hours and Minutes. The maximum time allowed is 17 hours and 59 minutes. To disable this function set the Timeout time to 0.

- Touch the Change button next to the Timeout value and use the keypad to enter the Timeout value in hours and minutes. Touch the OK button to accept.

NOTE: The TIMEOUT alarm does not turn off the relay when using one of the BLOWDOWN options for relays 1-4 and relay 7.
6.5.2.1.4 Setpoint Direction

The relays can be configured to activate when the reading Goes Above the setpoint or when the reading Goes Below the setpoint. To set up the relay to energize on a rising Input, set the relay to activate When Reading Goes Above the setpoint. To set up to feed on a falling Input, set the relay to activate When Reading Goes Below the setpoint.

- Touch the Goes Above / Goes Below button to alternate between Goes Above and Goes Below

6.5.2.1.5 Biocide Lockout

The Bio Lock button is used to lock out a relay during a Schedule Feed. This button has two settings: On and Off. On causes the relay to lock out when any relay that is tied to the same flow switch input is in a Schedule Feed sequence. Off allows the relay to continue to operate normally regardless of a Schedule Feed sequence.

- Touch the Bio Lock button to alternate between On and Off.

6.5.2.2 Relays 1-4 and Relay 7 Blowdown Method

**NOTE:** Set up the Blowdown relays before setting the other relays.

Relays 1-4 and relay 7 have additional features for Blowdown because they have both a normally open and a normally closed contact. When Setpoint is selected for relays 1-4 and 7 the following will appear on the screen:
6.5.2.2.1 Blowdown by Setpoint

The blowdown relay (relay 1-4 and relay 7) can be configured to blowdown based on setpoint.

In the BLOWDOWN SETPOINT screen you will select the Conductivity input, set the SETPOINT, set the DEADBAND, set the TIMEOUT alarm, select the SETPOINT DIRECTION, select a flow switch input, and configure the BIOCIDAL LOCKOUT.

• From the Setpoint Menu of the relay, select Blowdown by Setpoint

![Blowdown Setpoint Screen]

The Blowdown Setpoint can be based on any of the four available conductivity inputs. The conductivity inputs that are currently installed are shown at the top of the screen.

• Touch the appropriate conductivity sensor input. This conductivity value will control the operation of this Blowdown relay.

The SETPOINT is the Input value that you are trying to maintain.

Check with your water treatment engineer to determine the setpoint for your system needs.

• Touch the Change button next to the Setpoint value and use the keypad to enter the Setpoint value. Touch the OK button to accept.

Due to continuous fluctuations in the Input level, it is necessary to have a DEADBAND range or stable readings will be difficult to maintain. "Deadband" refers to the difference between the ON point and the OFF point and it straddles the setpoint. The Deadband should be a small percentage of the setpoint. Half the deadband amount will be automatically put above the setpoint, and the other half below it.

For a relay configured to operate when the reading goes above the setpoint, the relay will turn on at the setpoint value plus ½ of the deadband value and turn off at the setpoint value minus ½ of the deadband value.
For example, a conductivity setpoint of 1000 µS with a deadband of 20 µS would result in
the relay turning on at 1010 µS and turning off at 990 µS.

- Touch the Change button next to the Deadband value and use the keypad to enter the Deadband value. Touch the OK button to accept.

The **TIMEOUT** alarm is designed to notify the operator of a problem in the Blowdown system such as, a valve is stuck closed or a strainer is clogged. It will also help to protect the system from over bleeding when the indicated conductivity does not display a change in value. The timeout function will display a visual alarm on the display but it will **NOT turn off the relay**. This time is displayed in Hours and Minutes. The maximum time allowed is 17 hours and 59 minutes. To disable this function set the Timeout time to 0.

- Touch the Change button next to the Timeout value and use the keypad to enter the Timeout value in hours and minutes. Touch the OK button to accept.

The Blowdown relay can be configured to activate when the reading **Goes Above** the setpoint or when the reading **Goes Below** the setpoint. This is useful for use in a chill loop. To set up the relay to energize on a rising Input, set the relay to activate When Reading Goes Above the setpoint. To set up to feed on a falling Input, set the relay to activate When Reading Goes Below the setpoint.

- Touch the Goes Above / Goes Below button to alternate between Goes Above and Goes Below.

The **Bio Lock** button is used to lock out a relay during a Schedule Feed. This button has two settings: On and Off. On causes the relay to lock out when any relay that is tied to the same flow switch input is in a Schedule Feed sequence. Off allows the relay to continue to operate normally regardless of a Schedule Feed sequence.

- Touch the Bio Lock button to alternate between On and Off.

The Blowdown relay must be tied to a **flow switch** input. All relays that are tied to the same flow switch input are considered a single system and will interact with each other for Blowdowns, Biocide Lockouts, Percent of Bleed, and Schedule Feeds.

- Touch the button for the desired flow switch input. MB IN 3 and MB IN 4 are located inside the NexSys™ Control System enclosure. NDIGI 3 and NDIGI 4 are located on the optional Digital Input Node.

**NOTE:** All relays **MUST** be tied to a flow switch input and programming cannot proceed until both a sensor input and a flow switch input are selected for each relay.

- To accept any changes touch the DONE button or to reject the changes touch the Cancel button.
6.5.2.2 Blowdown by Cycles of Make-up

Whenever the NexSys™ Control System has both a main conductivity and a make-up conductivity installed on the same flow switch input, the blowdown relay (relay 1-4 and relay 7) can be configured to blowdown based on a Cycles of Make-up setpoint instead of just the tower setpoint. The difference between the two is that a tower setpoint is a fixed conductivity value and does not change with a change in the makeup water conductivity. A cycle setpoint is the number of cycles of concentration of the cooling tower water that is desired and will adjust the actual tower setpoint automatically to maintain the cycles of concentration desired based on the makeup water conductivity.

For example: If the tower setpoint is set to 1000µS, the NexSys™ Control System will always try to maintain a reading of 1000 µS in the cooling tower, no matter the value of the makeup water conductivity. If a cycle setpoint of 3.0 is set, the NexSys™ Control System will always try to maintain a conductivity value in the cooling tower that is 3 times the current makeup water conductivity.

This feature is useful if the make-up water quality varies or if there are multiple sources of make-up.

Note: The main conductivity input must be installed as NCON1 with the make-up conductivity input installed as NCON2, or the main conductivity input must be installed as NCON3 with the make-up conductivity input installed as NCON4.

- From the Setpoint Menu of the relay, select Blowdown by Cycle of Make-up

The Cycles Setpoint can be based on the multiple of NCON1 to NCON2 or the multiple of NCON3 to NCON4. Only the conductivity inputs that are currently installed will be shown. If the main conductivity input is NCON1 then the makeup MUST be NCON2. If the main conductivity input is NCON3 then the makeup MUST be NCON4.

- Touch the appropriate main conductivity sensor input (NCON 1 or NCON3).
The Cycles Setpoint is the number of cycles of concentration you are trying to maintain. The Cycles Setpoint is a multiple of the Make-up water conductivity and the NexSys™ Control System uses the value entered to calculate the actual conductivity setpoint value. For instance, if your make-up water is 1000µS and you want to maintain 3 Cycles, enter 3.0 as the Cycles Setpoint, and the setpoint will be automatically calculated at 3000µS.

Check with your water treatment engineer to determine the setpoint for your system needs.

- Touch the Change button next to the Cycles Setpoint value and use the keypad to enter the Setpoint value. Touch the OK button to accept.

Due to continuous fluctuations in the Input level, it is necessary to have a DEADBAND range or stable readings will be difficult to maintain. "Deadband" refers to the difference between the ON point and the OFF point and it straddles the setpoint. The Deadband should be a small percentage of the setpoint. For a relay configured to operate based on Cycles Setpoint, the relay will turn on at the setpoint value plus ½ of the deadband value and turn off at the setpoint value minus ½ of the deadband value.

For example, a Cycles Setpoint of 3.0 with a deadband of 0.1 and the make-up conductivity is 1000 µS would result in a deadband value of 100 and the relay turning on at 3050 µS and turning off at 2950 µS.

- Touch the Change button next to the Deadband value and use the keypad to enter the Deadband value. Touch the OK button to accept.

The TIMEOUT alarm is designed to notify the operator of a problem in the Blowdown system such as, a valve is stuck closed or a strainer is clogged. It will also help to protect the system from over bleeding when the indicated conductivity does not display a change in value. The timeout function will display a visual alarm on the display but it will NOT turn off the relay. This time is displayed in Hours and Minutes. The maximum time allowed is 17 hours and 59 minutes. To disable this function set the Timeout time to 0.

- Touch the Change button next to the Timeout value and use the keypad to enter the Timeout value in hours and minutes. Touch the OK button to accept.

The Bio Lock button is used to lock out a relay during a Schedule Feed. This button has two settings: On and Off. On causes the relay to lock out when any relay that is tied to the same flow switch input is in a Schedule Feed sequence. Off allows the relay to continue to operate normally regardless of a Schedule Feed sequence.

- Touch the Bio Lock button to alternate between On and Off.
The Blowdown relay must be tied to a **flow switch** input. All relays that are tied to the same flow switch input are considered a single system and will interact with each other for Blowdowns, Biocide Lockouts, Percent of Bleed, and Schedule Feeds.

- Touch the button for the desired flow switch input. MB IN 3 and MB IN 4 are located inside the NexSys™ Control System enclosure. NDIGI 3 and NDIGI 4 are located on the optional Digital Input Node.

**NOTE:** All relays **MUST** be tied to a flow switch input and programming cannot proceed until both a sensor input and a flow switch input are selected for each relay.

- To accept any changes touch the DONE button or to reject the changes touch the Cancel button.

### 6.5.2.2.3 Blowdown by Volume

The Blowdown relay (Relays 1-4 and relay 7) can be configured to operate based on water meter inputs instead of the conductivity input. There are two methods of blowdown by volume; Blowdown by Blowdown Meter Volume and Blowdown by Time after Make-up.

**NOTE:** For these configurations of the blowdown relay, W/M3 and W/M4 are not able to be used for the blowdown function.

- From the Blowdown Setpoint Menu of the relay touch Blowdown by Volume

- Touch Blowdown by B/D Volume or Blowdown by Time after Makeup
6.5.2.2.3.1 Blowdown by Blowdown Meter Volume

The Blowdown relay can be configured to turn on after a specified amount of make-up volume for a specified amount of blowdown volume.

NOTE: For this configuration of the blowdown relay, W/M 1 is always assumed to be the makeup water meter and W/M 2 is assumed to be the blowdown water meter. This feature is only available for use with W/M 1 and W/M 2. Ensure that this is the case with your wiring or conductivity control will not function properly.

The Make-up Volume setting is the amount of make-up volume after which you want to energize the blowdown valve. If you have a Contacting head water meter make sure that this volume is a multiple of the contacting head gallons per contact. For example, if you have a 100 gallons per contact water meter use a setting of 100, 200, or 300... Do not use 150, 175, etc...

- Touch the Change button next to the Make-up Volume value and use the keypad to enter the Volume value. Touch the OK button to accept.

The Blowdown Volume setting is the amount of blowdown volume that you want to blowdown. If you have a Contacting head water meter make sure that this volume is a multiple of the contacting head gallons per contact. For example, if you have a 100 gallons per contact water meter use a setting of 100, 200, or 300... Do not use 150, 175, etc...

- Touch the Change button next to the Blowdown Volume value and use the keypad to enter the Volume value. Touch the OK button to accept.
The **TIMEOUT** alarm is designed to notify the operator of a problem in the Blowdown system such as, a valve is stuck closed or a strainer is clogged. It will also help to protect the system from over bleeding when the indicated blowdown volume does not display a change in value. The timeout function will display a visual alarm on the display but it will **NOT turn off the relay**. This time is displayed in Hours and Minutes. The maximum time allowed is 17 hours and 59 minutes. **To disable this function** set the Timeout time to 0.

- Touch the Change button next to the Timeout value and use the keypad to enter the Timeout value in hours and minutes. Touch the OK button to accept.

The **Bio Lock** button is used to lock out a relay during a Schedule Feed. This button has two settings: On and Off. On causes the relay to lock out when any relay that is tied to the same flow switch input is in a Schedule Feed sequence. Off allows the relay to continue to operate normally regardless of a Schedule Feed sequence.

- Touch the Bio Lock button to alternate between On and Off.

The Blowdown relay must be tied to a **flow switch** input. All relays that are tied to the same flow switch input are considered a single system and will interact with each other for Blowdowns, Biocide Lockouts, Percent of Bleed, and Schedule Feeds.

- Touch the button for the desired flow switch input. MB IN 3 and MB IN 4 are located inside the NexSys™ Control System enclosure. NDIGI 3 and NDIGI 4 are located on the optional Digital Input Node.

**NOTE:** All relays **MUST** be tied to a flow switch input and programming cannot proceed until both a sensor input and a flow switch input are selected for each relay.

- To accept any changes touch the DONE button or to reject the changes touch the Cancel button.
6.5.2.2.3.2 Blowdown by Time after Make-up

The Blowdown relay can be configured to turn on after a specified amount of make-up volume for a specified amount of time.

NOTE: For this configuration of the blowdown relay, this feature is only available for use with W/M 1. Ensure that this is the case with your wiring or conductivity control will not function properly.

The Make-up Volume setting is the amount of make-up volume after which you want to energize the blowdown valve. If you have a Contacting head water meter make sure that this volume is a multiple of the contacting head gallons per contact. For example, if you have a 100 gallons per contact water meter use a setting of 100, 200, or 300… Do not use 150, 175, etc...

- Touch the Change button next to the Make-up Volume value and use the keypad to enter the Volume value. Touch the OK button to accept.

The Blowdown For This amount of time setting is the amount of time that you want the blowdown relay to energize for after receiving make-up. If you have a Contacting head water meter make sure that this volume is a multiple of the contacting head gallons per contact. For example, if you have a 100 gallons per contact water meter use a setting of 100, 200, or 300… Do not use 150, 175, etc...

- Touch the Change button next to the Blowdown For This amount of time value and use the keypad to enter the Volume value. Touch the OK button to accept.
The **Bio Lock** button is used to lock out a relay during a Schedule Feed. This button has two settings: On and Off. On causes the relay to lock out when any relay that is tied to the same flow switch input is in a Schedule Feed sequence. Off allows the relay to continue to operate normally regardless of a Schedule Feed sequence.

- Touch the Bio Lock button to alternate between On and Off.

The Blowdown relay must be tied to a **flow switch** input. All relays that are tied to the same flow switch input are considered a single system and will interact with each other for Blowdowns, Biocide Lockouts, Percent of Bleed, and Schedule Feeds.

- Touch the button for the desired flow switch input. MB IN 3 and MB IN 4 are located inside the NexSys™ Control System enclosure. NDIGI 3 and NDIGI 4 are located on the optional Digital Input Node.

**NOTE:** All relays **MUST** be tied to a flow switch input and programming cannot proceed until both a sensor input and a flow switch input are selected for each relay.

- To accept any changes touch the DONE button or to reject the changes touch the Cancel button.
6.5.3 Feed by Water Meter

Each of the relays can be configured to operate based on a Water Meter input. After the user specified amount of water meter input is received, the relay will energize for a user specified amount of time.

- From the Relay Configuration screen, touch Feed by Wtr Mtr under the desired relay.

The relay can be configured to operate based on any one of the water meter inputs or by the sum of water meter 1 and water meter 2.

- Touch the desired Water Meter input

The Feed after Gal/Ltrs setting is the amount of water meter volume after which you want to energize the relay. If you have a Contacting head water meter make sure that this volume is a multiple of the contacting head gallons per contact. For example, if you have a 100 gallons per contact water meter use a setting of 100, 200, or 300... Do not use 150, 175, etc...

For the set up of the relay we are not concerned with the units of volume, whether it is gallons or liters because the units of volume are determined by the water meter setup.

- Touch the Change button next to the Feed after Gal/Ltrs value and use the keypad to enter the Volume value. Touch the OK button to accept.

The amount of time that the relay will be energized is set in the Feed for this time field.

- Touch the Change button next to the Feed for this time value and use the keypad to enter the time value. This time is in minutes and seconds. Touch the OK button to accept.
The **Bio Lock** button is used to lock out a relay during a Schedule Feed. This button has two settings: On and Off. On causes the relay to lock out when any relay that is tied to the same flow switch input is in a Schedule Feed sequence. Off allows the relay to continue to operate normally regardless of a Schedule Feed sequence.

- Touch the Bio Lock button to alternate between On and Off.

The relay must be tied to a **flow switch** input. All relays that are tied to the same flow switch input are considered a single system and will interact with each other for Blowdowns, Biocide Lockouts, Percent of Bleed, and Schedule Feeds.

- Touch the button for the desired flow switch input. MB IN 3 and MB IN 4 are located inside the NexSys™ Control System enclosure. NDIGI 3 and NDIGI 4 are located on the optional Digital Input Node.

**NOTE:** All relays **MUST** be tied to a flow switch input and programming cannot proceed until both a water meter input and a flow switch input are selected for the relay.

- To accept any changes touch the DONE button or to reject the changes touch the Cancel button.

### 6.5.4 Feed by Percent of Blowdown

Each of the relays can be configured to operate based on a Percent of the amount of time that the Blowdown relay was on. The Percent of Blowdown is a method to feed chemical proportional to the amount of Make-up when no water meter is used. The relay will activate for a percentage of the time that the blowdown was on after the blowdown shuts off. For example, if 50% is entered and the blowdown relay is on for 10 minutes, the relay will be energized for 5 minutes after the blowdown shuts off.

- From the Relay Configuration screen, touch Percent Blowdown under the desired relay.
The percentage of blowdown time that the relay will be energized is set in the **Feed for this % time** field.

- Touch the Change button next to the Feed for this % time value and use the keypad to enter the percentage value. Touch the OK button to accept.

The **Bio Lock** button is used to lock out a relay during a Schedule Feed. This button has two settings: On and Off. On causes the relay to lock out when any relay that is tied to the same flow switch input is in a Schedule Feed sequence. Off allows the relay to continue to operate normally regardless of a Schedule Feed sequence.

- Touch the Bio Lock button to alternate between On and Off.

The relay must be tied to a **flow switch** input. All relays that are tied to the same flow switch input are considered a single system and will interact with each other for Blowdowns, Biocide Lockouts, Percent of Bleed, and Schedule Feeds.

- Touch the button for the desired flow switch input. MB IN 3 and MB IN 4 are located inside the NexSys™ Control System enclosure. NDIGI 3 and NDIGI 4 are located on the optional Digital Input Node.

**NOTE:** All relays **MUST** be tied to a flow switch input and programming cannot proceed until both a water meter input and a flow switch input are selected for the relay.

- To accept any changes touch the DONE button or to reject the changes touch the Cancel button.
6.5.5 Feed by Percent of Time

Each of the relays can be configured to operate based on a Percent of Time. The Percent of Time is a method to feed chemical periodically throughout the day. This relay control scheme works in patterns of 20-second time blocks. A relay is on for some multiple of 20 seconds and off for some multiple of 20 seconds. Below is a chart showing some of the operation times for Percent of Time.

<table>
<thead>
<tr>
<th>Percent</th>
<th>On Time</th>
<th>Off Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1%</td>
<td>20 Sec</td>
<td>1980 Sec (33m)</td>
</tr>
<tr>
<td>5%</td>
<td>20 Sec</td>
<td>380 Sec (6m20s)</td>
</tr>
<tr>
<td>10%</td>
<td>20 Sec</td>
<td>180 Sec (3m)</td>
</tr>
<tr>
<td>25%</td>
<td>20 Sec</td>
<td>60 Sec</td>
</tr>
<tr>
<td>33%</td>
<td>20 Sec</td>
<td>40 Sec</td>
</tr>
<tr>
<td>50%</td>
<td>20 Sec</td>
<td>20 Sec</td>
</tr>
<tr>
<td>66%</td>
<td>40 Sec</td>
<td>20 Sec</td>
</tr>
<tr>
<td>75%</td>
<td>60 Sec</td>
<td>20 Sec</td>
</tr>
<tr>
<td>90%</td>
<td>180 Sec (3m)</td>
<td>20 Sec</td>
</tr>
<tr>
<td>95%</td>
<td>380 Sec (6m20s)</td>
<td>20 Sec</td>
</tr>
<tr>
<td>99%</td>
<td>1980 Sec (33m)</td>
<td>20 Sec</td>
</tr>
</tbody>
</table>

Note: In the case of “33%”, once every 66 minutes, the “off” time would extend an extra 20 seconds to make up for the accumulation of the odd % value vs. a 24 hour clock, since the percent of time is based on a 24 hour clock in 20 second increments. In the case of “66%”, every 66 minutes, the “on” time would extend an extra 20 seconds to make up for the accumulation of the odd % value vs. a 24 hour clock.

To determine the total amount of chemical fed over a 24 hour period, multiply the percent of time by the number of hours a day that your controller is operating, then multiply by your chemical pump flow rate per hour.

For example:

We select 10% of the time, our controller operates 24 hours a day and our chemical pump flow rate is 1 gallon per hour.

\[
10\% \times 24 \text{ hours} \times 1\text{ gallon} = 2.4 \text{ Gallons} \quad \frac{\text{Day}}{\text{Hour}} \times \frac{1\text{gallon}}{\text{Day}} = 2.4 \text{ Gallons}
\]

Note: The number of hours a day that the controller is operating only includes the amount of time that the controller has power, has flow in the system, and is not in a biocide sequence (unless configured to operate during a biocide sequence, SEE Bio Lock).
• From the Relay Configuration screen, touch Percent Time under the desired relay.

The percentage of time that the relay will be energized is set in the % field.

• Touch the Change button next to the % value and use the keypad to enter the time value. Touch the OK button to accept.

The **Bio Lock** button is used to lock out a relay during a Schedule Feed. This button has two settings: On and Off. On causes the relay to lock out when any relay that is tied to the same flow switch input is in a Schedule Feed sequence. Off allows the relay to continue to operate normally regardless of a Schedule Feed sequence.

• Touch the Bio Lock button to alternate between On and Off.

The relay must be tied to a **flow switch** input. All relays that are tied to the same flow switch input are considered a single system and will interact with each other for Blowdowns, Biocide Lockouts, Percent of Bleed, and Schedule Feeds.

• Touch the button for the desired flow switch input. MB IN 3 and MB IN 4 are located inside the NexSys™ Control System enclosure. NDIGI 3 and NDIGI 4 are located on the optional Digital Input Node.

**NOTE:** All relays **MUST** be tied to a flow switch input and programming cannot proceed until both a water meter input and a flow switch input are selected for the relay.

• To accept any changes touch the DONE button or to reject the changes touch the Cancel button.
6.5.6 Schedule Feed

The feed schedule is used to feed chemicals, such as biocides, on a time of day basis with or without an ORP setpoint override. The ORP setpoint override allows the NexSys™ Control System to feed based on an ORP setpoint only during the times specified in the feed schedule. This is useful to dose the cooling water system to a specific level of ORP.

The NexSys™ Control System has the ability to perform a Pre-Feed Bleed before adding chemicals in the Feed Schedule. This allows the controller to reduce the conductivity in the cooling tower to a point where a bleed will not be necessary during the Scheduled Feed sequence. To assist the operator in calculating a Pre-Feed Bleed Setpoint there is a built-in Pre-Bleed calculator screen.

Each of the relays, except for relay #1, can be configured to operate on a Feed Schedule. There are 16 possible feed slots in the feed schedule and a user configurable, repeating cycle calendar from 1 to 28 days in length.

Setting up the Feed Schedule is a three part process: setting the number of days in the cycle, configuring a relay to operate on a feed schedule, and programming the feed schedule for each Feed Schedule relay.

The Cycle Calendar
The first step is to set the number of days in the Cycle Calendar. This is the total number of days in the repeating cycle. If the same chemical will be feed every day, then the cycle calendar should be set up for a 1 day cycle. If the same chemical will be fed every specific weekday, such as every Tuesday, then the cycle calendar should be set up for a 7 day cycle. If the same chemical will be fed every other week, then the cycle calendar should be set up for a 14 day cycle.

To set the number of days in the Cycle Calendar:

- From the Main Menu, touch the System Parameters button, and then touch the Bio/Schedule Setup button.

The number of days in the feed schedule is set in the Days in Schedule field. This number of days in the feed schedule will be used for ALL scheduled feeds.

- Touch the Change button next to the Days in Schedule and use the keypad to enter the number of days. Touch the OK button to accept.
The Today is What Day in the Chosen Cycle field is used to set the start of the cycle calendar as it will start today. If a 7 day cycle has been chosen and a 3 is set in this field, the cycle begins at day 3.

- Touch the Change button next to the Today is What Day field and use the keypad to enter the day to start the cycle. Touch the OK button to accept.

- To accept any changes touch the DONE button or to reject the changes touch the Cancel button.

**Configure a Relay to Operate on a Feed Schedule**

The relays that will be used as scheduled feed relays must be configured to operate on a feed schedule, tied to a conductivity input (if installed), and tied to a flow switch input. This is done in the Relay Configuration screen.

- To access the relay configuration screens and configure the relay as a Feed Schedule relay, from the one of the two system screens, touch the Main Menu button. Then touch the RELAYS button. Then touch the Schedule Feed button for the desired relays. The following screens will appear.

The Feed Schedule will perform Pre-Feed Bleed and this requires the Feed Schedule relay to be tied to a conductivity input.

- Touch the desired conductivity input button.

The relay must be tied to a **flow switch** input. All relays that are tied to the same flow switch input are considered a single system and will interact with each other for Blowdowns, Biocide Lockouts, Percent of Bleed, and Schedule Feeds.

- Touch the button for the desired flow switch input. MB IN 3 and MB IN 4 are located inside the NexSys™ Control System enclosure. NDIGI 3 and NDIGI 4 are located on the optional Digital Input Node.

**NOTE:** All relays **MUST** be tied to a flow switch input and programming cannot proceed until a flow switch input is selected for the relay.

- To accept any changes touch the DONE button or to reject the changes touch the Cancel button.
Programming the Feed Schedule

Once the relays are configured to operate on a feed schedule, it is time to program the schedule.

- From the Main Menu touch RELAYS and in the Relay Configuration screen touch the Go to Scheduled Feed Calendar button.

The Scheduled Feed Config screen is used to select the feed slot to program. There are 16 possible feed slots. Each Feed Sequence will take up one of these slots. At the bottom of the screen there is a useful tool, using the Blackmore method, to assist the operator in determining the Pre-Feed Bleed Setpoint for the cooling tower system. This tool will be discussed at the end of this section.

- Touch a feed slot to program it.

The Scheduled Feed Setting screen displays the feed schedule for the selected feed slot. The current day of the feed schedule is displayed at the top of the screen. This will assist the operator in setting up the feed schedule for the feed schedule relays.

The relays that are configured to operate on a feed schedule are displayed on the right-hand side of the screen. A blue button indicates that the relay has been configured as a feed schedule relay and is available for programming on a feed schedule; a red button indicates that the relay has not been configured as a feed schedule relay and is not available for programming on a feed schedule. The button will turn green when it is selected.

- Touch the button for the desired relay to program.
The **Day to Feed** field is the day of the cycle to activate the selected relay.

**NOTE:** When setting this value make sure that the value entered is within the range of days of the cycle or the relay will not activate.

- Touch the Change button next to the Day to Feed value and use the keypad to enter the Day value. Touch the OK button to accept.

The **Start Time** is the time that the feed sequence will begin. This time is on a 24 hour clock, i.e. 2300 is 11:00 p.m.

- Touch the Change button next to the Start Time value and use the keypad to enter the Start Time value. Touch the OK button to accept.

The **Pre-Feed Bleed** reduces the conductivity to a value that is lower than the normal operating setpoint to prevent the need to bleed during the feed sequence. This helps to prevent exceeding any conductivity limits during a feed sequence.

The **Pre-Feed Blow Duration** is the amount of time that the blowdown relay can energize to reduce the conductivity down to the Feed Schedule setpoint. At the end of this time, even if the conductivity has not reached the feed schedule setpoint, the sequence moves to the feed duration and energizes the Feed Schedule relay.

- Touch the Change button next to the Start Time value and use the keypad to enter the Start Time value. Touch the OK button to accept.

The **Cond Setpoint** is a conductivity setpoint that is used only during the Scheduled Feed sequence to lower the conductivity to a value that will allow the feed sequence to be completed without requiring a bleed off to occur. This conductivity setpoint should be lower than the normal operating setpoint. This field should already be filled in with the current blowdown setpoint of the cooling tower system.

**Note:** The Blowdown relay for this system must be programmed before the Feed Schedule conductivity setpoint is set or the feed schedule will not accept the feed schedule conductivity setpoint.

- Touch the Change button next to the Cond Setpoint value and use the keypad to enter the Setpoint value. Touch the OK button to accept.

**Note:** To assist the operator in calculating a Pre-Feed Bleed Setpoint there is a built-in Pre-Bleed calculator screen in the NexSys™ Control System. The Pre-Bleed calculator is discussed at the end of this section.

- Touch the Next Step arrow button at the bottom right of the screen.
The Feed Schedule relay is able to be activated for a time value or an ORP setpoint.

When the feed schedule is configured to operate for a time value, the Feed Schedule relay is energized for a user specified amount of time with an additional user specified Lockout Duration.

When the feed schedule is configured to operate with an ORP setpoint, the Feed Schedule relay is energized to raise and maintain the ORP value to a user specified ORP setpoint for a user specified amount of time.

To configure the relay to activate for a **Timed Feed:**

The **Feed duration** is the amount of time that the feed schedule relay will be energized. This time is in hours and minutes.

- Touch the Time Feed button and touch the Change button next to the Chem Feed Duration value and use the keypad to enter the Feed time value. This time is in Hours and Minutes. Touch the OK button to accept.

The **Scheduled Feed Lockout Duration** is an additional amount of time that the system will lock out any relays within that system that are programmed to lockout during a scheduled feed sequence. This time is in hours and minutes.

- Touch the Change button next to the Scheduled Feed Lockout Duration value and use the keypad to enter the Lockout time value. This time is in Hours and Minutes. Touch the OK button to accept.

- To accept any changes touch the DONE button or to reject the changes touch the Cancel button.
To configure the relay to activate for a **Timed ORP Feed:**

The **Feed duration** is the amount of time that the feed schedule relay will be energized. This time is in hours and minutes.

- Touch the red ORP button at the top of the screen and touch the blue ORP button for the ORP sensor input. Touch the Change button next to the ORP Setpoint value and use the keypad to enter the ORP Setpoint value.

The **ORP Setpoint value** is the ORP reading that the controller will maintain for the Feed Duration time.

- Touch the Change button next to the Chem Feed Duration value and use the keypad to enter the Feed time value. This time is in Hours and Minutes. Touch the OK button to accept.

- To accept any changes touch the DONE button or to reject the changes touch the Cancel button.

**The Blackmore Method**

The Blackmore method is a calculation the operator can perform, using the NexSys™ Control System, to determine the proper Pre-Feed Bleed setpoint for use in the Feed Schedule programming.

The formulas for calculating the Pre-Feed Bleed setpoint are:

\[
\frac{E \times CT}{V} (\mu) = LC \\
C - LC = \text{Pre-feed setpoint}
\]

Where:

- **E** = Evaporation rate of the cooling tower system in GPM
- **\(\mu\)** = Makeup water conductivity in µS
- **CT** = Required Contact time in minutes
- **V** = System Volume in gallons
- **LC** = Calculated Lock out concentration in µS
- **C** = Normal operating conductivity setpoint in µS

The NexSys™ Control System will perform these calculations with the entry of five data points: Evaporation Rate in GPM, Required Contact Time in minutes, Make-up Water Conductivity in µS, Total System Volume in gallons, and the Normal Operating Conductivity Setpoint.
• Touch the Change button next to the Evaporation Rate value and use the keypad to enter the Evaporation Rate value. This value is in GPM. Touch the OK button to accept.

• Touch the Change button next to the Contact Time value and use the keypad to enter the Contact Time value. This value is in minutes. This is the same amount of time that should be entered into the Lockout Duration field in the Scheduled Feed settings. Touch the OK button to accept.

• Touch the Change button next to the Make-up Water Conductivity value and use the keypad to enter the M/U Conductivity value. This value is in µS. Touch the OK button to accept.

• Touch the Change button next to the System Volume value and use the keypad to enter the System Volume value. This value is in Gallons. Touch the OK button to accept.

• Touch the Change button next to the Normal Setpoint value and use the keypad to enter the Normal Setpoint value. This value is in µS. Touch the OK button to accept.

The NexSys™ Control System will return two values; the Lockout Concentration which is the expected increase in conductivity during the Feed sequence, and the Calculated Pre-Feed Setpoint which will be entered in the Cond Setpoint field in the Scheduled Feed settings.

• Touch the Back button to return to the Scheduled Feed Configuration screen.
6.6 Configuring the Water Meter Inputs

The NexSys™ Control System will accept 2 water meter inputs standard and another two water meter inputs with the use of a Digital Input Node. The NexSys™ Control System will work directly with open collector output type water meters such as the following types of meters: dry contacting head meters, paddle wheel type meters such as the Signet model 2535 and 2540, and the Autotrol 1 inch and 2 inch meters. Contact Lakewood Instruments for other types of water meters.

To set up the water meter inputs, from the Main Menu:

- Touch the Water Meters button and then touch the water meter input to configure. Note: Water meter inputs 3 and 4 only appear if the optional NDIG is installed.

In the Water Meter Install Configuration screen the operator is able to choose the type of water meter, configure the water meter for that type of water meter, select the units of measurements, and reset the water meter totals.

- Touch the button for the type of water meter to configure.

For a contacting head type meter, the gallons/liters per contact are entered in the available field. For a paddle wheel type water meter, the K-factor for that water meter/pipe size is entered in the available field.

- Touch the Change button next to the gallons/liters or K factor value and use the keypad to enter the value. Touch the OK button to accept.

The water meter inputs are able to be displayed in gallons or liters. Note: This should agree with the water meter that is installed in the system as the NexSys™ Control System does not convert the units from one to the other.

- Touch the units of measurement; gallons or liters.

The total water meter counts can be reset to zero for each water meter input.

- Touch the Reset Totals button to reset the water meter input total to zero.

- To accept any changes touch the DONE button or to reject the changes touch the Cancel button.
6.7 Node Install De-install

The NexSys™ Control System makes use of nodes in a mapped network. Nodes are mini-CPUs that have a specific function, such as pH or conductivity. A mapped network means that only nodes that are mapped into the software may be installed and used. Custom maps are available, contact Lakewood Instruments for details.

Nodes have to be physically connected to the system and they have to be installed in the software. When nodes are removed from the system, they have to be de-installed in the software before physically removing them from the system. Nodes are installed and de-installed in the Node Installation/De-Installation menu.

To access the Node Install De-Install screens:

- From the Main Menu, touch the Node Install De-Install button. This is the Node Install screen.

From the Node Install screen, the operator can install nodes, see the installation status of nodes, view the communications status of the nodes, and access the De-Install screen.

The buttons for nodes that are currently installed will be green. Nodes that are not currently installed will be black.

The transmit indicator next to each node button is used to indicate failed communication with an installed node. The normal status of this indicator is black, but if the node fails to communicate with the NexSys™ Control System for a given period of time, the indicator will flash yellow and red to indicate that there is an issue with that node.

Each Node has a Service Pin button and three LEDs; a yellow service LED that flashes with a node is not installed, and a red and green transmit and receive LED that flash indicating traffic on the network.
To Install a Node:

- Touch the button for the node to install. The screen will display the instructions for node installation along with a picture of the action to be taken.
- Go to the node that is being installed.
- Verify that the yellow LED is flashing.
- Press the Service Pin for 2 seconds.
- Verify that the red and green LEDs start flickering and the yellow LED turns off.
- Touch the Node Install button on the screen. Verify the button for that node turned green.

Nodes **MUST** be de-installed from the software before physically disconnecting them from the system. If they are not de-installed, they will not be able to be installed on another controller.

To De-Install a node:

- From the Main Menu, touch the Node Install De-Install button and touch the De-Install button in the bottom right corner.

All nodes that are currently installed in the software are indicated by a green button.

- Touch the button for the node to be de-installed. The button for that node will turn black and the service LED on the affected node will start flashing yellow indicating that it is no longer installed in the software.
6.8 Alarms

The NexSys™ Control System has many alarms associated with it. There are alarms for high and low readings, alarms for relay timeouts, and alarms for sensor diagnostics.

To access the Alarm Menu from the Main Menu:

- Touch the Alarms Button.

The Alarm menu allows the operator to select the alarms that are actively displayed, view alarm history, and change sensor alarm levels.

Alarm / Email Notifications button is used to select the alarms that will give an active alarm notification. The active alarm notification is an alarm bar that is displayed at the top or bottom of all screens and requires the operator to acknowledge the alarm in order to stop the alarm from displaying on all screens. The date and time that the alarm is received and acknowledged are logged in the Alarm History. Email addresses for alarm notifications are set using the TouchMaker Lite software program.

To select the alarms to be actively displayed:

- Touch the Alarm/Email Notifications button and then touch the type of alarms button.
• Touch the blue buttons for the alarms to set the active notification of that alarm. The button will turn green for the selected alarms.

**Note:** Only the alarms that are selected in the Notifications screen will be displayed as Active Alarms, Show in the Alarm Bar, require the operator to acknowledge the alarm, and be logged in the Alarms History. All other alarms will only be displayed in the two Alarm Home screens.

**Set the Sensor High and Low Level Alarms**
The High and Low alarms for the sensor inputs are user settable by touching the Change Sensor Alarms levels button. The Change Sensor Alarms Levels button takes the operator to the Configure Processes screen to select the sensor input to be configured.

There is a configure process screen for each of the sensor input nodes. These configuration screens are used to configure the sensor input and for setting the high and low alarm levels.

**To set the high and low alarm levels for the selected sensor input:**

• Touch the blue button for the desired sensor input.

**Note:** there is no high or low alarm associated with the Water Meter inputs.
Note: For the 4-20 mA inputs you must select the channel of the input to configure.

- Touch the Change button next to the Hi or Lo Alarm value and use the keypad to enter the value. Touch the OK button to accept.

The status of all alarms can be viewed from the two Active Alarm home screens. The alarm home screens are accessed by touching the up arrow from the System 1 home screen.

Active alarms are indicated by a red indicator in the alarm matrix. The green indicators indicate no active alarm.

**Alarm Bar**

All active unacknowledged alarms are indicated in an alarm bar at the top or bottom of each screen. The alarm must be acknowledged to remove it from the Alarm Bar.

```
000 pH1 Broken Glass Alarm
```

The Alarm Bar indicates the active alarm and has two buttons; an Alarm Bar Location button (<>), and an Acknowledge button (i).

The Alarm Bar Location button (<> ) switches the alarm bar location form the bottom of the screen to the top of the screen.

The Acknowledge button (i ) takes the operator to the Alarm Acknowledge screen. The Alarm Acknowledge screen allows the operator to acknowledge the alarm and logs the date and time that each alarm occurs, the date and time that the operator acknowledges the alarm, and the date and time that the alarm clears.
The Alarm Acknowledge screen has a left and right arrow at the top of the screen to allow the operator to scroll through all of the Alarm Acknowledge screens. There are screens for Relay Overfeed Alarms, Conductivity sensor 1 and 2, Conductivity sensor 3 and 4, pH1 and ORP1, pH2 and ORP2, and 4-20 mA.

In the example above, the NexSys™ Control System logs the date and time and description of the alarm on the top line. It logs the date and time that the alarm was acknowledged and then the date and time that the alarm condition cleared on the bottom line.

To acknowledge an alarm:

- Touch the Acknowledge button for each active alarm. If there are multiple alarms, touch the Next button to scroll to the next alarm and touch the Acknowledge button.

Once an alarm is acknowledged, it no longer appears on the alarm bar at the top or bottom of each screen but will still show in the Active Alarm Home screens.

6.9 Clock-Date Settings

The date and time must be set for the controller to operate properly.

To set the Date and Time:

- Touch the Set Time and/or Set Date button and use the keypad to enter the value. Touch the OK button to accept.
6.10 System Parameters

The System Parameters Menu provides access to: Process parameters screens, Component name change, Set the number of days in the Bio Schedule, Reset the display, Change the password, Set up the Email Alarm Notifications, and View system usage information.

6.10.1 Process Parameters

The Process Parameters Menu allows the operator access to: Configure the sensor inputs, Set the sensor high and low alarm points, Configure the 4-20 mA inputs including setting the high and low alarm points and ranges, and Configure the water meter inputs.

To Enter the Process Parameters screens:

- From the Main Menu, touch the System Parameters button and then touch the Process Parameters button. Select the Input to be configured by touching the button for that input.

6.10.1.1 Configure the Conductivity Inputs

The Conductivity sensor inputs must be configured for proper operation. The Temperature Compensation, Cell Constant, Dampening, Additional Temperature Compensation, and the High and Low Conductivity Alarm points are set in this menu.

- From the Configure Process screen touch the button for the desired Conductivity Input.
- To accept any changes touch the DONE button or to reject the changes touch the Cancel button.
6.10.1.1.1 Temperature Compensation

The Conductivity Input is able to accept the following types of temperature compensation inputs: None, 500 NTC, 4K NTC, 10K NTC, 100 PTC, 1K PTC, 3K NTC, and 10K PTC.

- To set the Temperature compensation, touch the button for the Temp Comp Setting.

The standard cooling tower sensor used with the NexSys™ Control System uses the 500 NTC temperature compensator.

Lakewood Instruments conductivity sensors’ temperature compensators:
- 1169202.....500 NTC
- 1167286.....500 NTC
- 1167162.....NONE

6.10.1.1.2 Cell Constants

The Conductivity Input is adjustable for different cell constants.

- Touch the change button next to the Cell Constant field and use the keypad to enter the cell constant value. Touch the OK button to accept.

The standard cooling tower sensor used with the NexSys™ Control System has a cell constant of 0.380.

Lakewood Instruments conductivity sensors’ cell constants:
- 1169202.....0.380
- 1167286.....0.380
- 1167162.....0.108

6.10.1.1.3 Dampening

Dampening slows down the rate of change of the indicated conductivity reading. The default setting is 0.5. A larger value increases the dampening and a smaller value decreases the dampening.

- Touch the change button next to the Dampening field and use the keypad to enter the Dampening value. Touch the OK button to accept.
6.10.1.4 % per Deg C

Conductivity values are temperature dependent. The degree to which temperature affects the conductivity value is based on the many different ions that may be present. This menu item allows the user to adjust the compensation value to more closely match the different ions that may be present in the process. The default value is 2 percent per °C (the approximate compensation value for NaCl).

The degree to which temperature affects conductivity can be calculated using the following formula:

\[ G_t = G_{t_{cal}} \{1 + \alpha(T - T_{cal})\} \]

where: \( G_t \) = conductivity at any temperature \( T \) in °C, \( G_{t_{cal}} \) = conductivity at calibration temperature \( T_{cal} \) in °C, \( \alpha \) = temperature coefficient of solution at \( T_{cal} \) in °C.

To determine that \( \alpha \) of other solutions, simply measure conductivity at a range of temperatures and graph the change in conductivity versus the change in temperature. Divide the slope of the graph by \( G_{t_{cal}} \) to get \( \alpha \).

**To set up the Percent per °C:**

- Touch the change button next to the Dampening field and use the keypad to enter the Dampening value. Touch the OK button to accept.

6.10.1.5 High and Low Alarm Settings

The conductivity sensor inputs have a high and low alarm associated with them.

**To set the high and low alarm levels for the selected sensor input:**

- Touch the Change button next to the Hi or Lo Alarm value and use the keypad to enter the value. Touch the OK button to accept.
6.10.1.2 Configure the pH Inputs

The pH sensor inputs must be configured for proper operation. The Temperature Compensation, Dampening, Additional Temperature Compensation, pH Probe Shield setting, and the High and Low pH Alarm points are set in this menu.

- From the Configure Processes screen touch the button for the desired pH Input.
- To accept any changes touch the DONE button or to reject the changes touch the Cancel button.

6.10.1.2.1 Temperature Compensation

The pH Input is able to accept the following types of temperature compensation inputs: None, 500 NTC, 4K NTC, 10K NTC, 100 PTC, 1K PTC, 3K NTC, and 10K PTC.

- To set the Temperature compensation, touch the button for the Temp Comp Setting.

The standard cooling tower sensor used with the NexSys™ Control System uses None.

Lakewood Instruments pH sensors' temperature compensators:
1269422.....NONE 520 series.....10K PTC
1240472.....NONE
1167155.....NONE

6.10.1.2.2 Dampening

Dampening slows down the rate of change of the indicated pH reading. The default setting is 0.5. A larger value increases the dampening and a smaller value decreases the dampening.

- Touch the change button next to the Dampening field and use the keypad to enter the Dampening value. Touch the OK button to accept.
6.10.1.2.3 pH per deg C

pH values are temperature dependent. Sometimes the default temperature compensation is not adequate for the application. This setting allows the operator to enter in an additional compensation value in pH per degree C. The default value is zero.

- Touch the change button next to the Dampening field and use the keypad to enter the Dampening value. Touch the OK button to accept.

6.10.1.2.4 pH Probe Shield

The NexSys™ Control System is able to accept different types of pH sensors. Depending on the sensor, sometimes the pH probe shield is on the reference and sometimes it is on the ground.

- To set the pH probe shield setting, touch the button for either Ref or GRND.

The standard cooling tower sensor used with the NexSys™ Control System uses the shield on reference setting.

Lakewood Instruments pH sensors’ probe shield settings:
1269422.....REF  520 series.....GRND
1240472.....REF
1167155.....REF

6.10.1.2.5 High and Low Alarm Settings

The pH sensor inputs have a high and low alarm associated with them.

To set the high and low alarm levels for the selected sensor input:

- Touch the Change button next to the Hi or Lo Alarm value and use the keypad to enter the value. Touch the OK button to accept.
6.10.1.3 Configure the ORP Inputs

The ORP sensor inputs must be configured for proper operation. The Dampening and the High and Low pH Alarm points are set in this menu.

- From the Configure Processes screen touch the button for the desired ORP Input.
- To accept any changes touch the DONE button or to reject the changes touch the Cancel button.

6.10.1.3.1 Dampening

Dampening slows down the rate of change of the indicated ORP reading. The default setting is 0.5. A larger value increases the dampening and a smaller value decreases the dampening.

- Touch the change button next to the Dampening field and use the keypad to enter the Dampening value. Touch the OK button to accept.

6.10.1.3.2 ORP Probe Shield

The NexSys™ Control System is able to accept different types of ORP sensors. Depending on the sensor, sometimes the pH probe shield is on the reference and sometimes it is on the ground.

- To set the ORP probe shield setting, touch the button for either Ref or GRND.

The standard cooling tower sensor used with the NexSys™ Control System uses the shield on reference setting.

Lakewood Instruments pH sensors’ probe shield settings:
1269423…..REF 530 series…..GRND
1240473…..REF
1169065…..REF
6.10.1.3.3 High and Low Alarm Settings

The ORP sensor inputs have a high and low alarm associated with them.

To set the high and low alarm levels for the selected sensor input:

- Touch the Change button next to the Hi or Lo Alarm value and use the keypad to enter the value. Touch the OK button to accept.

6.10.1.4 Configure the 4-20 mA Inputs

The 4-20 mA inputs must be configured for proper operation. The Range, Dampening, and the High and Low Alarm points are set in this menu.

- From the Configure Processes screen, touch the button for the desired 4-20 mA Input node and touch the button for the desired 4-20 mA channel. There are four channels per 4-20 mA input node.

- To accept any changes touch the DONE button or to reject the changes touch the Cancel button.

6.10.1.4.1 Set the 4-20 mA Range

The range of the 4-20 mA input must be set to match the range of the 4-20 mA device that is providing the 4-20 mA input. This is done by setting a 4 mA value and a 20 mA value. Note: The units of measure are set in the Component Name Change menu.

To set the Range of the Input:

- Touch the Change button next to the 4mA value and use the keypad to enter the 4mA value. Touch the OK button to accept.

- Touch the Change button next to the 20mA value and use the keypad to enter the 20mA value. Touch the OK button to accept.
6.10.1.4.2 Dampening

Dampening slows down the rate of change of the indicated 4-20 mA reading. The default setting is 0.5. A larger value increases the dampening and a smaller value decreases the dampening.

- Touch the change button next to the Dampening field and use the keypad to enter the Dampening value. Touch the OK button to accept.

6.10.1.4.3 High and Low Alarm Settings

The 4-20 mA inputs have a high and low alarm associated with them.

To set the high and low alarm levels for the selected 4-20 mA input:

- Touch the Change button next to the Hi or Lo Alarm value and use the keypad to enter the value. Touch the OK button to accept.

6.10.1.5 Configure the Water Meter Inputs

The NexSys™ Control System will accept 2 water meter inputs standard and another two water meter inputs with the use of a Digital Input Node. The NexSys™ Control System will work directly with open collector output type water meters such as the following types of meters: dry contacting head meters, paddle wheel type meters such as the Signet model 2535 and 2540, and the Autotrol 1 inch and 2 inch meters. Contact Lakewood Instruments for other types of water meters.

To set up the water meter inputs:

- Touch the Water Meters button and then touch the water meter input to configure. Note: Water meter inputs 3 and 4 only appear if the optional NDIG is installed.

In the Water Meter Install Configuration screen the operator is able to choose the type of water meter, configure the water meter for that type of water meter, select the units of measurements, and reset the water meter totals.

- Touch the button for the type of water meter to configure.
For a contacting head type meter, the gallons/liters per contact are entered in the available field. For a paddle wheel type water meter, the K-factor for that water meter/pipe size is entered in the available field.

- Touch the Change button next to the gallons/liters or K factor value and use the keypad to enter the value. Touch the OK button to accept.

The water meter inputs are able to be displayed in gallons or liters. Note: This should agree with the water meter that is installed in the system as the NexSys™ Control System does not convert the units from one to the other.

- Touch the units of measurement: gallons or liters.

The total water meter counts can be reset to zero for each water meter input.

- Touch the Reset Totals button to reset the water meter input total to zero.

- To accept any changes touch the DONE button or to reject the changes touch the Cancel button.

### 6.10.2 Component Name Change

Changing the name of the installed components makes it easier to keep track of the inputs and outputs. In the Component Name Change menu, the names of: the relay outputs, Water Meter Inputs, Flow Switch Inputs, pH Inputs, Conductivity Inputs, ORP Inputs, 4-20 mA Inputs and 4-20 mA Inputs units of measure are changed.

To access the Component Name Change menu:

- From the Main Menu, touch the System Parameters button and then touch the Component Name Change button.

**Note:** Use the arrow buttons to switch between the different Name Change screens.
6.10.2.1 Relay Name Change

The names of the relay outputs can be changed to any name up to 6 characters long.

To change the name of a relay output:

- Touch the name of the relay in the blue box and use the keypad to enter the new name. Touch the OK button to accept.

6.10.2.2 Conductivity, pH, and ORP Inputs Name Change

The names of the pH, Conductivity, and ORP inputs can be changed to any name up to 4 characters long.

To change the name of a sensor input:

- Touch the name of the input in the blue box and use the keypad to enter the new name. Touch the OK button to accept.
6.10.2.3 Water Meter and Flow Switch Name Change

The names of the water meter inputs can be changed to any 4 character name and the Flow Switch inputs can be changed to any 5 character name.

To change the name of water meter or flow switch input:

- Touch the name of the input in the blue box and use the keypad to enter the new name. Touch the OK button to accept.

6.10.2.4 4-20 mA Inputs Name Change and Units of Measure

The names of the 4-20 mA inputs can be changed to any 4 character name and the units of measurement can be changed to any 3 character name.

To change the name or the units of measurement of the 4-20 mA:

- Touch the name or units of the 4-20 mA input in the blue box and use the keypad to enter the new name. Touch the OK button to accept.
6.10.3 Bio/Schedule Setup

Setting up the Feed Schedule is a three part process: setting the number of days in the cycle, configuring a relay to operate on a feed schedule, and programming the feed schedule for each Feed Schedule relay. Setting the number of days in the cycle is performed in the Bio/Schedule Setup menu, while configuring a relay to operate on a feed schedule and programming the feed schedule are performed in the Relay Configuration screens.

Schedule Setup and Config
The total number of days in the repeating cycle for the Scheduled Feed relays is set in this screen. Choosing the number of days is based on how the Feed Schedule is to function. If the same chemical will be feed every day, then the cycle calendar should be set up for a 1 day cycle. If the same chemical will be fed every specific weekday, such as every Tuesday, then the cycle calendar should be set up for a 7 day cycle. If the same chemical will be fed every other week, then the cycle calendar should be set up for a 14 day cycle.

To set the number of days in the Cycle Calendar:

- From the Main Menu, touch the System Parameters button, and then touch the Bio/Schedule Setup button.

The number of days in the feed schedule is set in the Days in Schedule field. This number of days in the feed schedule will be used for ALL scheduled feeds.

- Touch the Change button next to the Days in Schedule and use the keypad to enter the number of days. Touch the OK button to accept.

The Today is What Day in the Chosen Cycle field is used to set the start of the cycle calendar as it will start today. If a 7 day cycle has been chosen and a 3 is set in this field, the cycle begins at day 3.

- Touch the Change button next to the Today is What Day field and use the keypad to enter the day to start the cycle. Touch the OK button to accept.

- To accept any changes touch the DONE button or to reject the changes touch the Cancel button.
6.10.4 Reset Display

The Reset Display button in the System Parameters menu is used to reboot the display without resetting the rest of the controller. This may be necessary if the display were to become scrambled.

To Reboot the Display:

- Touch the Reset Display button in the System Parameters screen and touch the red Reset Display button on the next screen.

Note: If the Reset Display button is touched, the Display will reboot!

6.10.5 Change Password

The NexSys™ Control System has a security function to limit access to the Main Menu. The Change Password button in the System Parameters Menu allows the operator access to change the password. Changing the password places the NexSys™ Control System into the security mode and will require the operator to enter the password to access the main menu. When the password is entered, the operator will have access to the Main Menu for approximately 300 seconds before returning to the security mode. The default password is 0000.

To disable the security mode, change the password back to 0000.

To change the password and enable or disable the security:

- Touch the Change Password button in the System Parameters Menu and use the keypad to enter the new password. Touch the OK button to accept.

The security mode only prevents access to the Main Menu. The operator will still have access to the Home screens, the Calibration screens, and manual relay operation.

Note: When you change the password, the security mode will be enabled. Make sure you record your password and store it in a safe and secure place.
6.10.6 Alarms/Email Notifications

Alarms and Email Notifications are discussed in section 6.7.

6.10.7 System Usage

The System Usage button in the System Parameters Menu allows the operator to view the System Usage information. The System Usage information includes items such as: communications information, CPU usage, Memory usage, Firmware Version, Mail State, Mail Error code, and the Lon Service Pin for the display. The Mail State and Mail Error are diagnostic tools to troubleshoot email errors. As an email is being processed the Mail State will count up and when completed will reset to all zeros. If an error is encountered the Mail State will lock in on a number and the Mail Error will display a code.

6.10.8 Documentation

The NexSys™ Control System has most of the manual and drawings incorporated into the screens. Almost all of the screens have a help screen that is accessed by touching the question mark button on that screen.

There is additional documentation that is available by touching the Documentation button in the Main Menu.
6.11 Boot Menu

The NexSys™ Control System has a Boot Menu where functions associated with the Touch Screen display are set. This includes setting the unit to automatically switch to Daylight Saving Time, check the status of the backup battery, set the Ethernet settings, set the remote access password, enable/disable the E-mail service, recalibrate the touch screen, adjust the display brightness, and adjust the sound.

The Boot menu is accessed by cycling the power to the controller while holding your finger at the top left corner of the display as it reboots. The display will beep when it accesses the boot menu.

The Main Boot Menu screen looks like:

<table>
<thead>
<tr>
<th>MAIN</th>
<th>DATE/TIME</th>
<th>ETHERNET</th>
<th>VNC/MAIL</th>
<th>TOUCH</th>
<th>DISPLAY</th>
<th>EXIT</th>
</tr>
</thead>
</table>

**Touchlon Offline Menu**

- **Firmware Version:** 1.96
- **Hardware Revision:** 02
- **Date/Time:** We 17.09.2014 14:75:02
- **Ram Usage:** 2932/13563kB
- **Flash Usage:** 3427/12745kB
- **CPU Usage:** 13%
- **Screens Loaded:** 137
- **Fonts Loaded:** 26
- **Pictures Loaded:** 288
- **Texts Loaded:** 2597
- **LON NeuronID:** 80000019CDAA

It shows the operator information about the display.

The Date/Time Button will take the operator the to Date Time screen:

<table>
<thead>
<tr>
<th>MAIN</th>
<th>DATE/TIME</th>
<th>ETHERNET</th>
<th>VNC/MAIL</th>
<th>TOUCH</th>
<th>DISPLAY</th>
<th>EXIT</th>
</tr>
</thead>
</table>

**Set Date and Time**

- **Time Zone Correction (UTC):** -6h
- **NTP-Server:**
- **Daylight Saving:** YES
- **Backup Battery:** OK
In this screen the Time can be set to automatically adjust for Daylight Savings time and the status of the battery backup is displayed.

The Ethernet button will take the operator to the Ethernet setup screen:

<table>
<thead>
<tr>
<th>MAIN</th>
<th>DATE/TIME</th>
<th>ETHERNET</th>
<th>VNC/MAIL</th>
<th>TOUCH</th>
<th>DISPLAY</th>
<th>EXIT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>172</td>
<td>016</td>
<td>000</td>
<td>004</td>
<td></td>
</tr>
<tr>
<td>Project IP:</td>
<td>Subnet Mask:</td>
<td>255</td>
<td>255</td>
<td>255</td>
<td>000</td>
<td></td>
</tr>
<tr>
<td>Gateway:</td>
<td>DNS Server:</td>
<td>172</td>
<td>016</td>
<td>000</td>
<td>001</td>
<td></td>
</tr>
</tbody>
</table>

MAC Address: 000AB003A2B2
Offline IP: 192.168.000.082
Subnet: 255.255.255.000 - Gateway: 192.168.000.001

The VNC-Mail button will take the operator to the VNC/e-mail setup screen:

<table>
<thead>
<tr>
<th>MAIN</th>
<th>DATE/TIME</th>
<th>ETHERNET</th>
<th>VNC/MAIL</th>
<th>TOUCH</th>
<th>DISPLAY</th>
<th>EXIT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>VNC AccessKey</td>
<td>VNC Password</td>
<td>VNC</td>
<td>HTTP</td>
<td>Key Enabled</td>
<td>VNC Enabled</td>
<td>Reset Connection</td>
</tr>
<tr>
<td>________</td>
<td>____________________________</td>
<td>________</td>
<td>________</td>
<td>Key Enabled</td>
<td>VNC Enabled</td>
<td>Reset Connection</td>
</tr>
</tbody>
</table>

More e-mail settings coming soon!

The Remote Access Password is set in the VNC password field. The password can be up to 16 characters long. The default remote password is PonFarr.

The e-mail access is enabled/disabled in this screen with the E-Mail button.

Note: If the NexSys™ Control System does not have Ethernet or internet access, disable the E-Mail access.

Note: Do NOT change the VNC settings without contacting Lakewood Instruments First!
The **Touch** button will take the operator to the Touch Screen Calibration screen:

<table>
<thead>
<tr>
<th>MAIN</th>
<th>DATE/TIME</th>
<th>ETHERNET</th>
<th>VNC/MAIL</th>
<th>TOUCH</th>
<th>DISPLAY</th>
<th>EXIT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Recalibrate Touch ?</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Yes</strong></td>
<td><strong>No</strong></td>
</tr>
</tbody>
</table>

This will allow the operator to recalibrate the touch points of the display.

The **Display** button will take the operator to the Display Settings screen:

<table>
<thead>
<tr>
<th>MAIN</th>
<th>DATE/TIME</th>
<th>ETHERNET</th>
<th>VNC/MAIL</th>
<th>TOUCH</th>
<th>DISPLAY</th>
<th>EXIT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Brightness:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Brightness To:</strong></td>
<td><strong>0 sec</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Switch Screen:</strong></td>
<td><strong>300</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Screensaver:</strong></td>
<td><strong>0 sec</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Sound Output:</strong></td>
<td><strong>Yes</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Sound Volume:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Rotate 180˚:</strong></td>
<td><strong>Yes</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>Fade Screens:</strong></td>
<td><strong>Yes</strong></td>
</tr>
</tbody>
</table>

In this screen the operator can adjust the brightness of the display by touching the Brightness button. Touch on the right side of the button to increase the brightness and touch the left side of the button to decrease the brightness.

The brightness can also be set to automatically adjust after a user specified period of time with no activity on the touch screen.

The **NexSys™ Control System** has the ability to display a screensaver after a user specified amount of time with no activity on the touch screen. Contact Lakewood Instruments for details!
The sound touch screen for alarms can be enabled/disabled and has a volume adjust button. Touch on the right side of the button to increase the sound level and touch the left side of the button to decrease the sound level.

To **Exit** the Boot Menu, touch the Exit button:

<table>
<thead>
<tr>
<th>MAIN</th>
<th>DATE/TIME</th>
<th>ETHERNET</th>
<th>VNC/MAIL</th>
<th>TOUCH</th>
<th>DISPLAY</th>
<th>EXIT</th>
</tr>
</thead>
</table>

Save Settings ?

Yes  No  Cancel

Set Factory Defaults

The operator will be prompted to save the changes to the settings. Touch Yes to save the changes and exit the menu, touch No to exit the menu without saving the settings, or touch cancel to return to the Boot Menu.

**Note:** Do not touch the Set Factory Defaults button!

This will require reloading the software to the controller!
7.0 Maintenance

Periodic maintenance is required to ensure trouble free operation of the NexSys™ Control System. The following sections cover the required maintenance.

7.1 Sensor Maintenance

Routine maintenance is necessary in order to maximize the efficiency and accuracy of your sensor.

7.1.1 Conductivity Sensor

Clean the electrode end of the Conductivity sensor at least once per month. Cleaning of the Conductivity sensor may need to be performed more frequently if it is in a high fouling environment.

- Remove power from the controller and shut the inlet and outlet valves.
- Remove the sensor from its plumbing.
- Clean the electrodes with a soft steel wire brush. Do not use a brass brush. Do not use cloth to clean the electrodes. Cloth has oils that will foul the sensor.
- If there is oil on the sensor tips, use isopropyl alcohol to clean the electrode.
- It is recommended that you use a 10% Muriatic or HCL acid to clean the sensor if necessary.
- Wash the sensor off with tap water.
- Install the sensor in its plumbing.
- Restore sample flow and check for leaks.
- Restore power to the controller.
- Perform a calibration of the Conductivity.

7.1.2 ORP Sensor or pH Sensor

Clean the electrode end of the ORP or pH sensor at least once per month. Cleaning of the ORP or pH sensor may need to be performed more frequently if it is in a high fouling environment.

- Remove power from the controller and shut the inlet and outlet valves.
- Remove the sensor from its plumbing.
- Be careful not to touch the glass electrode. Do not use cloth to clean the electrode. Cloth has oils that will foul the sensor.
- If there is oil on the sensor glass, use 90% isopropyl alcohol to clean the electrode.
- It is recommended that you use a 10% Muriatic or HCL acid to clean the sensor.
- Wash the sensor off with tap water.
- Install the sensor in its plumbing.
- Restore sample flow and check for leaks.
- Restore power to the controller.
- Allow the reading to stabilize for approximately 30 minutes.
- Perform a calibration of the ORP or pH.
7.2 Flow Switch Maintenance

If you have the flow switch plumbing assembly, you may need to periodically clean the wetted parts in this assembly.

- Shut the inlet and outlet valves and shut off power to the controller.
- Turn the lock ring for the flow switch counterclockwise.
- Pull out the clear flow sight tube and remove the float with your fingers.
- Use a bottlebrush on the float, flow sight and the flow switch assembly to remove any debris or foreign material.
- Clean and lubricate the “O” ring with a silicone-based lubricant (petroleum-based lubricants will cause the O-ring to swell).
- Lock down the lock ring after you replace the components.
- Restore flow and check for leaks.

<table>
<thead>
<tr>
<th>Find No.</th>
<th>Part No.</th>
<th>Part Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1167266</td>
<td>Flowsight</td>
</tr>
<tr>
<td>2</td>
<td>1166418</td>
<td>O-Ring (flow sight)</td>
</tr>
<tr>
<td>3</td>
<td>1167234</td>
<td>Flow Magnet</td>
</tr>
<tr>
<td>4</td>
<td>1169740</td>
<td>Locking Ring Kit</td>
</tr>
<tr>
<td>5</td>
<td>1107004</td>
<td>Reed Switch</td>
</tr>
<tr>
<td>6</td>
<td>1166417</td>
<td>O-Ring (check valve)</td>
</tr>
</tbody>
</table>

*FlowSwitch Assembly*
7.2.1 Replacing the Reed Switch

If you ever need to replace the reed switch for the flow switch, follow the procedure below.

- Remove the power to the controller and shut off the sample flow.
- Disconnect the flow switch wires from the controller.
- Remove the screws holding the flow switch plumbing assembly and disconnect flow switch assembly from piping, if necessary to gain access to the reed switch.
- Pull hard on the wires that go to the reed switch assembly to remove the reed switch from the plumbing assembly.
- Push the new reed switch into the plumbing assembly and wire the new reed switch to the controller.
- Re-install plumbing.
- Restore flow to the plumbing assembly and check for leaks.
- Restore power to the controller.

7.3 Replacing the Fuse

The NexSys™ Control System contains one 15A, 250V fuse. It is a Littelfuse 0314015.HXP. The fuse holder is located at the left-hand side of the power supply board inside of the enclosure. It is accessible by opening the outer door and inner door of the enclosure. Replacement fuses must be a fast blow type. If a fuse is blown, the display may be blank and the indicator lights inside the enclosure may be dark when the unit is connected to power.
8.0 Troubleshooting

8.1 Error Messages

This section discusses some of the more common questions with The NexSys™ Control System. These notes are not intended to be all-inclusive—only to cover the most common situations. If you have other questions or are need support, contact the Lakewood Instruments Technical Service Department toll free at (800) 228-0839.

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>WHAT THIS MEANS</th>
<th>CORRECTIVE ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Conductivity: HIGH ALARM”.</td>
<td>Conductivity is too high with respect to the high alarm setpoint.</td>
<td>1.  Check the High Alarm Value.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.  Check relay setpoints and deadbands.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.  Check operation of bleed-off valve. Use the manual relay control to help.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.  Check blowdown valve is not stuck closed or the line is restricted.</td>
</tr>
<tr>
<td>“Conductivity: LOW ALARM”.</td>
<td>Conductivity is too low with respect to the low alarm setpoint.</td>
<td>1.  Check the Low Alarm Value.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2.  Check relay setpoints and deadbands.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.  Check blowdown valve is not stuck open.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4.  Check that the system is not overflowing.</td>
</tr>
<tr>
<td>Water meters not accumulating.</td>
<td>There may be a problem with the wiring or the reed switch in the meter may be bad.</td>
<td>1.  Is the controller configured for your type of water meter?</td>
</tr>
<tr>
<td></td>
<td>For water meters other than the contacting head type, check the manufacturer’s user manual for that particular water meter.</td>
<td>2.  Try simulating a water meter input.</td>
</tr>
<tr>
<td>Display is blank.</td>
<td>There may be a problem with the incoming power, the fuse or the circuit board.</td>
<td>1.  Check the fuse. Replace if blown.</td>
</tr>
<tr>
<td></td>
<td>Open the front panel to troubleshoot.</td>
<td>2.  Does the unit have power? Verify with volt meter.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3.  If there is power to terminals LINE and NTRL on the Power In terminal block, call Lakewood Instruments Technical Service for more information.</td>
</tr>
<tr>
<td>PROBLEM</td>
<td>WHAT THIS MEANS</td>
<td>CORRECTIVE ACTION</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Timeout Alarm</td>
<td>This indicates that the controller has been trying to blow down or feed chemical for longer than the user-programmed time and is unable to reach the setpoint.</td>
<td>1. Check for proper operation of pump or valve. Use the manual relay control to help.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Check that the chemical drum is not empty.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Check for power to the chemical pump.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Verify the relay timeout time is properly set for your application (see RELAYS in MAIN menu).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. To reset this alarm, momentarily turn off flow to the controller to get the no flow alarm.</td>
</tr>
<tr>
<td>FLOW OFF</td>
<td>Flow input switch is not closed.</td>
<td>1. The flow switch float may be stuck or no flow is present.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Flow switch may be bad. Replace reed switch in plumbing assembly.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. If no flow switch is used, a jumper wire should be installed across the flow switch input. Removing the jumper disables all relay outputs.</td>
</tr>
<tr>
<td>Bleed valve relay is closed above setpoint.</td>
<td>Controller may be in biocide schedule.</td>
<td>Check feed schedule.</td>
</tr>
<tr>
<td>Bleed valve relay is open below setpoint.</td>
<td>High conductivity alarm will force the bleed valve to open.</td>
<td>1. Check High conductivity alarm setpoint. Change setpoint if necessary.</td>
</tr>
<tr>
<td></td>
<td>Controller may be doing a pre-bleed before feeding biocide.</td>
<td>2. Check feed schedule. Adjust as necessary.</td>
</tr>
<tr>
<td>PROBLEM</td>
<td>WHAT THIS MEANS</td>
<td>CORRECTIVE ACTION</td>
</tr>
<tr>
<td>-----------------------</td>
<td>------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>“COND: Fouled SENSOR”</td>
<td>Conductivity sensor is not reading properly.</td>
<td>1. Clean sensor.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Check wiring. Verify that all connectors are fully mated.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Replace conductivity sensor.</td>
</tr>
<tr>
<td>“ORP: HIGH ALARM”</td>
<td>ORP is too high with respect to the high alarm setpoint.</td>
<td>1. See (RLY: TIME OUT).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Check the High Alarm Value.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Check relay setpoints and deadbands.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Check chemical drum levels.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5. Check proper operation of chemical pumps.</td>
</tr>
<tr>
<td>“ORP: LOW ALARM”</td>
<td>ORP is too low with respect to the low alarm setpoint.</td>
<td>1. See (RLY: TIME OUT).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Check the Low Alarm Value.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Check relay setpoints and deadbands.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Check chemical drum levels.</td>
</tr>
<tr>
<td>“pH: HIGH ALARM”</td>
<td>pH is too high with respect to the high alarm setpoint.</td>
<td>2. See (RLY: TIME OUT).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Check the High Alarm Value.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Check relay setpoints and deadbands.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Check chemical drum levels.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>6. Check proper operation of chemical pumps.</td>
</tr>
<tr>
<td>“pH: LOW ALARM”</td>
<td>pH is too low with respect to the low alarm setpoint.</td>
<td>1. See (RLY: TIME OUT).</td>
</tr>
<tr>
<td></td>
<td></td>
<td>2. Check the Low Alarm Value.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3. Check relay setpoints and deadbands.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4. Check chemical drum levels.</td>
</tr>
</tbody>
</table>
9.0 Factory Service

Technical Support for Lakewood Instruments can be reached by calling (800) 228-0839 or (414) 355-2807 or faxing (414) 355-3508, or by email at csd@lakewoodinstruments.com Monday through Friday, 7:30 a.m. – 5:00 p.m. Central Time.

**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
When calling Lakewood Instruments, please have your controller’s complete model number and serial number available, together with the firmware version so that the Technician can better assist you.

Refer to the Ordering Information section of this manual for part numbered replacement parts.

Write your controller’s complete model number, serial number, and firmware version here so that you will have them available if you wish to contact a Lakewood Instruments technician.

Model Number:
Serial Number:
Firmware Version:
10.0 Drawings
WIRING INSTRUCTIONS
1. 1269423 sensor goes into upper bushing with SMB Connector
2. 1269423 sensor goes into lower bushing with SMB Connector
3. 1189362 sensor goes into upper left bushing
4. 1187395 (reed switch) goes into upper right bushing
5. 1/2" plug (1188424) goes into bottom two 1/2" holes

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Note: "NC" terminals on relays 1-6 are used to drive motorized ball valves closed. They are powered (hot) whenever the relay is "off" and input power is provided.

NexSys is registered trademark of Lakewood Instruments, LLC.
NOTES: UNLESS OTHERWISE SPECIFIED

IF NO FLOW SWITCH IS USED, SHORT OUT PINS 1 & 2 or 3 and 4 WITH WIRE

CONTACTING HEAD TYPE WATER METER

FLOW SWITCH 1 (Digi 3)

FLOW SWITCH 2 (Digi 4)

AUTOTROL TURBINE WATER METER

2535/2540 PADDLE WHEEL

NOTICE ON REPRODUCTIONS

Lakewood INSTRUMENTS®

WIRING DIAGRAM FOR WATER METER INPUTS ON NexSys®

1269424-9b