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NOTES, WARNINGS and CAUTIONS

Information that is especially important to note is identified by following labels:

• NOTE
• WARNING or CAUTION
• IMPORTANT
• TIP

![Note icon]

NOTE: Provides you with information that is important to successfully setup and use the Programmable Digital Meter.

![Caution icon]

CAUTION or WARNING: Tells you about the risk of electrical shock.

![Caution icon]

CAUTION, WARNING or IMPORTANT: Tells you of circumstances or practices that can effect the instrument’s functionality and must refer to accompanying documents.

![Tip icon]

TIP: Provides you helpful hints.
PART 1
INTRODUCTION
1.1 Description

This device can be purchased as monitor (read process value only) or as a controller.

- The iLD Big Display controller offers unparalleled flexibility in process measurement. Each unit allows the user to select the input type, from 10 thermocouple types (J, K, T, E, R, S, B, C, N and J DIN), Pt RTDs (100, 500 or 1000 Ω, with either 385 or 392 curve), DC voltage, or DC current. The voltage/current inputs are fully scalable to virtually all engineering units, with selectable decimal point, perfect for use with pressure, flow or other process input.

- The temperature control can be achieved by using on/off or PID heat/cool control strategy. Control can be optimized with an auto tune feature. The instrument offers a ramp to setpoint with timed soak period before switching off the output.

- The iLD Big Display device features a large, three color programmable display with capability to change a color every time the Alarm is triggered. The standard features include dual outputs with relay, SSR, dc pulse, analog voltage or current. Options include programmable RS-232 or RS-485 serial communication and excitation. Analog Output is fully scalable and may be configured as a proportional controller or retransmission to follow your display. Universal power supply accepts 100 to 240 Vac.
1.2 Safety Considerations

This device is marked with the international caution symbol. It is important to read this manual before installing or commissioning this device as it contains important information relating to Safety and EMC (Electromagnetic Compatibility).

This instrument is protected in accordance with Class I of EN 61010 (110/240 AC power connections). Installation of this instrument should be done by qualified personnel. In order to ensure safe operation, the following instructions should be followed.

This instrument has no power-on switch. An external switch or circuit-breaker shall be included in the building installation as a disconnecting device. It shall be marked to indicate this function, and it shall be in close proximity to the equipment within easy reach of the operator. The switch or circuit-breaker shall meet the relevant requirements of IEC 947–1 and IEC 947-3 (International Electrotechnical Commission). The switch shall not be incorporated in the main supply cord.

Furthermore, to provide protection against excessive energy being drawn from the main supply in case of a fault in the equipment, an overcurrent protection device shall be installed.

- Do not exceed voltage rating on the label located on the top of the instrument housing.
- Always disconnect power before changing signal and power connections.
- Do not use this instrument on a work bench without its case for safety reasons.
- Do not operate this instrument in flammable or explosive atmospheres.
- Do not expose this instrument to rain or moisture.
- Unit mounting should allow for adequate ventilation to ensure instrument does not exceed operating temperature rating.
- Use electrical wires with adequate size to handle mechanical strain and power requirements. Install without exposing bare wire outside the connector to minimize electrical shock hazards.

EMC Considerations

- Whenever EMC is an issue, always use shielded cables.
- Never run signal and power wires in the same conduit.
- Use signal wire connections with twisted-pair cables.
- Install Ferrite Bead(s) on signal wires close to the instrument if EMC problems persist.

Failure to follow all instructions and warnings may result in injury!
1.3 Before You Begin

Inspecting Your Shipment:
Remove the packing slip and verify that you have received everything listed. Inspect the container and equipment for signs of damage as soon as you receive the shipment. Note any evidence of rough handling in transit. Immediately report any damage to the shipping agent. The carrier will not honor damage claims unless all shipping material is saved for inspection. After examining and removing the contents, save the packing material and carton in the event reshipment is necessary.

Customer Service:
If you need assistance, please call the nearest Customer Service Department, listed in this manual.

Manuels, Software:
The latest Operation and Communication Manual as well as free configuration software and ActiveX controls are available from the website listed in this manual or on the CD-ROM enclosed with your shipment.

For first-time users: Refer to the QuickStart Manual for basic operation and set-up instructions.

If you have the Serial Communications/Ethernet Option you can easily configure the controller on your computer or on-line.

To Disable Outputs:
Standby Mode is useful during setup of the instrument or when maintenance of the system is necessary. When the instrument is in standby, it remains in the ready condition but all outputs are disabled. This allows the system to remain powered and ready to go.

When the instrument is in "RUN" Mode, push twice to disable all outputs and alarms. It is now in "STANDBY" Mode. Push once more to resume "RUN" Mode.

PUSH TWICE to disable the system during an EMERGENCY.

To Reset the Meter:
When the controller is in the "MENU" Mode, push once to direct controller one step backward of the top menu item.

Push twice to reset controller, prior to resuming "Run" Mode except after "Alarms", that will go to the "Run" Mode without resetting the controller.
PART 2
SETUP
2.1 Mounting

NOTE: The display will be NEMA4 rated when Bail Mounted and appropriate liquid proof fittings are used, such as Heyco or Sealcon. When Panel Mounted, the display will be NEMA4 rated only from the front.

Figure 2.1 Mounting
Mounting iLD Big Display Through Panel:
1. Using the panel cutout diagram shown in your Quick Start Manual, cut an opening in the panel.
2. Remove six (or eight) screws at the back of iLD Big Display to remove back cover.
3. Insert the unit into the opening from the front of the panel so the gasket seals between the bezel and the front of the panel.
4. Pass all wiring through customer drilled holes in back cover and connect wiring to terminal blocks.
5. Align back cover to iLD Big Display and reinstall screws.

Mounting iLD Big Display on Bail:
1. Remove six (or eight) screws at the back of iLD Big Display to remove back cover.
2. Pass all wiring through customer drilled holes in back cover and connect wiring to terminal blocks.
3. Align back cover to iLD Big Display and reinstall screws.
4. Mark the location of mounting screws on the flat surface.
5. Be sure to leave enough room around the bail to allow for removal and rotation of the display.
6. The display can be rotated for the best viewing angle.

Table 2.1 Front Panel Annunciators

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Output 1/Setpoint 1/Alarm 1 indicator</td>
</tr>
<tr>
<td>2</td>
<td>Output 2/Setpoint 2/Alarm 2 indicator</td>
</tr>
<tr>
<td>°C</td>
<td>°C unit indicator</td>
</tr>
<tr>
<td>°F</td>
<td>°F unit indicator</td>
</tr>
<tr>
<td>‡</td>
<td>Changes display to Configuration Mode and advances through menu items*</td>
</tr>
<tr>
<td>†</td>
<td>Used in Program Mode and Peak Recall*</td>
</tr>
<tr>
<td>‰</td>
<td>Used in Program Mode and Valley Recall*</td>
</tr>
<tr>
<td>⊿</td>
<td>Accesses submenus in Configuration Mode and stores selected values*</td>
</tr>
</tbody>
</table>

* See Part 3 Operation: Configuration Mode
2.2 Rear Panel Connections

The rear panel connections are shown in Figures 2.2 and 2.3.

<table>
<thead>
<tr>
<th>Table 2.2 Rear Panel Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>POWER</strong></td>
</tr>
<tr>
<td><strong>INPUT</strong></td>
</tr>
<tr>
<td><strong>OUTPUT 1</strong></td>
</tr>
<tr>
<td><strong>OUTPUT 2</strong></td>
</tr>
<tr>
<td><strong>OPTION</strong></td>
</tr>
</tbody>
</table>
2.3 Electrical Installation

2.3.1 Power Connections

⚠️ **Caution:** Do not connect power to your device until you have completed all input and output connections. Failure to do so may result in injury!

Connect the main power connections as shown in Figure 2.4.

![Figure 2.4 Main Power Connections](image)

![Figure 2.5 Inside Cover Rear View](image)
2.3.2 Thermocouple

The figure below shows the wiring hookup for any thermocouple type. For example, for Type K hookup, connect the yellow wire to the TB7(+) terminal and the red wire to the TB8(-) terminal.

When configuring your controller, select Thermocouple and Thermocouple Type in the Input Type menu (see Part 3).

![Figure 2.6 Thermocouple Wiring Hookup](image)

Table 2.3 TC Wire Color Chart

<table>
<thead>
<tr>
<th>TYPE</th>
<th>Input Connector</th>
<th>Jacket (external insulation)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Terminal 8 (-)</td>
<td>Terminal 7 (+)</td>
</tr>
<tr>
<td>J</td>
<td>Red</td>
<td>White</td>
</tr>
<tr>
<td>K</td>
<td>Red</td>
<td>Yellow</td>
</tr>
<tr>
<td>T</td>
<td>Red</td>
<td>Blue</td>
</tr>
<tr>
<td>E</td>
<td>Red</td>
<td>Purple</td>
</tr>
<tr>
<td>N</td>
<td>Red</td>
<td>Orange</td>
</tr>
<tr>
<td>R</td>
<td>Red</td>
<td>Black</td>
</tr>
<tr>
<td>S</td>
<td>Red</td>
<td>Black</td>
</tr>
<tr>
<td>B</td>
<td>Red</td>
<td>Gray</td>
</tr>
</tbody>
</table>

Grade: Black, Yellow, Blue, Purple, Brown, Green, Black
2.3.3 Two/Three/Four-Wire RTD

The figures below show the input connections and input connector jumpers (shown in bold lines) required to hookup a 2-, 3- or 4-wire RTD.

**Figure 2.7**

**a) RTD-1000 ohm and 500 ohm Wiring Hookup**

The **two-wire** connection is simplest method, but does not compensate for lead-wire temperature change and often requires calibration to cancel lead-wire resistance offset.

The **three-wire** connection works best with RTD leads closely equal in resistance. The device measures the RTD, plus upper and lower lead drop voltage and the subtracts twice the measured drop in the lower supply current lead producing excellent lead-resistance cancellation for balanced measurements.

The **four-wire** RTD hookup is applicable to unbalanced lead resistance and enables the device to measure and subtract the lead voltage, which produces the best lead-resistance cancellation.

**When configuring your controller, select RTD type and RTD value in the Input Type menu (see Part 3).**

If the input wires of the meter get disconnected or broken, it will display **-OPN** “Input (+) Open” message except in case of 500/1000 Ω 2-wire RTD. In this case the display shows **-OPN** “Input (-) Open” message. For safety purpose you may want to set up your alarm to be triggered when input is open. See Alarm 1 & 2 chapters for details.
2.3.4 Process Current

The figure below shows the wiring hookup for Process Current 0 – 20 mA.

![Process Current Wiring Hookup](image)

**Figure 2.8 Process Current Wiring Hookup (Internal and External Excitation)**

When configuring your instrument, select Process Type in the Input Type Menu (see Part 3).

2.3.5 Process Voltage

The figure below shows the wiring hookup for Process Voltage 0 – 100 mV, 0 – 1 V, 0 – 10 V.

![Process Voltage Wiring Hookup](image)

**Figure 2.9 a) Process Voltage Wiring Hookup b) Process Voltage Wiring Hookup with Sensor Excitation**

**RL** - Voltage limiting resistor, which allows conversion of the 24 Vdc internal excitation voltage to the appropriate process input value. For instance: if the potentiometer value is equal to 10 kΩ, the minimum RL is 14 kΩ for 10 V process input.

When configuring your instrument, select Process Type in the Input Type Menu (see Part 3).
2.3.6 Wiring Outputs

This meter has two, factory installed, outputs. The SPDT Mechanical Relay, SPST Solid State Relay, Pulse and Analog Output Connection are shown below.

![Diagram of TB5 with wiring connections for OUTPUT 1 and OUTPUT 2, showing RELAY and SSR connections.]

This device may have a programmable communication output. The RS-232 and RS-485 Output Connection are shown below.

![Diagram of TB4 with wiring connections for RS232/485, showing RTN, Rx, and Tx connections.]

Figure 2.10
a) Mechanical Relay and SSR Outputs Wiring Hookup
b) Pulse and Analog Outputs Wiring Hookup

Figure 2.11
a) RS-232 Output Wiring Hookup  b) RS-485 Output Wiring Hookup
This device may also have an excitation output.

**Figure 2.12 Excitation Output**

**Note**

Excitation is not available if communication option is installed.

This device has snubber circuits designed to protect the contacts of the mechanical relays when it switches to inductive loads (i.e. solenoids, relays). These snubbers are internally connected between the Common (C) and Normally Open (NO) relay contacts of Output 1 and Output 2.

**Note**

If you have an inductive load connected between Common (C) and Normally Closed (NC) contacts of the mechanical relays and you want to protect them from the rush current during the switching period, you have to connect an external snubber circuit between Common (C) and Normally Closed (NC) contacts as indicated in the figure below.

**Figure 2.13 Snubber Circuits Wiring Hookup**
PART 3
OPERATION: Configuration Mode
3.1 Introduction

The instrument has two different modes of operation. The first, Run Mode, is used to display values for the Process Variable, and to display or clear Peak and Valley values. The other mode, Menu Configuration Mode, is used to navigate through the menu options and configure the controller. Part 3 of this manual will explain the Menu Configuration Mode. For your instrument to operate properly, the user must first "program" or configure the menu options.

Turning your Controller On for the First Time

The device becomes active as soon as it is connected to a power source. It has no On or Off switch. The device at first momentarily shows the software version number, followed by reset RST, and then proceeds to the Run Mode.

Table 3.1 Button Function in Configuration Mode

<table>
<thead>
<tr>
<th>Button</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>MENU</td>
<td>To enter the Menu, the user must first press MENU button. Use this button to advance/navigate to the next menu item. The user can navigate through all the top level menus by pressing MENU. While a parameter is being modified, press MENU to escape without saving the parameter.</td>
</tr>
<tr>
<td>(UP)</td>
<td>Press the up button to scroll through “flashing” selections. When a numerical value is displayed press this key to increase value of a parameter that is currently being modified. Holding the button down for approximately 3 seconds will speed up the rate at which the set point value increments. In the Run Mode press causes the display to flash the PEAK value – press again to return to the Run Mode.</td>
</tr>
<tr>
<td>(DOWN)</td>
<td>Press the down button to go back to a previous Top Level Menu item. Press this button twice to reset the controller to the Run Mode. When a numerical value is flashing (except set point value) press to scroll digits from left to right allowing the user to select the desired digit to modify. When a setpoint value is displayed press to decrease value of a setpoint that is currently being modified. Holding the button down for approximately 3 seconds will speed up the rate at which the setpoint value is decremented. In the Run Mode press causes the display to flash the VALLEY value – press again to return to the Run Mode.</td>
</tr>
<tr>
<td>ENTER</td>
<td>Press the enter button to access the submenus from a Top Level Menu item. Press to store a submenu selection or after entering a value — the display will flash a message to confirm your selection. To reset flashing Peak or Valley press. In the Run Mode, press ENTER twice to enable Standby Mode with flashing STBY.</td>
</tr>
</tbody>
</table>

Note: Except for Alarms, modifying any settings of the menu configuration will reset the instrument prior to resuming Run Mode.
3.2 Menu Configuration

It is recommended that you put the controller in the Standby Mode for any configuration change other than Setpoints & Alarms.

Figure 3.1 Flow Chart for ID and Setpoints
3.2.1 ID Number

SEE ID MENU SELECTION IN CONFIGURATION SECTION FOR ENABLE/DISABLE OR CHANGE ID CODE.

If ID Code is **Disabled** or set as **Default** (0000) the menu will skip ID step to Setpoint Menu.

If ID Code is set to **Full** Security Level and user attempts to enter the Main Menu, they will be prompted for an ID Code.

If ID Code is set to **Setpoint/ID** Security Level and user attempts to enter the Configuration Menu, they will be prompted for an ID Code.

**ENTERING YOUR NON-DEFAULT FULL SECURITY ID NUMBER.**

1. Press **1)** Display shows **Id**.
2. Press **2)** Display advances to **_____**.
3. Press **&** 3) Press **a** to increase digit 0-9. Press **b** to activate next digit (flashing). Continue to use **a** and **b** to enter your 4-digit ID code.
4. Press **4)** If the correct ID code is entered, the menu will advance to the Setpoint 1 Menu, otherwise an error message **ERR** will be displayed and the instrument will return to the Run Mode.

To change ID Code, see ID Menu in the Configuration section.

**ENTERING YOUR NON-DEFAULT SETPOINT/ID SECURITY ID NUMBER.**

5. Press **5)** Display shows **SP1** Setpoint 1 Menu.
6. Press **6)** Display shows **SP2** Setpoint 2 Menu.
7. Press **7)** Display shows **Id** ID Code Menu.
8. Press **8)** Display advances to **_____**.
9. Press **&** 9) Use **a** and **b** to change your ID Code.
10. Press **10)** If correct ID Code is entered, the display will advance to the **INPT** Input Menu, otherwise the error message **ERR** will be displayed and the controller will return to the Run Mode.

To prevent unauthorized tampering with the setup parameters, the instrument provides protection by requiring the user to enter the ID Code before allowing access to subsequent menus. If the ID Code entered does not match the ID Code stored, the controller responds with an error message and access to subsequent menus will be denied.

Use numbers that are easy for you to remember. If the ID Code is forgotten or lost, call customer service with your serial number to access and reset the default to **0000**.
3.2.2 Set Points

SETPOINT 1:

- Press \( \mathcal{O} \) \( (1) \) Press \( \mathcal{O} \), if necessary until \( SP \) \( 1 \) prompt appears.
- Press \( \mathcal{D} \) \( (2) \) Display shows previous value of “Setpoint 1”.
- Press \( \mathcal{A} \) \& \( \mathcal{B} \) \( (3) \) Press \( \mathcal{A} \) and \( \mathcal{B} \) to increase or decrease Setpoint 1 respectively.

**Note**
Holding \( \mathcal{A} \) \& \( \mathcal{B} \) buttons down for approximately 3 seconds will speed up the rate at which the Setpoint value increments or decrements.

- Press \( \mathcal{A} \) \& \( \mathcal{B} \) \( (4) \) Continue to use \( \mathcal{A} \) and \( \mathcal{B} \) to enter your 4-digit Setpoint 1 value.
- Press \( \mathcal{D} \) \( (5) \) Display shows \( STRD \) stored message momentarily and then advances to \( SP \) \( 2 \) only, if a change was made, otherwise press \( \mathcal{O} \) to advance to \( SP \) \( 2 \) Setpoint 2 Menu.

SETPOINT 2:

- Press \( \mathcal{D} \) \( (6) \) Display shows previous value of “Setpoint 2”.
- Press \( \mathcal{A} \) \& \( \mathcal{B} \) \( (7) \) Press \( \mathcal{A} \) and \( \mathcal{B} \) to increase or decrease Setpoint 2 respectively.

**Note**
Holding \( \mathcal{A} \) \& \( \mathcal{B} \) buttons down for approximately 3 seconds will speed up the rate at which the setpoint value increments or decrements.

- Press \( \mathcal{D} \) \( (8) \) Display shows \( STRD \) stored message momentarily and then advances to \( CNFG \) only, if a change was made, otherwise press \( \mathcal{O} \) to advance to \( CNFG \) Configuration Menu.
3.2.3 Configuration Menu

Enter Configuration Menu:

Press ☞ 1) Press ☞, if necessary, until CNFG prompt appear.
Press ☞ 2) Display advances to INPT Input Menu.
Press ☞ 3) Pressing and releasing ☞ to scroll through all available menus of Configuration section.

3.2.4 Input Type Menu

Figure 3.2 Flow Chart for Configuration Menu

Figure 3.3 Flow Chart for Input Type Menu
Input Type (Thermocouple)

ENTER INPUT TYPE MENU:

1) Press ☀, if necessary, until ◆HF ☣ prompt appears.
2) Display advances to ◆INPF Input Menu.
3) Display flashes ◆.c, ◆T.c or ◆PR CF (Thermocouple, RTD or Process). If the displayed input type is ◆.c, press ☀ to skip to step 6 (◆.c stops flashing).

THERMOCOUPLE SUBMENU:

4) Scroll through the available selection to ◆.c (flashing).
5) Display shows ◆T.R d stored message momentarily and then ◆.c (not flashing).
6) Display flashes previous thermocouple type selection. i.e. J (see below for types).
7) Scroll through the available thermocouple types to the selection of your choice.
8) Display shows ◆T.R d stored message momentarily and then advances to the ◆R.d Reading Configuration Menu.

Use the Input Type (Thermocouple) (RTD) or (Process) and verify your Electrical Installation (see Section 2.3).

Display: J K T E N D N J R S B C
Input Type (RTD)

ENTER INPUT TYPE MENU:

1) Press \( \mathcal{A} \), if necessary, until \( \text{CNFG} \) prompt appears.
2) Display advances to \( \text{INPT} \) Input Menu.
3) Display flashes \( \text{CNFG}, \text{RTD} \) or \( \text{PROC} \) (Thermocouple, RTD or Process). If the displayed input type is \( \text{RTD} \), press \( \mathcal{A} \) to skip to step 6 (\( \text{RTD} \) stops flashing).

RTD SUBMENU:

4) Scroll through the available selection to \( \text{RTD} \) (flashing).
5) Display shows \( \text{STRD} \) stored message momentarily and then \( \text{RTD} \) (not flashing).
6) Display flashes previous RTD type selection i.e. \( \text{392.2} \) (see below for RTD types selection).
7) Scroll through the available RTD types to the selection of your choice.
8) Display shows \( \text{STRD} \) stored message momentarily and then advances to \( \text{RTD} \) RTD value.

RTD Types: \( \text{392} \), \( \text{385} \) Two, Three or Four-wire
Display: \( \text{392.2}, \text{392.3}, \text{392.4}, \text{385.2}, \text{385.3}, \text{385.4} \)

\( \text{Note} \) \( \text{Last digit indicates: 2-, 3- or 4-wire input.} \)

RTD VALUE SUBMENU:

9) Display flashes previous RTD value selection i.e. \( \text{100_} \) (see below for RTD value selection).
10) Scroll through the available RTD values to the selection of your choice.
11) Display shows \( \text{STRD} \) stored message momentarily and then advances to \( \text{RDG} \) Reading Configuration Menu.

RTD Values: \( \text{100 ohm} \), \( \text{500 ohm} \), \( \text{1000 ohm} \)
Display: \( \text{100_}, \text{500_}, \text{1000} \)
Input Type (Process)

ENTER INPUT TYPE MENU:
Press 1) Press , if necessary, until prompt appears.
Press 2) Display advances to Input Menu.
Press 3) Display flashes T, R, or PROC (Thermocouple, RTD or Process). If the displayed input type is PROC, press to skip to step 6 (PROC stops flashing).

PROCESS SUBMENU:
Press 4) Scroll through the available selection to PROC (flashing).
Press 5) Display shows stored message momentarily and then PROC (not flashing).
Press 6) Display flashes previous Process type selection. i.e. 0-10 (see below for Process types selection).
Press 7) Scroll through the available Process types to the selection of your choice.
Press 8) Display shows stored message and then advances to Reading Configuration Menu.

Process Types: 100 mV 1 V 10 V 0 – 20 mA
Display: 0-0.1 0-1.0 0-10 0-20

For 4-20 mA Input select 0-20 mA then adjust the Input/Reading accordingly. To adjust 4-20 mA input, see example under INPUT/READ sub menu. The factory preset value is 4-20 mA.

3.2.5 Reading Configuration

It is recommended that you put the controller in the Standby Mode for any configuration change other than Setpoints & Alarms.

Figure 3.4 Flow Chart for Reading Configuration Menu
ENTER READING CONFIGURATION MENU:

Press ↓ 1) Press ↓, if necessary, until CHFG prompt appears.
Press ↓ 2) Display advances to INPT Input Menu.
Press ↓ 3) Display advances to RDG Reading Configuration Menu.
Press ↓ 4) Display advances to DEC Decimal Point.

DECIMAL POINT SUBMENU:

Press ↓ 5) Display flashes previous selection for Decimal location.
Press ↑ 6) Scroll through the available selections and choose Decimal location: FFFF or F FF.F (also FF FF and F.FFF — if PROC Process type was selected in the Input Type Menu).
Press ↓ 7) Display shows STRD stored message momentarily and then advances to TEMP Temperature Unit.

Note  
Decimal Point for Process Input Type is passive.

TEMPERATURE UNIT SUBMENU:

Press ↓ 8) Display flashes previous Temperature Unit selection.
Press ↑ 9) Scroll through the available selections to the Temperature Unit of your choice: °F or °C.
Press ↓ 10) Display shows STRD stored message momentarily and then advances to FLTR Filter Constant.

FILTER CONSTANT SUBMENU:

Press ↓ 11) Display flashes previous selection for Filter Constant.
Press ↑ 12) Scroll through the available selections: 0001, 0002, 0004, 0008, 0016, 0032, 0064, 0128
Press ↓ 13) Display shows STRD stored message momentarily only, if change was made, otherwise press ↓ to advance to the next menu.

Note
If Process was selected in the Input Type Menu the display will advance to IN.RD Input/Reading Submenu, otherwise the display advances to the ALR Alarm 1 Menu.

The Filter Constant Submenu allows the user to specify the number of readings stored in the Digital Averaging Filter.

Tip
For PID control select filter value 0001-0004. A filter value of 2 is approximately equal to 1 second RC low pass time constant.
Reading Configuration (If Process was selected)

INPUT/READING (SCALE AND OFFSET) SUBMENU:

Input Voltage or Current can be converted or scaled into values appropriate for the process or signal being measured. So, a reading may be displayed, for example, in units of weight or velocity instead of in amperes or volts.

The instrument determines Scale and Offset values based on two user-provided input values entered with the corresponding readings. Note that “In1” Input 1 and “In2” Input 2 are represented and entered as a product of the input voltage/current and the conversion number from the Table 3.1.

The following instructions include details for a specific scenario in which a 4-20 mA input (in the 20 mA Process Mode) is to be represented as a measurement of 0-100 percent.

14) Press \textbf{[In] \text{RD}} at the \textbf{[In] \text{RD}} prompt. Display shows \textbf{[In]} Input 1 submenu.

15) Display shows Input 1 value with 1st digit flashing.

16) Use \textbf{[In] \text{RD}} and \textbf{[In] \text{RD}} buttons to enter \textbf{[In]} value. The \textbf{[In]} value = min. input value \* conversion number.

17) Display advances to \textbf{[RD]} Reading 1 Submenu.

18) Use \textbf{[In] \text{RD}} and \textbf{[In] \text{RD}} buttons to enter \textbf{[RD]} value. This value represents \textbf{[In]} in terms of some meaningful engineering units. To show the 4 mA as zero percent enter \textbf{[RD]} value = 0000.

Example: \textbf{[RD]} value = 0000.

19) Display \textbf{[In]} Input 2 Submenu.

20) Display shows Input 2 value with 1st digit flashing. The \textbf{[In]} value = max. input value \* conversion number.

Example: 20(mA) \* 500 = 10000 (9999).

21) Use \textbf{[In]} and \textbf{[In]} buttons to enter \textbf{[In]} value.

22) Display advances to \textbf{[RD]} Reading 2 Submenu.

23) Use \textbf{[In]} and \textbf{[In]} buttons to enter \textbf{[RD]} value.

Example: \textbf{[RD]} value = 0100.

24) Display flashes \textbf{[Str]} stored message momentarily and then advances to \textbf{[ALR]} only, if change was made, otherwise press \textbf{[In]} to advance to \textbf{[ALR]} Alarm 1 Menu.
Conversion number is a coefficient of conversion between input values and real full display range (10000 counts, shown as 9999). See Table 3.2 below for proper conversion number.

Table 3.2 Conversion Table

<table>
<thead>
<tr>
<th>RANGE</th>
<th>CONVERSION NUMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 mV</td>
<td>10000 / (100 x 1) = 100</td>
</tr>
<tr>
<td>1 V</td>
<td>10000 / (1000 x 1) = 10</td>
</tr>
<tr>
<td>10 V</td>
<td>10000 / (1000 x 10) = 1</td>
</tr>
<tr>
<td>0 -20 mA</td>
<td>10000 / (20 x 1) = 500</td>
</tr>
</tbody>
</table>

Example =
0 - 1 V = 0 - 100.0
In 1 = 0
Rd 1 = 0
Inp 2 = 9999
Rd 2 = 100.0
3.2.6 Alarm 1

This unit is equipped with two physical outputs that can only be configured as follows: Alarm 1 & Alarm 2, Alarm 1 & Output 2, Output 1 & Alarm 2, Output 1 & Output 2, Analog Out 1 & Alarm 2, Analog Out 1 & Output 2. Analog Out available only if Analog Output Option board is factory installed.

If Analog Output Option is installed, the controller will skip Alarm 1 Menu item to Analog Output.

Alarm must be DISABLED if Ramp is ENABLED.

---

**Figure 3.5 Flow Chart for Alarm 1**

**ENTER ALARM 1 MENU:**

1) Press \( \circ \), if necessary, until \( \text{CFG} \) prompt appears.
2) Display advances to \( \text{INPT} \) Input Menu.
3) Press \( \circ \), if necessary, until Display advances to \( \text{ALR} \) Alarm 1 Menu.
4) Display advances to Alarm 1 \( \text{ENBL} \) Enable or \( \text{DSBL} \) Disable Submenu and flashes the previous selection.
ALARM 1 ENABLE/DISABLE SUBMENU:

Press \( \uparrow \) 5) Scroll though the available selection until \( \text{ENbl} \) displays to use Alarm 1.
Press \( \downarrow \) 6) Display shows \( \text{STrd} \) stored message momentarily and then advances to \( \text{AbSo} \) only if it was changed, otherwise press \( \\
\) to advance to \( \text{AbSo} \) Alarm 1 Absolute/Deviation Submenu.

If \( \text{DSbl} \) Alarm 1 Disabled was selected, all submenus of Alarm 1 Menu will be skipped and meter advances to \( \text{ALR2} \) Alarm 2 Menu. If \( \text{Enbl} \) Alarm 1 Enabled was selected, Output 1 would be automatically Disabled, and reassigned as Alarm 1.

ALARM 1 ABSOLUTE/DEVIATION SUBMENU:

Press \( \uparrow \) 7) Display flashes previous selection. Press \( \uparrow \) to \( \text{AbSo} \) Absolute or \( \text{DEn} \) Deviation.
Press \( \downarrow \) 8) Display shows \( \text{STrd} \) stored message momentarily and then advances to \( \text{Ltch} \) only if it was changed, otherwise press \( \\
\) to advance to \( \text{Ltch} \) Alarm 1 Latch/Unlatch Submenu.

Absolute Mode allows Alarm 1 to function independently from Setpoint 1. If the process being monitored does not change often, then "Absolute" Mode is recommended.

Deviation Mode allows changes to Setpoint 1 to be made automatically to Alarm 1. Deviation mode is typically the ideal mode if the process temperature changes often. In Deviation Mode, set Alarm 1 a certain number of degrees or counts away from Setpoint 1 — this relation remains fixed even if Setpoint 1 is changed.

ALARM 1 LATCH/UNLATCH SUBMENU:

Press \( \uparrow \) 9) Display flashes previous selection. Press \( \uparrow \) to \( \text{Ltch} \) Latched or \( \text{Unlt} \) Unlatched.
Press \( \downarrow \) 10) Display shows \( \text{STrd} \) stored message momentarily and then advances to \( \text{CcLl} \) only, if it was changed, otherwise press \( \\
\) to advance to \( \text{CcLl} \) Contact Closure Submenu.

Latched Mode: Relay remains "latched" until reset. To reset already latched alarm, select Alarm Latch and press Max twice (i.e. Unlatch and then back to Latch) or from a Run Mode, push \( \uparrow \) twice to put the controller in Standby Mode and then push \( \downarrow \) one more time to return to the Run Mode.

Unlatched Mode: Relay remains latched only as long as the alarm condition is true.
CONTACT CLOSURE SUBMENU:

Press 11) Display flashes previous selection. Press to Normally Closed or Normally Open.

Press 12) Display shows stored message momentarily and then advances to only if it was changed, otherwise press to advance to Active Submenu.

Normally Open: If this feature is selected, then the relay is "energized" only when an alarm condition occurs.

Normally Closed: "Fail Safe" Mode. Relay is energized under "normal" conditions and becomes de-energized during alarm or power failure.

ACTIVE SUBMENU:

Press 13) Display flashes previous selection. Press to scroll through the available selections: Above, Below, Hi/Low and Band. (Band is active if Deviation was selected).

Press 14) Display shows stored message momentarily and then advances to only if it was changed, otherwise press to advance to Alarm Enable/Disable at Power On Submenu.

Above: Alarm 1 condition triggered when the process variable is greater than the Alarm Hi Value (Low value ignored).

Below: Alarm 1 condition triggered when the process variable is less than the Alarm Low Value (Hi value ignored).

Hi/Low: Alarm 1 condition triggered when the process variable is less than the Alarm Low Value or above the Hi Value.

Band: Alarm 1 condition triggered when the process variable is above or below the "band" set around Setpoint 1. Band equals Hi Value (Low Value ignored). A "band" is set around the Setpoint by the instrument only in the "Deviation" Mode.
ALARM ENABLE/DISABLE AT POWER ON:

Press 15) Display flashes previous selection. Press to enable or disable.
Press 16) Display shows stored message momentarily and then advances to only if it was changed, otherwise press to advance to the Alarm 1 Low Value Submenu.

If the alarm is enabled at Power On, the alarm will be active right after reset. If the alarm is disabled at Power On, the alarm will become enabled when the process value enters the non alarm area. The alarm is not active while the process value is approaching Setpoint 1.

ALARM 1 LOW VALUE SUBMENU:

Press 17) Display flashes 1st digit of previous value. Use and to enter new value.
Press 18) Use and to enter Alarm 1 Low Value.
Press 19) Display shows stored message momentarily and then advances to only, if it was changed, otherwise press to advance to Alarm 1 Hi Value Submenu.

ALARM 1 HI VALUE SUBMENU:

Press 20) Display flashes 1st digit of previous value. Use and to enter new value.
Press 21) Use and to enter Alarm 1 Hi Value.
Press 22) Display shows stored message momentarily and then advances to the next menu only, if it was changed, otherwise press to advance to the next menu.
3.2.7 Analog Output (Retransmission)

Analog Output can be configured as Retransmission or Control outputs. In this section we will discuss Retransmission Output.

This unit is equipped with two physical outputs that can only be configured as follows: *Alarm 1 & Alarm 2, Alarm 1 & Output 2, Output 1 & Alarm 2, Output 1 & Output 2, Analog Out 1 & Alarm 2, Analog Out 1 & Output 2*. Analog Output is available only, if Analog Output Option board is factory installed.

*Note* If Analog Output Option is not installed, the instrument will skip to Alarm 2 Menu.

**Figure 3.6 Flow Chart for Analog Output (Retransmission)**

**ENTER ANALOG OUTPUT MENU:**

Press © 1) Press ©, if necessary, until **CNFG** prompt appears.
Press © 2) Display advances to **INPT** Input Menu.
Press © 3) Press ©, if necessary, until Display advances to **ANLG** Analog Output Menu.
Press © 4) Display advances to Analog Output **ENBL** Enable or **DSBL** Disable Submenu and flashes the previous selection.
ANALOG OUTPUT ENABLE/DISABLE SUBMENU:

Press ↖ 5) Scroll though the available selection until Enbl displays to use Analog Output Retransmission (output proportional to the input signal).

Press ↗ 6) Display shows StRd stored message momentarily and then advances to Curr or VoLt Submenu only if it was changed, otherwise press ↘ to advance to Curr or VoLt Current/Voltage Submenu.

If dSbI Analog Output Disabled was selected, all submenus of Analog Output Menu will be skipped and the meter will advance to ALR2 Alarm 2 Menu. If Enbl Analog Output Enabled was selected, Output 1 would be automatically Disabled, and reassigned as Analog Output.

CURRENT/VOLTAGE SUBMENU:

Press ↗ 7) Display flashes Curr Current or VoLt Voltage.

Press ↖ & ↗ 8) Scroll through the available selection: Current or Voltage (Example VoLt).

Press ↗ 9) Display shows StRd stored message momentarily and then advances to RdI Submenu only if it was changed, otherwise press ↗ to advance to RdI Reading 1 Submenu.

READING 1:

Press ↗ 10) Display flashes 1st digit of previous “Reading 1” value.

Press ↖ & ↗ 11) Enter “Reading 1” value. (Example 0000)

Press ↗ 12) Display advances to Out 1 Submenu.

OUT 1:

Press ↗ 13) Display flashes 1st digit of previous “Out 1” value.

Press ↖ & ↗ 14) Enter “Out 1” value. (Example 00.00)

Press ↗ 15) Display advances to Rd 2 Reading 2 Submenu.

READING 2:

Press ↗ 16) Display flashes 1st digit of previous “Reading 2” value.

Press ↖ & ↗ 17) Enter “Reading 2” value. (Example 9999)

Press ↗ 18) Display advances to Out 2 Submenu.

OUT 2:


Press ↖ & ↗ 20) Enter “Out 2” value. (Example 10.00)

Press ↗ 21) Display advances to the ALR2 Alarm 2 Menu.

The above example is for 0-10 V of the entire range of the Process Input and Analog Output. For 0-20 mA output you need to set “Analog Type” to Current and OUT 2 to 20.00.
Accuracy of Analog Output board is +/-1% of FS (Full Scale) when following conditions are satisfied:
1. The input is not scaled below 1% of Input FS (10 mV @ 1 V or 0.2 mA @ 20 mA input ranges).
2. Analog Output is not scaled below 3% of Output FS (300 mV @ 10 V or 0.6 mA @ 20 mA output ranges).

Otherwise certain corrections need to be applied.
**For example:**
For entire range of process input, the Analog Output on 10 V FS scaled for 300 mV output range:

\[
\begin{align*}
\text{Rd1} &= 0000, \quad \text{Out1} = 00.00 \\
\text{RD2} &= 9999, \quad \text{Out2} = 00.30
\end{align*}
\]

The measured output will be as follows:

\[
\begin{align*}
\text{Rd1} &= 0000, \quad \text{Out1} = -0.07 \text{ V} \\
\text{Rd2} &= 9999, \quad \text{Out2} = 0.23 \text{ V}
\end{align*}
\]

This means that for 300 mV output range we have -70 mV offset at zero and at full scale. In order to compensate this 70 mV offset the correct scaling will be as follows:

\[
\begin{align*}
\text{Rd1} &= 0000, \quad \text{Out1} = 00.07 \\
\text{Rd2} &= 9999, \quad \text{Out2} = 00.37
\end{align*}
\]

The above corrections need to be applied only for Input scaled below 1% of FS and Output scaled below 3% of FS or if you need the Analog Output accuracy to be better than 1% of FS.
3.2.8 Alarm 2

This unit is equipped with two physical outputs that can only be configured as follows: **Alarm 1 & Alarm 2, Alarm 1 & Output 2, Output 1 & Alarm 2, Output 1 & Output 2, Analog Out 1 & Alarm 2, Analog Out 1 & Output 2.** Analog Out available only if Analog Output Option board is factory installed.

**Note:** Alarm must be DISABLED if Ramp is ENABLED.

---

**Figure 3.7 Flow Chart for Alarm 2**

**ENTER ALARM 2 MENU:**

Press 📦 1) Press 📦, if necessary, until **CONF** prompt appears.
Press 📦 2) Display advances to **INPT** Input Menu.
Press 📦 3) Press 📦, if necessary, until Display advances to **ALRM** Alarm 2 Menu.
Press 📦 4) Display advances to Alarm 2 **ENBL** Enable or **DSBL** Disable Submenu.
ALARM 2 ENABLE/DISABLE SUBMENU:

Press 5) Display flashes previous selection. Press ▲ until **ENBL** displays to use Alarm 2.

Press 6) Display shows **STR** stored message momentarily and then advances to **Absa** only if it was changed, otherwise press ▼ to advance to **Absa** Absolute/Deviation Submenu.

If **DSBL** Alarm 2 Disabled was selected, all submenus of Alarm 2 will be skipped and meter advances to **LOOP** Loop Break Time Menu. If **ENBL** Alarm 2 Enabled was selected, Output 2 will automatically Disabled, and reassigned as Alarm 2.

The remaining Alarm 2 menu items are identical to Alarm 1 Menu. Modifying Alarm Settings will not reset the instrument.

### 3.2.9 Loop Break Time

![Flow Chart for Loop Break Time](image)

**Figure 3.8 Flow Chart for Loop Break Time**

**ENTER LOOP BREAK TIME MENU:**

Press ▼ 1) Press ▼ if necessary, until **CHFG** prompt appears.

Press ▼ 2) Display advances to **INPE** Input Menu.

Press ▼ 3) Press ▼ if necessary, until Display advances to **LOOP** Loop Break Time Menu.

Press ▼ 4) Display advances to Loop Break Time **ENBL** Enable or **DSBL** Disable Submenu and flashes the previous selection.

**LOOP BREAK ENABLE/DISABLE SUBMENU:**

Press ▼ 5) Scroll through the available selections: **ENBL** or **DSBL**.

Press ▼ 6) Display shows **STR** stored message momentarily and then advances to **b.e iN** Loop Break Time Value Submenu.

Loop Break is an additional safety feature intended to monitor the rate of change of the process value, while approaching the SP1. It is strictly intended as an additional warning system, therefore its use is entirely optional. An active Loop Break will cause the Process Value digits to blink in a rotating pattern. If the process value reaches the set point the blinking will stop and **b.e iN** is completed successfully, otherwise **b.R.AL** Break Alarm warning will flash, and Output 1 will be turned off.
LOOP BREAK TIME VALUE SUBMENU:

Press 7) Display flashes 1st digit of previous Loop Value.
Press & 8) Press and buttons to enter a new Loop Value (0 to 99.59).
Press 9) Display shows stored message momentarily and then advances to Reading Adjust Submenu.

Loop Break Time Value allows the user to determine the time interval in MM:SS (from zero to 99 minutes and 59 seconds) that the Process Value changes at least 10 counts or if the Input Type is either RTD or Thermocouple, the value changes 4° Fahrenheit or 2° Celsius. At the specified time interval, if the process value change is less than the stated rate, flashing will be displayed, the output 1 will be de-energized, and Alarm 1 energized. Loop break time will be disabled when the Process Value (PV) enters the control band.

C.J. READING ADJUST SUBMENU:

Press 10) Display flashes 1st digit of previous reading adjust value.
Press & 11) Press and buttons to enter a new Reading Adjust value (-1999 to 9999).
Press 12) Display shows stored message momentarily and then advances to Setpoint Deviation Menu.

Reading Offset Adjust (C.J.) allow the user to fine tune a minor error of the transducer, however some applications may require a large offset adjust. (Displayed Process Value = Measured Process Value ± R.ADJ). R.ADJ is adjustable between -1999 to 9999.

SETPOINT DEVIATION ENABLE/DISABLE SUBMENU:

Press 13) Display advances to Setpoint Deviation Enable or Disable Submenu and flashes the previous selection.
Press 14) Scroll through the available selections: Enable or Disable.
Press 15) Display shows stored message momentarily and then advances to Menu.

Setpoint Deviation Submenu, if “enabled”, allows changes to Setpoint 1 to be made automatically to Setpoint 2. This mode is very helpful if the Process Value changes often. In Setpoint Deviation Mode, set SP2 a certain number of degrees or counts away from SP1 - this relation remains fixed when SP1 is changed. For instance: Setting SP1=200 and SP2=20 and enabling means that the absolute value of SP2=220. Moving SP1 to 300, the absolute value of SP2 becomes 320.
THERMOCOUPLE FIELD CALIBRATION SUBMENU:

⚠️ **CAUTION:** Do not perform the following steps until you fully understand this entire section.

RTD and Process are perfectly calibrated. This section is applicable to Thermocouple (TC) calibration only.

Be sure that the TC being used to calibrate the meter is of the type selected in the TC submenu. Place the TC in an ice-bath (or other 0°C / 32°F environment). In ambient temperature conditions: connect the TC to the meter, apply power to the meter.

⚠️ **CAUTION:** Do not proceed with TC calibration unless the above conditions have been in effect for at least one hour.

Press ◀ 7) Display shows CAL°.
Press ◀ 8) Display shows flashing 0000.
Press ◀ * 9) Display will still show flashing 0000.
Press ◀ * 10) Display shows OUT1 (meaning Calibration is complete)

* If you accidentally engage the flashing 0000 (CAL° alert) simply re-press the last button you pressed, to avoid unintentionally mis-calibrating your meter.
3.2.10 Output 1

Alarm 1 and Output 1 or Analog Output (Retransmission) share the same contacts on the rear panel connector. If Alarm 1 or Analog Output (Retransmission) is Enabled, Output 1 is automatically Disabled.

It is recommended that you put the controller in the Standby Mode for any configuration change other than Setpoints & Alarms.

Figure 3.9 Flow Chart for Output 1
ENTER OUTPUT 1 MENU:

1) Press ↓, if necessary, until CNFG prompt appears.
2) Display advances to INPUT Input Menu.
3) Press ↓, if necessary, until Display advances to OUT 1 Output 1 Menu.
4) Display advances to SELF Self Submenu.

SELF SUBMENU:

The Self Option allows the output of the instrument to be controlled manually from the front panel.

Press ↓

5) Display flashes the current setting of Self, ENBL Enabled or DSBL Disabled.
6) Press the button to select between Enable and Disable.
7) If Self ENBL Enabled was selected, display shows STRD stored message momentarily and then advances to the next menu (Output 1 setting is completed).

The output is now under the direct control of the operator and can be adjusted in the Run Mode (M00.0 to M99.9), by pressing the and buttons, where M calls for the Manual (Self) Control. For example, setting of M50.0 of an Analog Output of 0 to 10 Vdc would produce roughly 5 Vdc at the output.

8) If Self DSBL Disabled was selected, display shows STRD stored message momentarily and then advances to oPL0 Minimum/Percent Low Submenu of Output 1 Menu.

There is a shorter way to Enable or Disable Self Mode. From a Run Mode, press ↓ and then press ↓. Self Mode is Enabled now. Press or to display MXX.X. To disable Self, press ↓ and then press ↓. Display goes to the Run Mode. Self Mode is Disabled now.

MINIMUM/PERCENT LOW SUBMENU:

Specify in percent, the minimum value (0000) for control output. If the output is analog proportional (Current or Voltage), then the minimum voltage or current, in percent, is specified. If the output is time proportional (Relay, SSR or Pulse), then the minimum duty-cycle, in percent, is specified.

Press ↓

9) Display flashes 1st digit of previous “Percent Low” setting.
10) Use and buttons to enter a new value for “Percent Low”.
11) Display shows STRD stored message momentarily and then advances to oPH1 Maximum/Percent High Submenu.
MAXIMUM/PERCENT HIGH SUBMENU:

Specify in percent, the maximum value (99) for control output. If the output is analog proportional (Current or Voltage), then the maximum voltage or current, in percent, is specified. If the output is time proportional (Relay, SSR, or Pulse), then the maximum duty-cycle, in percent, is specified.

Press 12) Display flashes 1st digit of previous “Percent High” setting.
Press & 13) Use and buttons to enter a new value for “Percent High”.
Press 14) Display shows stored message momentarily and then advances to Control Type Submenu.

Example: On an Analog Output of 0~10 Vdc, a setting of %LO = 10 and %HI = 90, cause the minimum on the control output to be 1 V and the maximum on the control output to be 9 V. The same setting on a time proportional output, will cause 10% duty cycle for the minimum control output and 90% duty cycle for maximum control output. To disable %LO/HI, set LO to 00 and HI to 99. If %LO/HI is at other values than the default (%LO = 00, %HI = 99), SOAK is disabled.

*CONTROL TYPE OUTPUT:

(Relay, SSR, Pulse or Analog)
Press 15) Display flashes On/Off or Proportional, Integral, Derivative.
Press 16) Scroll through the available selections: “ON/OFF” or “PID”.
Press 17) Display flashes stored message momentarily and then advances to Action Type Submenu.

The ON/OFF control is a coarse way of controlling the process. The “Dead Band” improves the cycling associated with the On/Off control. The PID control is best for processes where the Setpoint is continuously changing and/or a tight control of the process variable is required. PID control requires tuning and adjustment of the “Proportional”, “Integral or Reset” and “Derivative or Rate” terms by a trial-and-error method. The instrument provides an "Auto Tuning" feature making the tuning process automatic, possibly optimum.

* If Analog Output (Current/Voltage) is your control Output 1, this menu i.e., Control type will not appear, instead 4-20 Current will be displayed. Select for a 4-20 mA current (2-10 V Voltage) outputs or for a 0-20 mA current (0-10 V Voltage) outputs. If 4-20 mA is enabled, %HI/LO setting will have no effect.

Both Current and Voltage control outputs are active simultaneously.
ACTION TYPE SUBMENU:

The error that results from the measurement of the Process Variable may be positive or negative since it may be greater or smaller than the Setpoint. If a positive error should cause the instrument output to increase (i.e. cooling), it would be called Direct Acting. If a negative error should cause the output to increase (i.e. heating), it would be called Reverse Acting.

Press \(d\) 18) Display flashes \(\text{DRct}\) Direct or \(\text{Rvrs}\) Reverse.
Press \(a\) 19) Scroll through the available selections: “Direct” or “Reverse”.
Press \(d\) 20) Display shows \(\text{STRd}\) stored message momentarily and then advances to \(\text{Auto}\) only, if it was changed, otherwise press \(d\) to advance to \(\text{Auto}\) Auto PID Submenu (if PID Control Type was selected).

If “ON/OFF” was selected in the Control Type, the display skips to the Dead Band Submenu.

AUTO PID SUBMENU:

Press \(d\) 21) Display flashes \(\text{ENbl}\) or \(\text{DSbl}\).
Press \(a\) 22) Scroll through the available selections: “Enable” or “Disable”.
Press \(d\) 23) Display shows \(\text{STRd}\) stored message momentarily and then advances to \(\text{ANTl}\) only, if it was changed, otherwise press \(d\) to advance to \(\text{ANTl}\) Anti Integral Submenu.

If “Enabled”, the controller can determine, by enabling Start PID, the optimum values for the three adjustments — Proportional, Reset and Rate corresponding to P, I, and D. These values may be changed once the auto tuning is complete.

If “Disabled” is selected, the user will manually enter these three adjustment values. If you want the instrument to do the auto PID and the P, PI or PID, first select auto disable and enter 0000 for unwanted parameter. i.e. for PI enter 0000 for the rate.

ANTI INTEGRAL SUBMENU:

Press \(d\) 24) Display flashes \(\text{ENbl}\) or \(\text{DSbl}\).
Press \(a\) 25) Scroll through the available selections: “Enable” or “Disable”.
Press \(d\) 26) Display shows \(\text{STRd}\) stored message momentarily and then advances to \(\text{STRt}\) only, if it was changed, otherwise press \(d\) to advance to \(\text{STRt}\) to Start Auto Tune PID Submenu (If auto PID was Enabled).

If Auto PID was disabled display advances to \(\text{Prop}\) Proportional Band Submenu.
If Anti Integral (Anti Windup) Submenu “Enabled”, this feature allows the error term outside the proportional band to be calculated and accumulated for integration. This may be an important feature in applications where fast response time is desirable.

START AUTO TUNE PID:

Press 27) Display flashes ENBL or DSBL.
Press 28) Scroll through the available selections: “Enable” or “Disable”.
Press 29) Display shows STRD stored message momentarily and then advances to CYCL only, if it was changed, otherwise press  to advance to CYCL Cycle Time Submenu.

If “Enabled”, the controller is ready to calculate P, PI or PID parameters. The instrument performs this by activating the output and observing the delay and rate at which the Process Value changes. The setpoints must be at least 18°F or 10°C above the (PV) Process Value in order to perform Auto Tune, otherwise an error message will be displayed.

To start Auto Tune PID select PID, enable Auto PID and enable Start PID. Sometimes Auto PID parameter needs fine tuning i.e. for each 5°F overshoot increase the Proportional Band (PB) by 15% and for each ±1°F fluctuation at the Setpoint (SP) increase reset by 20%.

Once started, display shows A.TUN with letters blinking in the rotating pattern. When auto tune stops, display will show process value. Do not perform any operations or settings before first stopping Auto Tune. Any alarms or other output is disabled during Auto Tune.

If “AUTO PID” was “DISABLED”, the display will show the following three submenus. This allows the user to manually enter values for Proportional, Reset and Rate terms corresponding to P, I, and D. It also can be used for auto PID for disabling unwanted parameter i.e. PI enter 0000 for rate.

PROPORTIONAL BAND SUBMENU:

Press 30) Display flashes 1st digit of the previous Proportional band value.
Press 31) Press  and  buttons to enter a new “Proportional Band” value.
Press 32) Display shows STRD stored message momentarily and then advances to REST only, if it was changed, otherwise press  to advance to REST Reset Setup Submenu.

Proportional band is in degrees of temperature or counts of process. Proportional band is defined, as the change in the instrument input to cause a 100% change in the controller output.
RESET SETUP SUBMENU:

Press 

33) Display flashes 1st digit of the previous I REST Reset value.

Press 

34) Press  and  buttons to enter a new “Reset” value.

Press 

35) Display shows STRD stored message momentarily and then advances to RATE only, if it was changed, otherwise press  to advance to RATE Rate Setup Submenu.

Reset unit is in seconds 0-3999.

RATE SETUP SUBMENU:

Press 

36) Display flashes 1st digit of previous D RATE Rate value.

Press 

37) Press  and  buttons to enter a new RATE value.

Press 

38) Display shows STRD stored message momentarily and then advances to the CYCL only, if it was changed, otherwise press  to advance to CYCL Cycle Time submenu for RTD and Thermocouple types.

Rate unit is in seconds 000.0-399.9.

If the Output 1 is Analog Option the display skips to Damping Factor.

CYCLE TIME SUBMENU:

Press 

39) Display flashes 1st digit of the previous CYCL Cycle Time value.

Press 

40) Press  and  buttons to enter a new “Cycle Time” value. (1 to 199 seconds)

Press 

41) Display shows STRD stored message momentarily and then advances to DPHC only, if it was changed, otherwise press  to advance to DPHC Damping Factor Submenu.

A Cycle Time selected between 1 and 199 seconds determines the total On/Off time of each proportional cycle. For example, a 15 second cycle time means that every 15 seconds the output will turn on for part or all of the cycle. For Relay control outputs, do not select a cycle time of less than 7 seconds or the relays’ lifetime will be shortened. For a cycle time of less than 7 seconds select SSR or DC pulse. Use an external SSR with the DC pulse option for higher currents (higher than 1 Amp).
DAMPING FACTOR SUBMENU:

Press ✈️ 42) Display flashes the previous “Damping Factor” selection.
Press ⬆️ 43) Scroll through the available selections: 0000, 0001, 0002, 0003, 0004, 0005, 0006, 0007.
Press ✈️ 44) Display flashes STRD stored message and then advances to OUT2 only, if it was changed, otherwise press ✈️ to advance to OUT2 Output 2 Menu.

Damping Factor is a measure of speed, overshoot, and undershoot in which the process variable responds to the output changes of the instrument, which were used during the Auto Tune. This value is typically set to the ratio of Rate to Reset. This Default value is (0003). For fast response time, this value should be decreased while for slow response time it should be increased.

The "DEADBAND" Submenu will only appear if "ON/OFF" was selected from the "Control Type" Menu.

DEADBAND SUBMENU:

Press ✈️ 45) Display flashes 1st digit of the previous dead Deadband value.
Press ⬆️ & ⬇️ 46) Press ⬆️ and ⬇️ buttons to enter a new “Deadband” value.
Press ✈️ 47) Display shows STRD stored message and then advances to OUT2 only, if it was changed, otherwise press ✈️ to advance to OUT2 Output 2 Menu.

Dead Band units are the same as Proportional Band units.

The Dead Band or neutral zone is the number of degrees or counts (if Input Type is Process) around the Setpoint which the Process Variable must pass above or below the Setpoint, before the output changes state.
3.2.11 Output 2

Output 2 and Alarm 2 share the same contacts on the rear panel connector. If Alarm 2 is **Enabled**, Output 2 is automatically **Disabled**.

It is recommended that you put the controller in the Standby Mode for any configuration change other than Setpoints & Alarms.

**Figure 3.10 Flow Chart for Output 2**

**ENTER OUTPUT 2 MENU:**

Press 1) Press , if necessary, until **CFG** prompt appears.
Press 2) Display advances to **INPT** Input Menu.
Press 3) Press , if necessary, until Display advances to **OUT2** Output 2 Menu.
Press 4) Display advances to **CRL** Control Type Submenu.

**CONTROL TYPE SUBMENU:**

Press 3) Display flashes **ON.OF** ON/OFF, or **PID** PID.
Press 4) Scroll through the available selections: “ON/OFF” or “PID”.
Press 5) Display shows **STRD** stored message momentarily and then advances to **AC T** only, if it was changed, otherwise press to advance to **AC T** Action Type Submenu.

The ON/OFF control is a coarse way of controlling the Process. The “Dead Band” improves the cycling associated with the ON/Off control. The PID control is best for processes where the Setpoint is continuously changing and/or tight control of the Process Variable is required.
ACTION TYPE SUBMENU:

The error that results from the measurement of the Process Variable may be positive or negative since it may be greater or smaller than the Setpoint. If a positive error should cause the instrument output to increase (i.e. cooling), it would be called Direct Acting. If a negative error should cause the output to decrease (i.e. heating), it would be called Reverse Acting.

Press 6) Display flashes Direct or Reverse.
Press 7) Scroll through the available selections: “Direct” or “Reverse”.
Press 8) Display shows stored message momentarily and then advances to Auto only, if it was changed, otherwise press to advance to Auto Auto PID Submenu (If PID Control type was selected).

If ON/OFF was selected in the Control Type, the display skips to the Dead Band Submenu.

AUTO PID SUBMENU:

Press 9) Display flashes Enable or Disable.
Press 10) Scroll through the available selections: “Enable” or “Disable”.

If "Enabled", the PID parameter of Output 1 will be copied to Output 2.

Press 11) Display shows stored message momentarily and then advances to the next submenu only, if it was changed, otherwise press to advance to the next submenu.

If AUTO PID was ENABLED", the display skips to the CYCL CYCLE TIME submenu. If "AUTO PID" was "DISABLED", the display will show PROPORTIONAL BAND Submenu allowing the user to manually enter the Proportional Band value.

The Reset and Rate value are the same as Output 1.

PROPORTIONAL BAND SUBMENU:

Press 12) Display flashes 1st digit of the previous Proportional Band value.
Press & 13) Press and buttons to enter a new Proportional Band value.
Press 14) Display shows stored message momentarily and then advances to CYCL only, if it was changed, otherwise press to advance to the CYCL Cycle Time Submenu.

Refer to “Proportional Band” Submenu of “Output 1” Menu.
CYCLE TIME SUBMENU:

Press 15) Display flashes 1st digit of the previous “Cycle Time” value.
Press 16) Press and buttons to enter a new “Cycle Time” value (1 to 199 seconds).
Press 17) Display shows stored message momentarily and then advances to only, if it was changed, otherwise press to advance to Ramp Value Submenu.

A cycle time selected between 1 to 199 seconds indicates the total On/Off time of each proportional cycle. For example, a 15 second cycle time means that every 15 seconds the output will turn on for part or all of the cycle. For Relays’ Control Outputs, do not select a cycle time of less than 7 seconds or the relays’ lifetime will be shortened. For a cycle time of less than 7 seconds select SSR or DC pulse. Use an external SSR with the DC pulse option for higher current (higher than 1 Amp).

The DEADBAND Submenu will only appear if the ON/OFF was selected from the "Control Type" Submenu.

DEADBAND SUBMENU:

Press 18) Display flashes 1st digit of the previous “Dead Band” value.
Press 19) Press and buttons to enter a new “Dead Band” value.
Press 20) Display shows stored message momentarily and then advances to only, if it was changed, otherwise press to advance to Ramp Value Menu.

Dead Band units are the same as Proportional Band units.

The Dead Band is the number of degrees or counts around the Setpoint which the Process Variable must pass through before the output changes state.
3.2.12 Ramp & Soak

Alarm must be DISABLED if Ramp is ENABLED.

It is recommended that you put the controller in the Standby Mode for any configuration change other than Setpoints & Alarms.

**Figure 3.11 Flow Chart for Ramp and Soak**

**ENTER RAMP AND SOAK MENU:**

Press 1) Press , if necessary, until prompt appears.
Press 2) Display advances to Input Menu.
Press 3) Press , if necessary, until Display advances to Ramp and Soak Menu.

**RAMP ENABLE/DISABLE SUBMENU:**

Press 4) Display advances to “Ramp Enable/Disable” Submenu and flashes or .
Press 5) Scroll through the available selections: “Enable” or “Disable”.
Press 6) Display shows stored message momentarily and then advances to Soak Enable/Disable Menu.

If Ramp Disable was selected, display skips to the next menu item (ID Code).

**SOAK ENABLE/DISABLE SUBMENU:**

Press 7) Display flashes or .
Press 8) Scroll through the available selections: “Enable” or “Disable”.
Press 9) Display shows stored message momentarily and then advances to “Ramp Value” Submenu.
Ramp & Soak provides users with the flexibility to slowly bring the Process Variable (PV) to the desired setpoint. Ramp & Soak values are specified in HH.MM format. The Ramp value indicates the time specified to bring the process variable to Setpoint 1 (SP1). Once the set point is reached, the PID takes over and the Process Variable will be controlled at the desired set point indefinitely. If Soak is enabled, PID will control the Process Variable at the specified Setpoint for the duration of Soak time and then will turn off Output 1. To start a new Ramp/Soak cycle, reset the instrument by pressing \( \odot \) and then \( \bigstar \) button.

An active Ramp/Soak will change SP1 one degree above the PV and will cause the most significant digit to blink. The SP1 will be incremented by one degree until it reaches the original SP1. The minimum Ramp time must be at least twice the time that it will take the PV to reach the Setpoint Value (SV) with OUT 1 fully ON.

**RAMP VALUE SUBMENU:**

- Press \( \odot \) 10) Display flashes 1st digit of previous stored “Ramp Value”.
- Press \( \bigtriangleup \) & \( \bigstar \) 11) Press \( \bigtriangleup \) and \( \bigstar \) buttons to enter a new “Ramp Value”.
- Press \( \odot \) 12) Display shows \( \text{STRD} \) stored message momentarily and then advances to “Soak Value” Submenu.

**SOAK VALUE SUBMENU:**

- Press \( \odot \) 13) Display flashes 1st digit of previous stored “Soak Value”.
- Press \( \bigtriangleup \) & \( \bigstar \) 14) Press \( \bigtriangleup \) and \( \bigstar \) buttons to enter a new “Soak Value”.
- Press \( \odot \) 15) Display shows \( \text{STRD} \) stored message and advances to the \( \text{ID} \) ID Code Menu.

The Ramp and Soak time is 00:00 to 99:59 i.e. HH.MM. (from zero to 99 hours and 59 minutes) During Ramp & Soak do not perform any operations or settings before first stopping it. Any alarms or other output are disabled during this time. To stop Ramp & Soak first put instrument into Standby Mode, then go to Ramp & Soak Menu and disable it.
**3.2.13 ID CODE**

![Flow Chart for ID Code](image)

**ENTER ID CODE MENU:**
- Press 1) Press , if necessary, until prompt appears.
- Press 2) Display advances to Input Menu.
- Press 3) Press , if necessary, until Display advances to ID Code Menu.

**ENTERING OR CHANGING YOUR (NON-DEFAULT) ID CODE:**
- Press 4) Display advances to with 1st under score flashing.
- Press & 5) Press and to enter your 4-digit “ID Code” number.

![Note]

- If entered “ID Code” is incorrect display shows Error message momentarily and then skips to the Run Mode.

- Press 7) Display flashes the first digit of previous entered “ID Code” number.
- Press & 8) Press and buttons to enter your new “ID Code” number.
- Press 9) Display shows stored message momentarily and then advances to the Full Security Submenu.
ENTERING OR CHANGING YOUR (DEFAULT) ID CODE:

Enter \textit{Id} menu (Repeat steps from 1 to 3).

Press \textbullet 10) Display advances to \textit{CH. Id} Change ID Code Submenu.
Press \textbullet 11) Display shows 0000 message with flashing 1st digit.

\textbf{Note}\nThe user can change the default “ID Code” if they wish, if not press \textbullet and menu will skip to \textit{Full} Full Security Submenu.

Press \textbullet & \textdownarrow 12) Press \textbullet and \textdownarrow buttons to enter your new “ID Code” number.
Press \textbullet 13) Display shows \textit{Strd} stored message momentarily and then advances to the \textit{Full} Full Security Submenu.

FULL SECURITY LEVEL SUBMENU:

Press \textbullet 14) Display flashes \textit{Enbl} Enable or \textit{dsbl} Disable.
Press \textbullet 15) Scroll through the available selections: “Enable” or “Disable”.
Press \textbullet 16) Display shows \textit{Strd} stored message momentarily and then advances to \textit{Sp. Id} Setpoint/ID Submenu.

\textbf{Note}\nIf "Full" Security Level is "Enabled" and the user attempts to enter the Main Menu, they will be prompted for an ID Code. The ID Code should be correct to enter the instrument Menu item.

SETPOINT/ID SECURITY LEVEL SUBMENU:

This Security Level can be functional only if \textit{Full} Security Level is Disabled.

Press \textbullet 17) Display flashes \textit{Enbl} Enable or \textit{dsbl} Disable.
Press \textbullet 18) Scroll through the available selections: “Enable” or “Disable”.
Press \textbullet 19) Display shows \textit{Strd} stored message momentarily and then advances to \textit{Comm} Communication Submenu.

\textbf{Note}\nIf "Setpoint/ID" Security Level is "Enabled" and the user attempts to advance into the \textit{Cfg} Configuration Menu, he will be prompted for ID Code number. The ID Code should be correct to proceed into the Configuration Menu, otherwise display will show an Error and skip to the Run Mode.

\textbf{Note}\nIf “Full” and “Setpoint/ID” Security Levels are "Disabled", the ID code will be “Disabled” and user will not be asked for ID Code to enter the Menu items (“ID” Submenu will not show up in “ID/Setpoint” Menu).
3.2.14 COMMUNICATION OPTION

Purchasing the controller with Serial Communications permits an instrument to be configured or monitored from an IBM PC compatible computer using software available from the website or on the CD-ROM enclosed with your shipment. For complete instructions on the use of the Communications Option, refer to the Serial Communications Reference Manual.

Figure 3.13 Flow Chart for Communication Option
ENTER COMMUNICATION OPTION MENU:

Press 1) Press ☞, if necessary, until CHFG prompt appears.
Press 2) Display advances to INPUT Input Menu.
Press 3) Press ☞, if necessary, until Display advances to COMM Communication Options Menu.
Press 4) Display advances to C.PAR Communication Parameters Submenu.

If Communication Option is not installed, the display shows NONE and skips to the Color Display Menu.

COMMUNICATION PARAMETERS SUBMENU:

Allows the user to adjust Serial Communications Settings of the instrument.
When connecting an instrument to a computer or other device, the Communications Parameters must match. Generally the default settings (as shown in Section 5) should be utilized.

Press 5) Display advances to baud Baud Submenu.

BAUD SUBMENU:

Press 6) Display flashes previous selection for baud value.
Press 7) Scroll through the available selections: 300, 600, 1200, 2400, 4800, 9600, 19.2k.
Press 8) Display shows STRD stored message momentarily and then advances to PRTY only, if it was changed, otherwise press ☞ to advance to PRTY Parity Submenu.

PARITY SUBMENU:

Press 9) Display flashes previous selection for “Parity”.
Press 10) Scroll through the available selections: NO, ODD, EVEN.
Press 11) Display shows STRD stored message momentarily and then advances to DATA only, if it was changed, otherwise press ☞ to advance to DATA Data Bit Submenu.

DATA BIT SUBMENU:

Press 12) Display flashes previous selection for “Data Bit”.
Press 13) Scroll through the available selections: 7-BIT, 8-BIT.
Press 14) Display shows STRD stored message and then advances to STOP only, if it was changed, otherwise press ☞ to advance to STOP Stop Bit Submenu.
STOP BIT SUBMENU:

Press \( \downarrow \) 15) Display flashes previous selection for “Stop Bit”.
Press \( \uparrow \) 16) Scroll through the available selections: 1-BIT, 2-BIT.
Press \( \downarrow \) 17) Display shows STRD stored message momentarily and then advances to BUS.F only, if it was changed, otherwise press \( \downarrow \) to advance to BUS.F Bus Format Submenu.

BUS FORMAT SUBMENU:

Determines Communications Standards and Command/Data Formats for transferring information into and out of the controller via the Serial Communications Bus. Bus Format submenus essentially determine how and when data can be accessed via the Serial Communications of the device.

Press \( \downarrow \) 18) Display advances to M.BUS Modbus Submenu.

MODBUS PROTOCOL SUBMENU:

Press \( \downarrow \) 19) Display flashes previous selection for M.BUS.
Press \( \uparrow \) 20) Scroll through the available selections: NO, YES.
Press \( \downarrow \) 21) Display shows STRD stored message momentarily and then advances to LF only, if it was changed, otherwise press \( \downarrow \) to advance to LF Line Feed submenu.

To select iSeries Protocol, set Modbus submenu to “No”.
To select Modbus Protocol, set Modbus submenu to “Yes”.

If Modbus Protocol was selected, the following Communications Parameters must be set as: No Parity, 8-bit Data Bit, 1-Stop Bit. Do not attempt to change these parameters.

LINE FEED SUBMENU:

Determines if data sent from the instrument will have a Line Feed appended to the end - useful for viewing or logging results on separate lines when displayed on communications software at a computer.

Press \( \downarrow \) 22) Display flashes previous selection for “Line Feed”.
Press \( \uparrow \) 23) Scroll through the available selections: NO, YES.
Press \( \downarrow \) 24) Display shows STRD stored message momentarily and then advances to ECHO only, if it was changed, otherwise press \( \downarrow \) to advance to ECHO Echo Submenu.

ECHO SUBMENU:

When valid commands are sent to the instrument, this determines whether the command will be echoed to the Serial Bus. Use of echo is recommended in most situations, especially to help verify that data was received and recognized by the controller.
Press 25) Display flashes previous selection for “Echo”.
Press 26) Scroll through the available selections: NO, YES.
Press 27) Display flashes stored message momentarily and then advances to only if it was changed, otherwise press to advance to Communication Standard Submenu.

COMMUNICATION INTERFACE STANDARD SUBMENU:

Determines whether device should be connected to an RS-232C serial port (as is commonly used on IBM PC-compatible computers) or via an RS-485 bus connected through appropriate RS-232/485 converter. When used in RS-485 Mode, the device must be accessed with an appropriate Address Value as selected in the Address Submenu described later.

Press 28) Display flashes previous selection for “Standard”.
Press 30) Display shows stored message momentarily and then advances to only, if it was changed, otherwise press to advance to Data Flow Mode Submenu.

DATA FLOW MODE SUBMENU:

Determines whether the instrument will wait for commands and data requests from the Serial Bus or whether the instrument will send data automatically and continuously to the Serial Bus. Devices configured for the RS-485 Communications Standard operate properly only under Command Mode.

Press 31) Display flashes previous selection for “Mode”.
Press 32) Scroll through the available selections: “Command”, “Continuous”.
Press 33) Display shows stored message momentarily and then advances to only, if it was changed, otherwise press to advance to Data Separation Submenu.

DATA SEPARATION CHARACTER SUBMENU:

Determines whether data sent from the device in Continuous Data Flow Mode will be separated by spaces or by Carriage Returns.

Press 34) Display flashes previous selection for “Separation” Submenu.
Press 35) Scroll through the available selections: “Space” or “Carriage Return”.
Press 36) Display shows stored message momentarily and then advances to only, if it was changed, otherwise press to advance to Data Format Submenu.
DATA FORMAT SUBMENU:

Preformatted data can be sent automatically or upon request from the controller. Use the Data Format Submenus to determine what data will be sent in this preformatted data string. Refer to the iSeries Communications Manual for more information about the data format. At least one of the following suboptions must be enabled and hence output data to the Serial Bus.

Note: This menu is applicable for Continuous Mode of RS-232 communication.

Press † 37) Display advances to STAT Alarm Status Submenu.

ALARM STATUS SUBMENU:

Includes Alarm Status bytes in the data string.

Press † 38) Display flashes previous selection for “Status” (alarm status).
Press † 39) Scroll through the available selections: NO, YES.
Press † 40) Display shows STRD stored message momentarily and then advances to RDNG only, if it was changed, otherwise press † to advance to RDNG Reading Submenu.

MAIN READING SUBMENU:

Includes Main Reading in the data string.

Press † 41) Display flashes previous selection for “Reading”.
Press † 42) Scroll through the available selections: NO, YES.
Press † 43) Display shows STRD stored message momentarily and then advances to PEAK only, if it was changed, otherwise press † to advance to PEAK Peak Submenu.

PEAK VALUE SUBMENU:

Includes Peak Value in the data string.

Press † 44) Display flashes previous selection for PEAK Submenu.
Press † 45) Scroll through the available selections: NO, YES.
Press † 46) Display shows STRD stored message momentarily and then advances to VALY only, if it was changed, otherwise press † to advance to VALY Valley Submenu.

VALLEY VALUE SUBMENU:

Includes Valley Value in the data string.

Press † 47) Display flashes previous selection for “Valley”.
Press † 48) Scroll through the available selections: NO, YES.
Press † 49) Display shows STRD stored message momentarily and then advances to UNIT only, if it was changed, otherwise press † to advance to UNIT Temperature Unit Submenu.
TEMPERATURE UNIT SUBMENU:
Includes a byte in the data string to indicate whether reading is in Celsius or Fahrenheit.

Press ☞ 50) Display flashes previous selection for UNIT.
Press ▲ 51) Scroll through the available selections: NO, YES.
Press ● 52) Display shows STORED stored message momentarily and then advances to ADDR only, if it was changed, otherwise press ● to advance to ADDR Address Setup Submenu.

ADDRESS SETUP SUBMENU:
Note This menu is applicable to the RS-485 Option only.

Press ○ 53) Display advances to “Address Value” (0000 to 0199) Submenu.

ADDRESS VALUE SUBMENU:

Press ○ 54) Display flashes 1st digit of previously stored Address Value.
Press ▲ & ▼ 55) Press ▲ and ▼ to enter new “Address Value”.
Press ● 56) Display shows STORED stored message momentarily and then advances to ER,EM only, if it was changed, otherwise press ● to advance to ER,EM Transmit Time Interval Submenu.

TRANSMIT TIME INTERVAL SUBMENU:
Note This menu is applicable if “Continuous” Mode was selected in the “Data Flow Mode” Submenu and the device is configured as an RS-232C Standard device. Also, one or more options under the Data Format Submenu must be enabled.

Press ○ 57) Display advances to “Transmit Time Value” Submenu.

TRANSMIT TIME INTERVAL VALUE SUBMENU:
Determines the interval at which data will be emitted to the RS-232 Serial Bus when the instrument is in Continuous Data Flow Mode.

Press ▲ & ▼ 59) Press ▲ and ▼ to enter new “Transmit Time Value”, e.g. 0030 will send the data every 30 seconds in Continuous Mode.
Press ● 60) Display shows STORED stored message momentarily and then advances to CLR only, if it was changed, otherwise press ● to advance to CLR Color Display Selection Menu.

Note For more details, refer to the Communication Manual available at the website listed in the cover page of this manual or on the CD-ROM enclosed with your shipment.
3.2.15 DISPLAY COLOR SELECTION

This submenu allows the user to select the color of the display.

![Flow Chart for Display Color Selection](image)

**ENTER DISPLAY COLOR SELECTION MENU:**

- Press 1) Press , if necessary, until prompt appears.
- Press 2) Display advances to Input Menu.
- Press 3) Press , if necessary, until Display advances to Display Color Selection Menu.
- Press 4) Display advances to Normal Color Submenu.

**NORMAL COLOR DISPLAY SUBMENU:**

- Press 5) Display flashes the previous selection for “Normal Color”.
- Press 6) Scroll through the available selections: GRN, RED or AMBR.
- Press 7) Display shows stored message momentarily and then advances to only, if it was changed, otherwise press to advance to Alarm 1 Display Color Submenu.

The menu below allows the user to change the color of display when alarm is triggered.

**ALARM 1 DISPLAY COLOR SUBMENU:**

- Press 8) Display flashes previous selection for “Alarm 1 Color Display”.
- Press 9) Scroll through the available selections: GRN, RED or AMBR.
- Press 10) Display shows stored message momentarily and then advances to only, if it was changed, otherwise press to advance to Alarm 2 Display Color Submenu.
ALARM 2 DISPLAY COLOR SUBMENU:

Press d 11) Display flashes previous selection for “Alarm 2 Color Display”.
Press a 12) Scroll through the available selections: GRN, RED or AMBR.
Press d 13) Display shows STRD stored message momentarily and then momentarily shows the software version number, followed by RST Reset, and then proceeds to the Run Mode.

IN ORDER TO DISPLAY ONE COLOR, SET THE SAME DISPLAY COLOR ON ALL THREE SUBMENUS ABOVE.

If user wants the Display to change color every time when both Alarm 1 and Alarm 2 are triggered, the Alarm values should be set in such a way that Alarm 1 value is always on the top of Alarm 2 value, otherwise value of Alarm 1 will overwrite value of Alarm 2 and Display Color would not change when Alarm 2 is triggered.

Example 1:
Output 1 & Output 2 = SSR
Alarm Setup: Absolute, Above, Alarm 2 HI Value “ALR.H” = 200, Alarm 1 HI Value “ALR.H” = 400

Display Colors change sequences:

<table>
<thead>
<tr>
<th>GREEN</th>
<th>RED</th>
<th>AMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>AL2.H = 200</td>
<td>AL1.H = 400</td>
</tr>
</tbody>
</table>

Example 2:
Output 1 & Output 2 = Pulse
Alarm Setup: Absolute, Below, Alarm 2 Low Value “ALR.L” = 300, Alarm 1 Low Value “ALR.L” = 100
Color Display Setup: "N.CLR" = Green, "1.CLR" = Amber, "2.CLR" = Red

Display Colors change sequences:

<table>
<thead>
<tr>
<th>AMBER</th>
<th>RED</th>
<th>GREEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>AL1.L = 100</td>
<td>AL2.L = 300</td>
</tr>
</tbody>
</table>
Example 3:
Output 1 = Analog Output (Alarm 1 disabled), Setpoint 1 = 300,
Output 2 = Relay, Setpoint 2 = 200
Alarm 1 & 2 Setup: Deviation, Band, “ALR.H” = 10

Display Colors change sequences:

<table>
<thead>
<tr>
<th>RED</th>
<th>RED</th>
<th>RED</th>
<th>GREEN</th>
<th>RED</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>190</td>
<td>200</td>
<td>210</td>
<td>290</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>300</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>310</td>
</tr>
</tbody>
</table>

Tip
Alarm 1 is designed to monitor the Process Value around the Setpoint 1.
Alarm 2 is designed to monitor the Process Value around the Setpoint 2.
If Analog Output Option board is installed (Alarm 1 is disabled), only
Alarm 2 is active and only two colors are available.

Example 4:
Output 1 = Relay, Setpoint 1 = 200
Output 2 = Relay, Setpoint 2 = 200
Alarm 1 Setup: Deviation, Band, “ALR.H” = 20
Alarm 2 Setup: Deviation, Hi/Low, “ALR.H” = 10, “ALR.L” = 5

Display colors change sequences:

<table>
<thead>
<tr>
<th>AMBER</th>
<th>RED</th>
<th>GREEN</th>
<th>GREEN</th>
<th>RED</th>
<th>AMBER</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>180</td>
<td>195</td>
<td>200</td>
<td>210</td>
<td>220</td>
</tr>
</tbody>
</table>

Note
Reset: The instrument automatically resets after the last menu of
the Configuration Mode has been entered. After the instrument
resets, it advances to the Run Mode.
PART 4
SPECIFICATIONS

Accuracy
±0.5°C temp; 0.03% reading process

Resolution
1°/0.1°; 10 µV process

Temperature Stability
1) RTD: 0.04°C/°C
2) TC @ 25°C (77°F): 0.05°C/°C
- Cold Junction Compensation
3) Process: 50 ppm/°C

NMRR
60 dB

CMRR
120 dB

A/D Conversion
Dual slope

Reading Rate
3 samples per second

Digital Filter
Programmable

Display
4-digit or 6-digit, 7-segment LED
57.2 mm (2.25”) or 101.6mm (4.00”)
red, green and amber programmable
colors for process variable, set point
and temperature units

Warm up to Rated Accuracy
60 min.

CONTROL
Action
Reverse (heat) or direct (cool)

Modes
Time and Amplitude Proportional
Control Modes; selectable Manual
or Auto PID, Proportional,
Proportional with Integral,
Proportional with Derivative with
Anti-reset Windup and ON/OFF
Rate
0 to 399.9 seconds

Reset
0 to 3999 seconds

Cycle Time
1 to 199 seconds; set to 0 for
ON/OFF operation

Gain
0.5 to 100% of span; Setpoints 1
or 2

Damping
0000 to 0008

Soak
00.00 to 99.59 (HH:MM), or OFF

Ramp to Setpoint
00.00 to 99.59 (HH:MM), or OFF

Auto Tune
Operator initiated from front panel

INPUT
Input Types
Thermocouple, RTD, Analog Voltage,
Analog Current

Thermocouple Type (ITS 90)

Thermocouple Lead Resistance
100 ohm max

RTD Input (ITS 68)
100/500/1000 Ω Pt sensor, 2-, 3- or
4-wire; 0.00385 or 0.00392 curve

Voltage Input
0 to 100 mV, 0 to 1 V, 0 to 10 Vdc

Input Impedance
10 MΩ for 100 mV
1 MΩ for 1 or 10 Vdc

Current Input
0 to 20 mA (5 ohm load)
CONTROL OUTPUT 1 & 2
Relay
250 Vac or 30 Vdc @ 3 A
(Resistive Load); configurable for on/off, PID and Ramp and Soak
Output 1: SPDT type, can be configured as Alarm 1 output
Output 2: SPDT type, can be configured as Alarm 2 output
SSR
20-265 Vac @ 0.05-0.5 A
(Resistive Load); continuous
DC Pulse
Non-Isolated; 10 Vdc @ 20 mA
Analog Output (Output 1 only)
Non-Isolated, Proportional 0 to 10 Vdc or 0 to 20 mA; 500 Ω max

COMMUNICATIONS (optional)
RS-232 or RS-485 programmable
300 to 19.2 K baud; complete programmable setup capability; program to transmit current display, alarm status, Peak and Valley value.
RS-485
Addressable from 0 to 199
Connection
Screw terminals

ALARM 1 & 2 (programmable):
Type
Same as Output 1 & 2
Operation
High/low, above/below, band, latch/unlatch, normally open/normally closed and process/deviation; front panel configurations

ANALOG OUTPUT (programmable)
Non-Isolated, Retransmission 0 to 10 Vdc or 0 to 20 mA, 500 Ω max (Output 1 only). Accuracy is ± 1% of FS when following conditions are satisfied.
1) Input is not scaled below 1% of Input FS.
2) Analog Output is not scaled below 3% of Output FS.

EXCITATION
(optional in place of Communication)
24 Vdc @ 25 mA

INSULATION
Power to Input/Output
2500 Vac per 1 minute test
(RS-232/485, Input or Output)
Between Inputs
500 Vac per 1 minute test
Approvals
See Approval Section

GENERAL
Power
100-240 Vac +/-10%, 50/60 Hz
22.5 W
Fuse
4A, 250V, GFE, 5x20mm
Environmental Conditions
0 to 40°C (32 to 104°F), 90% RH non-condensing
Installation Category
II per EN61010-1
Equipment Class
I per EN61010-1
Pollution Degree
2 per EN61010-1
Protection
NEMA-4x (IP65) front bezel
Dimensions and Panel Cutout
Refer to Quickstart Specifications.
Weight
Refer to Quickstart Specifications.
### Table 4.1 Input Properties

<table>
<thead>
<tr>
<th>TC</th>
<th>Input Type</th>
<th>Range</th>
<th>Accuracy*</th>
</tr>
</thead>
<tbody>
<tr>
<td>J</td>
<td>Iron-Constantan</td>
<td>-210 to 760°C</td>
<td>0.4°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-346 to 1400°F</td>
<td>0.7°F</td>
</tr>
<tr>
<td>K</td>
<td>CHROMEGA&lt;sub&gt;TM&lt;/sub&gt;-ALOMEGA&lt;sub&gt;TM&lt;/sub&gt;</td>
<td>-270 to -160°C</td>
<td>1.0°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-160 to 1372°C</td>
<td>0.4°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-454 to -256°F</td>
<td>1.8°F</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-256 to 2502°F</td>
<td>0.7°F</td>
</tr>
<tr>
<td>T</td>
<td>Copper-Constantan</td>
<td>-270 to -190°C</td>
<td>1.0°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-190 to 400°C</td>
<td>0.4°C</td>
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<tr>
<td></td>
<td></td>
<td>-454 to -310°F</td>
<td>1.8°F</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-310 to 752°F</td>
<td>0.7°F</td>
</tr>
<tr>
<td>E</td>
<td>CHROMEGA-Constantan</td>
<td>-270 to -220°C</td>
<td>1.0°C</td>
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<td></td>
<td></td>
<td>-220 to 1000°C</td>
<td>0.4°C</td>
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<td>-454 to -364°F</td>
<td>1.8°F</td>
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<tr>
<td></td>
<td></td>
<td>-364 to 1832°F</td>
<td>0.7°F</td>
</tr>
<tr>
<td>R</td>
<td>Pt/13%Rh-Pt</td>
<td>-50 to 40°C</td>
<td>1.0°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>40 to 1788°C</td>
<td>0.5°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-58 to 104°F</td>
<td>1.8°F</td>
</tr>
<tr>
<td></td>
<td></td>
<td>104 to 3250°F</td>
<td>0.9°F</td>
</tr>
<tr>
<td>S</td>
<td>Pt/10%Rh-Pt</td>
<td>-50 to 100°C</td>
<td>1.0°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100 to 1768°C</td>
<td>0.5°C</td>
</tr>
<tr>
<td></td>
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<td>-58 to 212°F</td>
<td>1.8°F</td>
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<tr>
<td></td>
<td></td>
<td>212 to 3214°F</td>
<td>0.9°F</td>
</tr>
<tr>
<td>B</td>
<td>30%Rh-Pt/6%Rh-Pt</td>
<td>200 to 640°C</td>
<td>1.0°C</td>
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<tr>
<td></td>
<td></td>
<td>640 to 1820°C</td>
<td>0.5°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>212 to 1184°F</td>
<td>1.8°F</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1184 to 3308°F</td>
<td>0.9°F</td>
</tr>
<tr>
<td>C</td>
<td>5%Re-W/26%Re-W</td>
<td>0 to 2354°C</td>
<td>0.4°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>32 to 4253°F</td>
<td>0.7°F</td>
</tr>
<tr>
<td>N</td>
<td>Nicrosil-Nisil</td>
<td>-250 to -100°C</td>
<td>1.0°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-100 to 1300°C</td>
<td>0.4°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-418 to -148°F</td>
<td>1.8°F</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-148 to 2372°F</td>
<td>0.7°F</td>
</tr>
<tr>
<td>L</td>
<td>J, DIN</td>
<td>-200 to 900°C</td>
<td>0.4°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-328 to 1652°F</td>
<td>0.7°F</td>
</tr>
<tr>
<td>RTD</td>
<td>Pt, 0.00385, 100 Ω, 500 Ω, 1000 Ω</td>
<td>200 to 900°C</td>
<td>0.4°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>200 to 1652°F</td>
<td>0.7°F</td>
</tr>
<tr>
<td>RTD</td>
<td>Pt, 0.00392, 100 Ω, 500 Ω, 1000 Ω</td>
<td>-200 to 850°C</td>
<td>0.4°C</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-328 to 1562°F</td>
<td>0.7°F</td>
</tr>
<tr>
<td>PROCESS</td>
<td>Voltage</td>
<td>0 to 100 mV, 0 to 1 V, 0 to 10 Vdc</td>
<td>0.03% rdg</td>
</tr>
<tr>
<td>PROCESS</td>
<td>Current</td>
<td>0 to 20 mA, 4 to 20 mA</td>
<td>0.03% rdg</td>
</tr>
</tbody>
</table>
### Table 5.1 Factory preset value

<table>
<thead>
<tr>
<th>MENU ITEMS</th>
<th>FACTORY PRESET VALUES</th>
<th>NOTES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Set Point 1 (SP1)</td>
<td>000.0</td>
<td></td>
</tr>
<tr>
<td>Set Point 2 (SP2)</td>
<td>000.0</td>
<td></td>
</tr>
<tr>
<td><strong>Input:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input Type (INPT)</td>
<td>TC, type K</td>
<td></td>
</tr>
<tr>
<td><strong>Reading Configuration (RDG):</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Decimal Point (DEC.P)</td>
<td>FFF.F</td>
<td></td>
</tr>
<tr>
<td>Temperature unit (TEMP)</td>
<td>°F</td>
<td></td>
</tr>
<tr>
<td>Filter value (FLTR)</td>
<td>0004</td>
<td></td>
</tr>
<tr>
<td><strong>Alarm 1 &amp; 2:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alarm 1 (ALR1), Alarm 2 (ALR2)</td>
<td>Disable (DSBL)</td>
<td></td>
</tr>
<tr>
<td>Absolute/Deviation (ABSO/DEV)</td>
<td>Absolute (ABSO)</td>
<td></td>
</tr>
<tr>
<td>Latch/Unlatch (LTCH/UNLT)</td>
<td>Unlatch (UNLT)</td>
<td></td>
</tr>
<tr>
<td>Contact Closure (CT.CL)</td>
<td>Normally Open (N.O.)</td>
<td></td>
</tr>
<tr>
<td>Active (ACTV)</td>
<td>Above (ABOV)</td>
<td></td>
</tr>
<tr>
<td>Alarm At Power On (A.P.ON)</td>
<td>Disable (DSBL)</td>
<td>Alarm 1 only</td>
</tr>
<tr>
<td>Alarm Low (ALR.L)</td>
<td>-100.0</td>
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</tr>
<tr>
<td>Alarm High (ALR.H)</td>
<td>400.0</td>
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<tr>
<td><strong>LOOP:</strong></td>
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<td></td>
</tr>
<tr>
<td>Loop Break Time (LOOP)</td>
<td>Disable (DSBL)</td>
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</tr>
<tr>
<td>Loop Value (B.TIM)</td>
<td>00:59</td>
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</tr>
<tr>
<td>Reading Adjust Value (R.ADJ)</td>
<td>000.0</td>
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</tr>
<tr>
<td><strong>ANALOG OUTPUT (Retransmission):</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Analog Output (ANLG)</td>
<td>Enabled (ENBL)</td>
<td></td>
</tr>
<tr>
<td>Current/Voltage (CURR/VOLT)</td>
<td>Voltage (VOLT)</td>
<td></td>
</tr>
<tr>
<td>Scale and Offset Reading:</td>
<td>Reading: 0 - 999.9 cts, Output: 0 - 10 V</td>
<td></td>
</tr>
<tr>
<td><strong>OUTPUT 1 &amp; 2:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self (SELF)</td>
<td>Disabled (DSBL)</td>
<td>Output 1 only</td>
</tr>
<tr>
<td>% Low Value (%LO)</td>
<td>0000</td>
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<tr>
<td>% High Value (%HI)</td>
<td>0099</td>
<td>Output 1 only</td>
</tr>
<tr>
<td>Control Type (CTRL)</td>
<td>On/Off</td>
<td></td>
</tr>
<tr>
<td>Action Type (ACTN)</td>
<td>Reverse (RVRS)</td>
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</tr>
<tr>
<td>Dead Band (DEAD)</td>
<td>020.0</td>
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<tr>
<td>PID Auto (AUTO)</td>
<td>Disable (DSBL)</td>
<td>Output 1 only</td>
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<tr>
<td>Anti Integral (ANTI)</td>
<td>Disable (DSBL)</td>
<td>Output 1 only</td>
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<td>Proportion Value (PROP)</td>
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<tr>
<td>Reset Value (REST)</td>
<td>0180</td>
<td>Output 1 only</td>
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<tr>
<td>Rate Value (RATE)</td>
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<td>Output 1 only</td>
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<tr>
<td>Cycle Value (CYCL)</td>
<td>0007</td>
<td></td>
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<tr>
<td>Damping Factor (DPNG)</td>
<td>0003</td>
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</tr>
<tr>
<td>MENU ITEMS</td>
<td>FACTORY PRESET VALUES</td>
<td>NOTES</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>-----------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Ramp &amp; Soak (RAMP):</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ramp (RAMP)</td>
<td>Disable (DSBL)</td>
<td></td>
</tr>
<tr>
<td>Soak (SOAK)</td>
<td>Disable (DSBL)</td>
<td></td>
</tr>
<tr>
<td>Ramp Value (RAMP)</td>
<td>00:00</td>
<td></td>
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<tr>
<td>Soak Value (SOAK)</td>
<td>00:00</td>
<td></td>
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<tr>
<td>ID:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ID Value</td>
<td>0000</td>
<td></td>
</tr>
<tr>
<td>Full ID (FULL)</td>
<td>Disable (DSBL)</td>
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</tr>
<tr>
<td>Set Point ID (ID.SP)</td>
<td>Disable (DSBL)</td>
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<td>Communication Parameters:</td>
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<td>Baud Rate (BAUD)</td>
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<tr>
<td>Parity (PRTY)</td>
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<tr>
<td>Data bit (DATA)</td>
<td>7 bit</td>
<td></td>
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<tr>
<td>Stop Bit</td>
<td>1 bit</td>
<td></td>
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<tr>
<td>Modbus Protocol (M.BUS)</td>
<td>No</td>
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<tr>
<td>Line Feed (LF)</td>
<td>No</td>
<td></td>
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<tr>
<td>Echo (ECHO)</td>
<td>Yes</td>
<td></td>
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<tr>
<td>Standard Interface (STND)</td>
<td>RS-232 (232C)</td>
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</tr>
<tr>
<td>Command Mode (MODE)</td>
<td>Command (CMD)</td>
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<tr>
<td>Separation (SEPR)</td>
<td>Space (SPCE)</td>
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<tr>
<td>Alarm Status (STAT)</td>
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<tr>
<td>Reading (RDNG)</td>
<td>Yes</td>
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<tr>
<td>Peak</td>
<td>No</td>
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<td>Valley (VALY)</td>
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<tr>
<td>Units (UNIT)</td>
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<tr>
<td>Multipoint Address (ADDR)</td>
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<tr>
<td>Transmit Time (TR.TM)</td>
<td>0016</td>
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<tr>
<td>Display Color (COLR):</td>
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<tr>
<td>Normal Color (N.CLR)</td>
<td>Green (GRN)</td>
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<tr>
<td>Alarm 1 Color (1.CLR)</td>
<td>Red (RED)</td>
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<tr>
<td>Alarm 2 Color (2.CLR)</td>
<td>Amber (AMBR)</td>
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</tr>
</tbody>
</table>
1. Electromagnetic Compatibility (EMC)

This device conforms with requirements of EMC Directive 89/336/EEC, amended by 93/68/EEC. This instrument complies with the following EMC Immunity Standards as tested per EN 61326-2:1998 (Industrial Locations)

<table>
<thead>
<tr>
<th>Phenomena</th>
<th>Test Specification</th>
<th>Basic Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrostatic Discharge</td>
<td>+/- 4 kV contact discharge</td>
<td>IEC 1000-4-2 Performance Criteria B</td>
</tr>
<tr>
<td></td>
<td>+/- 8 kV air discharge</td>
<td></td>
</tr>
<tr>
<td>Radio Frequency electromagnetic field.</td>
<td>27 - 1000 MHz 3 V/m 80% AM (1 KHz)</td>
<td>IEC 1000-4-3 Performance Criteria A</td>
</tr>
<tr>
<td>Fast Transients</td>
<td>+/- 2 kV (ac mains) +/- 1 kV (dc, signal I/O) 5/50 ns Tr/Th, 5 KHz rep. freq.</td>
<td>IEC 1000-4-4 Performance Criteria B</td>
</tr>
<tr>
<td>Surge</td>
<td>+/- 1.0 kV AC Port L-L +/- 2.0 kV AC Port L-PE +/- 1.0 kV DC Port L-L +/- 2.0 kV DC Port L-PE</td>
<td>IEC 1000-4-5 Performance Criteria B</td>
</tr>
<tr>
<td>Radio Frequency conducted</td>
<td>0.15 - 80 MHz 3 Vrms 80% AM (1 KHz)</td>
<td>IEC 1000-4-6 Performance Criteria A</td>
</tr>
</tbody>
</table>

This instrument complies with the following EMC Emission Standards as tested per EN 61326-2:1998 (Class B equipment)

<table>
<thead>
<tr>
<th>Phenomena</th>
<th>Frequency Range</th>
<th>Limits</th>
<th>Basic Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Radiated Emission</td>
<td>30-230 MHz 230-1000 MHz</td>
<td>30 dB_V/m at 10 m 37 dB_V/m at 10 m quasi peak</td>
<td>CISPR 22 Class B</td>
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<tr>
<td>Conducted Emission</td>
<td>0.15-0.5 MHz 0.5-5 MHz 5-30 MHz</td>
<td>66-56 dB_V quasi peak 56 dB_V quasi peak 60 dB_V quasi peak</td>
<td>CISPR 22 Class B</td>
</tr>
</tbody>
</table>

2. Safety

This device conforms with Low Voltage Directive 73/23/EEC, amended by 93/68/EEC. The following LVD requirements have been met to comply with EN 61010-1, 1993 (Electrical equipment for measurement, control and laboratory use)

1. Pollution Degree 2
2. Installation Category II
3. Class I Equipment (100-240 Vac Powered Units)
WARRANTY/DISCLAIMER

OMEGA ENGINEERING, INC. warrants this unit to be free of defects in materials and workmanship for a period of 61 months from date of purchase. OMEGA's WARRANTY adds an additional one (1) month grace period to the normal five (5) 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.

OMEGA is pleased to offer suggestions on the use of its various products. However, OMEGA neither assumes responsibility for any omissions or errors nor assumes liability for any damages that result from the use of its products in accordance with information provided by OMEGA, either verbal or written. OMEGA warrants only that the parts manufactured by the company will be as specified and free of defects. OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED. LIMITATION OF LIABILITY: The remedies of purchaser set forth herein are exclusive, and the total liability of OMEGA with respect to this order, whether based on contract, warranty, negligence, indemnification, strict liability or otherwise, shall not exceed the purchase price of the component upon which liability is based. In no event shall OMEGA be liable for consequential, incidental or special damages.

CONDITIONS: Equipment sold by OMEGA is not intended to be used, nor shall it be used: (1) as a “Basic Component” under 10 CFR 21 (NRC), used in or with any nuclear installation or activity; or (2) in medical applications or used on humans. Should any Product(s) be used in or with any nuclear installation or activity, medical application, used on humans, or misused in any way, OMEGA assumes no responsibility as set forth in our basic WARRANTY/DISCLAIMER language, and, additionally, purchaser will indemnify OMEGA and hold OMEGA harmless from any liability or damage whatsoever arising out of the use of the Product(s) in such a manner.

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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