PHUCN600 Multi-parameter Controller & Analyzer
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WARNING: These products are not designed for use in, and should not be used for, human applications.
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Introduction

The PHUCN600 series multi-parameter controller is a microprocessor based controller capable of measuring one of the following parameters, pH, ORP or conductivity.

When shipped from the factory, the PHUCN600 series is not set to measure any one parameter. When the PHUCN600 series is powered up for the first time, it will display the meter selection screen where the meter type must be selected. (refer to section 4.6 Meter Selection)

This meter selection screen will only be displayed when the unit is powered up for the first time.

After the user selects a meter type the PHUCN600 series will remain set to that meter type until it is changed with the meter selection menu function in the Utilities menu.

To return the PHUCN600 series to its factory settings, the user must re-select the current meter type from the meter selection menu function. This will override all set-points and return all settings back to the factory settings.

The PHUCN600 User’s menu has been divided into five main categories

- Calibration, used to calibrate the PHUCN600 series with the selected sensor
- Utilities, Used to manually control or override the outputs.
- Setup, used to configure the PHUCN600 series’ many options
- Diagnostics, used to troubleshoot any problems with the PHUCN600 series
- Outputs, used to configure the PHUCN600 series’ outputs.

There are two displays on the PHUCN600 series. A bright LED numeric display with bar graph on the outside front panel, and a 2-line, 16-character LCD display on the inside. The LED readout on the outside panel can be seen several yards away. The distinctive, color-coded bar graph will immediately indicate if you are within the process parameters that you set (green), if the control relays are on (yellow) and if you are in alarm condition (red). This makes diagnosing pump and alarm malfunctions easy. All configuration and control functions are performed on the LCD menu on the inside front panel.

A universal mounting kit is included for surface, panel and pipe-mount applications. The 1/4 DIN enclosure makes panel-mount cutouts and engineering simple.

PHUCN600 series is packaged in a rugged NEMA 4X polycarbonate enclosure making it ideally suited for heavy-duty applications such as industrial wastewater neutralization, municipal water and wastewater, pulp and paper, and process control.
### Section I - Specifications

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<th>Display</th>
<th>pH</th>
<th>ORP</th>
<th>Conductivity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Display</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Front Panel: 4 x 7 segment 1/2&quot; LED display, 1 LED indicator 0-1 line, 1 LED Bar Graph</td>
<td></td>
<td></td>
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<tr>
<td>Inside Panel: 2 x 16 alpha-numeric LCD display</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measuring Range</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>pH: 0.01 to 14.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temp: 0 to 100°C or 32° to +212°F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ORP: -1999 to +1999mV (Dependent on sensor)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temp: 0 to 100°C or 32° to +212°F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measuring Range</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>mS/cm³</td>
<td>0 to 20.00</td>
<td>1.0</td>
<td></td>
</tr>
<tr>
<td>uS/cm³</td>
<td>0 to 20.00</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Ω/cm³</td>
<td>0 to 20.00</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Temp: 0 to 100°C or 32° to +212°F</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature Compensation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Automatic or Manual</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 to 100°C (32° to +212°F)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not required</td>
<td></td>
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<td></td>
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<tr>
<td>Automatic or Manual</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>User selectable temperature compensation slope 0.0 to 10.0%/°C.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0 to 100°C (32° to +212°F)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature Unit</td>
<td>°C or °F</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature Sensor</td>
<td>User selectable: 3000Ω NTC Thermistor, 3000Ω NTC Thermistor or Pt. 1000 RTD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calibration Modes</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Auto-Calibration</td>
<td></td>
<td></td>
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<tr>
<td>Manual Calibration</td>
<td></td>
<td></td>
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<tr>
<td>Temperature Calibration</td>
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<td></td>
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<tr>
<td>Manual Calibration</td>
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<tr>
<td>Temperature Calibration</td>
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<tr>
<td>Dry Calibration</td>
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<tr>
<td>Sample Calibration</td>
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<tr>
<td>Temperature Compensation</td>
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<td></td>
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<tr>
<td>Ambient Conditions</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature: -20°C to +60°C or -4°F to +140°F</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Humidity: 0 to 90% RH (non-condensing)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Menu Access Inside Panel</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auto-Calibration, Manual Calibration, Temperature Display</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manual Calibration</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temperature Display</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full Access to all parameters of operations menu</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Menu to PHUCN600 Distance</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Differential Sensor: 3000 ft (914 m)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Combination Sensor: 10 ft (3 m)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>300 ft (91.4 m)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Relay Outputs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two Control Relays, 10A / NO, 5A / NC @ 240VAC or 28VDC.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mode: Process control, Adjustable parameters: process direction, rising or falling on-set point, off set-point, (0 to 100% of full scale), cycle timer (on, off, 0 to 600 seconds), failsafe (on, off).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One Alarm Relay, 10A / NO, 5A / NC @ 240VAC or 28VDC.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mode: High / Low Alarm, Adjustable parameters: Low on, Low off set-point (0 to 100% of full scale, low on must be less than low off), High On, High Off set-point (0 to 100% of full scale, high on must be greater than high off).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analog Outputs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 to 20mA Channel 1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolated Output, Range expand 0 - 100% of full scale (min segment 10% of full scale), max. load 800Ω</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 to 20mA Channel 2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Isolated Output, Range expand 0 - 100% of full scale (min segment 10% of full scale), max. load 800Ω</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Memory Back-up</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All user settings are retained indefinitely in memory (EEPROM)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mechanical</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Enclosure: NEMA 4X, 1/4 DIN, polycarbonate enclosure with four 1/2&quot; conduit holes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mounting: Universal Mounting kit for surface, pipe and panel mount, is included</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Sensor Input</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probe: 600 to 6000mV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temp. Sensor: 0 to 9999Ω</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Probe: -1999 to +1999mV</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temp. Sensor: 0 to 9999Ω</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cell: 0 to 9999Ω</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Temp. Sensor: 0 to 9999Ω</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Invalid Entries</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Invalid entries cannot be stored</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manual Test Mode</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Process value can be simulated with arrow keys to verify correct setup of outputs</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manual Relay Override</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relays can be set to on / off / auto, to verify correct wiring of auxiliary devices, or to manually adjust process</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output Hold</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All outputs are placed on hold when PHUCN600 is in Menu mode</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calibration Data</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recall data from last calibration, calibration mode, 1st &amp; 2nd accepted buffer value and probe mV output, calibration temperature, calibration slope, and probe efficiency</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recall data from last calibration, calibration buffer accepted value, and cell resistance, calibration temperature</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Auto Return</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>User selectable auto return if unit is left in menu mode or if relays are left in manual override mode for more than 10 min.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Display Damping</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>User can select rate at which the PHUCN600 updates display. Enables display damping of unstable process</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net Weight</td>
<td>2.2lbs (1kg)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Section 2 - Installation

### 2.1 Unpacking

Save the shipping carton and packing material in case the instrument needs to be stored or returned. Inspect the instrument and packing material for shipping damage and report any problems immediately.

### 2.2 Location

Locate the controller/ analyzer close to the sensor. The list below gives typical maximum distances for various sensors. Refer to the sensor specifications for exact information.

- PHE-600/610 Series Differential pH Probe 3000 ft (914 meters)
- ORE-600/610 Series Differential ORP Probe 3000 ft (914 meters)
- CDE-600 Series Conductivity Probe 300 ft (91 meters)

### 2.3 Mounting
Panel Mount – The PHUCN600 series can be panel mounted to a panel using the hardware kit provided. The panel cutout dimensions are shown in fig. 2.1.

Pipe Mount – The PHUCN600 series can also be mounted to a horizontal or vertical pipe with:

- a minimum outside diameter of 1.30” (33mm) (for example 1” CPVC pipe)
- and a maximum of 2.375” (60mm) (for example 2” CPVC pipe)
Surface Mount – The PHUCN600 series can be surface mounted using the hardware kit provided with the unit.
3.1 Conduit Connections

The PHUCN600 series has four 1/2" conduit holes, 2 on each side of the enclosure as shown on fig. 2.1. The unit is shipped with these holes plugged with liquid tight conduit seals. These must be left in unused holes to maintain the NEMA 4X integrity. Use approved conduit hubs to connect the conduit, connect these to the conduit before connecting to the enclosure.

*Wire Specification:* Size and fuse wire according to local electrical code. Maximum current not to exceed 10A when used to power auxiliary devices powered via internal connections.

3.2 A.C. Power Connections

*Caution:* This instrument uses 120 or 240 50/60 Hz AC power. Opening the enclosure door exposes you to potentially hazardous line power voltage which might be present on the terminals of plug P3 and P4. Always remove line power before working in this area. If the relay contacts on P4 are powered from a separate source from the line power on P3, be sure to disconnect that power before proceeding. The PHUCN600 flip out door contains only low voltage and is safe to handle.

The PHUCN600 series is available in two power models. The PHUCN610 is designed to operate at 240 VAC. The PHUCN601 is designed to operate at 120 VAC. To connect power to the PHUCN600, remove the terminal block plug P3 and connect the wiring as shown below.
3.3 pH and ORP Differential Probe connections and setup

The drawing shows the connections for the 5-wire Differential probes. The cable should be run in a conduit separate from AC power wires, and via a separate conduit hole.

**Note:** Leave 4” to 6” slack for all wires connected to the terminals of P6. Slack required so that wires do not interfere with opening or closing of the front door.

If the cable of the differential probe is cut, the blue wire is not used.

Once connected, step through the LCD menus to select the probe in the order shown. The first two steps may be skipped if the meter is already configured for pH or ORP and a Differential Probe. When using a pH probe, it is important to ensure that the PHUCN600 is reading the probe temperature correctly for accurate temperature compensation. The ORP probe does not require temperature compensation, although the PHUCN600 can display process temperature measured by the probe. The factory temperature calibration is usually accurate enough that no adjustments are necessary.
3.4 pH or ORP Combination Probe connections and setup

The drawing shows the connections for the Combination style probes. The cable should be run in a conduit separate from AC power wires, and via a separate conduit hole. The cable length should not exceed 10 feet (3 meters).

The 2 wire version has no temperature sensor and is connected via a coaxial wire. In a pH meter, the user should set the T COMP OVERRIDE menu to ON (Section 4.11) and adjust the temperature setting to the actual probe temperature. In an ORP meter, the user should set the T.DISp OVERRIDE to ON (Section 5.10) to blank the temperature reading on the display.

The 4 wire version has two additional wires for the probe internal temperature sensor. Ensure that the T COMP OVERRIDE or T.DISp OVERRIDE is OFF.

Note: Leave 4” to 6” slack for all wires connected to the terminals of P6. Slack required so wires do not interfere with opening/closing of front door.

CAUTION: Always remove line power before unplugging or plugging in the P6 connector.

Once connected, step through the LCD menus to select the probe in the order shown. The first two steps may be skipped if the meter is already configured for a Combination Probe. If a two wire pH probe is used, which has no temperature sensor, ensure that the Temp. Comp. Override is set to same temperature as the buffer before calibrating. If a two wire ORP probe is used, you can blank the Temp display with the T DISp OVERRIDE menu.
3.5 Conductivity Cell (Contacting style) connections and setup

The drawing shows the connections for the Conductivity Cells (Contacting style). The cable should be run in a conduit separate from the AC power wires, and via a separate conduit hole. The cell cable length should not exceed 300ft. (91 meters).

**Note:** Leave 4” to 6” slack for all wires connected to the terminals of P6. Slack required so that wires do not interfere with opening or closing of the front door.

Once connected, step through the LCD menus to select the cell in the order shown. The TEMP COMP CURVE setup default is 1.8%/deg C. This is acceptable for most process applications. If your process is significantly different from this, change the setting in the TEMP COMP CURVE menu.

**CAUTION:** Always remove line power before unplugging or plugging in the P6 connector.
3.7 Relay connections

The PHUCN600 series controller has three internal relays. Relays A and B are for control, the Alarm Relay can be configured for alarm functions or as an additional control relay.

The connections to the relays are shown in the drawing. Note that the AC power is internally connected to the relay terminal plug P4. This is used to provide 120V or 240V AC power for the relay contacts.

Wire Specification: Size and fuse wire according to local electrical code. Wire size not to exceed 14 AWG.

**Caution:**
The contacts are rated at 10 amp N.O. and 5 amp N.C. Do not exceed this rating. When switching larger currents, use an auxiliary relay switched by the controller relay to extend the controller relay life. If the relays are controlling an inductive load, use appropriate transient suppression at the load.
Section 3 - Electrical Connections and Setup

3.8 RELAY A and B Setup

(LCD MENU SECTIONS - pH: 4.18 & 4.19, ORP: 5.17 & 5.18, Conductivity: 6.18 & 6.19)

Relay A & Relay B on the PHUCN600 series are SPDT dry contact relays. They are configurable to operate in response to rising or falling process values. Each relay has independently adjustable on and off set-points, cycle times, and fail-safe options.

The operator would use the control relays if the device to be controlled is a simple on/off device. For example a pump, solenoid valve, fan, or an indicating light.

The control relays have 6 user configurable settings:

**DIRECTION**: The relay can be set to control either a rising or falling process. If for example the relay is set to control a falling process, the ON set-point must be set lower than the OFF set-point. If the relay is set to control a falling process, the PHUCN600 will not allow the RELAY OFF set point to be set lower than the RELAY ON set-point. This rule will also apply to a rising process.

**RELAY ON set-point**: This is the process value at which the relay will energize. This value can be set anywhere between 0-100% of the range.

**RELAY OFF set-point**: This is the process value at which the relay will de-energize. Depending on the direction for which the relay is configured, the RELAY OFF set-point will only be setable in a limited range.

**CYCLE ON time**: To obtain a tighter process control, and limit over-shoot, the control relay can be set with the cycling feature. This feature, if enabled, will cause the control relay to cycle when the process is between the RELAY ON set-point and RELAY OFF set-point. The cycle on time is the amount of time in seconds that the relay will be energized. It can be set between 0 and 600 seconds.

**CYCLE OFF time**: The CYCLE OFF time is the amount of time in seconds that the relay will be de-energized, it can be set between 0 and 600 seconds. To disable the cycling feature set the cycle off time to 0.

**OVERFEED TIMER**: The overfeed timer is designed to help safeguard against a process or instrumentation error causing one of the control relays to remain energized for extended periods of time.

When enabled, the overfeed timer will time out if the control RELAY OFF set point is not reached inside the overfeed time out. The control relays will de-energize, the alarm relay will energize and an LED will flash at the front.

**FAILSAFE**: The FAILSAFE feature is designed to reverse the normal action of the control relay.

When the relay is set to FAILSAFE OFF the relay will operate as a normal relay. When the relay is de-energized the NO contacts are open and the NC contacts are closed. Thus the device connected via the NO contacts will be off. When the relay becomes energized the device will be on.

When the relay is set to FAILSAFE ON, the normal action of the relay is reversed. Thus the NO contacts act as the NC contact and the NC act as the NO. The device connected to the NC contacts will be energized when the RELAY ON set-point is reached. The relay will be de-energized but because it is acting in reverse the device will be energized. When the RELAY OFF set-point is reached the relay will energize and the device connected to the NC contact will de-energize.

The purpose of the Fail Safe option is to have the device turned on in the event of a power interruption.

The factory default for FAILSAFE is OFF.
3.9 ALARM RELAY Setup

The third relay (Relay C) is used as an alarm relay. The alarm relay on the PHUCN600 is a SPDT dry contact relay.

This relay will respond to both a rising and falling process. The alarm relay will act as a low alarm (falling process) and a high alarm (rising process). Both relays will have independently adjustable on and off set-points. The ALARM ON set-points will always be set before the ALARM OFF set-points. The controller will not let the user input a value below the ALARM ON set-point. The same rule holds true for the high alarm.

The control relays have 5 user configurable settings:

- **ALARM LOW ON set-point**: This is the low process value that will cause the relay to energize. This value can be set anywhere between 0-100% of the range.

- **ALARM LOW OFF set-point**: This is the value that the process must reach in order to de-energize the alarm relay after it has dropped below the ALARM LOW ON set-point. This value must be higher than the ALARM LOW ON set-point.

- **ALARM HIGH ON set-point**: This is the process value that will cause the relay to energize. This value can be set anywhere between 0-100% of the range.

- **ALARM HIGH OFF set-point**: This is the value that the process must reach in order to de-energize the alarm relay after it has increased over the ALARM HIGH ON set-point. This value must be lower than the ALARM HIGH ON set-point.

- **FAILSAFE**: This option can be turned on or off. It reverses the normal action of the relay. (see description under control relay)

**ALARM SET-POINT ERROR**: If the ALARM LOW ON set-point is set higher than the factory default ALARM LOW OFF set-point, when the user advances from the ALARM LOW ON set-point to the ALARM LOW OFF set-point the shark will adjust the ALARM LOW OFF set-point to be equal to the ALARM LOW ON set-point. If the user then tries to decrease the ALARM LOW OFF set-point the controller will display the ALARM LOW ALARM setup error screen.

This screen will be displayed for 10 seconds, then return back to the setup screen that was previously displayed. If the user presses the down key again the error message will be displayed again for 10 seconds. The user must accept the LOW OFF set-point, equal to, or greater than the LOW ON set-point.

The same conditions apply to the ALARM HIGH set-points. Except the ALARM HIGH OFF set-point must be lower than the ALARM HIGH ON set-point. If the user tries to increase the ALARM HIGH OFF set-point higher than the ALARM HIGH ON set-point the High Alarm setup error screen will be displayed.

**ALARM RELAY DISABLE**: If the user sets the ALARM LOW ON set-point and the ALARM LOW OFF set-point equal to 0% of the range. It will disable the low alarm relay.

If the user sets the ALARM HIGH ON set-point and the ALARM HIGH OFF set-point equal to 100% of the range. It will disable the high alarm relay.
3.10 MANUAL TEST MODE

(LCD MENU SECTIONS - pH: 4.4, ORP: 5.3, Conductivity: 6.4)

Once the relays are configured, the setup can be tested using Manual Test Mode to simulate process changes.

MANUAL TEST MODE is used to simulate a process reading in order to verify the correct response of the outputs. When in the MANUAL TEST MODE, the relays and outputs are no longer placed on hold as they are when in the rest of the menu. The relays and outputs will react to the simulated change in process as if the controller was in RUN MODE.

Note that when the user exits the MANUAL TEST MODE, the relays and outputs will remain in the MANUAL TEST MODE state until the user enters RUN MODE.

3.11 RELAY OVERRIDE

(LCD MENU SECTION - pH: 4.5, ORP: 5.4, Conductivity: 6.5)

Relay Override is used to manually override the state of the relays. The user is able to set the operating mode of the relay as AUTO/ON/OFF (the default and RUN MODE states are AUTO).

This feature can be used to energize or de-energize the relays to manually correct the process, or to shut down an ancillary device to perform maintenance. When in the RELAY OVERRIDE mode, the relays are no longer placed on hold as they are when in the other menus.

Note that if the RELAY AUTO RETURN is set to "ON", the controller will place all the relay settings back to AUTO 10 minutes after the controller returns to the run mode.
3.12 4-20 mA Isolated Outputs
Channel 1 and Channel 2
(LCD MENU SECTIONS - pH: 4.21 & 4.22, ORP: 5.20 & 5.21, Conductivity: 6.21 & 6.22)

The PHUCN600 Series Controller has two 4 to 20mA outputs, electrically isolated from each other and ground. Either output can source current into a maximum of 800 ohms.

Channel 1 (the primary output) is located on the flip out door, terminal plug P6. Channel 1 is dedicated to track the process and has fully independent and fully adjustable 4 & 20 mA output setpoints. This will enable the operator to span the output over the desired range.

Channel 2 (the secondary output) is located in the enclosure terminal plug P1. Channel 2 can be selected to track the process value or temperature and has fully independent and adjustable 4 & 20 mA output setpoints.

Both Channel 1 and 2 can be precisely trimmed through the LCD menu for precision applications.

The drawing shows the connections for both outputs.

Wire Specification: 22 AWG 7/30, insulation 0.010”

Note: Leave 4” to 6” slack for all wires connected to the terminals of P6. Slack required so that wires do not interfere with opening or closing of the front door.
3.13 Service

PHUCN600 SERVICE TO BE PERFORMED BY QUALIFIED PERSONNEL ONLY.

3.14 Fuse Replacement

WARNING:
DISCONNECT LINE POWER TO THE UNIT TO AVOID THE POSSIBILITY OF ELECTRICAL SHOCK.

1. Proceed after disconnecting line power from the instrument.

2. Open the front panel by rotating the quarter-turn fasteners, using a flat blade screwdriver, to expose the relay board.

3. The fuse, F1, is located in the middle of the relay board, directly above the three terminal connectors.

4. Remove the open fuse and replace it only with a fuse of the same type and rating. REFER TO THE FUSE RATING TABLES BELOW.

5. Close the front panel and secure using the quarter-turn fasteners.

6. Restore power to the unit.

Fuse Rating Table for 120 volt operation

| Fuse Type: Slo-Blo fuse 5 x 20mm | Fuse Ratings: 250 VAC, 100mA |

Fuse Rating Table for 240 volt operation

| Fuse Type: Slo-Blo fuse 5 x 20mm | Fuse Ratings: 250 VAC, 50mA |
Section 4 - Using the PHUCN600 in pH Mode

RUN LED (GREEN)
LED WILL BE ILLUMINATED WHEN THE CONTROLLER IS IN THE RUN MODE. IT WILL BE OFF WHEN THE CONTROLLER IS IN THE MENU MODE.

4 DIGIT, 7 SEGMENT LED DISPLAY
DISPLAYS PROCESS VALUE IN RUN MODE. DISPLAYS CALIBRATION DATA IN CALIBRATION MODE.

RELAY C (ALARM RELAY) STATUS LED’s (RED)
BOTTOM LED WILL ILLUMINATE WHEN ALARM RELAY IS ENERGIZED BECAUSE OF LOW ALARM CONDITION.
TOP LED WILL ILLUMINATE WHEN ALARM RELAY IS ENERGIZED BECAUSE OF HIGH ALARM CONDITION.

BAR GRAPH LED’s (GREEN)
LINEAR INDICATOR OF PROCESS VALUE. (REFER TO SECTION 4.13)

CALIBRATION FROM THE FRONT PANEL
4 PUSH BUTTONS USED TO CALIBRATE THE CONTROLLER FROM THE FRONT PANEL. (REFER TO SECTIONS 4.22 & 4.23)

REMOVABLE TERMINAL BLOCK CONNECTORS
“SNAP-ON” CONNECTORS FOR EASY WIRING OF YOUR pH SENSOR AND PRIMARY 4-20mA OUTPUT. (REFER TO SECTIONS 3.3, 3.4 & 3.12)

2 LINE, 16 CHARACTER LCD DISPLAY
MAIN MENU INTERFACE SCREEN

NOTE
WHEN THE CONTROLLER IS TAKEN INTO MENU MODE VIA THE INSIDE LCD SCREEN, THE FRONT 7-SEGMENT LED WILL DISPLAY ---- IN PLACE OF THE TEMPERATURE. THIS FEATURE WILL BE DISABLED IF THE TEMPERATURE COMPENSATION OVERRIDE IS TURNED ON IN THE SETUP MENU.

INSIDE PANEL

SIMPLE THREE-BUTTON INTERFACE
FOR FAST & EASY SETUP (REFER TO SECTIONS 4.0 TO 4.21)
This example shows a MANUAL calibration with buffers of 7pH & 4pH. When performing a manual calibration, any two known buffer solutions can be used.

Place the probe in the first buffer solution, be sure to clean and rinse the Probe first with D.I. water and then insert it in the 7.00 buffer. Press [STORE] to store the calibration data and return back to the Manual Cal menu so the user can select another function.

If the calibration did not appear to be correct, press the [STORE] key which will return back to the Manual Cal menu.

When performing a manual calibration, any two known buffer solutions can be used.

The controller will read the pH value, averaging a number of results to get a stable calibration value.

Please wait for the controller to complete the measurement.

When complete, the controller will report the measured value.

Use the [UP] and [DOWN] keys to adjust the reading until it agrees with the actual buffer pH value.

When complete, the controller will report the measured value.

The controller will read the pH value, averaging a number of results to get a stable calibration value.

Place the probe in the second buffer. Be sure to clean and rinse the Probe first with D.I. water and then insert it in the 4.00 buffer.

Press [STORE] to store the value and move to BUFFER2.

Then press [STORE] to move the cursor to the RH position.

Then press [STORE] to store the value and complete the Manual Calibration.

After 5 seconds, the controller will compute the slope of the calibration, the estimated probe efficiency and the probe temperature.

If the calibration is OK, use the [UP] key to move the cursor over the Y text and press the down key.

If the calibration is not correct, press the [STORE] key which will return back to the Manual Cal menu.
If an error occurs, the controller will indicate a "BUFFER ERROR" alarm. This could be caused by:
- using a defective buffer
- incorrect probe wiring
- defective probe

Press \( \text{<button>}\) to return to the Auto cal menu, try to correct the problem and calibrate again, or go to the diagnostics menu to test the probe.

If an error occurs, the controller will indicate a "BUFFER ERROR" alarm. This could be caused by:
- using the same buffer twice
- using a defective buffer
- incorrect probe wiring
- defective probe

Press \( \text{<button>}\) to return to the Auto cal menu, try to correct the problem and calibrate again, or go to the diagnostics menu to test the probe.

This example shows an AUTO calibration with buffers of 7pH & 4pH.

When performing an auto calibration, any two standard buffers of 4.00, 7.00 or 10.00 pH can be used. The buffers will be automatically recognized if the probe measures them within +/- 1 pH of their nominal value.

If the calibration did not appear to be correct, press the \( \text{<button>}\) key which will return back to the Auto cal menu.
If the Temperature Compensation Override is set to ON (see section 4.11), the controller cannot calibrate the temperature sensor. This display will appear to alert the user to the condition.

If the calibration did not appear to be correct, press the key which will return back to the Temp Calibration menu.

The controller displays the current probe temperature. If this incorrect, the controller can be adjusted to compensate.

Press the key once which will move the cursor over the least sign. digit of the temperature display.

Use the and keys to adjust the reading until it agrees with the known temperature of the probe.

Press the key which will move the cursor back to the RH side of temperature display.

Press the key to accept the reading and move to the store function.

"T FACTOR SHIFTED" will be displayed for 5 seconds to indicate that the temperature sensor has been calibrated. The controller will then move to the store function.

This will store the calibration data and return back to the Temp Calibration setup so the user can select another function.

NOTE
PRESS THE AND KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE
Manual Test Mode is used to simulate a process reading in order to verify the correct response of the outputs. When in the Manual Test Mode, the outputs are no longer placed on hold as they are when in the rest of the menu.

When a relay is energized, the characters a, b, c will change to upper case A, B, C.

The CH1 4-20 mA output will track the change in process.

As the value is changed, the state of the relays will change depending on their settings in the OUTPUTS menu.

a/A - state of Relay A
b/B - state of Relay B
c/C - state of Alarm relay

As well, Channel 1 4-20 ma output will also follow the process value change. The actual change will depend on how the CH1 output was scaled in the OUTPUTS menus. (See Section 4.21)

When the user exits the Manual Test Mode, the relays and 4-20mA outputs will remain in the Test Mode state until the operator enters the run mode. The relays and outputs will then revert back to the previous On-line state.

NOTE:
When the user exits the Manual Test Mode, the relays and 4-20mA outputs will remain in the Test Mode state until the operator enters the run mode. The relays and outputs will then revert back to the previous On-line state.

NOTE
PRESS THE  AND  KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE.
The Relay Override menu is used to manually override the state of the relays. The user is able to set the operating mode of the relay as AUTO/ON/OFF (the default and run mode state are AUTO). This feature can be used to turn the relays ON or OFF to manually correct the process, or to shut down an ancillary device to perform maintenance. When in the Relay Override mode, the outputs are no longer placed on hold as they are when in the other menus.

To use the Relay Override function, press the \texttt{<} key once.

**CAUTION:**
Note that if the Relay Auto Return Menu is set to "ON", the controller will place all these settings back to AUTO 10 minutes after the controller returns to the run mode.

If you wish to Override Relay A, press the \texttt{<} key once which will move the cursor over to the AUTO/ON/OFF text. Use the \texttt{<} key to change the Override state from AUTO - controlled by process settings ON - relay forced on OFF - relay forced off The relay will react immediately.

If you wish to accept the Override setting, press the \texttt{<} key once to move the cursor to the RH of the display.

If you do not wish to Override Relay A, then use the \texttt{<} key to move to Relay B.

If you wish to Override Relay B, press the \texttt{<} key once which will move the cursor over to the AUTO/ON/OFF text. Use the \texttt{<} key to change the Override state from AUTO - controlled by process settings ON - relay forced on OFF - relay forced off The relay will react immediately.

If you wish to accept the Override setting, press the \texttt{<} key once to move the cursor to the RH of the display.

Then use the \texttt{<} key to move to the Override setting for Relay B.

If you do not wish to Override Relay B, then use the \texttt{<} key to the Alarm Relay.

To Alarm Relay (Relay C) Override.
If you wish to Override Relay C, Press the "CC" key.

If you do not wish to Override Relay C, then use the "COR" key to the Store function.

Use the "UP" or "DOWN" key to change the Override state from AUTO - controlled by process settings, ON - relay forced on, OFF - relay forced off. The relay will react immediately.

If you wish to accept the Override setting, Press the "CC" key once to move the cursor to the RH of the display.

Then use the "COR" key to move to the Override setting for Relay C.

If you wish to store the state of the Relay Overrides, press the "COR" key to highlight the Y character.

With "N" highlighted, pressing the "COR" key will NOT store the Override states of the relays, but they will revert to the state they were in before the menu was entered. Note that, if any of the relays were in a specific Override state before the menu was entered (i.e. not in AUTO), they will revert to that state again unless the changes are STORED.

Then press the "COR" key to store the Override states of all the relays and return back to the Override menu.

NOTE
PRESS THE "UP" AND "DOWN" KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE
The Meter Selection menu is used to select the meter type that the controller is configured for, either pH, ORP or Conductivity. Once selected, the controller will initialize itself for the selected meter's functionality and move to run mode.

To reset the controller back to all the factory default values, reselect the current meter type.

Press the key to initialize the controller as a pH meter.
Press the key to initialize the controller as an ORP meter.
Press the key to initialize the controller as a Conductivity meter.
Press the key to initialize the controller as a Flow meter.
Press the key to Exit and return to the Utilities menu.

If you do not wish to initialize to this type of meter after all, then press the key to return back to the Meter Selection menu.

If you do wish to initialize to this type of meter, press the key to highlight the Y character.

Then press The controller will initialize itself for a specific meter.

NOTE
PRESS THE AND KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE
If you wish to reset the overfeed timer, then press the \( \downarrow \) key to proceed and return back to the Utilities menu.

The reset overfeed timer will reset the timers for both relay A & relay B at the same time.

If the control relay overfeed timer has been enabled, the relay will "time out" after the specified overfeed time. When the relay times out, it must be manually reset. The time out will be signaled by the time out LED flashing on the front panel.

The reset overfeed timer will reset the timers for both relay A & relay B at the same time.

NOTE
PRESS THE \( \uparrow \) AND \( \downarrow \) KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE
PROBE SELECT will allow the user to select whether the probe is a 2 or 4 wire combination probe, or a 5 wire differential probe.

With "N" selected, pressing the key will NOT store the selection, but simply return to the PROBE SELECT Menu. This function is useful if you wish to view the current selection without making any changes.

Press the key once which will move the cursor back to the RH side of the display.

Once the correct probe type is selected, move to the store function to save the selection.

Press the key to accept the setting and move to the store function.

Then press the key to store the selection and return to the PROBE SELECT Menu.

Note: Refer to Appendix A - Probe Configuration Table

Note:
If using the 2 wire Combination Probe (which doesn't have a temperature sensor), T COMP OVERRIDE must be set to ON, and the actual probe temperature set through the T COMP OVERRIDE menu. (see sec. 4.12)
TEMP UNIT allows the user to select either Degrees Centigrade or Fahrenheit units for display.

With "N" selected, pressing the key will NOT store the selection, but simply return to the TEMP UNIT Selection Menu. This function is useful if you wish to view the current selection without making any changes.

Press the key once which will move the cursor over the unit type, C or F.

Use the or key to select C or F.

Press the key once which will move the cursor back to the RH side of the display.

Press the key to accept the change and move to the store function.

Or press the key to highlight the Y character.

Then press the key to store the selection and return to the TEMP UNIT Selection Menu.

NOTE
PRESS THE AND KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE.
TEMP SENSOR allows the user to select the type of temperature sensor used in the probe.

The factory default for pH is a 300 Ω NTC Thermistor. The user can also select a 3000 Ω NTC Thermistor or a 1000 RTD.

With "N" selected, pressing the key will NOT store the selection, but simply return to the TEMP SENSOR Selection Menu. This function is useful if you wish to view the current selection without making any changes.

Press the key once which will move the cursor over to the sensor type.

Use the or to select the sensor type.

Once the correct Sensor has been selected press the key once which will move the cursor back to the RH side of the display.

Press the key once which will move the cursor over to the sensor type.

Or press the key to highlight the Y character.

Then press the key to store the selection and return to the TEMP SENSOR Selection Menu.

NOTE
PRESS THE AND KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE.
CAUTION:

If AUTO RETURN RELAYS is ON, regardless of the user settings of the states of the relays, Relays will default to AUTO 10 minutes after the controller returns to Run Mode.

With "N" selected, pressing the key will NOT store the selection, but simply return to the AUTO RETURN Selection Menu. This function is useful if you wish to view the current selection without making any changes.

NOTE
PRESS THE "<" AND ">", KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE

MENU ON will cause the controller to exit the menu and revert back to the online run mode after 10 minutes with no buttons pressed. This feature ensures that if a user forgets to return back to run mode, the controller will not be left in an offline state. If for some reason, the user would like to remain in the menu mode for extended periods of time, the AUTO RETURN function can be set to "OFF*.

AUTO RETURN is used to select what conditions will cause the controller to time-out of the operations menu, or reset the relay override function.

To change the MENU RETURN setting, Press the key once which will move the cursor to the ON or OFF text.

Use the or keys to select either ON or OFF.

Press the key once which will move the cursor back to the RH side of the display.

Press the key to accept the change and move to the RELAYS auto return function. RELAYS ON will cause the relays to return to the AUTO mode if the controller returns to Online after 10 minutes of inactivity. This ensures the controller will be put back in control of the process if accidentally left offline.

Or press the key to highlight the Y character.

Then press the key to store the selection and return to the Auto Return Selection Menu.
Temperature Compensation Override is used to manually set the actual probe or process temperature. This is useful if the probe does not have a temperature sensor or if the process temperature is constant. When the override is enabled, the controller will use the selected temperature when performing temperature compensation calculations.

**NOTE**

Press the **[ ]** and **[ ]** keys together to go immediately back to Run Mode.

With "N" selected, pressing the **[ ]** key will NOT store the selection, but simply return to the T. Comp Override Menu. This function is useful if you wish to view the current selection without making any changes.

If you wish to save the setting, press the **[ ]** key to highlight the **Y** character.

Then press the **[ ]** key to store the selection and return to the T. COMP OVERRIDE Menu.
The Display Damping menu allows the user to adjust the rate at which the display and all outputs are updated. This allows the user to dampen out unstable process readings. The damping can be set from 0 seconds to 10 seconds. (default value is 0 sec.)

With "N" selected, pressing the \[ \text{key} \] will NOT store the selection, but simply return to the Display Damping Menu. This function is useful if you wish to view the current selection without making any changes.

If you wish to save the setting, press the \[ \text{key} \] to highlight the \( Y \) character. Then press the \[ \text{key} \] once which will move the cursor back to the RH side of the display.

Press the \[ \text{key} \] once which will move the cursor over the seconds digit.

Use the \[ \text{key} \] and \[ \text{key} \] to adjust the damping time, the default setting is 0 seconds. The setting can be adjusted from 0 to 10 seconds.

Press the \[ \text{key} \] key once which will move the cursor back to the RH side of the display.

Press the \[ \text{key} \] to accept the setting and move to the store function.

If you wish to save the setting, press the \[ \text{key} \] once which will move the cursor back to the RH side of the display.

Then press the \[ \text{key} \] to store the selection and return to the Display Damping Menu.

NOTE
PRESS THE \[ \text{key} \] AND \[ \text{key} \] KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE
The BAR GRAPH O/R menu allows the user control over the resolution of the bar graph on the front panel of the controller. The factory default for this function is "OFF" which means the 3 green LEDs are set to operate between the ON set points of Relay A and B. This may not always be acceptable, and this function allows the user to override these settings.

Press the key once which will move the cursor over the first character.

Use the and keys to select the override either ON or OFF.

Press the key once which will move the cursor back to the RH side of the display.

Press the key to adjust the setting for the Low Green Led.

Press the key to accept the reading and move to the High Green Led setting.

The controller displays the current setting for the highest green Led of the bar graph.

Press the key once which will move the cursor over the least sign. digit.

Use the and keys to select the override either ON or OFF.

Press the key once which will move the cursor back to the RH side.

Press the key to adjust the setting for the Low Green Led.

Press the key to accept the reading and move to the store function directly.

Press the key to move the cursor back to the RH side.

Press the key to store function.

Use the and keys to select the override either ON or OFF.

Press the key once which will move the cursor over the first character.

With "N" selected, pressing the key will NOT store the selection, but simply return to the Bar Graph O/R Menu. This function is useful if you wish to view the current selection without making any changes.

If you wish to save the setting, press the key to highlight the Y character.

Press the key once which will move the cursor over the first character.

Then press the key to store the selection and return to the Bar Graph O/R Menu.

Press the key skip the setting for the Low Green Led and move to the setting for the High Green Led.

Press the key skip the setting for the High Green Led and move to store function.

NOTE
PRESS THE AND KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE.

Then press the key to store the selection and return to the Bar Graph O/R Menu.
The FIRMWARE REV menu allows the user to see what revision of the firmware is currently installed in the controller. This is a Read Only menu item.

NOTE
PRESS THE ← AND → KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE.
The Calibration Data menu is a series of read only screens which allow the user to view the data collected during the last calibration.

Press \( \langle \rangle \) to view the first Calibration Data screen.

Calibration Mode
2 point calibration
Press \( \langle \rangle \) to view the next Calibration Data screen.

1st POINT  PH = 7.00
INPUT FROM PROBE = - 19 mV

2nd POINT  PH = 4.00
INPUT FROM PROBE = + 143 mV

Probe Temperature at which calibration was performed = 19.4°C

Calculated slope based on 2 point calibration = 59.16 mV/pH

Calculated efficiency based on 2 point calibration = 91%
Troubleshooting a pH probe using the sensor input

Sensor input displays the uncompensated sensor input data. The pH probe values are displayed in mV (millivolts). The temperature sensor value is displayed in Ω (ohm).

Connect the pH probe as per Probe Configuration Table below.

1. Place the probe in buffer 7pH (allow temperature to stabilize)
   • Probe should read 0mV [±50mV]
   • Temperature should read 300Ω [±50Ω] @ 25°C
   • Record both of these numbers.

2. Place the probe in buffer 4pH
   • Probe should read +160mV more than probe value at 7pH
   • Temperature should read the same as in 7pH

3. Place the probe in buffer 10pH
   • Probe should read -160mV less than probe value at 7pH
   • Temperature should read the same as in 7pH

<table>
<thead>
<tr>
<th>Model#</th>
<th>Probe Select</th>
<th>Temp. Sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>PHE-610</td>
<td>DIFFERENTIAL</td>
<td>300Ω</td>
</tr>
<tr>
<td>PHE-620</td>
<td>DIFFERENTIAL</td>
<td>300Ω</td>
</tr>
<tr>
<td>PHE-600</td>
<td>DIFFERENTIAL</td>
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</tr>
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</tr>
<tr>
<td>ORE-600</td>
<td>DIFFERENTIAL</td>
<td>300Ω</td>
</tr>
</tbody>
</table>
If you wish to change the setting, press the \( \text{UP} \) key once which will move the cursor to the first character of the value to be changed.

The relay can be set to control either a RISING or FALLING process.

In a FALLING process, the control relay will energize when the process falls below a set value. In this case, the ON set-point must be set lower than the OFF set-point.

In a RISING process, the control relay will energize when the process rises above a set value. In this case, the ON set-point must be set higher than the OFF set-point.

The RELAY OFF setting is the process value at which the relay will de-energize. The setting must be rationalized against the ON setting. For example, in a falling process, the Off setting must be higher than the ON setting.

The controller will not allow you to select the RELAY OFF value on the wrong side of the RELAY ON value for the selected direction. If the user tries to set the RELAY OFF on the wrong side, the following errors will be displayed:

- **FALLING PROCESS**
  - ON SPT < OFF SPT
  - Error when trying to set OFF point lower than ON point when set to falling.

- **RISING PROCESS**
  - ON SPT > OFF SPT
  - Error when trying to set OFF point higher than ON point when set to rising.

Use the \( \text{DOWN} \) and \( \text{UP} \) keys to change the setting.

Press the \( \text{UP} \) key once which will move the cursor back to the RH side of the display.

Press the \( \text{DOWN} \) key to accept the setting and move to the next setting.

Press the \( \text{UP} \) key once which will move the cursor back to the RH side of the display.

Press the \( \text{DOWN} \) key to accept the setting and move to the next setting.

Press the \( \text{UP} \) key once which will move the cursor back to the RH side of the display.

Press the \( \text{DOWN} \) key to accept the setting and move to the next setting.

Press the \( \text{UP} \) key once which will move the cursor back to the RH side of the display.

Press the \( \text{DOWN} \) key to accept the setting and move to the next setting.

**NOTE**

Press the \( \text{UP} \) AND \( \text{DOWN} \) KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE.
The relay can be set to CYCLE when the process is between the RELAY ON setting and the RELAY OFF setting. This is meant to help eliminate overshoot.

The CYCLE ON time is the amount of time in seconds that the relay will be on. The value can be set between 0 and 600 seconds. The default ON time is 5 seconds.

The CYCLE OFF time is the amount of time in seconds that the relay will be off for, it can be set between 0 - 600 seconds.

To disable the cycling feature set the cycle off time to 0.

The Default OFF time is 0 seconds.

The OVERFEED TIMER is designed to help safeguard against a process or instrumentation error causing one of the control relays to remain energized for extended periods of time.

When enabled, the user must select the desired overfeed timeout time (1-999 min.)

If the overfeed timer times out:
• Alarm relay will energize.
• Control (A&B) will de-energize
• LED on front will flash

Must be reset via Utilities Menu or Power reset.

The FAIL SAFE feature is designed to reverse the normal action of the relay.

When set to FAIL SAFE OFF, the relay will operate as a normal relay, which means that when the relay is not energized the NO contacts are open, and a device connected via the NO contacts is turned off. When the relay becomes energized the device turns on.

When the relay set to FAIL SAFE ON, the normal action of the relay is reversed. Thus the NO contact acts as the NC contacts and the NC acts as the NO. Therefore the device connected to the NC contacts will be turned on when the relay on set-point is reached. Actually the relay will be de-energized but because it is acting in reverse the device will be turned on. When the relay off set-point is reached the relay will energize and the device connected to the NC contact will turn off.

The reason that the Fail Safe option would be used is to have the device turned on in the event of a power interruption.

With "N" selected, pressing the key will NOT store the selection, but simply return to the OUTPUTS Menu. This function is useful if you wish to view the current selection without making any changes.

If you wish to change the setting, press the key once which will move the cursor to the first character of the value to be changed

Use the and keys to change the setting

Press the key once which will move the cursor back to the RH side of the display.

If you wish to change the setting, press the key once which will move the cursor to the first character of the value to be changed

Use the and keys to change the setting

Press the key once which will move the cursor back to the RH side of the display.

Press the key to accept the setting and move to the next setting.

If you wish to change the setting, press the key once which will move the cursor to the first character of the value to be changed

Use the and keys to change the setting

Press the key once which will move the cursor back to the RH side of the display.

Press the key once which will move the cursor back to the RH side of the display.

Press the key to accept the setting and move to the next setting.

If you wish to change the setting, press the key once which will move the cursor to the first character of the value to be changed

Use the and keys to change the setting

Press the key once which will move the cursor back to the RH side of the display.

Press the key to accept the setting and move to the STORE function.
The RELAY ON setting is the process value at which the relay will energize. It may be set anywhere between 0-100% of the range.

The RELAY OFF setting is the process value at which the relay will de-energize. The setting must be rationalized against the On setting. For example, in a falling process, the Off setting must be higher than the ON setting.

The controller will not allow you to select the RELAY OFF value on the wrong side of the RELAY ON value for the selected direction. If the user tries to set the RELAY OFF on the wrong side, the following errors will be displayed:

- **FALLING PROCESS**
  - ON SPT < OFF SPT
  - Error when trying to set OFF point lower than ON point when set to falling.

- **RISING PROCESS**
  - ON SPT > OFF SPT
  - Error when trying to set OFF point higher than ON point when set to rising.

TO CYCLE ON

Press the key once which will move the cursor to the first character of the value to be changed.

Use the and keys to change the setting.

Press the key once which will move the cursor back to the RH side of the display.

Press the key to accept the setting and move to the next setting.

### Relay B

Relay B can be configured for the following operations:
- Response to rising or falling process values
- Adjustable on and off set-points
- Cycle on and off times
- Failsafe operation

Each function will be explained below.
The relay can be set to CYCLE when the process is between the RELAY ON setting and the RELAY OFF setting. This is meant to help eliminate overshoot.

The CYCLE ON time is the amount of time in seconds that the relay will be on. The value can be set between 0 and 600 seconds. The default ON time is 5 seconds.

The CYCLE OFF time is the amount of time in seconds that the relay will be off for, it can be set between 0 - 600 seconds.

To disable the cycling feature set the cycle off time to 0.

The Default OFF time is 0 seconds.

The OVERFEED TIMER is designed to help safeguard against a process or instrumentation error causing one of the control relays to remain energized for extended periods of time.

When enabled, the user must select the desired overfeed timeout time (1-999 min.)

If the overfeed timer times out:
- Alarm relay will energize.
- Control (A&B) will de-energize
- LED on front will flash

Must be reset via Utilities Menu or Power reset.

The FAIL SAFE feature is designed to reverse the normal action of the relay.

When set to FAIL SAFE OFF, the relay will operate as a normal relay, means that when the relay is not energized the NO contacts are open, and a device connected via the NO contacts is turned off. When the relay becomes energized the device turns on.

When the relay is set to FAIL SAFE ON, the normal action of the relay is reversed. Thus the NO contact acts as the NC contacts and the NC acts as the NO. Therefore the device connected to the NC contacts will be turned on when the relay on set-point is reached. Actually the relay will be de-energized but because it is acting in reverse the device will be turned on. When the relay off set-point is reached the relay will energize and the device connected to the NC contact will turn off.

The reason that the Fail Safe option would be used is to have the device turned on in the event of a power interruption. For example, a process that needs a constant feed, would want a pump to turn on in the event of a power interruption. For example, a process or instrumentation error causing one of the control relays to remain energized for extended periods of time.

The reason that the Fail Safe option would be used is to have the device turned on in the event of a power interruption. For example, a process that needs a constant feed, would want a pump to turn on in the event of a power interruption. For example, a process or instrumentation error causing one of the control relays to remain energized for extended periods of time.

When enabled, the user must select the desired overfeed timeout time (1-999 min.)

If the overfeed timer times out:
- Alarm relay will energize.
- Control (A&B) will de-energize
- LED on front will flash

Must be reset via Utilities Menu or Power reset.

The FAIL SAFE feature is designed to reverse the normal action of the relay.

When set to FAIL SAFE OFF, the relay will operate as a normal relay, means that when the relay is not energized the NO contacts are open, and a device connected via the NO contacts is turned off. When the relay becomes energized the device turns on.

When the relay is set to FAIL SAFE ON, the normal action of the relay is reversed. Thus the NO contact acts as the NC contacts and the NC acts as the NO. Therefore the device connected to the NC contacts will be turned on when the relay on set-point is reached. Actually the relay will be de-energized but because it is acting in reverse the device will be turned on. When the relay off set-point is reached the relay will energize and the device connected to the NC contact will turn off.

The reason that the Fail Safe option would be used is to have the device turned on in the event of a power interruption. For example, a process that needs a constant feed, would want a pump to turn on in the event of a controller power failure.

With "N" selected, pressing the key will NOT store the selection, but simply return to the OUTPUTS Menu. This function is useful if you wish to view the current selection without making any changes.

With "Y" selected, pressing the key will store the selection and return to the OUTPUTS menu.
The ALARM RELAY will respond to both a rising and falling process. The ALARM RELAY will act as a low alarm (falling process) and a high alarm (rising process). Both relay bands will have independently adjustable on and off set-points. If a low alarm set-point is set at a value 3.00pH for example, the off set-point must be set higher. The controller will not let the user input a value below 3.00pH. The same rule holds true for the high alarm.

The Alarm Relay can be configured for the following operations:
- LOW ON Set-point
- LOW OFF Set-point
- HIGH ON Set-point
- HIGH OFF Set-point
- Failsafe

The LOW ON set point is the low process value that will cause the relay to energize. This value can be set anywhere 0-100% of Full Scale.

The LOW OFF set point is the value that the process must reach in order to de-energize the alarm relay after it has dropped below and tripped the LOW ON set-point. This value must be higher than the LOW ON Set-point.

The HIGH ON set-point is the high process value that will cause the relay to energize. This value can be set anywhere 0-100% of Full Scale.

TO HIGH OFF

NOTE
PRESS THE AND KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE
The HIGH OFF set-point is the value that the must reach in order to de-energize the alarm relay after it has increased over and tripped the HIGH ON set-point. This value must be lower than the HIGH ON set-point.

The FAIL SAFE feature is designed to reverse the normal action of the relay. When set to FAIL SAFE OFF, the relay will operate as a normal relay, which means that when the relay is not energized the NO contacts are open, and a device connected via the NO contacts is turned off. When the relay becomes energized the device turns on.

When the relay is set to FAIL SAFE ON, the normal action of the relay is reversed. Thus the NO contact acts as the NC contacts and the NC acts as the NO. Therefore the device connected to the NC contacts will be turned on when the relay on set-point is reached. Actually the relay will be de-energized but because it is acting in reverse the device will be turned on. When the relay off set-point is reached the relay will energize and the device connected to the NC contact will turn off.

The reason that the Fail Safe option would be used is to have the device turned on in the event of a power interruption.

If the Low On set-point is set higher than the factory default Low Off set-point, when the user advances from the low on set-point to the Low Off set-point the controller will adjust the Low Off set-point to be equal to the Low On set-point. If the user then tries to decrease the Low Off set-point the Controller will display the Low Alarm setup error screen.

This screen will be displayed for 10 seconds, then return back to the setup screen that was previously displayed. The same conditions apply to the High alarm set-points. Except the High Off set-point must be lower than the High On set-point higher than the High On set-point the High Alarm setup error screen will be displayed.

With "N" selected, pressing the key will NOT store the selection, but simply return to the OUTPUTS Menu. This function is useful if you wish to view the current selection without making any changes.
The Controller has 2 4-20mA outputs, electrically isolated from each other and ground. Either output can source current into a maximum of 800 ohms. See Section 3.12 for wiring diagram. Channel 1 (the primary output) is located on the flip out door, terminal plug P6. Channel 1 is dedicated to track the process and has fully independent and fully adjustable 4 & 20 mA output adjustments. This will enable the operator to span the output over the desired range.

The TUNE function allows the user to precisely adjust the 4-20 mA output to compensate for any errors in the output circuitry. Normally, tuning the 4-20mA output is not necessary. To make the adjustment, place an accurate current meter in series with the 4-20 mA output, with the appropriate loads connected. When the TUNE menu is selected, the controller puts 20 mA out the terminals. Use the or keys to adjust the 20 mA output to get exactly 20. The TUNE value can be adjusted over the range from 0 to 1000, these are unitless numbers used for tuning purposes only.

With “N” selected, pressing the key will NOT store the selection, but simply return to the OUTPUTS Menu. This function is useful if you wish to view the current selection without making any changes.

The example below shows the 4-20 mA set to 4mA = 7.00pH and 20mA = 14pH. The output would then span 4 to 20 mA for a pH swing of 7.0 to 14.0. Note that the span can reversed, in that 4 mA can be set to a high pH value, and 20 mA can be set to a low pH value, effectively reversing the control direction.

If you wish to change the setting, press the key once which will move the cursor to the first character of the value to be changed.

If you wish to change the setting, press the key once which will move the cursor to the first character of the value to be changed.

If you wish to change the setting, press the key once which will move the cursor to the first character of the value to be changed.

The Controller has 2 4-20mA outputs, electrically isolated from each other and ground. Either output can source current into a maximum of 800 ohms. See Section 3.12 for wiring diagram. Channel 1 (the primary output) is located on the flip out door, terminal plug P6. Channel 1 is dedicated to track the process and has fully independent and fully adjustable 4 & 20 mA output adjustments. This will enable the operator to span the output over the desired range.

The TUNE function allows the user to precisely adjust the 4-20 mA output to compensate for any errors in the output circuitry. Normally, tuning the 4-20mA output is not necessary. To make the adjustment, place an accurate current meter in series with the 4-20 mA output, with the appropriate loads connected. When the TUNE menu is selected, the controller puts 20 mA out the terminals. Use the or keys to adjust the 20 mA output to get exactly 20. The TUNE value can be adjusted over the range from 0 to 1000, these are unitless numbers used for tuning purposes only.

With “N” selected, pressing the key will NOT store the selection, but simply return to the OUTPUTS Menu. This function is useful if you wish to view the current selection without making any changes.

The example below shows the 4-20 mA set to 4mA = 7.00pH and 20mA = 14pH. The output would then span 4 to 20 mA for a pH swing of 7.0 to 14.0. Note that the span can reversed, in that 4 mA can be set to a high pH value, and 20 mA can be set to a low pH value, effectively reversing the control direction.

If you wish to change the setting, press the key once which will move the cursor to the first character of the value to be changed.

If you wish to change the setting, press the key once which will move the cursor to the first character of the value to be changed.

If you wish to change the setting, press the key once which will move the cursor to the first character of the value to be changed.

The example below shows the 4-20 mA set to 4mA = 7.00pH and 20mA = 14pH. The output would then span 4 to 20 mA for a pH swing of 7.0 to 14.0. Note that the span can reversed, in that 4 mA can be set to a high pH value, and 20 mA can be set to a low pH value, effectively reversing the control direction.

If you wish to change the setting, press the key once which will move the cursor to the first character of the value to be changed.

If you wish to change the setting, press the key once which will move the cursor to the first character of the value to be changed.

If you wish to change the setting, press the key once which will move the cursor to the first character of the value to be changed.
The Controller has 2 4-20mA outputs, electrically isolated from each other and ground. Either output can source current into a maximum of 800 ohms. Channel 2 can be selected to track the process or temperature. Channel 2 has fully independent and fully adjustable 4 & 20 mA output adjustments. This will enable the operator to span the output over the desired range.

Note that if the T COMP OVERRIDE is ON and Channel 2 output is set to track temperature, the output will not change, but hold at a value representing the temperature set in the T COMP OVERRIDE.

The example below shows the 4-20 mA set to 4mA = 0°C and 20mA = 100°C. The output would then span 4 to 20 mA for a temperature swing of 0°C to 100°C. Note that the span can be reversed, in that 4 mA can be set to a high process value, and 20 mA can be set to a low process value, effectively reversing the control direction.

The TUNE function allows the user to precisely adjust the 4-20mA output to compensate for any errors in the output circuitry. Normally, fine tuning the 4-20mA output is not necessary.

The make the adjustment, place an accurate current meter in series with the 4-20 mA output, with the appropriate loads connected. When the TUNE menu is selected, the controller puts 20mA out to the terminals. Use the or keys to adjust the 20mA output to get exactly 20.

The TUNE value can be adjusted over the range from 0 to 1000, these are unitless numbers used for tuning purposes only.

Note that if the T COMP OVERRIDE is ON and Channel 2 output is set to track temperature, the output will not change, but hold at a value representing the temperature set in the T COMP OVERRIDE.

If you wish to change the setting, press the key once which will move the cursor to the first character of the value to be changed.

Use the and keys to change the setting.

Press the key once which will move the cursor back to the LH side of the display.

Press the key to accept the setting and move to the next setting.

The 4mA, 20mA and TUNE functions are set up the same way as 4 - 20 mA CH 1 output.

With "N" selected, pressing the key will NOT store the selection, but simply return to the OUTPUTS Menu. This function is useful if you wish to view the current selection without making any changes.
**pH - LED Display Menu - pH Auto Calibrate 4.23**

**MANUAL CALIBRATE**
This menu allows the user to manually calibrate the probe, the user enters the known buffer values.

**AUTO CALIBRATE**
Auto Calibrate will automatically detect the buffers used to calibrate, and set the display to the appropriate settings.

**RUN**
The display will flash.

**Err**
If the controller detects an error, it will flash the Err (Error) screen and return back to Auto Calibrate.

The Controller will display BUF2, prompting the user to place the probe in the second buffer solution. Be sure to clean and rinse the Probe first with D.I. water and then insert it in the 4.00/10.00 buffer. Press the key.

The controller will display "BUF1" for about 10 seconds while it reads the buffer. The controller will determine which one of the standard buffers is being used, either 4, 7 or 10, and will set the display to that value.

**CAL**
Press the key to select Manual Calibration

Press the key to go immediately back to Run mode

**CAL**
Press the key to select Auto Calibration

If the displayed value is correct, press the key.

Press the key again to confirm the entry.

**Eff**
If the controller detects a problem, it will flash the Err (Error) screen and return back to Auto Calibrate.

**Resume**
The controller will display BUF1, prompting the user to place the probe in the first buffer solution. Be sure to clean and rinse the Probe first with D.I. water and then insert it in the 7.00 buffer. Press the key.

The controller will flash "BUF1" for about 10 seconds while it reads the buffer. The controller will determine which one of the standard buffers is being used, either 4, 7 or 10, and will set the display to that value.

Press the key again to confirm the entry.

**CAL**
The display will flash.

Press the key to select Manual Calibration

The Controller will display BUF1, prompting the user to place the probe in the second buffer solution. Be sure to clean and rinse the Probe first with D.I. water and then insert it in the 0.00/10.00 buffer. Press the key.

The controller will flash "BUF2" for about 10 seconds while it reads the buffer. The controller will determine which one of the standard buffers is being used, and will set the display to that value.

If the displayed value is correct, press the key.

Press the key again to confirm the entry.

The Controller will display E for 3 seconds to indicate it is calculating the probe efficiency value. It will then display the actual efficiency for a few seconds and then revert back to run mode.
TO AUTO CALIBRATE

MANUAL CALIBRATE

The Controller will display bUF2, prompting the user to place the probe in the second buffer solution.

Be sure to clean and rinse the Probe first with D.I. water and then insert it in the 4.00/10.00 buffer. Press the ENTER key.

The controller will flash “bUF1” for about 10 seconds while it reads the buffer. It will then display the pH value based on an ideal theoretical pH slope.

Use the and keys to adjust the display until it reads the correct value of the buffer.

Press the ENTER key to accept the setting. The display will flash.

The controller will display “bUF1” for about 10 seconds while it reads the buffer. It will then display the pH value based on an ideal theoretical pH slope.

Use the and keys to adjust the display until it reads the correct value of the buffer.

Press the ENTER key to accept the setting. The display will flash.

Press the key again to confirm the change in calibration value.

The controller will display “bUF2” for about 10 seconds while it reads the buffer. It will then display the pH value based on an ideal theoretical pH slope.

Use the and keys to adjust the display until it reads the correct value of the buffer.

Press the ENTER key to accept the setting. The display will flash.

Press the key again to confirm the change in calibration value.

If the controller detects an error, it will flash the Err (Error) screen and return back to Manual.

The Controller will display bUF1, prompting the user to place the probe in the first buffer solution.

Be sure to clean and rinse the Probe first with D.I. water and then insert it in the 7.00 buffer. Press the ENTER key.

The controller will flash “bUF1” for about 10 seconds while it reads the buffer. It will then display the pH value based on an ideal theoretical pH slope.

Use the and keys to adjust the display until it reads the correct value of the buffer.

Press the ENTER key to accept the setting. The display will flash.

Press the key again to confirm the change in calibration value.

The Controller will display EFF for 3 seconds to indicate it is calculating the probe efficiency value.

It will then display the actual efficiency for a few seconds and then revert back to run mode.

Press the key to go immediately back to Run mode.
**Section 5 - Using the PHUCN600 in ORP Mode**

**RUN LED (GREEN)**
LED will be illuminated when the controller is in the run mode. It will be off when the controller is in the menu mode.

**4 DIGIT, 7 SEGMENT LED DISPLAY**
Displays process value in run mode. Displays calibration data in calibration mode.

**RELAY C (ALARM RELAY) STATUS LED’s (RED)**
Bottom LED will illuminate when alarm relay is energized because of low alarm condition. Top LED will illuminate when alarm relay is energized because of high alarm condition.

**BAR GRAPH LED’s (GREEN)**
Linear indicator of process value. (Refer to Section 5.12)

**RELAY B STATUS LED (YELLOW)**
LED will be illuminated when relay B is energized.

**RELAY A STATUS LED (YELLOW)**
LED will be illuminated when relay A is energized.

**TEMPERATURE DISPLAY**
When the 'up' and 'down' arrow keys are pressed simultaneously, the LED will display the current process temperature for 5 seconds. This feature will be disabled if the 'temperature compensation override' is turned on in the setup menu. In this case the LED will display ---- in place of the temperature.

**CALIBRATION FROM THE FRONT PANEL**
4 push buttons used to calibrate the controller from the front panel. (Refer to Sections 5.21)

**REMOVABLE TERMINAL BLOCK CONNECTORS**
"Snap-on" connectors for easy wiring of your ORP sensor and primary 4-20mA output. (Refer to Sections 3.3, 3.4 & 3.12)

**2 LINE, 16 CHARACTER LCD DISPLAY**
Main menu interface screen

**NOTE**
When the controller is taken into menu mode via the inside LCD screen, the front 7-segment LED will display ----. The status & bar graph LED’s will be turned off. The 4 push buttons on the front will not respond.

**SIMPLE THREE-BUTTON INTERFACE**
For fast & easy setup. (Refer to Sections 5.0 to 5.20)
Place the probe in the buffer solution, be sure to clean and rinse the Probe first with D.I. water and then insert it in the mV buffer.

Press \[\text{DOWN} \] to store the calibration data and return back to the Manual Cal menu so the user can select another function.

Press \[\text{UP} \] and \[\text{DOWN} \] to move the cursor over the Y text and press the down key.

If the calibration did not appear to be correct, press the \[\text{UP} \] key which will return back to the Manual Cal menu.

The controller will display the mV value and the probe temperature for 5 seconds. If the T.DISPLAY O/R is enabled, the display will show "TEMP O/R ON".

If the calibration is OK, use the \[\text{UP} \] and \[\text{DOWN} \] keys to adjust the reading until it agrees with the actual buffer mV value.

Press \[\text{UP} \] to move the cursor to the RH position.

Please wait for the controller to complete the measurement.

When complete, the controller will report the measured value.

The controller will read the mV value, averaging a number of results to get a stable calibration value.

If the calibration did not appear to be correct, press the \[\text{UP} \] key which will return back to the Manual Cal menu.
If the Temperature Display Override is set to ON (see section 5.11), the controller cannot calibrate the temperature sensor. This display will appear to alert the user to the condition.

If the calibration did not appear to be correct, press the key which will return back to the Temp Calibration menu.

The controller displays the current probe temperature. If this incorrect, the controller can be adjusted to compensate.

Use the and keys to adjust the reading until it agrees with the known temperature of the probe.

Press the key once which will move the cursor over the least sign. digit of the temperature display.

Press the key once which will move the cursor back to the RH side of temperature display.

Press the key to accept the reading and move to the store function.

"T FACTOR SHIFTED" will be displayed for 5 seconds to indicate that the temperature sensor has been calibrated. The Shark will then move to the store function.

This will store the calibration data and return back to the Temp Calibration setup so the user can select another function.

NOTE
PRESS THE AND KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE
Manual Test Mode is used to simulate a process reading in order to verify the correct response of the outputs. When in the Manual Test Mode, the outputs are no longer placed on hold as they are when in the rest of the menu.

The range is 0 to +1000mV.

**NOTE:** When the user exits the Manual Test Mode, the relays and 4-20mA outputs will remain in the Test Mode state until the operator enters the run mode. The relays and outputs will then revert back to the previous On-line state.

When a relay is energized, the characters a,b,c will change to upper case A,B,C.

The CH1 4-20 mA output will track the change in process.

As the value is changed, the state of the relays will change depending on their settings in the OUTPUTS menu.

- a/A - state of Relay A
- b/B - state of Relay B
- c/C - state of Alarm relay

As well, Channel 1 4-20 mA output will also follow the process value change. The actual change will depend on how the CH1 output was scaled in the OUTPUTS menus. (See Section 5.20)

**NOTE:**
Press the key once which will move the cursor over the least digit of the simulated process value.

Use the and keys to change the simulated process value.

As the value is changed, the state of the relays will change depending on their settings in the OUTPUTS menu.

**NOTE:** Press the key once to move the cursor to the RH side of the display.

Press the key to return to the MANUAL TEST MODE menu.

When the user exits the Manual Test Mode, the relays and 4-20mA outputs will remain in the Test Mode state until the operator enters the run mode. The relays and outputs will then revert back to the previous On-line state.

**NOTE:**
Press the and keys together to go immediately back to RUN MODE.
Relay Override is used to manually override the state of the relays, the user is able to set the operating mode of the relay as AUTO/ON/OFF (the default and run mode state are AUTO). This feature can be used to turn the relays ON or OFF to manually correct the process, or to shut down an ancillary device to perform maintenance. When in the Relay Override mode, the outputs are no longer placed on hold as they are when in the other menus.

To use the Relay Override function, press the key.

Note that if the Relay Auto Return Menu is set to "ON", the controller will place all these settings back to AUTO if the controller is put back in run mode, and there is no button activity for 10 minutes.

If you wish to Override Relay A, Press the key once which will move the cursor over to the AUTO/ON/OFF text.

If you do not wish to Override Relay A, then use the key to move to Relay B.

If you wish to Override Relay B, Press the key once which will move the cursor over to the AUTO/ON/OFF text.

NOTE: Press the and keys together to go immediately back to Run Mode.

Then use the key to move to the Override setting for Relay B.

If you wish to accept the Override setting, Press the key once to move the cursor to the RH of the display.

Then use the key to move to the Override setting for Relay B.

Then use the key to move to the Override setting for Relay B.

If you wish to accept the Override setting, Press the key once to move the cursor to the RH of the display.

Then use the key to move to the Override setting for Relay B.

If you wish to accept the Override setting, Press the key once to move the cursor to the RH of the display.

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If you wish to accept the Override setting, Press the key once to move the cursor to the RH of the display.

Then use the key to move to the Override setting for Relay B.

If you wish to accept the Override setting, Press the key once to move the cursor to the RH of the display.
If you do not wish to Override Relay C, then use the key to the Alarm Relay.

With "N" highlighted, pressing the key will NOT store the Override states of the relays, but they will revert to the state they were in before the menu was entered. Note that, if any of the relays were in a specific Override state before the menu was entered (i.e. not in AUTO), they will revert to that state again unless the changes are STORED.

If you wish to store the state of the Relay Overrides, press the key to highlight the Y character.

Then press the key to store the Override states of all the relays and return back to the Override menu.

NOTE
Relay C is the Alarm Relay.

Press the and keys together to go immediately back to Run Mode.
The Meter Selection menu is used to select the meter type that the controller is configured for, either pH, ORP or Conductivity. Once selected, the controller will initialize itself for the selected meter's functionality and move to run mode.

To reset the controller back to all the factory default values, reselect the current meter type.

If you do not wish to initialize to this type of meter after all, then press key to return back to the Meter Selection menu.

If you do wish to initialize to this type of meter, press the key to highlight the Y character.

Press the key to initialize the controller as a Flow meter.

Press the key to initialize the controller as a Conductivity meter.

Press the key to initialize the controller as an ORP meter.

Press the key to initialize the controller as a pH meter.

Press the key to exit and return to the Utilities menu.

Then press The controller will initialize itself for a specific meter.

If you do not wish to initialize to this type of meter after all, then press key to return back to the Meter Selection menu.

NOTE
PRESS THE AND KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE
If you wish to reset the overfeed timer, then press the key to proceed and return back to the Utilities menu.

If you do not wish to reset the overfeed timer after all, press the key to highlight the N character and press the key to return back to the Utilities menu.

NOTE
PRESS THE AND KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE
ORP - Setup Menu - Probe Select 5.7

PROBE SELECT will allow the user to select whether the probe is a 2 or 4 wire combination probe, or a 5 wire differential probe.

With "N" selected, pressing the key will NOT store the selection, but simply return to the PROBE SELECT Menu. This function is useful if you wish to view the current selection without making any changes.

Note: If using the 2 wire Combination Probe (which doesn't have a temperature sensor), T DISP OVERRIDE must be set to ON, and the actual probe temperature set through the T DISP OVERRIDE menu. (see sec. 5.11)

Use the or keys to scroll through the probe styles available. In this case, the user can select - the 2 or 4 wire combination probe - the 5 wire differential probe

Once the correct style probe is selected, move to the store function to save the selection. Press the key once which will move the cursor back to the RH side of the display.

Or press the key to highlight the Y character.

Then press the key to store the selection and return to the PROBE SELECT Menu.

Press the AND keys together to go immediately back to RUN MODE.
TEMP UNIT allows the user to select either Degrees Centigrade or Fahrenheit units for display.

With "N" selected, pressing the key will NOT store the selection, but simply return to the TEMP UNIT Selection Menu. This function is useful if you wish to view the current selection without making any changes.

Press the key once which will move the cursor over the unit type, C or F.

Use the or to select C or F.

Press the key once which will move the cursor back to the RH side of the display.

Press the key to accept the change and move to the store function.

Or press the key to highlight the Y character.

Then press the key to store the selection and return to the TEMP UNIT Selection Menu.

NOTE
PRESS THE UP AND DOWN KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE.
TEMP SENSOR allows the user to select the type of temperature sensor used in the probe.

The factory default for ORP is a 300 NTC Thermistor. The user can also select a 3000 NTC Thermistor or a 1000 RTD.

With "N" selected, pressing the key will NOT store the selection, but simply return to the TEMP SENSOR Selection Menu. This function is useful if you wish to view the current selection without making any changes.

With "Y" selected, pressing the key will NOT store the selection, but simply return to the TEMP SENSOR Selection Menu. This function is useful if you wish to view the current selection without making any changes.

Press the key once which will move the cursor over to the sensor type.

Use the or key to select the sensor type.

Once the correct Sensor has been selected press the key once which will move the cursor back to the RH side of the display.

Press the key once which will move the cursor over to the sensor type.

Or press the key to highlight the Y character.

Press the key to accept the change and move to the store function.

Then press the key to store the selection and return to the TEMP SENSOR Selection Menu.

NOTE

PRESS THE AND KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE
ORP - Setup Menu - Auto Return 5.10

AUTO RETURN is used to select what conditions will cause the controller to time-out of the operations menu or reset the relay override function.

MENU ON will cause the controller to exit the menu and revert back to the online run mode after 10 minutes with no buttons pressed. This feature ensures that if a user forgets to return back to run mode, the controller will not be left in an offline state. If for some reason, the user would like to remain in the menu mode for extended periods of time, the AUTO RETURN function can be set to "OFF".

To change the MENU RETURN setting, press the key once which will move the cursor to the ON or OFF text.

Use the or keys to select either ON or OFF.

Press the key once which will move the cursor back to the RH side of the display.

Press the key once which will move the cursor back to the RH side of the display.

Press the key to accept the change and move to the RELAYS auto return function. RELAYS ON will cause the relays to return to the AUTO mode if the controller returns to Online after 10 minutes of inactivity. This ensures the controller will be put back in control of the process if accidentally left offline.

Press the key once which will move the cursor to the ON or OFF text.

Use the or keys to select either ON or OFF.

Press the key once which will move the cursor back to the RH side of the display.

Press the key to accept the change and move to the STORE function.

Or press the key to highlight the Y character.

Then press the key to store the selection and return to the Auto Return Selection Menu.

NOTE
PRESS THE AND KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE

CAUTION:
If AUTO RETURN RELAYS is ON, regardless of the user settings of the states of the relays, Relays will default to AUTO 10 minutes after the controller returns to Run Mode.

With "N" selected, pressing the key will NOT store the selection, but simply return to the AUTO RETURN Selection Menu. This function is useful if you wish to view the current selection without making any changes.

AUTO RETURN
RELAYS OFF

STORE?
Y N

NOT stored

STORE?
Y N

StoredProcedure
T. Display Override is used to blank the Temperature Display on the LCD menu and place 4 dots on the LED menu when Temp display is requested. This is to ensure the user isn't shown a temperature value that isn't valid.

Use the or keys to select either ON or OFF.

Press the key to accept the change and move to the store function.

Press the key once which will move the cursor back to the RH side of the display.

Then press the key to store the selection and return to the T. DISP OVERRIDE Menu.

NOTE

PRESS THE AND KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE

With "N" selected, pressing the key will NOT store the selection, but simply return to the T. Disp. Override Menu. This function is useful if you wish to view the current selection without making any changes.
The Display Damping menu allows the user to adjust the rate at which the display and all outputs are updated. This allows the user to dampen out unstable process readings. The damping can be set from 0 seconds to 10 seconds. (default value is 0 sec.)

Use the keys to adjust the damping time, the default setting is 0 seconds. The setting can be adjusted from 0 to 10 seconds.

Press the key once which will move the cursor to the RH side of the display.

If you wish to save the setting, press the key to highlight the Y character.

Then press the key to store the selection and return to the Display Damping Menu.
The BAR GRAPH O/R menu allows the user control over the resolution of the bar graph on the front panel of the controller. The factory default for this function is "OFF" which means the 3 green LEDs are set to operate between the ON set points of Relay A and B. This may not always be acceptable, and this function allows the user to override these settings.

Press the \( \text{UP} \) key once which will move the cursor to the first character of the bar graph.

Use the \( \text{UP} \) and \( \text{DN} \) to adjust the setting for the Low Green Led.

Press the \( \text{UP} \) key to accept the reading and move to the Low Green Led setting.

Press the \( \text{UP} \) key once which will move the cursor to the Least Sign. digit.

Use the \( \text{UP} \) and \( \text{DN} \) to adjust the setting for the Low Green Led.

Press the \( \text{UP} \) key once which will move the cursor back to the RH side of the display.

Press the \( \text{UP} \) key which will move the cursor back to the RH side of the display.

The controller displays the current setting for the highest green Led of the bar graph.

Press the \( \text{UP} \) key once which will move the cursor over the least sign. digit.

Use the \( \text{UP} \) and \( \text{DN} \) to adjust the setting for the High Green Led.

Press the \( \text{UP} \) key once which will move the cursor back to the RH side.

Press the \( \text{UP} \) key which will move the cursor back to the RH side.

The controller displays the current setting for the lowest green Led of the bar graph.

Press the \( \text{UP} \) key once which will move the cursor to the RH side of the display.

Press the \( \text{UP} \) key to accept the reading and move to the store function.

If you wish to save the setting, press the \( \text{UP} \) key to highlight the Y character.
The FIRMWARE REV menu allows the user to see what revision of the firmware is currently installed in the controller. This is a Read Only menu item.

NOTE
PRESS THE AND KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE
The Calibration Data menu is a series of read only screens which allow the user to view the data collected during the last calibration.

If the Temperature Display Override is ON (Section 5.11), the display will show

Press \( \text{calibration mode to view the next Calibration Data screen.} \)

1st POINT 600mV

Probe Temperature at which calibration was performed = 19.4 C

NOTE
PRESS THE \( \text{and } \) KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE

Calibration Mode
1 point calibration

Press \( \text{to view the first Calibration Data screen.} \)

CALIBRATION DATA
MODE 1PT

BUFFER 600mV

CALIBRATION DATA
CAL TEMP 19.4C

If the Temperature Display Override is ON (Section 5.11), the display will show

CALIBRATION DATA
TEMP O/R ON
The Sensor Input Menu allows the user to view real time, uncompensated process data from the probe. This is a Read only menu item.

The top line shows the mV input from the probe. The bottom line shows the actual value of the temperature sensor in ohms.

If the Probe is not equipped with a Temperature Sensing Device, and Temperature Display Override is ON (Section 5.11), the display will show:

PROBE 500mV
TEMP O/R ON

NOTE
PRESS THE ▶️ AND ◀️ KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE

Press ◀️ to view the Sensor Input data.
If you wish to change the setting, press the + key once which will move the cursor to the first character of the value to be changed.

The relay can be set to control either a RISING or FALLING process.

In a FALLING process, the control relay will energize when the process falls below a set value. In this case, the ON set-point must be set lower than the OFF set-point.

In a RISING process, the control relay will energize when the process rises above a set value. In this case, the ON set-point must be set higher than the OFF set-point.

The RELAY ON setting is the process value at which the relay will energize. It may be set anywhere between 0-100% of the range.

The RELAY OFF setting is the process value at which the relay will de-energize. The setting must be rationalized against the On setting. For example, in a falling process, the Off setting must be higher than the On setting.

The controller will not allow you to select the RELAY OFF value on the wrong side of the RELAY ON value for the selected direction. If the user tries to set the RELAY OFF on the wrong side, the following errors will be displayed:

FALLING PROCESS
ON SPT < OFF SPT
Error when trying to set OFF point lower than ON point when set to falling.

RISING PROCESS
ON SPT > OFF SPT
Error when trying to set OFF point higher than ON point when set to rising.
The relay can be set to CYCLE when the process is between the RELAY ON setting and the RELAY OFF setting. This is meant to help eliminate overshoot. The CYCLE ON time is the amount of time in seconds that the relay will be on. The value can be set between 0 and 600 seconds. The default ON time is 5 seconds.

The CYCLE OFF time is the amount of time in seconds that the relay will be off for, it can be set between 0 - 600 seconds.

To disable the cycling feature set the cycle off time to 0.

The Default OFF time is 0 seconds.

The OVERFEED TIMER is designed to help safeguard against a process or instrumentation error causing one of the control relays to remain energized for extended periods of time.

When enabled, the user must select the desired overfeed timeout time (1-999 min.)

If the overfeed timer times out:
• Alarm relay will energize.
• Control (A&B) will de-energize
• LED on front will flash

Must be reset via Utilities Menu or Power reset.

The FAIL SAFE feature is designed to reverse the normal action of the relay.

When set to FAIL SAFE OFF, the relay will operate as a normal relay, which means that when the relay is not energized the NO contacts are open, and a device connected via the NO contacts is turned off. When the relay becomes energized the device turns on. When the relay is set to FAIL SAFE ON, the normal action of the relay is reversed. Thus the NO contact acts as the NC contacts and the NC acts as the NO. Therefore the device connected to the NC contacts will be turned on when the relay on set-point is reached. Actually the relay will be de-energized but because it is in reverse the device will be turned on. When the relay off set-point is reached the relay will energize and the device connected to the NC contact will turn off.

The reason that the Fail Safe option would be used is to have the device turned on in the event of a power interruption.

With "N" selected, pressing the key will NOT store the selection, but simply return to the OUTPUTS Menu. This function is useful if you wish to view the current selection without making any changes.

NOTES
PRESS THE AND KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE

Use the and keys to change the setting
Press the key once which will move the cursor back to the RH side of the display.

Press the key to accept the setting and move to the next setting

If you wish to change the setting, press the key once which will move the cursor to the first character of the value to be changed
The RELAY ON setting is the process value at which the relay will energize. It may be set anywhere between 0-100% of the range.

The RELAY OFF setting is the process value at which the relay will de-energize. The setting must be rationalized against the On setting. For example, in a falling process, the Off setting must be higher than the On setting.

The controller will not allow you to select the RELAY OFF value on the wrong side of the RELAY ON value for the selected direction. If the user tries to set the RELAY OFF on the wrong side, the following errors will be displayed:

**FALLING PROCESS**

Error when trying to set OFF point lower than ON point when set to falling.

**RISING PROCESS**

Error when trying to set OFF point higher than ON point when set to rising.

Press the **<** key once which will move the cursor back to the RH side of the display.

Press the **<** key to accept the setting and move to the next setting.

NOTE

PRESS THE **<** AND **<** KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE
The relay can be set to CYCLE when the process is between the RELAY ON setting and the RELAY OFF setting. This is meant to help eliminate overshoot.

The CYCLE ON time is the amount of time in seconds that the relay will be on. The value can be set between 0 and 600 seconds.

The CYCLE OFF time is the amount of time in seconds that the relay will be off. It can be set between 0 and 600 seconds.

The Default OFF time is 0 seconds.

The Default ON time is 5 seconds.

The OVERFEED TIMER is designed to help safeguard against a process or instrumentation error causing one of the control relays to remain energized for extended periods of time.

When enabled, the user must select the desired overfeed timeout time 1-999 min.

If the overfeed times out:
• Alarm relay will energize.
• Control (A&B) will de-energize
• LED on front will flash

Must be reset via Utilities Menu or Power reset.

The FAIL SAFE feature is designed to reverse the normal action of the relay.

When set to FAIL SAFE OFF, the relay will operate as a normal relay, which means that when the relay is not energized the NO contacts are open, and a device connected via the NO contacts is off. When the relay becomes energized the device turns on.

When the relay is set to FAIL SAFE ON, the normal action of the relay is reversed. Thus the NO contact acts as the NC contacts and the NC acts as the NO. Therefore the device connected to the NO contacts will be turned on when the relay on set-point is reached. Actually the relay will be de-energized but because it is acting in reverse the device will be turned on. When the relay off set-point is reached the relay will energize and the device connected to the NO contact will turn off.

The reason that the Fail Safe option would be used is to have the device turned on in the event of a power interruption. For example, a process that needs a constant feed, would want a pump to turn on in the event of a controller power failure.

With "N" selected, pressing the key will NOT store the selection, but simply return to the OUTPUTS Menu.

This function is useful if you wish to view the current selection without making any changes.

If you wish to change the setting, press the key once which will move the cursor to the first character of the value to be changed.

Use the and keys to change the setting.

Press the key once which will move the cursor back to the RH side of the display.

Press the key to accept the setting and move to the next setting.

If you wish to change the setting, press the key once which will move the cursor to the first character of the value to be changed.

Use the and keys to change the setting.

Press the key once which will move the cursor back to the RH side of the display.

Press the key to accept the setting and move to the next setting.

If you wish to change the setting, press the key once which will move the cursor to the first character of the value to be changed.

Use the and keys to change the setting.

Press the key once which will move the cursor back to the RH side of the display.

Press the key to accept the setting and move to the STORE function.
The ALARM RELAY will respond to both a rising and falling process. The ALARM RELAY will act as a low alarm (falling process) and a high alarm (rising process). Both relay bands will have independently adjustable on and off set-points. If a low alarm set-point is set at a value 800mV for example, the off set-point must be set higher. The controller will not let the user input a value below 800mV. The same rule holds true for the high alarm.

The Alarm Relay can be configured for the following operations:
- LOW ON Set-point
- LOW OFF Set-point
- HIGH ON Set-point
- HIGH OFF Set-point
- Failsafe

The LOW ON set point is the low process value that will cause the relay to energize. This value can be set anywhere 0-100% of Full Scale.

The LOW OFF set point is the value that the process must reach in order to de-energize the alarm relay after it has dropped below and tripped the LOW ON set-point. This value must be higher than the LOW ON Set-point.

The HIGH ON set-point is the high process value that will cause the relay to energize. This value can be set anywhere 0-100% of Full Scale.

500mV  25.0C
CALIBRATION
UTILITIES
SETUP
DIAGNOSTICS

OUTPUTS
RELAY A
RELAY B
ALARM RELAY

If you wish to change the setting, press the key once which will move the cursor to the first character of the value to be changed.

Use the and keys to change the setting.
Press the key once which will move the cursor back to the RH side of the display.
Press the key to accept the setting and move to the next setting.

NOTE
PRESS THE AND KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE
The HIGH OFF set-point is the value that the must reach in order to de-energize the alarm relay after it has increased over and tripped the HIGH ON set-point. This value must be lower than the HIGH ON set-point.

The FAILSAFE feature is designed to reverse the normal action of the relay.

When set to FAILSAFE OFF, the relay will operate as a normal relay, which means that when the relay is not energized the NO contacts are open, and a device connected via the NO contacts is turned off. When the relay becomes energized the device turns on.

When the relay is set to FAILSAFE ON, the normal action of the relay is reversed. Thus the NO contact acts as the NC contacts and the NC acts as the NO. Therefore the device connected to the NC contacts will be turned on when the relay on set-point is reached. Actually the relay will be de-energized but because it is acting in reverse the device will be turned on. When the relay off set-point is reached the relay will energize and the device connected to the NC contact will turn off.

The reason that the Fail Safe option would be used is to have the device turned on in the event of a power interruption.

If the Low On set-point is set higher than the factory default Low Off set-point, when the user advances from the low on set-point to the Low Off set-point the controller will adjust the Low Off set-point to be equal to the Low On set-point. If the user then tries to decrease the Low Off set-point the Controller will display the Low Alarm setup error screen.

This screen will be displayed for 10 seconds, then return back to the setup screen that was previously displayed. The same conditions apply to the High alarm set-points. Except the High Off set-point must be lower than the High On set-point. If the user tries to increase the High Off set-point higher than the High On set-point the High Alarm setup error screen will be displayed.

If the user sets the low on set-point and the low off set-point equal to 0, it will disable the Low Alarm relay. Similarly, setting the High On set-point and the HIGH OFF set-point to 0 will disable the High Alarm.

With "N" selected, pressing the key will NOT store the selection, but simply return to the OUTPUTS Menu. This function is useful if you wish to view the current selection without making any changes.

If you wish to change the setting, press the key once which will move the cursor to the first character of the value to be changed.

NOTE: PRESS THE AND KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE

Or press the key to highlight the Y character.
The Controller has 2 4-20mA outputs, electrically isolated from each other and ground. Either output can source current into a maximum of 800 ohms. See Section 3.12 for wiring diagram. Channel 1 (the primary output) is located on the flip out door, terminal plug P6. Channel 1 is dedicated to track the process and has fully independent and fully adjustable 4 & 20 mA output adjustments. This will enable the operator to span the output over the desired range.

The example below shows the 4-20 mA set to 4mA =200mV and 20mA = 800mV. The output would then span 4 to 20 mA for a mV swing of 200mV to 800mV. Note that the span can be reversed, in that 4 mA can be set to a high mV value, and 20 mA can be set to a low mV value, effectivly reversing the control direction.

The TUNE function allows the user to precisely adjust the 4-20 mA output to compensate for any errors in the output circuitry. Normally, finding the 4-20mA output is not necessary.

To make the adjustment, place an accurate current meter in series with the 4-20 mA output, with the appropriate loads connected. When the TUNE menu is selected, the controller puts 20 mA out the terminals. Use the keys to adjust the 20mA output till it gets exactly 20.

The TUNE value can be adjusted over the range from 0 to 1000, these are unitless numbers used for tuning purposes only.

With "N" selected, pressing the key will NOT store the selection, but simply return to the OUTPUTS Menu. This function is useful if you wish to view the current selection without making any changes.

If you wish to change the setting, press the key once which will move the cursor to the first character of the value to be changed.

Use the keys to change the setting.

Press the key once which will move the cursor back to the RH side of the display.

Press the key to accept the setting and move to the next setting.

If you wish to change the setting, press the key once which will move the cursor to the first character of the value to be changed.

Use the keys to change the setting.

Press the key once which will move the cursor back to the RH side of the display.

Press the key to accept the setting and move to the next setting.

The example below shows the 4-20 mA set to 4mA =200mV and 20mA = 800mV. The output would then span 4 to 20 mA for a mV swing of 200mV to 800mV. Note that the span can be reversed, in that 4 mA can be set to a high mV value, and 20 mA can be set to a low mV value, effectively reversing the control direction.
The Controller has 2 4-20mA outputs, electrically isolated from each other and ground. Either output can source current into a maximum of 800 ohms. Channel 2 can be selected to track the process or temperature. Channel 2 has fully independent and fully adjustable 4 & 20 mA output adjustments. This will enable the operator to span the output over the desired range.

Note that if the T DISP OVERRIDE is ON and Channel 2 output is set to track temperature, the output will not change, but hold at a value representing the temperature set in the T DISP OVERRIDE.

The example below shows the 4-20 mA set to 4mA = 0°C and 20mA = 100°C. The output would then span 4 to 20 mA for a temperature swing of 0°C to 100°C. Note that the span can reversed, in that 4 mA can be set to a high process value, and 20 mA can be set to a low process value, effectively reversing the control direction.

The TUNE function allows the user to precisely adjust the 4-20mA output to compensate for any errors in the output circuitry. Normally, fine tuning the 4-20mA output is not necessary. The make the adjustment, place an accurate current meter in series with the 4-20mA output, with the appropriate loads connected. When the TUNE menu is selected, the controller puts 20mA out to the terminals. Use the or keys to adjust the 20mA output to get exactly 20.

The TUNE value can be adjusted over the range from 0 to 1000, these are unitless numbers used for tuning purposes only.

With "N" selected, pressing the key will NOT store the selection, but simply return to the OUTPUTS Menu. This function is useful if you wish to view the current selection without making any changes.

The 4mA, 20mA and TUNE functions are set up the same way as 4 - 20 mA CH 1 output.

NOTE
PRESS THE AND KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE
The Controller will display bUFF, prompting the user to place the probe in the buffer solution. Be sure to clean and rinse the Probe first with D.I. water and then insert it in the Buffer. Press the key.

The controller will flash "bUFF" for about 10 seconds while it reads the buffer. It will then display the mV value.

Use the and keys to adjust the display until it reads the correct value of the buffer.

Press the key to accept the setting.

The display will flash

Press the key again to confirm the change in calibration value.

Press the key to go immediately back to Run mode.
**Section 6 - Using the PHUCN600 in Conductivity Mode**

- **RUN LED (GREEN)**: LED will be illuminated when the controller is in the run mode. It will be off when the controller is in the menu mode.

- **4 DIGIT, 7 SEGMENT LED DISPLAY**: Displays process value in run mode. Displays calibration data in calibration mode.

- **RELAY C (ALARM RELAY) STATUS LED's (RED)**: Bottom LED will illuminate when alarm relay is energized because of low alarm condition. Top LED will illuminate when alarm relay is energized because of high alarm.

- **BAR GRAPH LED's (GREEN)**: Linear indicator of process value.

- **REMOVABLE TERMINAL BLOCK CONNECTORS**: "Snap-on" connectors for easy wiring of your conductivity sensors and primary 4-20mA output. (Refer to sections 3.5, & 3.12)

- **2 LINE, 16 CHARACTER LCD DISPLAY**: Main menu interface screen.

- **TEMPERATURE DISPLAY**: When the 'UP' and 'DOWN' arrow keys are pressed simultaneously, the LED will display the current process temperature for 5 seconds. This feature will be disabled if the 'temperature compensation override' is turned on in the setup menu. In this case, the LED will display ---- in place of the temperature.

- **NOTE**: When the controller is taken into menu mode via the inside LCD screen, the front 7-segment LED will display ----. The status & bar graph LED's will be turned off. The 4 push buttons on the front will not respond.

- **SIMPLE THREE-BUTTON INTERFACE**: For fast & easy setup (refer to sections 6.0 to 6.21)
Conductivity - Menu Overview 6.0

1000μS  25.0°C
CALIBRATION

UTILITIES

SETUP

DIAGNOSTICS

OUTPUTS

EXIT

COND. RANGE
SELECT MEASURING RANGE
SEC. 6.8

TEMP UNIT
SELECT DEG C OR DEG F
SEC. 6.9

TEMP SENSOR
SELECT TYPE OF TEMP SENSOR
SEC. 6.10

ENABLE TIME OUT
FROM MENU
SEC. 6.11

TEMP SETUP FOR
PROBE W/O TEMP. SENSOR
SEC. 6.12

SETUP DISPLAY AND
OUTPUT RESPONSE TIME
SEC. 6.13

T.COMP OVERRIDE
SETUP TEMP
COMPENSATION VALUE
SEC. 6.14

DISPLAY DAMPING

TEMP COMP CURVE

EXIT

FIRMWARE REV
DISPLAY FIRMWARE REVISION
SEC. 6.15

CALIBRATION DATA
DISPLAY PREVIOUS
CALIBRATION DATA
SEC. 6.16

SENSOR INPUT
DISPLAY UNCALIBRATED
PROBE DATA
SEC. 6.17

RELAY A
SETUP RELAY A
SEC. 6.18

RELAY B
SETUP RELAY B
SEC. 6.19

ALARM RELAY
SETUP ALARM RELAY
SEC. 6.20

4-20mA CH1
SETUP 4-20 mA CH 1 OUTPUT
SEC. 6.21

EXIT

4-20mA CH2
SETUP 4-20 mA CH. 2 OUTPUT
SEC. 6.22

MANUAL CAL COND
CALIBRATE PROBE
WITH BUFFER SOLN
SEC. 6.1

DRY CAL COND
CALIBRATE PROBE WITH
MANUFACTURER’S DATA
SEC. 6.2

TEMP CALIBRATION
CALIBRATE TEMP.
SENSOR IN PROBE
SEC. 6.3

EXIT

MANUAL TEST MODE
SIMULATE PROCESS
VERIFY OUTPUTS
SEC. 6.4

RELAY OVERRIDE
MANUALLY OVERRIDE
RELAYS
SEC. 6.5

METER SELECTION
SELECT TYPE
OF METER
SEC. 6.6

RESET OVERFD TIMER
RESETS RELAY
OVERFEED TIMER
SEC. 6.7

EXIT

DIAGNOSTICS

SETUP TEMP
SEC  6.13

SEC. 6.12

SEC. 6.11

SEC 6.10

SEC. 6.9

NOTE
PRESS THE  AND  KEYS
TOGETHER TO GO IMMEDIATELY BACK TO
RUN MODE
Manual Calibrate is used to "wet calibrate the cell". This can be done with the cell installed in the process, or with the cell suspended in a known buffer solution.

When calibrated "In Process", the actual conductivity is determined with a grab sample or a hand held meter, and the value entered in the display.

When calibrated with buffers, the cell is placed in a known buffer solution, and the value of the buffer entered on the display.

In both cases, make sure the cell has time to stabilize both in temperature and conductivity before entering any data.

**NOTE**

Press the **AND** keys together to go immediately back to RUN MODE.
Dry Calibration eliminates the need for conductivity reference solutions, the user inputs the Cell K factor supplied by the factory.

If the conductivity cell has a tag attached to it, specifying the exact cell constant, the user is prompted to enter this value.

NOTE: ACCELERATOR KEYS
Pressing the \( \uparrow \) or \( \downarrow \) key once will change the value by the smallest digit. Holding the key down will cause the value to change at an increasing rate until the key is released. Pressing the key again will cause the value to start changing at its slowest rate again. This allows the user to get to the new multiplier value quickly.

Press the \( \uparrow \) key once which will move the cursor over the least sign. digit of the display.

Use the \( \uparrow \) and \( \downarrow \) keys to adjust the value to the K factor specified on the probe tag.

Then press \( \rightarrow \) to move the cursor to the RH position.

If the setting is OK, use the \( \rightarrow \) key to move the cursor over the Y text and press the down key.

Press \( \rightarrow \) to store the calibration data and return back to the Dry Cal Cond menu so the user can select another function.

NOTE: PRESS THE \( \uparrow \) AND \( \rightarrow \) KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE.
Temperature Calibration

In most cases, the factor temperature calibration is accurate enough to ensure correct temperature readings. However, in some circumstances, the user may wish to ensure the temperature sensor is calibrated accurately, especially when operating at the extreme end of the conductivity cell temperature operating range, or where the temperature compensation is critical to correct process readings.

This menu allows the user to calibrate the temperature anywhere within its range.

Be aware that the conductivity reading is affected by the temperature reading (due to the temperature compensation) so accurate temperature calibration is vital to obtaining accurate conductivity readings. If the user is unsure of the calibration test fixture, then it would be best to leave the temperature calibration at its factory setting.

Be sure to allow the temperature of the cell to stabilize before attempting to calibrate the temperature sensor. This may take a significant amount of time as the sensor is buried behind a protective layer of epoxy which will cause some delay.

If the Temperature Compensation Override is set to ON (see section 6.12), the controller cannot calibrate the temperature sensor. This display will appear to alert the user to the condition.

This will store the calibration data and return back to the Temp Calibration setup so the user can select another function.

NOTE
PRESS THE AND KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE
Manual Test Mode is used to simulate a process reading in order to verify the correct response of the outputs. When in the Manual Test Mode, the outputs are no longer placed on hold as they are when in the rest of the menu.

When a relay is energized, the characters a,b,c will change to upper case A,B,C.

The CH1 4-20 mA output will track the change in process value.

As the value is changed, the state of the relays will change depending on their settings in the OUTPUTS menu.

- a/A - state of Relay A
- b/B - state of Relay B
- c/C - state of Alarm relay

As well, Channel 1 4-20 mA output will also follow the process value change. The actual change will depend on how the CH1 output was scaled in the OUTPUTS menus. (See Section 6.21)

NOTE:
When the user exits the Manual Test Mode, the relays and 4-20mA outputs will remain in the Test Mode state until the operator enters the run mode. The relays and outputs will then revert back to the previous On-line state.

NOTE:
Press the AND KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE
Relay Override is used to manually override the state of the relays, the user is able to set the operating mode of the relay as AUTO/ON/OFF (the default and run mode state are AUTO). This feature can be used to turn the relays ON or OFF to manually correct the process, or to shut down an ancillary device to perform maintenance. When in the Relay Override mode, the outputs are no longer placed on hold as they are when in the other menus.

To use the Relay Override function, press the ON key.

CAUTION:
Note that if the Relay Auto Return Menu is set to "ON", the controller will place all these settings back to AUTO if the controller is put back in run mode, and there is no button activity for 10 minutes.

If you wish to Override Relay A, Press the ON key once which will move the cursor over to the AUTO/ON/OFF text.

If you wish to Override Relay B, Press the ON key once which will move the cursor over to the AUTO/ON/OFF text.

If you do not wish to Override Relay B, then use the key to move to Relay A.

If you do not wish to Override Relay A, then use the key to move to Relay B.

To use the Relay Override function, press the ON key.

NOTE
PRESS THE AND KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE.

If you wish to accept the Override setting, Press the ON key once to move the cursor to the RH of the display.

If you wish to accept the Override setting, Press the ON key once to move the cursor to the RH of the display.
If you do not wish to Override Relay C, then use the "key to the Alarm Relay

If you wish to store the state of the Relay Overrides, press the "key to highlight the Y character.

With "N" highlighted, pressing the " key will NOT store the Override states of the relays, but they will revert to the state they were in before the menu was entered. Note that, if any of the relays were in a specific Override state before the menu was entered (i.e. not in AUTO), they will revert to that state again unless the changes are STORED.

Then use the " key to move the cursor to the Override setting for Relay C.

If you wish to Override Relay C, Press the " key once which will move the cursor over to the AUTO/ON/OFF text.

Then press the " key to store the Override states of all the relays and return back to the Override menu.

NOTE
Relay C is the Alarm Relay

NOTE
PRESS THE " AND " KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE.
The Meter Selection menu is used to select the meter type that the controller is configured for, either pH, ORP or Conductivity. Once selected, the controller will initialize itself for the selected meter's functionality and move to run mode.

Press the `key to initialize the controller as a pH meter.

Press the `key to initialize the controller as an ORP meter

Press the `key to initialize the controller as a Conductivity meter

Press the `key to initialize the controller as a Flow meter

Press the `key to Exit and return to the Utilities menu

To reset the controller back to all the factory default values, reselect the current meter type

Then press The controller will initialize itself for a specific meter

NOTE PRESS THE AND KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE
If you wish to reset the overfeed timer, then press the key to proceed and return back to the Utilities menu.

If the control relay overfeed timer has been enabled, the relay will "time out" after the specified overfeed time. When the relay times out, it must be manually reset. The time out will be signaled by the time out LED flashing on the front panel.

The reset overfeed timer will reset the timers for both relay A & relay B at the same time.

**NOTE**

Press the AND keys together to go immediately back to RUN MODE.
Conductivity Range will allow the user to select the measuring range of the instrument. The ranges can be selected from any of the following:

- 200 mS/cm - cell constant 50
- 2000 uS/cm - cell constant 1
- 200 uS/cm - cell constant 0.1
- 20 uS/cm - cell constant 0.1
- 2 uS/cm - cell constant 0.01
- 19.99 MΩ - cell constant 0.01

With "N" selected, pressing the key will NOT store the selection, but simply return to the COND RANGE Menu. This function is useful if you wish to view the current selection without making any changes.

Use the or keys to scroll through the available ranges.

Press the key once which will move the cursor over the last character of the range.

Once the correct range is selected, move to the store function to save the selection.

Press the key once which will move the cursor back to the RH side of the display.

Or press the key to highlight the Y character.

Then press the key to store the selection and return to the COND RANGE Menu.

NOTE
PRESS THE AND KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE
With "N" selected, pressing the "key will NOT store the selection, but simply return to the TEMP UNIT Selection Menu. This function is useful if you wish to view the current selection without making any changes.

Press the " key once which will move the cursor over the unit type, C or F.

Use the " or " to select C or F

Press the " key once which will move the cursor back to the RH side of the display.

Press the " key to accept the change and move to the store function

Or press the " key to highlight the Y character.

Then press the " key to store the selection and return to the TEMP UNIT Selection Menu.
TEMP SENSOR allows the user to select the type of temperature sensor used in the probe. The factory default for Conductivity is a 3000 Ω NTC thermistor. The user can also select a 300 Ω NTC thermistor or a Pt 1000 RTD.

With "N" selected, pressing the key will NOT store the selection, but simply return to the TEMP SENSOR Selection Menu. This function is useful if you wish to view the current selection without making any changes.

Use the or to select the sensor type.

Once the correct Sensor has been selected press the key once which will move the cursor back to the RH side of the display.

Press the key once which will move the cursor over to the sensor type.

Press the key to store the selection and move to the store function.

Or press the key to highlight the Y character.

Then press the key to store the selection and return to the TEMP SENSOR Selection Menu.

NOTE
PRESS THE AND KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE.
CONDUCTIVITY - SETUP MENU - AUTO RETURN 6.11

**AUTO RETURN** is used to select what conditions will cause the controller to time-out of the operations menu, or reset the relay override function.

**MENU ON** will cause the controller to exit the menu and revert back to the online run mode after 10 minutes with no buttons pressed. This feature ensures that if a user forgets to return back to run mode, the controller will not be left in an offline state. If for some reason, the user would like to remain in the menu mode for extended periods of time, the **AUTO RETURN** function can be set to "OFF".

To change the **MENU RETURN** setting, press the **↑** key once which will move the cursor to the **ON** or **OFF** text.

Use the **↓** or **↑** keys to select either ON or OFF.

Press the **→** key once which will move the cursor back to the RH side of the display.

Press the **→** key to accept the change and move to the **RELAYS** auto return function. **RELAYS ON** will cause the relays to return to the **AUTO** mode if the controller returns to Online after 10 minutes of inactivity. This ensures the controller will be put back in control of the process if accidentally left offline.

Or press the **→** key to highlight the **Y** character.

Press the **→** key once which will move the cursor to the **ON** or **OFF** text.

Use the **↓** or **↑** keys to select either ON or OFF.

Press the **→** key once which will move the cursor back to the RH side of the display.

Press the **↓** key to accept the change and move to the **STORE** function.

Press the **↓** key to store the selection and return to the **Auto Return** Selection Menu.

**NOTE**

**PRESS THE** **↓** AND **↑** **KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE**
Temperature Compensation Override is used to manually set the actual probe or process temperature. This is useful if the probe does not have a temperature sensor or if the process temperature is constant. When the override is enabled, the controller will use the selected temperature when performing temperature compensation calculations.

**Temperature Compensation Override**

- **COMPENSATE ON**: Press the key once which will move the cursor to the ON or OFF text. Use the or keys to select either ON or OFF.
- **COMPENSATE OFF**: Press the key once which will move the cursor back to the RH side of the.
- **Press the key to accept the change and move to the Temperature Entry function**.
- **The user can now enter the actual probe or process temperature**.
- **Press the key once which will move the cursor over the least significant digit of the temperature display**.
- **Press the key once which will move the cursor back to the RH side of the temperature display**.
- **Press the key to accept the reading and move to the store function**.

**NOTE**

PRESS THE AND KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE

With "N" selected, pressing the key will NOT store the selection, but simply return to the T. Comp Override Menu. This function is useful if you wish to view the current selection without making any changes.

If you wish to save the setting, press the key to highlight the Y character. Then press the key to store the selection and return to the T. COMP OVERRIDE Menu.
The Display Damping menu allows the user to adjust the rate at which the display and all outputs are updated. This allows the user to dampen out unstable process readings. The damping can be set from 0 seconds to 10 seconds. (default value is 0 sec.)

Press the key once which will move the cursor over the seconds digit.

Use the and keys to adjust the damping time, the default setting is 0 seconds. The setting can be adjusted from 0 to 10 seconds. Press the key once which will move the cursor back to the RH side of the display.

If you wish to save the setting, press the key to highlight the 'Y' character. Then press the key to store the selection and return to the Display Damping Menu.

With "N" selected, pressing the key will NOT store the selection, but simply return to the Display Damping Menu. This function is useful if you wish to view the current selection without making any changes.
The Temperature Compensation Curve setting allows the user to select the temperature compensation to match a specific process. The variation of Conductivity versus Temperature is dependent on the type of solids and liquids in water, so no fixed compensation value will accurately compensate every process. This setting allows the user to fine tune the compensation to their specific process.

Estimates of the correct compensation for certain chemicals are available and can be preset via this menu, otherwise the user will need to set the compensation to 0%/C, measure the effect of temperature for a specific process, calculate the actual compensation required and enter it through this menu.

The Compensation can be varied from 0%/C to 10%/C.

With "N" selected, pressing the key will NOT store the selection, but simply return to the Temp Cond Curve setting menu. This function is useful if you wish to view the current selection without making any changes.

Press the key once which will move the cursor over the least digit

Use the and to adjust the percent compensation. The setting can be changed from 0%/C to 10%/C.

Press the key once which will move the cursor back to the RH side of the display.

Press the key to accept the setting and move to the store function

If you wish to save the setting, press the key to highlight the Y character

Then press the key to store the selection and return to Temp Cond Curve setting menu.

NOTE
PRESS THE AND KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE
The FIRMWARE REV menu allows the user to see what revision of the firmware is currently installed in the controller. This is a Read Only menu item.

NOTE

PRESS THE \( \text{F} \) AND \( \text{S} \) KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE
The Calibration Data menu is a series of read only screens which allow the user to view the data collected during the last calibration.

**TYPICAL DISPLAYS FOR MANUAL CAL**
- **Calibration Mode**: 1 point calibration
- **Press** to view the next Calibration Data screen.
- **Conductivity of Buffer/Input Resistance**
- **Calculated Cell Constant**
- **Probe Temperature at which calibration was performed = 25.2°C**

**TYPICAL DISPLAYS FOR DRY CAL**
- **Calibration Mode**: Dry Cal
- **Press** to view the next Calibration Data screen.
- **No Buffer used in this Calibration Mode**
- **Cell Constant Setting**
- **Dry Cal does not use a buffer, so Probe Temperature was not recorded**

**NOTE**
Press **and** keys together to go immediately back to Run Mode
The Sensor Input Menu allows the user to view real time, uncompensated process data from the conductivity cell. This is a Read only menu item. This "Live Data" screen is useful for trouble shooting purposes when diagnosing cell or process problems.

Press \( \leftarrow \) and \( \rightarrow \) keys together to go immediately back to Run mode.

The top line shows the resistance of the cell, the bottom line shows the actual value of the temperature sensor in ohms.

Press \( \leftarrow \) to view the Sensor input data.
The relay can be set to control either a RISING or FALLING process. In a FALLING process, the control relay will energize when the process falls below a set value. In this case, the ON set-point must be set lower than the OFF set-point.

The RELAY ON setting is the process value at which the relay will energize. It may be set anywhere in the normal range of the sensor.

The RELAY OFF setting is the process value at which the relay will de-energize. The setting must be rationalized against the On setting. For example, in a falling process, the Off setting must be higher than the ON setting.

The controller will not allow you to select the RELAY OFF value on the wrong side of the RELAY ON value for the selected direction. If the user tries to set the RELAY OFF on the wrong side, the following errors will be displayed:

**FALLING PROCESS**

- Error when trying to set OFF point lower than ON point when set to falling.

**RISING PROCESS**

- Error when trying to set OFF point higher than ON point when set to rising.

If you wish to change the setting, press the key once which will move the cursor to the first character of the value to be changed.

Relay A can be configured for the following operations:
- Response to rising or falling process values
- Adjustable on and off set-points
- Cycle on and off times
- Failsafe operation
The relay can be set to CYCLE when the process is between the RELAY ON setting and the RELAY OFF setting. This is meant to help eliminate overshoot.

The CYCLE ON time is the amount of time in seconds that the relay will be on. The value can be set between 0 and 600 seconds. The default ON time is 5 seconds.

The CYCLE OFF time is the amount of time in seconds that the relay will be off, it can be set between 0 - 600 seconds.

To disable the cycling feature set the cycle off time to 0.

The Default OFF time is 0 seconds.

The OVERFEED TIMER is designed to help safeguard against a process or instrumentation error causing one of the control relays to remain energized for extended periods of time.

When enabled, the user must select the desired overfeed timeout time (1-999 min.)

If the overfeed timer times out:

- Alarm relay will energize.
- Control (A&B) will de-energize
- LED on front will flash

Must be reset via Utilities Menu or Power reset.

The FAIL SAFE feature is designed to reverse the normal action of the relay.

When set to FAIL SAFE OFF, the relay will operate as a normal relay, which means that when the relay is not energized the NC contacts are open and a device connected via the NO contacts is turned off. When the relay becomes energized the device turns on.

When the relay is set to FAIL SAFE ON, the normal action of the relay is reversed. Thus the NO contact acts as the NC contacts and the NC acts as the NO. Therefore the device connected to the NC contacts will be turned on when the relay on set-point is reached. Actually the relay will be de-energized but because it is acting in reverse the device will be turned on. When the relay off set-point is reached the relay will energize and the device connected to the NC contact will turn off.

The reason that the Fail Safe option would be used is to have the device turned on in the event of a power interruption.

The reason that the Fail Safe option would be used is to have the contact will turn off.

Actually the relay will be de-energized but because it is acting in
contacts will be turned on when the relay on set-point is reached.
the NC acts as the NO. Therefore the device connected to the NC
contacts are open, and a device connected via the NO contacts is
turned off. When the relay becomes energized the device turns on.

With "N" selected, pressing the key will NOT store the selection, but simply return to the OUTPUTS Menu. This function is useful if you wish to view the current selection without making any changes.

With "Y" selected, pressing the key will store the selection and return to the OUTPUTS menu.
The RELAY ON setting is the process value at which the relay will energize. It may be set anywhere in the normal range of the sensor.

The RELAY OFF setting is the process value at which the relay will de-energize. The setting must be rationalized against the ON setting. For example, in a falling process, the Off setting must be higher than the ON setting.

The controller will not allow you to select the RELAY OFF value on the wrong side of the RELAY ON value for the selected direction. If the user tries to set the RELAY OFF on the wrong side, the following errors will be displayed:

- **FALLING PROCESS**
  - ON SPT < OFF SPT
  - Error when trying to set OFF point lower than ON point when set to falling.

- **RISING PROCESS**
  - ON SPT > OFF SPT
  - Error when trying to set OFF point higher than ON point when set to rising.

**NOTE**
- Press the and keys together to go immediately back to RUN MODE
The relay can be set to CYCLE when the process is between the RELAY ON setting and the RELAY OFF setting. This is meant to help eliminate overshoot.

The CYCLE ON time is the amount of time in seconds that the relay will be on. The value can be set between 0 and 600 seconds. The default ON time is 5 seconds.

The CYCLE OFF time is the amount of time in seconds that the relay will be off for, it can be set between 0 - 600 seconds.

The Default OFF time is 0 seconds.

The Default OFF time is 0 seconds.

The OVERFEED TIMER is designed to help safeguard against process or instrumentation error causing one of the control relays to remain energized for extended periods of time. When enabled, the user must select the desired overfeed timeout time (1-999 min.)

If the overfeed timer times out:
- Alarm relay will energize.
- Control (A&B) will de-energize.
- LED on front will flash.

Must be reset via Utilities Menu or Power reset.

The FAIL SAFE feature is designed to reverse the normal action of the relay. When set to FAIL SAFE OFF, the relay will operate as a normal relay, which means that when the relay is not energized the NO contacts are open, and a device connected via the NO contacts is turned off. When the relay becomes energized the device turns on.

When the relay is set to FAIL SAFE ON, the normal action of the relay is reversed. Thus the NO contact acts as the NC contacts and the NC acts as the NO. Therefore the device connected to the NC contacts will be turned on when the relay on-set point is reached. Actually the relay will be de-energized but because it is acting in reverse the device will be turned on. When the relay off-set point is reached the relay will energize and the device connected to the NO contact will turn off.

The reason that the Fail Safe option would be used is to have the device turned on in the event of a power interruption. For example, a process that needs a constant feed, would want a pump to turn on in the event of a power interruption. For example, a process that needs a constant feed, would want a pump to turn on in the event of a controller power failure.

With "N" selected, pressing the key will NOT store the selection, but simply return to the OUTPUTS Menu. This function is useful if you wish to view the current selection without making any changes.

With "Y" selected, simply return to the OUTPUTS Menu.

Not stored
Or press the key to highlight the Y character

Stored

Then press the key to store the selection and return to the OUTPUTS menu.

If you wish to change the setting, press the key once which will move the cursor to the first character of the value to be changed.

Use the and keys to change the setting.

Press the key once which will move the cursor back to the RH side of the display.

If you wish to change the setting, press the key once which will move the cursor to the first character of the value to be changed.

Use the and keys to change the setting.

Press the key once which will move the cursor back to the RH side of the display.

Press the key to accept the setting and move to the next setting.

If you wish to change the setting, press the key once which will move the cursor to the first character of the value to be changed.

Use the and keys to change the setting.

Press the key once which will move the cursor back to the RH side of the display.

Press the key to accept the setting and move to the next setting.

If you wish to change the setting, press the key once which will move the cursor to the first character of the value to be changed.

Use the and keys to change the setting.

Press the key once which will move the cursor back to the RH side of the display.

Press the key to accept the setting and move to the STORE function.
The ALARM RELAY will respond to both a rising and falling process. The ALARM RELAY will act as a low alarm (falling process) and a high alarm (rising process). Both relay bands will have independently adjustable on and off set-points. If a low alarm on set-point is set at a value 800us for example, the off set-point must be set higher. The controller will not let the user input a value below the low alarm on. The same rule holds true for the high alarm.

The Alarm Relay can be configured for the following operations:
- LOW ON Set-point
- LOW OFF Set-point
- HIGH ON Set-point
- HIGH OFF Set-point
- Failsafe

If you wish to change the setting, press the key once which will move the cursor to the first character of the value to be changed.

Use the and keys to change the setting.

Press the key once which will move the cursor back to the RH side of the display.

Press the key to accept the setting and move to the next setting.

The LOW ON set point is the low process value that will cause the relay to energize. This value can be set anywhere 0-100% of Full Scale.

The LOW OFF set point is the value that the process must reach in order to de-energize the alarm relay after it has dropped below and tripped the LOW ON set-point. This value must be higher than the LOW ON Set-point.

The HIGH ON set-point is the high process value that will cause the relay to energize. This value can be set anywhere 0-100% of Full Scale.

NOTE
PRESS THE AND KEYS TOGETHER TO GO IMMEDIATELY BACK TO RUN MODE.
The HIGH OFF set-point is the value that the must reach in order to de-energize the alarm relay after it has increased over and tripped the HIGH ON set-point. This value must be lower than the HIGH ON set-point.

The FAIL SAFE feature is designed to reverse the normal action of the relay. When set to FAIL SAFE OFF, the relay will operate as a normal relay, which means that when the relay is not energized the NO contacts are open, and a device connected via the NO contacts is turned off. When the relay becomes energized the device turns on.

When the relay is set to FAIL SAFE ON, the normal action of the relay is reversed. Thus the NO contact acts as the NC contacts and the NC acts as the NO. Therefore the device connected to the NC contacts will be turned on when the relay on set-point is reached. Actually the relay will be de-energized but because it is acting in reverse the device will be turned on. When the relay off set-point is reached the relay will energize and the device connected to the NC contact will turn off.

The reason that the Fail Safe option would be used is to have the device turned on in the event of a power interruption.

If the Low On set-point is set higher than the factory default Low Off set-point, when the user advances from the low on set-point to the Low Off set-point the controller will adjust the Low Off set-point to be equal to the Low On set-point. If the user then tries to decrease the Low Off set-point the Controller will display the Low Alarm setup error screen.

This screen will be displayed for 10 seconds, then return back to the setup screen that was previously displayed. The same conditions apply to the High alarm set-points. Except the High Off set-point must be lower than the High On set-point. If the user tries to increase the High Off set-point higher than the High On set-point the High Alarm setup error screen will be displayed.

With "N" selected, pressing the key will NOT store the selection, but simply return to the OUTPUTS Menu. This function is useful if you wish to view the current selection without making any changes.
The Controller has 2 4-20mA outputs, electrically isolated from each other and ground. Either output can source current into a maximum of 800 ohms. See Section 3.12 for wiring diagram. Channel 1 (the primary output) is located on the flip out door, terminal plug P6. Channel 1 is dedicated to track the process and has fully independent and fully adjustable 4 & 20 mA output adjustments. This will enable the operator to span the output over the desired range.

The example below shows the 4-20 mA set to 4mA = 400uS and 20mA = 1800uS. The output would then span 4 to 20 mA for a conductivity swing of 400 to 1800. Note that the span can reversed, in that 4 mA can be set to a high conductivity value, and 20 mA can be set to a low conductivity value, effectively reversing the control direction.

The TUNE fuction allows the user to precisely adjust the 4-20 mA output to compensate for any errors in the output circuitry. Normally, finding the 4-20mA output is not necessary. The make the adjustment, place an accurate current meter in series with the 4-20 mA output, with the appropriate loads connected. When the TUNE menu is selected, the controller puts 20 mA out the terminals. Use the or keys to adjust the 20mA output to get exactly 20.

The TUNE value can be adjusted over the range from 0 to 1000, these are unitless.

With "N" selected, pressing the key will NOT store the selection, but simply return to the OUTPUTS Menu. This function is useful if you wish to view the current selection without making any changes.

If you wish to change the setting, press the key once which will move the cursor to the first character of the value to be changed. Use the and keys to change the setting. Press the key to accept the setting and move to the next setting. Press the key once which will move the cursor back to the RH side of the display.

The example below shows the 4-20 mA set to 4mA = 400uS and 20mA = 1800uS. The output would then span 4 to 20 mA for a conductivity swing of 400 to 1800. Note that the span can reversed, in that 4 mA can be set to a high conductivity value, and 20 mA can be set to a low conductivity value, effectively reversing the control direction.

The example below shows the 4-20 mA set to 4mA = 400uS and 20mA = 1800uS. The output would then span 4 to 20 mA for a conductivity swing of 400 to 1800. Note that the span can reversed, in that 4 mA can be set to a high conductivity value, and 20 mA can be set to a low conductivity value, effectively reversing the control direction.

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The example below shows the 4-20 mA set to 4mA = 400uS and 20mA = 1800uS. The output would then span 4 to 20 mA for a conductivity swing of 400 to 1800. Note that the span can reversed, in that 4 mA can be set to a high conductivity value, and 20 mA can be set to a low conductivity value, effectively reversing the control direction.
The Controller has 2 4-20mA outputs, electrically isolated from each other and ground. Either output can source current into a maximum of 800 ohms.

Channel 2 can be selected to track the process or temperature.

Channel 2 has fully independent and fully adjustable 4 & 20 mA output adjustments. This will enable the operator to span the output over the desired range.

Note that if the T COMP OVERRIDE is ON and Channel 2 output is set to track temperature, the output will not change, but hold at a value representing the temperature set in the T COMP OVERRIDE.

The example below shows the 4-20 mA set to 4mA = 0°C and 20mA = 100°C.

The output would then span 4 to 20 mA for a temperature swing of 0°C to 100°C.

Note that the span can be reversed, in that 4 mA can be set to a high process value, and 20 mA can be set to a low process value, effectively reversing the control direction.

The TUNE function allows the user to precisely adjust the 4-20 mA output to compensate for any errors in the output circuitry. Normally, fine tuning the 4-20 mA output is not necessary.

The make the adjustment, place an accurate current meter in series with the 4-20mA output, with the appropriate loads connected. When the TUNE menu is selected, the controller puts 20mA out to the terminals. Use the or keys to adjust the 20mA output to get exactly 20.

The TUNE value can be adjusted over the range from 0 to 1000, these are unitless numbers used for tuning purposes only.

With "N" selected, pressing the key will NOT store the selection, but simply return to the OUTPUTS Menu. This function is useful if you wish to view the current selection without making any changes.

The 4mA, 20mA and TUNE functions are set up the same way as 4 - 20 mA CH 1 output.
The Controller will display bUFF, prompting the user to place the probe in the buffer solution. Be sure to clean and rinse the Probe first with D.I. water and then insert it in the Buffer. Press the key.

The controller will flash "bUFF" for about 10 seconds while it reads the buffer. It will then display the conductivity value.

Use the and keys to adjust the display until it reads the correct value of the buffer.

Press the key to accept the setting.

The display will flash

Press the key again to confirm the change in calibration value.
WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of **13 months** from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping time. This ensures that OMEGA's customers receive maximum coverage on each product.

If the unit malfunctions, it must be returned to the factory for evaluation. OMEGA's Customer Service Department will issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective, it will be repaired or replaced at no charge. OMEGA's WARRANTY does not apply to defects resulting from any action of the purchaser, including but not limited to mishandling, improper interfacing, operation outside of design limits, improper repair, or unauthorized modification. This WARRANTY is VOID if the unit shows evidence of having been tampered with or shows evidence of having been damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components in which wear is not warranted, include but are not limited to contact points, fuses, and triacs.

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RETURN REQUESTS/INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA Customer Service Department. BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, PURCHASER MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OMEGA'S CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

The purchaser is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit.

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

1. Purchase Order number under which the product was PURCHASED,
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems relative to the product.

FOR **NON-WARRANTY** REPAIRS, consult OMEGA for current repair charges. Have the following information available BEFORE contacting OMEGA:

1. Purchase Order number to cover the COST of the repair,
2. Model and serial number of the product, and
3. Repair instructions and/or specific problems relative to the product.

OMEGA’s policy is to make running changes, not model changes, whenever an improvement is possible. This affords our customers the latest in technology and engineering.

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