INSTRUCTIONS FOR THE 32DZ SERIES 1/32 DIN DUAL ZONE MICROPROCESSOR BASED TEMPERATURE /PROCESS CONTROL
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MODEL IDENTIFICATION

Model 3 2 D Z

Input 1
1 = Thermocouple J,K,E,L,N
2 = Thermocouple T,R,S,B,C
4 = 1000 Ohm RTD
5 = Current, 0 or 4 to 20 mA
6 = Voltage, 0 or 2 to 10 V

Input 2
1 = Thermocouple J,K,E,L,N
2 = Thermocouple T,R,S,B,C
4 = 1000 Ohm RTD
5 = Current, 0 or 4 to 20 mA
6 = Voltage, 0 or 2 to 10 V

Options:

Output B
1 = SSR
2 = Switched Voltage 5 Vdc
3 = Relay
8 = DC SSR

Output A
1 = SSR
2 = Switched Voltage 5 Vdc
3 = Relay
5 = Proportional current
8 = DC SSR

Options:

992 RS-485 Serial Communications. Allows remote computer to read and write all control parameters.
9502 12 - 24 Vdc/Vac 50-400Hz power supply (control operates on low voltage equipment).

INSTALLATION

All models are designed for mounting in an enclosed panel. Select the position desired for the instrument on the panel. If more than one instrument is required, maintain the minimum of spacing requirements as shown on the drawing opposite. Closer spacing will structurally weaken the panel, and invalidate the IP66, UL type 4 rating of the panel.

It is not necessary to remove the instrument chassis from the housing for installation. If the instrument chassis is removed from the housing, you must follow the ANSI/IPC-A-610 standard for handling electronic assemblies to avoid damage from Electro-Static Discharge (ESD). Failure to properly handle the instrument may cause damage to the instrument.
Prepare the panel by cutting and deburring the required opening(s).

From the front of the panel, slide the housing through the cutout. The housing gasket should be flat against the housing flange before installing.

From the rear of the panel slide the mounting collar over the housing. Hold the housing with one hand and using the other hand, push the collar evenly against the panel until the spring loops are slightly compressed. The ratchets will hold the mounting collar and housing in place. To remove, gently lift the ratchets and slide a piece of heavy paper or mylar sheet under each ratchet (a business card works well). Slide the collar off of the housing.
WIRING

WARNING: The inputs of the instrument are not isolated from each other. The input sources must be isolated from each other. Thermocouples MUST be of the isolated junction type. Process inputs may not share a common external ground.

FAILURE TO OBSERVE THIS WARNING MAY CAUSE DANGEROUS OR LETHAL VOLTAGES TO BE PRESENT IN THE INSTRUMENT WHICH MAY CAUSE SERIOUS INJURY OR DEATH.

DO NOT RUN SIGNAL (CLASS 2) WIRING IN THE SAME CONDUIT OR CHASE AS THE POWER WIRING. ERRATIC OPERATION OR DAMAGE TO THE INSTRUMENT CIRCUITRY WILL RESULT.

Use only the type of thermocouple or RTD probe for which the control has been programmed. Maintain separation between wiring of sensor, auxiliary in or out, and other wiring. See the "Secure Menu" for input selection.

For thermocouple input always use extension leads of the same type designated for your thermocouple.

For supply connections use No. 18 AWG wires rated for at least 75°C. Use copper conductors only. All line voltage output circuits must have a common disconnect and be connected to the same pole of the disconnect.

Input wiring for thermocouple, voltage, current, and RTD; and output wiring for current, DC SSR, and 5 VDC is rated CLASS 2.
Control wiring is as shown.

The wiring terminals for the 32DZ are compression type. To open the wiring terminal, turn the screw for that terminal counterclockwise. Slide the wire into the terminal space. While holding the wire in place, turn the screw clockwise to tighten. Maximum torque is 0.424 N·m (3.75 in. lb.). Do not overtighten. The wire should be held snugly in place.

Wiring for Optional Inputs and Outputs

Wire power and outputs as shown. Wiring for options is shown below. All wiring shown below is Class 2. Shielded twisted pair is required for Option 992.

Option 992: Terminal 5 is line A (-). Terminal 6 is line B (+). Last control in chain must have 120 ohm ± 1% resistor across 5 and 6.

Option 9502: Connect 12 to 24 Volt ac or dc power to terminals 11 and 12. No polarity.

Note: Industry standard designation for RS-485 lines is A and B. Some equipment manufacturers use a non-standard designation of plus and minus. The association of A to minus and B to plus is based on a sample of devices marked as plus and minus and is not intended to represent ALL such labelled devices. Final responsibility for correct identification of leads and terminals rests with the user/installer and the manufacturer of the other device(s) installed in the system.
Wiring for 4 to 20mA Transmitter inputs

**WARNING:** The inputs of the instrument are not isolated from each other. The input sources must be isolated from each other. Process inputs may not share a common external ground.

FAILURE TO OBSERVE THIS WARNING MAY CAUSE DANGEROUS OR LETHAL VOLTAGES TO BE PRESENT IN THE INSTRUMENT WHICH MAY CAUSE SERIOUS INJURY OR DEATH.

Wire power and outputs as shown above. Two-wire transmitters wire as shown below.

For three or four wire transmitters follow the wiring instructions provided with your transmitter.

**DO NOT WIRE THE 24 VOLT POWER SUPPLY ACROSS THE INPUT OF THE CONTROL. DAMAGE TO THE INSTRUMENT INPUT CIRCUITRY WILL RESULT.**
The decimal point flashes when Self-Tune is operating.

Keys are illuminated when pressed. Key functions are as follows:

- **INDEX:** Pressing the INDEX key advances the display to the next menu item. May also be used in conjunction with other keys as noted below.

- **UP ARROW:** Increments a value, changes a menu item, or selects the item to ON. The maximum value obtainable is 9999 regardless of decimal point placement.

- **DOWN ARROW:** Decrements a value, changes a menu item, or selects the item to OFF. The minimum value obtainable is -1999 regardless of decimal point placement.

- **ENTER:** Pressing ENTER stores the value or the item changed. If not pressed, the previously stored value or item will be retained. The display will flash once when ENTER is pressed.

- **UP ARROW & ENTER:** Pressing these keys simultaneously brings up the secondary menu starting at the alarm, tune, or cycle item (depending on programming). Pressing these keys for 5 seconds will bring up the secure menu.

- **INDEX & DOWN ARROW:** Pressing these keys simultaneously will allow backing up one menu item, or if at the first menu item they will cause the display to return to the primary menu. If an alarm condition has occurred, these keys may be used to reset the alarm.

- **INDEX & ENTER:** Pressing these keys simultaneously and holding them for 5 seconds allows recovery from the various error messages. The following menu items will be reset:
  
  - **OPEN InP:** Input error message
  - **bAd InP:** Input error message
  - **CHEC CAL:** Check calibration error

Correct the problems associated with the above conditions before using these reset keys. More than one error could be present. Caution is advised since several items are reset at one time.

While in the **Primary or Secondary Menu**, if no key is pressed for a period of 30 seconds, the display will return to the HOME position displaying the
temperature value. While in the **Secure Menu**, if no key is pressed for a period of 60 seconds, the display will return to the HOME position displaying the temperature value. Outputs are disabled (turned off) when the **Secure Menu** is active.

**NOTE:** To move to the **Primary Menu** quickly from any other menu, press the **UP ARROW** & **ENTER** keys followed by pressing the **INDEX** & **DOWN ARROW** keys.

### SECURITY LEVEL SELECTION

Four levels of security are provided. The display shows the current security level. To change security levels change the password value using the **UP ARROW** and **DOWN ARROW** keys and pressing the **ENTER** key. Refer to the password table (following) for the correct value to enter for the security level desired. The **SEC 1** or **SEC2** menu items security level may be viewed or changed at any time regardless of the present security level.

To set the access level to, for example, `2`, at the **SEC 1** menu item press the **UP ARROW** key until the upper display shows the password, `1101`. Press the **ENTER** key. The display will blink, and return with the level value, `2`, in the upper display.

The password values shown in the table cannot be altered, so retain a copy of these pages for future reference. This is the only reference made to password values in this instruction book.

### PASSWORD TABLE

<table>
<thead>
<tr>
<th>Menu</th>
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<td>Primary</td>
<td>Locked</td>
<td>1</td>
<td><code>110</code></td>
</tr>
<tr>
<td>Secondary</td>
<td>Locked</td>
<td>2</td>
<td><code>1101</code></td>
</tr>
<tr>
<td>Secure</td>
<td>Locked</td>
<td>3</td>
<td><code>1011</code></td>
</tr>
<tr>
<td>Primary</td>
<td>Unlocked</td>
<td>4</td>
<td><code>111</code></td>
</tr>
<tr>
<td>Secondary</td>
<td>Locked</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secure</td>
<td>Unlocked</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
NOTATION CONVENTIONS FOR THE MENUS

Because of the number of features available in this control, information is included that may not apply to your specific control. All usable features are included in this book, but may not be used in your process. To increase clarity the following conventions are used:

1. Certain features, Menu Items, and functions shown in this book may or may not appear on your control, depending on other Menu Item selections. At various places in the Menus there are notes identifying Menu Items that "control" or "direct" other menu items. If you are looking for a particular menu item and can't find it, check the menu item that is its "control" for proper setting.

2. The "#" symbol is used in two ways. It is used inside a group of characters to indicate which set point function (SP1 or SP2) is being affected. It is also used before a group of characters of a menu item to indicate that there may be more than one selection or value for that menu item. This is used for certain repeated items such as in the Ramp/Soak Program section.

3. Features that apply only to Options will be printed in Italics.

THE HOME DISPLAY

The home display is the normal display while the control is operating. If no errors or functions are active, the HOME display will indicate the Process Variable (the temperature, pressure, flow, RH, etc., that is being measured) for Set Point 1 on the top display and the Process Variable for Set Point 2 on the bottom.

THE MENU EDIT FUNCTION

The Menu Edit function (Edit) allows quick access to operational and set up menu items for either or both of the zones. The Edit menu item appears at the top of the Secondary Menu and allows selection of the set point parameters. Setting Edit to 0 allows access to only the Peak (PEA1 and PEA2), Valley (VAL1 and VAL2), Local/Remote (LR), and address (Addr) menu items.

Setting Edit for either 1 or 2 allows access to the Secondary and Secure Menus for the zone selected.

Setting Edit for 3 allows access to both the Secondary and Secure Menus for both Zone 1 and Zone 2. Each menu presents the menu items for Zone 1 first, followed by the menu items for Zone 2, followed by any common menu items that may be present.
Menu items that are dedicated to either Zone 1 or Zone 2 will have either a 1 or 2 in them for identification.

If $\mathcal{E} \mathcal{d} \kappa$ is set to any value other than $\mathcal{D}$, the setting will be retained for a period of five minutes to allow handy, repeated access to that zone’s menus. After five minutes of keypad inactivity, the $\mathcal{E} \mathcal{d} \kappa$ setting will revert to $\mathcal{D}$, giving an added layer of security to prevent inadvertent changes to the instrument.

**PROGRAMMING SET POINTS FOR ALARM FUNCTIONS**

Caution: In any critical application where failure could cause expensive product loss or endanger personal safety, a redundant limit controller is required.

The 32DZ Series allows Zone 1 and / or Zone 2 to operate as limit or alarm type outputs. This function is available on both outputs. To enable a zone output to act as an alarm or limit, $\text{Out 1 (for Zone 1)}$ or $\text{Out 2 (for Zone 2)}$ should be set for $\text{OnOF}$.

When $\text{Out 1 and / or Out 2}$ are set to $\text{OnOF}$, then the alarm function menu items will appear in the Secure Menu for the selected zone(s).

When Set Point Power Interrupt ($\text{S#P}$) is programmed $\text{On}$ and Set Point Reset ($\text{S#rE}$) is programmed for $\text{Hold}$, the alarm will automatically reset after a power failure and on subsequent power restoration if no alarm condition is present.

If Set Point Inhibit ($\text{S#iH}$) is selected $\text{On}$, an alarm condition is suspended upon power up until the process value passes through the alarm set point once. Alarm inhibit can be restored as if a power up took place by pressing both the $\text{INDEX}$ and $\text{ENTER}$ keys for 5 seconds.

Warning: If inhibit is on and a power failure occurs during a high alarm, on restoration of power inhibit will suppress the alarm. Do not use the Set Point Inhibit feature if a hazard may be created by this action. Be sure to test all combinations of high and low set point inhibit actions before placing control into operation.
Set Point 2 Tracking

Some applications will call for Set Point 2 to follow or ‘track’ the setting for Set Point 1. This can be done by changing the \( S_{2t} \) setting in the Secure Menu (\( Ed \) \( t \) set for 2 or 3). For a tracking \( SP_2 \), set \( S_{2t} \) to \( dE \).

The Factory Default setting for \( S_{2t} \) is \( AbS \), making \( SP_2 \) completely independent of \( SP_1 \).

When setting \( SP_2 \) value when Set Point 2 is programmed as deviation (\( S_{2t} = dE \)), set the difference in value from the Set Point 1 \( SP_1 \) desired. For example if Set Point 2 is required to be 5 degrees below the \( SP_1 \), then set \( SP_2 \) to -5. If Set Point 2 is required 20 degrees above the \( SP_1 \), then set \( SP_2 \) to 20. If \( SP_1 \) is changed, the \( SP_2 \) setting will continue to hold the same relationship as originally set.

When setting \( SP_2 \) value when Set Point 2 is programmed as absolute (\( S_{2t} = AbS \)), simply set the value at which the alarm is to occur.

OPERATION OF SELF TUNE® FUNCTION

Self Tune® allows automatic selection of the necessary parameters to achieve best control operation from your 32DZ Series control. If you are using the control output as a simple on-off function (e.g. \( Out \) set for \( On\text{OF} \)), none of the following will apply.

Theory of Operation

The Self Tune function calculates the \( Pb_1, rES_1 \), and \( rtE_1 \) parameters under the \( P id 1 \) \( t \) \( unE \) selection, \( Pb_2, rES_2 \), and \( rtE_2 \) parameters under the \( P id 2 \) \( t \) \( unE \) selection, the \( Fbd_1 \) and \( Frt_1 \) parameters, and the \( Fbd_2 \) and \( Frt_2 \) parameters, as shown in the Secondary Menu. These values are determined by measuring the response of the process connected to the control. When Self Tune is started, the control temporarily acts as an on-off control. While in this mode the control measures the overshoot and undershoot of the process, and the period of the process (the time from peak value to the next peak value). These measurements are collected over a period that lasts three periods of overshoot and undershoot. The data collected over this time is then compared and calculated into final PID and Fuzzy Logic values. The effect of Fuzzy Logic on the process is still controlled by the \( F, 1 \) and \( F, 2 \) (fuzzy intensity) settings. If \( F, 1 \) or \( F, 2 \) is 0, the \( Fbd_1, Frt_1, Fbd_2, \) and \( Frt_2 \) will be calculated, but will have no effect.

The calculations for Zone 1 and Zone 2 are completely independent. Each zone has separate Self Tune and Fuzzy Logic parameters.
The calculations for the PID values are the same as used in the standard Ziegler - Nichols equations that have been recognized as standard for decades.

The only modification to the application of the Ziegler - Nichols equations is controlled by the \textit{dFC1} and \textit{dFC2} menu items. These menu items control the amount of rate (derivative) that is applied. A \textit{dFC1} or \textit{dFC2} setting of 3 (factory default) or less allows for less damping. A \textit{dFC1} or \textit{dFC2} setting of 4 allows for critical damping as set forth in Ziegler - Nichols. A \textit{dFC1} or \textit{dFC2} setting of 5 or more allows over damping of the process.

\textbf{Program Setup and Operation}

In the secondary menu set \textit{tun1} or \textit{tun2} to \textit{SELF}. Skip \textit{Lrn1} / \textit{Lrn2} and check to make sure that \textit{dFC1} / \textit{dFC2} is (are) set to the desired value. Back up to \textit{Lrn1} / \textit{Lrn2} and set to \textit{YES}. The control will begin the Self Tune function. While the Self Tune function is active, the right hand decimal point on the lower display will blink. When Self Tune is complete, the blinking will stop.

After Self Tune is complete, the \textit{tun1} / \textit{tun2} setting(s) automatically switch(es) to \textit{PID}. This allows examination and / or modification of the values calculated. We recommend that you do not change the calculated values unless you have a firm understanding of the parameters involved and their function. For more information on PID tuning, please contact your supplier.

\section*{OPERATION AND PROGRAMMING OF OPTIONS}

\textbf{Option 992, Serial Communication.}

The serial communications option allows the control to be written to and read from a remote computer or other similar digital device. Communication is allowed through a RS-485 (Option 992) port.

See Wiring for Optional Inputs and Outputs for information on wiring the communication lines. Wiring for the RS-485 is run from control to control in a daisy chain fashion with a termination resistor (120 ohms) across the transmit and receive terminals of the last control in the chain.

Select the control address and communication baud rate with the \textit{Addr} and \textit{bAud} menu items in the Secure Menu. The address for Zone 1 will be the address selected. The address for Zone 2 will be the address selected for Zone 1 plus one. For example, if \textit{Addr} is set to $\textit{\#E}$, Zone 1 parameters will be addressed through address $\textit{\#E}$ and Zone 2 parameters will be addressed through address $\textit{\#F}$. 
FACTORY DEFAULT PROCEDURE

If for any reason you wish to restore the factory settings use the following procedure.
1. Turn off power to control
2. Turn on power to control
3. While control is performing SELF tEST, press and hold the INDEX and ENTER keys.
4. The control will display the ROM ID code. Press INDEX.
5. The control will display FACT dFLT. If you wish to just restore factory settings, Press ENTER and DOWN ARROW at the same time. The control will be reset to the original factory settings.
6. Press INDEX to display OPT. If your control is equipped with an option, press the UP ARROW to display the option number. If the number is flashing, press ENTER. An enabled option does not flash.
7. Press INDEX to display ACPT. Select YES or no.
   YES Changes are accepted and control re-boots.
   no Changes are discarded and control re-boots.
8. Press ENTER.
The control will re-initialize with Factory Default settings.

THE BAUD RATE AND ADDRESS MENU ITEMS WILL TAKE EFFECT ON THE NEXT POWER UP OF THE CONTROL. BE SURE TO POWER CYCLE THE CONTROL BEFORE USING THE NEW BAUD RATE AND ADDRESS.

In operation, you have the option of preventing a write command from the host computer. To prevent the host from writing to the control change the LOrE menu item in the Secondary Menu to LOC. To allow the host to write commands to the control set LOrE to rE. (The host does have the ability to change the LOrE state, but it is not automatic.)

If your system depends on constant reading or writing to and from the host, you may wish to set the No Activity Timer (nAt) to monitor the addressing of the control. When the LOrE is set to rE and the nAt is set to any value other than OFF, the control will expect to be addressed on a regular basis. If the control is not addressed in the time set by the value of nAt, then the control will display the error message CHEC LOrE. To clear the message set LOrE to LOC.
MENU SELECTIONS

PRIMARY MENU
Press INDEX to advance to the next menu item. Press UP ARROW or DOWN ARROW to change the value in the display. Press ENTER to retain the value.

SP1 Set Point 1 Adjust, Control Point 1.

SP2 Set Point 2 Adjust, Control Point 2.

SECONDARY MENU
Hold UP ARROW & ENTER. Press INDEX to advance to the next menu item. Press UP ARROW or DOWN ARROW to change the value in the display. Press ENTER to retain the value.

Ed Ed Ed Ed Ed
Edit Set Point parameters: Select 0, 1, 2, or 3.

0 Edit function is off.

1 Edit Secondary and Secure Menus for Set Point 1.

2 Edit Secondary and Secure Menus for Set Point 2.

3 Edit Secondary and Secure Menus for both Set Points in sequence (menu items for Set Point 1 followed by menu items for Set Point 2).

If Ed Ed Ed Ed Ed is set to 0, begin.
If Ed Ed Ed Ed Ed is set to 1 or 3, jump to Out1Out1Out1Out1Out1 on page 17.
If Ed Ed Ed Ed Ed is set to 2, jump to Out2Out2Out2Out2Out2 on page 21.

PER1 The Peak feature stores the highest input the control has measured for Zone 1 since the last reset or Power On. At Power On, PER1 is reset to the present input value. To manually reset the value PER1 must be in the lower display. Press the ENTER key to reset. PER1 will be reset and display the present input value.

URL1 The Valley feature stores the lowest input the Instrument has measured for Zone 1 since the last reset or Power On. At Power On, URL1 is reset to the present input. To manually reset the value URL1 must be in the lower display. Press the ENTER key. URL1 will be reset and display the present input value.

PERS2 The Peak feature stores the highest input the control has measured for Zone 2 since the last reset or Power On. At
Power On, PEA2 is reset to the present input. To manually reset the value PEA2 must be in the lower display. Press the ENTER key to reset. PEA2 will be reset and display the present input value.

UAL2  The Valley feature stores the lowest input the Instrument has measured for Zone 2 since the last reset or Power On. At Power On, UAL2 is reset to the present input. To manually reset the value UAL2 must be in the lower display. Press the ENTER key. UAL2 will be reset and display the present input value.

LorE  (Option 992, Serial Communications) Local / Remote Status: Select LOC or rE.

LOC  The host computer is advised not to send remote commands. Any write commands sent to the controls will be rejected.

rE  The host computer is allowed to send write commands. If the control is not addressed within the time set in the nAt (No Activity Timer, see Secure Menu) the CHK LorE error message will be displayed.

Addr  (Option 992, Serial Communications) Control Address: Set from 1 to 3FF. This number (hexadecimal, base 16) must match the address number used by the host computer. Viewed only in this menu. The value displayed is for Zone 1. The address for Zone 2 is the value for Zone 1 plus one. To change this parameter, see Addr in the Secure Menu.

End of Secondary Menu when Ed is set to 0.
If Ed  is set to 1 or 3, begin.
If Ed  is set to 2, jump to Out2 on page 20.

**Out 1**

**Output selection:** Select **OnOF**, **ItP**, or **IPuL**.

**OnOF**

A setting of **OnOF** allows the control to operate as a simple on/off mode. This setting forces the control to turn off at set point, and on at the set point plus the differential (SP id). When selected, the **Out 1/OnOF** menu item is followed by ####/SP id, and the **tun 1, Pb 1, rES 1, Ofs 1, rE 1, and Rs 1** selections in the Secondary menu and the **Sid 1** and **Sid 1H** selections in the Secure menu are suppressed.

**SP id**

Set Point On-Off Differential (hysteresis). Select 1 to 9999 (direct acting), or -1 to -9999 (reverse acting). This value will be negative for reverse acting set points, and positive for direct acting outputs. Set the value for the amount of difference between the turn off point (set point) and the turn on point. The following drawing shows output behavior for reverse and direct action.

---

**Time Proportioning Cycle Time.** Select **ItP** to 80tP.

**ItP**

A setting of **ItP** is recommended for solid state outputs (SSR, DC SSR, or 5VDC).

**2tP to 80tP**

Time Proportioning Control is adjustable in 1 second steps. Recommended for mechanical outputs (relays, solenoids, etc.). For best contact life, a time should be selected as long as possible without causing the process to wander.

**Pulsed Time Proportioning Output:** Select **IPuL** to **7PuL**. **IPuL** = Linear and **7PuL** = most nonlinear. Changes output linearity for use in cooling applications or for an extremely fast response processes. At the center of the proportional band, a pulse
value of 1 provides an output of one second on and one second off (50% output). A pulse value of 2 provides an output of one second on and two seconds off (33% output). Output at center of band equals one second on, $2^{(\text{pulse value} - 1)}$ seconds off.

For Current (Code 5) outputs only.

**Tun** Tuning Choice: Select **SELF**, **Pid**, **SLO**, **nor**, or **FAST**. The instrument will evaluate the Process and select the PID values to maintain good control. Active for SP1 only.

**Lrn** Select **YES** or **no**

**YES** Start Learning the Process. After the process has been learned the menu item will revert to **no**.

**no** Learning will stay in present mode.

**dFC** Damping factor, Select **OFF**, 1 to 7. Sets the ratio of Rate to Reset for the SELF tune mode. 7 = most Rate. Factory set to 3. For a fast response process the value should be lowered (less Rate). For a slower process the value should be increased (more Rate).

**Pid** Manually adjust the PID values. PID control consists of three basic parameters, Proportional Band (Gain), Reset Time (Integral), and Rate Time (Derivative).

**Pb** Proportional Band (Bandwidth). Select 1 to 9999 $^\circ$F, $^\circ$C, or counts.

**rES** Automatic Reset Time. Select **OFF**, 0.1 to 99.9 minutes. Select **OFF** to switch to **OFS**.

**OFS** Manual Offset Correction Select **OFF**, 0.1 to 99.9%. Select **OFF** to switch to **rES**.

**rTE** Rate Time. Select **OFF**, 0.01 to 99.9999 minutes, Derivative.

**SLO** PID values are preset for a slow response process.

**nor** PID values are preset for a normal response process.

**FAST** PID values are preset for a fast response process.

**ArS** Anti- Reset Windup Feature: Select **On** or **OFF**.

**On** Reset Offset value will be cleared to 0% when the process input is not within the Proportional Band.
OFF  Reset Offset Value is retained in memory when the 
process input is not within the Proportional Band.

Art1  Approach Rate Time: Select OFF, 0.0 to 99.99 minutes. The 
function defines the amount of Rate applied when the input 
is outside of the Proportional Band. The Art1 time and the 
rtE time are independent and have no effect on each other. 
To increase damping effect and reduce overshoot set the 
approach rate time for a value greater than the natural rise 
time of the process (natural rise time = process value time 
to set point).

F1  Fuzzy Logic Intensity: Select 0 to 100%. 0% is OFF 
(disables Fuzzy Logic). The function defines the amount of 
impact Fuzzy Logic will have on the output. If F1 is set 
to 0, Fbd1 and Frt1 below will not appear.

Fbd1  Fuzzy Logic Error Band: Select 0 to 4000 °F, °C, or counts. 
Sets the bandwidth of the Fuzzy Logic. Set Fbd1 equal to 
PID proportional band (Pb1) for best results. Self Tune, 
when used, calculates this value. Will not appear if F1 is 
0.

Frt1  Fuzzy Logic Rate of Change: Select 0.00 to 99.99 counts/ 
second. For best initial setting, find the count/second 
change of process value near Set Point 1 with output ON 
(100% output). Multiply this value by 3. Set Frt1 to this 
calculated value. Self Tune, when used, calculates this 
value. Will not appear if F1 is 0.

PER1  The Peak feature stores the highest input the control has 
measured for Zone 1 since the last reset or Power On. At 
Power On, PER1 is reset to the present input value. To 
manually reset the value PER1 must be in the lower display. 
Press the ENTER key to reset. PER1 will be reset and 
display the present input value.

UAL1  The Valley feature stores the lowest input the Instrument 
has measured for Zone 1 since the last reset or Power On. 
At Power On, UAL1 is reset to the present input. To manually 
reset the value UAL1 must be in the lower display. Press 
the ENTER key. UAL1 will be reset and display the present 
input value.
Input Correction: Select -500 to 500 °F, °C, or counts. This feature allows the input value to be changed to agree with an external reference or to compensate for sensor error. **Note:** The \( \text{inC} \) is reset to zero when the input type is changed, or when decimal position is changed.

Digital Filter: Select \text{OFF} to 99. In some cases the time constant of the sensor, or noise could cause the display to jump enough to be unreadable. A setting of 2 is usually sufficient to provide enough filtering for most cases, (2 represents approximately a 1 second time constant). When the 0.1 degree resolution is selected this should be increased to 4. If this value is set too high, controllability will suffer.

Loop Break Protection: Select \text{OFF} to 99999 seconds. If, during operation, the output is minimum (0%) or maximum (100%), and the input moves less than 5°F (3°C) or 5 counts over the time set for \( \text{LPb} \), the \text{LOOP bAd} message will appear. The loop break error can be reset by pressing the \text{ENTER} key when at the \( \text{LPb} \) menu item. The \text{INDEX} & \text{ENTER} keys may also be used.

If \( \text{Ed it} \) is set to 1, jump to \( \text{LoE} \) on page 24. If \( \text{Ed it} \) is set to 3, continue.
If $E_d\neq E$ is set to 1, jump to LorE on page 24.
If $E_d\neq E$ is set to 3, continue.
If $E_d\neq E$ is set to 2, begin.

**Out2** Output selection: Select OnOF, ItP, or PuL.

*OnOF* A setting of OnOF allows the control to operate as a simple on/off mode. This setting forces the control to turn off at set point, and on at the set point plus the differential (SP2d). When selected, the Out2/OnOF menu item is followed by ####/SP2d, and the tun2, Pb2, rEs2, OFS2, rTE2, and ArS2 selections in the Secondary menu and the S20L and S20H selections in the Secure menu are suppressed.

*SP2d* Set Point On-Off Differential (hysteresis). Select 1 to 9999 (direct acting), or -1 to -9999 (reverse acting). This value will be negative for reverse acting set points, and positive for direct acting outputs. Set the value for the amount of difference between the turn off point (set point) and the turn on point. The following drawing shows output behavior for reverse and direct action.

- ###/tPtP Time Proportioning Cycle Time. Select ItP to 80tP. A setting of ItP is recommended for solid state outputs (SSR, DC SSR, or 15VDC).
- 2tP to 80tP Time Proportioning Control is adjustable in 1 second steps. Recommended for mechanical outputs (relays, solenoids, etc.). For best contact life, a time should be selected as long as possible without causing the process to wander.
- #PuL Pulsed Time Proportioning Output: Select PuL to 7PuL. PuL = Linear and 7PuL = most nonlinear. Changes output linearity for use in cooling applications or for an extremely fast response processes. At the
center of the proportional band, a pulse value of 1 provides an output of one second on and one second off (50% output). A pulse value of 2 provides an output of one second on and two seconds off (33% output). Output at center of band equals one second on, 2(pulse value-1) seconds off.

Tuning Choice: Select SELF, P id, SLO, nor, or FAST.

SELF The Controller will evaluate the Process and select the PID values to maintain good control.

Lrn2 Select YES or no

YES Start Learning the Process. After the process has been learned the menu item will revert to no.

no Learning will stay in present mode.

dFC2 Damping factor, Select OFF, 1 to 7. Sets the ratio of Rate to Reset for the SELF tune mode. 7 = most Rate. Factory set to 3. For a fast response process the value should be lowered (less Rate). For a slower process the value should be increased (more Rate).

P id Manually adjust the PID values. PID control consists of three basic parameters, Proportional Band (Gain), Reset Time (Integral), and Rate Time (Derivative).

Pb2 Proportional Band (Bandwidth). Select 1 to 9999 °F, °C, or counts.

rES2 Automatic Reset Time. Select OFF, 0.1 to 99.9 minutes. Select OFF to switch to OFS2.

OFS2 Manual Offset Correction Select OFF, 0.1 to 99.9%. Select OFF to switch to rES2.

rE2 Rate Time. Select OFF, 0.01 to 99.9999 minutes, Derivative.

SLO PID values are preset for a slow response process.

nor PID values are preset for a normal response process.

FAST PID values are preset for a fast response process.

ArS2 Anti-Reset Windup Feature: Select On or OFF.

On Reset Offset value will be cleared to 0% when the process input is not within the Proportional Band.
OFF  Reset Offset Value is retained in memory when the process input is not within the Proportional Band.

Art2  Approach Rate Time: Select OFF, 0.01 to 99.99 minutes. The function defines the amount of Rate applied when the input is outside of the Proportional Band. The Art2 time and the $rE2$ time are independent and have no effect on each other. To increase damping effect and reduce overshoot set the approach rate time for a value greater than the natural rise time of the process (natural rise time = process value time to set point).

F, 2  Fuzzy Logic Intensity: Select 0 to 100%. 0% is OFF (disables Fuzzy Logic). The function defines the amount of impact Fuzzy Logic will have on the output. If F, 2 is set to 0, Fbd2 and Frt2 below will not appear.

Fbd2  Fuzzy Logic Error Band: Select 0 to 4000 °F, °C, or counts. Sets the bandwidth of the Fuzzy Logic. Set Fbd2 equal to PID proportional band (Pb2) for best results. Self Tune, when used, calculates this value automatically. Will not appear if F, 2 is set to 0.

Frt2  Fuzzy Logic Rate of Change: Select 0.00 to 99.99 counts/second. For best initial setting, find the count/second change of process value near set point 1 with output ON (Output is 100%). Multiply this value by 3. Set Frt2 to this calculated value. Self Tune, when used, calculates this value automatically. Will not appear if F, 2 is set to 0.

PEA2  The Peak feature stores the highest input the control has measured for Zone 2 since the last reset or Power On. At Power On, PEA2 is reset to the present input. To manually reset the value PEA2 must be in the lower display. Press the ENTER key to reset. PEA2 will be reset and display the present input value.

UAL2  The Valley feature stores the lowest input the Instrument has measured for Zone 2 since the last reset or Power On. At Power On, UAL2 is reset to the present input. To manually reset the value UAL2 must be in the lower display. Press the ENTER key. UAL2 will be reset and display the present input value.
InC

Input Correction: Select \(-500\) to \(+500\) °F, °C, or counts. This feature allows the input value to be changed to agree with an external reference or to compensate for sensor error. **Note**: InC is reset to zero when the input type is changed, or when decimal position is changed.

Fi

Digital Filter: Select **OFF**, 1 to 99. In some cases the time constant of the sensor, or noise could cause the display to jump enough to be unreadable. A setting of 2 is usually sufficient to provide enough filtering for most cases, (2 represents approximately a 1 second time constant). When the 0.1 degree resolution is selected this should be increased to 4. If this value is set too high, controllability will suffer.

Lp

Loop Break Protection: Select **OFF**, 1 to 99999999999999999999 seconds. If, during operation, the output is minimum (0%) or maximum (100%), and the input moves less than 5°F (3°C) or 5 counts over the time set for Lp, the LOOP bAd message will appear. The loop break error can be reset by pressing the ENTER key when at the Lp menu item. The INDEX & ENTER keys may also be used.

The following Menu Items operate on the entire instrument. There is no Zone or Set Point distinction. They will appear in the Ed, Ed, Ed, and Ed menus.

Lo (Option 992, Serial Communications) Local / Remote Status: Select **LOC** or **rE**.

LOC The host computer is advised not to send remote commands. Any write commands sent to the controls will be rejected.

rE The host computer is allowed to send write commands. If the control is not addressed within the time set in the nAt (No Activity Timer, see Secure Menu) the CHEC LorE error message will be displayed.

Addr (Option 992, Serial Communications) Control Address: Read value from 1 to 3FF. This number (hexadecimal, base 16) must match the address number used by the host computer. Viewed only in this menu. The value displayed is for Zone 1. The address for Zone 2 is the value for Zone 1 plus one (e.g. if Addr is set to 17, Zone 1 is assigned to
address \( \text{Addr} \) and Zone 2 is assigned to address \( \text{Addr} \). To change this parameter, see Addr in the Secure Menu.

### Secure Menu

Hold **UP ARROW** & **ENTER** for 5 Seconds. Press **INDEX** to advance to the next menu item. Press **UP ARROW** or **DOWN ARROW** to change the value in the display. Press **ENTER** to retain the value.

OUTPUTS ARE DISABLED (TURNED OFF) WHILE THE INSTRUMENT IS IN SECURE MENU.

If \( \text{Ed} \) is set to 0, begin.

If \( \text{Ed} \) is set to 1 or 3, jump to SEC1 on page 26.

If \( \text{Ed} \) is set to 2, jump to SEC2 on page 29.

**Note:** There are no standard menu items for the Secure Menu when \( \text{Ed} \) is set to 0.

**Addr**  
(Option 992, Serial Communications) Control Address: Select from 1 to 3FE. This number (hexadecimal, base 16) must match the address number used by the host computer. The value displayed is for Zone 1. The address for Zone 2 is the value for Zone 1 plus one (e.g. if \( \text{Addr} \) is set to 1717, Zone 1 is assigned to address 171717171717 and Zone 2 is assigned to address 181818181818). Addresses 100, 200, and 300 are reserved for Factory use.

**Baud**  
(Option 992, Serial Communications) Communication Baud Rate: Select 300, 1200, 2400, 4800, 9600, or 19200. This number must match the baud rate used by the host computer.

**nAt**  
(Option 992, Serial Communications) No Activity Timer: Set from OFF or 1 to 99 minutes.  
1 - 99 Maximum time between host computer accesses. If timer counts to 0, CHECK or E will be displayed.  
OFF No Activity Timer function is disabled.

End of Secure Menu when \( \text{Ed} \) is set to 0.
If $Ed$ is set to 1 or 3, begin.
If $Ed$ is set to 2, jump to SEC2 on page 30.

SEC 1  Security Code: See the Security Level Selection and the Password Table in this manual, in order to enter the correct password.

InP 1  Input Type: Select one of the following. Refer to the Input wiring section for the proper wiring.

Input Group 1
- $J$ - Type “J” Thermocouple
- $K$ - Type “K” Thermocouple
- $E$ - Type “E” Thermocouple
- $L$ - Type “L” Thermocouple
- $N$ - Type “N” Thermocouple
- $T$ - Type “T” Thermocouple
- $R$ - Type “R” Thermocouple
- $S$ - Type “S” Thermocouple
- $B$ - Type “B” Thermocouple
- $C$ - Type “C” Thermocouple

Input Group 2
- $P38$ - 1000 ohm Platinum (DIN 0.00385 Ω/°C)
- $P$ - DC Current Input 0.0 to 20.0 or 4.0 to 20.0 mA.
- $V$ - DC Voltage Input 0.0 to 10.0 or 2.0 to 10.0 volts.

Caution: Do not change the Input Type outside of the programming Group on the Model Number. The input will not function correctly if the Input Type is set to a selection outside the specified Input Group.

OSP 1  Zero Suppression: Select On or Off. Only with Current and Voltage input types.

- Off - The input range will start at 0 (zero) Input.
- On - The input range will start at 4.00 mA or 2.00 V.

Unt 1  °F, °C or none.

- °F lamp is On and temperature inputs will be displayed in degrees Fahrenheit.
- °C lamp is On and temperature inputs will be displayed in degrees Celsius.
- none - Both the °F and °C lamps will be Off. This selection is only available with Current and Voltage Inputs.
Note: If both Set Point 1 and Set Point 2 are set for temperature inputs, they must both be set for the same scale. While it is possible to set one input as degrees F and the other degrees C, as there is only one descriptor, one of the displays is likely to be mis-read. If one Set Point is set for process input, you may select to display either the temperature descriptor or neither (nonE).

dPt i  Decimal Point Positioning: Select 0, 0.0, 0.00, or 0.000. On temperature type inputs this will only effect the Process Value, SP i, and InC i. For Current and Voltage Inputs all Menu Items related to the Input will be affected.

0  No decimal Point is selected. This is available for all Input Types.

0.0  One decimal place is available for Type J, K, E, T, L, RTD’s, Current and Voltage Inputs.

0.00  Two decimal places is only available for Current and Voltage Inputs.

0.000  Three decimal places is only available for Current and Voltage inputs.

Int i  Input Fault Timer: Select OFF, 0.1 to 540.0 minutes. Whenever an Input is out of range (UFL or OFL displayed), shorted, or open the timer will start. When the time has elapsed, the instrument will disable the output(s) and display bAd InP. If OFF is selected, the Input Fault Timer will not be recognized (time = infinite).

Sen i  Sensor Rate of Change: Select OFF, 1 to 4000 °F, °C, or counts per 1 second period. This value is usually set to be slightly greater than the fastest process response expected during a 1 second period, but measured for at least 2 seconds. If the process is faster than this setting, the Sen i bAd error message will appear. The outputs will then be turned off. This function can be used to detect a runaway condition, or speed up detection of an open thermocouple. Use the INDEX & ENTER keys to reset.

SCL i  Scale Low: Select 100 to 9999 counts below SCH i. The total span between SCL i and SCH i must be within 11998 counts. Maximum setting range is -1999 to 9999 counts. Minimum span is 100 counts. For Current and Voltage inputs, this will set the low range end. Viewable only for Thermocouple and RTD ranges.
**Scale High**: Select **100** to **9999** counts above **SCL**. The total span between **SCL** and **SCH** must be within 11998 counts. Maximum setting range is -**999** to +**9999** counts. Minimum span is 100 counts. For Current and Voltage inputs, this will set the high range end. Viewable only for Thermocouple and RTD ranges.

**Set Point Low**: Select from the lowest input range value to **SPH1** value. This will set the minimum **SP** value that can be entered. The value for **SP** will not stop moving when this value is reached. Attempting to set a value for **SP** lower than **SPL** will result in a **CHEC SP** error. The value will not be accepted.

**Set Point High**: Select from the highest input range value to **SPL1** value. This will set the maximum **SP** value that can be entered. The value for **SP** will not stop moving when this value is reached. Attempting to set a value for **SP** higher than **SPH** will result in a **CHEC SP** error. The value will not be accepted.

**Set Point State**: Select **dir** or **rei**.

**dir** Direct Action. As the input increases the output will increase. Most commonly used in cooling processes.

**rei** Reverse Action. As the input increases the output will decrease. Most commonly used in heating processes.

If **Out** is set for **#P**, **#PUL**, or **ProP**, then **S1OL** and **S1OH** (following) appear. If **Out** is set for **OnOF**, then skip to **S1rE**.

**Set Point Output Low Limit**: Select 0 to **90**% but not greater than **S1OL**. This item limits the lowest output value. This is useful for adding a bias to the process when needed. Factory set to 0 for output codes 1, 2, 3, and 8. Factory set to 20 for output code 5 (20% output equals 4 mA output).

**Set Point Output High Limit**: Select **10** to **100**% but not less than **S1OL** for output codes 1, 2, 3, or 8. Select **10** to **102**% but not less than **S1OL** for output code 5. This item allows setting the maximum output limit. This is useful with processes that are over powered. Adjustment to **102**% allows setting current output to force a full on condition for output
devices which do not have bias adjustments. Factory set to 100 for all output codes.

If Out 1 is set for ##tP, #PUL, or ProP, then skip to S ILP.

S lE Set Point Reset. Select OnOF or Hold.

OnOF Control will automatically reset when process passes back through SP id.

Hold Manual Reset. Reset (acknowledge) by simultaneously pressing the INDEX & DOWN ARROW keys for 5 seconds.

S iP Set Point Power Interrupt. Select On or OFF.

On Alarm Power Interrupt is On. Control will automatically reset on power-up if no alarm condition exists.

OFF Alarm Power Interrupt is OFF. Control will power-up in alarm condition regardless of condition of process.

S iH Set Point Inhibit: Select On or OFF.

On Alarm Inhibit is On. Alarm action is suspended until the process value first enters a non-alarm condition.

OFF Alarm Inhibit is OFF.

S ILP Set Point Lamp: Select On or Off.

On Lamp ON when Output is On.

Off Lamp OFF when Output is On.

If Ed is set to 1, jump to Addr on page 33. If Ed is set to 3, continue.
If $Ed \neq 1$, jump to $Sp \neq 0$ on page 33.  
If $Ed \neq 2$, continue.  
If $Ed \neq 2$, begin.

**SEC2**  
Security Code: See the Security Level Selection and the Password Table in this manual, in order to enter the correct password.

**InP2**  
Input Type: Select one of the following. Refer to the Input wiring section for the proper wiring.

- **J** - Type “J” Thermocouple
- **K** - Type “K” Thermocouple
- **E** - Type “E” Thermocouple
- **L** - Type “L” Thermocouple
- **N** - Type “N” Thermocouple
- **T** - Type “T” Thermocouple
- **R** - Type “R” Thermocouple
- **S** - Type “S” Thermocouple
- **B** - Type “B” Thermocouple
- **C** - Type “C” Thermocouple

**Input Group 1**

**Input Group 2**

**Input Group 4**

**Input Group 5**

**Input Group 6**

1000 ohm Platinum (DIN 0.00385 $\Omega/\Omega/°C$)

DC Current Input 0.0 to 20.0 or 4.0 to 20.0 mA.

DC Voltage Input 0.0 to 10.0 or 2.0 to 10.0 volts.

- - - - Reserved

**Caution:** Do not change the Input Type outside of the programming Group on the Model Number. The input will not function correctly if the Input Type is set to a selection outside the specified Input Group.

**OSP2**  
Zero Suppression: Select $On$ or $Off$. Only with Current and Voltage input types.

- **Off** The input range will start at 0 (zero) Input.
- **On** The input range will start at 4.00 mA or 2.00 V.

**Unlt2**  
$F$, $C$ or $nonE$

- **F** °F lamp is On and temperature inputs will be displayed in degrees Fahrenheit.
- **C** °C lamp is On and temperature inputs will be displayed in degrees Celsius.
- **nonE** Both the °F and °C lamps will be Off. This selection is only available with Current and Voltage Inputs.
Note: If both Set Point 1 and Set Point 2 are set for temperature inputs, they must both be set for the same scale. While it is possible to set one input as degrees F and the other degrees C, since there is only one descriptor, one of the displays is likely to be mis-read. If one Set Point is set for process input, you may select to display either the temperature descriptor or neither (nonE).

**dPt2**  
Decimal Point Positioning: Select **0**, **0.0**, **0.00**, or **0.000**. On temperature type inputs this will only effect the Process Value, SP1, SP2, and InC1|InC2. For Current and Voltage Inputs all Menu Items related to the Input will be affected.

- **0**: No decimal Point is selected. This is available for all Input Types.
- **0.0**: One decimal place is available for Type J, K, E, T, L, RTD's, Current and Voltage Inputs.
- **0.00**: Two decimal places is only available for Current and Voltage Inputs.
- **0.000**: Three decimal places is only available for Current and Voltage inputs.

**Int2**  
Input Fault Timer: Select **OFF, 0, 1 to 540.0** minutes. Whenever an Input is out of range (UFL or OFL displayed), shorted, or open the timer will start. When the time has elapsed, the instrument will disable the output(s) and display **bAd InP**. If **OFF** is selected, the Input Fault Timer will not be recognized (time = infinite).

**Sen2**  
Sensor Rate of Change: Select **OFF, 1 to 4000** °F, °C, or counts per 1 second period. This value is usually set to be slightly greater than the fastest process response expected during a 1 second period, but measured for at least 2 seconds. If the process is faster than this setting, the **Sen2 bAd** error message will appear. The outputs will then be turned off. This function can be used to detect a runaway condition, or speed up detection of an open thermocouple. Use the INDEX & ENTER keys to reset.

**Scl2**  
Scale Low: Select **100** to **9999** counts below **SCH2**. The total span between **Scl2** and **SCH2** must be within 11998 counts. Maximum setting range is -1999 to +9999 counts. Minimum span is 100 counts. For Current and Voltage inputs, this will set the low range end. Viewable only for Thermocouple and RTD ranges.
**Scale High:** Select 100 to 9999 counts above SCL2. The total span between SCL2 and SCH2 must be within 11998 counts. Maximum setting range is -1999 to +9999 counts. Minimum span is 100 counts. For Current and Voltage inputs, this will set the high range end. Viewable only for Thermocouple and RTD ranges.

**Set Point Low:** Select from the lowest input range value to SPH1 value. This will set the minimum SP2 value that can be entered. The value for SP2 will not stop moving when this value is reached. Attempting to set a value for SP2 lower than SPL2 will result in a CHEC SP2 error. The value will not be accepted.

**Set Point High:** Select from the highest input range value to SPL2 value. This will set the maximum SP2 value that can be entered. The value for SP2 will not stop moving when this value is reached. Attempting to set a value for SP2 higher than SPH2 will result in a CHEC SP2 error. The value will not be accepted.

**Set Point State:** Select d or r.
- **d** Direct Action. As the input increases the output will increase. Most commonly used in cooling processes.
- **r** Reverse Action. As the input increases the output will decrease. Most commonly used in heating processes.

If Out2 is set for ##tP, or #PUL, then S20H and S20H (following) appear. If Out2 is set for ONOF, then skip to S2rE.

**Set Point Output Low Limit:** Select 0 to 90% but not greater than S20H. This item limits the lowest output value. This is useful for adding a bias to the process when needed. Factory set to 0 for output codes 1, 2, 3, and 8. Factory set to 20 for output code 5 (20% output equals 4 mA output).

**Set Point 1 Output High Limit:** Select 10 to 100% but not less than S20L for output codes 1, 2, 3, or 8. Select 10 to 102% but not less than S20L for output code 5. This item allows setting the maximum output limit. This is useful with processes that are over powered. Adjustment to 102% allows setting current output to force a full on condition for output
devices which do not have bias adjustments. Factory set to 100 for all output codes.

If Out is set for #tP, #PUL, or Prop, then skip to S2LP.

S2rE Set Point Reset. Select OnOF or Hold.
OnOF Control will automatically reset when process passes back through SP2d.
Hold Manual Reset. Reset (acknowledge) by simultaneously pressing the INDEX & DOWN ARROW keys for 5 seconds.

S2P Set Point Power Interrupt. Select On or OFF.
On Alarm Power Interrupt is On. Control will automatically reset on power-up if no alarm condition exists.
OFF Alarm Power Interrupt is OFF. Control will power-up in alarm condition regardless of condition of process.

S2 .H Set Point Inhibit: Select On or OFF.
On Alarm Inhibit is On. Alarm action is suspended until the process value first enters a non-alarm condition.
OFF Alarm Inhibit is OFF.

S2LP Set Point Lamp: Select On or OoFF.
On Lamp ON when Output is ON.
OoFF Lamp OFF when Output is ON.

S2t Set Point 2 type: Select Abs or dE.
Abs Absolute SP2. SP2 is independent of SP1, and may be set anywhere between the limits of SPL2 and SPH2.
dE Deviation SP2. SP2 is set as a deviation from SP1, and allows SP2 to retain its relationship with SP1 when SP1 is changed.

Note: The SPL2 and SPH2 settings must be set to correspond with the SPL1 and SPH1 settings. If not, a CHEC SP2 error may be generated by a change of SP1.
The following Menu Items operate on the entire Instrument. There is no Set Point distinction. These items will appear in both the Ed, Ed2, and Ed3 menus.

**SP 1o**  Set Point 1 Output Select: Select **OutA** or **Outb**.

- **OutA**  Set Point 1 is routed through Output A, Set Point 2 is routed through Output B.
- **Outb**  Set Point 1 is routed through Output B, Set Point 2 is routed through Output A.

**COPY**  Copy Zone Parameters. Copies program parameters from one zone to the other.

- **none**  No copy function is performed. Factory default.
- **1to2**  Copies all parameters from Zone 1 to Zone 2.
- **2to1**  Copies all parameters from Zone 2 to Zone 1.

**Addr**  (Option 992, Serial Communications) Control Address: Select from 1 to 3FE. This number (hexadecimal, base 16) must match the address number used by the host computer. The value displayed is for Zone 1. The address for Zone 2 is the value for Zone 1 plus one (e.g. if Addr is set to 1?, Zone 1 is assigned to address 1? and Zone 2 is assigned to address 18). Addresses 100, 200, and 300 are reserved for Factory use.

**bAud**  (Option 992, Serial Communications) Communication Baud Rate: Select 300, 1200, 2400, 4800, 9600, or 19200. This number must match the baud rate used by the host computer.

**nAt**  (Option 992, Serial Communications) No Activity Timer: Set from **OFF** or 1 to 99 minutes.

- **1 - 99**  Maximum time between host computer accesses. If timer counts to 0, **CHEC** or **E** will be displayed.
- **OFF**  No Activity Timer function is disabled.
SPECIFICATIONS

Selectable Inputs: Thermocouple, RTD, DC Voltage, or DC Current selectable.

Input Impedance:
Thermocouple = 3 megohms minimum. RTD current = 200 µA.
Current = 10 ohms. Voltage = 5000 ohms.

Sensor Break Protection: De-energizes control output to protect system after customer set time. (See InP1 and InP2 in Secondary Menu.)

Set Point Range: Selectable (See Range Chart Page 39).
Display: Two 4 digit, 7 segment 6.35 mm (0.25”) high LEDs.
Control Action: Reverse (usually heating), Direct (usually cooling) selectable.

Proportional Band: 1 to 9999 °F, °C, or counts.
Reset Time (Integral): Off or 0.1 to 99.9 minutes.
Rate Time (Derivative): Off or 0.01 to 99.99 minutes.
Cycle Rate: 1 to 80 seconds.
On - Off Differential: Adjustable 1° F, 1° C, or 1 count to full scale in 1° F, 1° C, or 1 count steps.
Fuzzy Percent: 0 to 100%.
Fuzzy Rate: Off or 0.01 to 99.99 minutes.
Fuzzy Band: Off or 1 to 4000 °F, °C, or counts.
Accuracy: ±0.25% of span, ±1 least significant digit.
Resolution: 1 degree or 0.1 degree, selectable.

Line Voltage Stability: ±0.05% over the supply voltage range.
Temperature Stability: 100 ppm /°C typical, 200 ppm /°C maximum.

Common Mode Rejection: 140 db minimum at 60 Hz.
Normal Mode Rejection: 65 db typical, 60 db at 60 Hz.

Isolation:
Relay and SSR outputs: 1500 Vac to all other inputs and outputs.
SP1 Current output: Non-isolated, share common groung with input.
SP1 and SP2 Switched Voltage outputs: Non-isolated, shares common ground with input.

Supply Voltage: 100 to 240 Vac, nominal, +10 -15%, 50 to 400 Hz. single phase; 132 to 240 Vdc, nominal, +10 -20%.
Supply Voltage (Option 9502): 12 to 24 Vdc, Vac 40-400 Hz, ±20%.
Power Consumption: 5VA maximum.
Operating Temperature: -10 to +55 °C (+14 to 131 °F).
Storage Temperature: -40 to +80 °C (-40 to 176 °F).

Humidity Conditions: 0 to 90% up to 40 °C non-condensing, 10 to 50% at 55 °C non-condensing.

Memory Backup: Nonvolatile memory. No batteries required.

Control Output Ratings:
   - **AC SSR (Output A, Output B):** 0.75 A @ 240 Vac at 25 °C (77°F). Derates to 0.5 A @ 55° C (130°F).
   - **DC SSR (Output A, Output B):** 1.25 A @ 32VDC at 25° C (77°F), derates to 1.0 A at 55° C (130°F).
   - **Relay (Output A, Output B):** SPST, 3 A @ 240 Vac resistive; 1.5A @ 240 Vac inductive; 1/10 HP @ 120 Vac.
   - **Current (non-isolated, Output A only):** 0 to 20 mA across 600 ohms maximum.
   - **Switched Voltage (non-isolated, Output A, Output B):** 5 Vdc @ 20 mA.

Panel Cutout: 45.0 mm x 22.2 mm (1.772" x 0.874").

Depth Behind Mounting Surface: 111.6 mm (4.395").

Weight: 114 g (4 oz).

Agency Approvals: UL and C-UL, file #E83725; CE.

Front Panel Rating: IP66, Type 4.
### Diagnostic Error Messages

<table>
<thead>
<tr>
<th>Display</th>
<th>Meaning</th>
<th>SP Outputs</th>
<th>Action Required</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>No display lighted</strong></td>
<td>Display is blank. Instrument is not getting power, or the supply voltage is too low.</td>
<td>Set point outputs inactive</td>
<td>Check that the power supply is on, or that the external fuses are good.</td>
</tr>
<tr>
<td><strong>FAIL TEST</strong></td>
<td>Fail test appears upon power up if the internal diagnostics detect a failure. This message may occur during operation if a failure is detected. Displays flash.</td>
<td>Set point outputs inactive</td>
<td>The display alternates between <strong>FAIL TEST</strong> and one of the following messages: <strong>FACT</strong> or <strong>dFLt</strong>: Memory may be corrupted. Press the <strong>ENTER</strong> key and the <strong>DOWN ARROW</strong> key to start the factory default procedure. <strong>rET FACT</strong>: Unrecoverable error, return to factory for service.</td>
</tr>
<tr>
<td><strong>CHEC SP1</strong></td>
<td>This message will appear upon power up if SP1 is set outside of the SPL1/SPL2 values.</td>
<td>Set point output(s) inactive</td>
<td>Correct the <strong>SP1</strong>, or adjust the <strong>SPL1</strong> values by programming new values.</td>
</tr>
<tr>
<td><strong>CHEC SP2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CHEC SPL1 OR SPH1</strong></td>
<td>This message appears at power up if SPL or SPH values are programmed outside the input range ends.</td>
<td>Set point output(s) inactive</td>
<td>Correct the <strong>SPL1</strong>, <strong>SPH1</strong>, <strong>SPL2</strong> values by programming new values.</td>
</tr>
<tr>
<td><strong>CHEC SPL2 OR SPH2</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>CHEC LorE</strong></td>
<td>This message appears if the Serial Communications has timed out.</td>
<td>Set point outputs active</td>
<td>Restore the communications line and switch the <strong>LorE</strong> to <strong>LOC</strong>.</td>
</tr>
<tr>
<td><strong>SEnC</strong></td>
<td>Sensor Rate of Change exceeded the programmed limits set for <strong>SEnC</strong>. Appears in display of affected zone.</td>
<td>Set point output(s) inactive</td>
<td>Check for the cause of the error. The value setting may be too slow for the process, or the sensor is intermittent. Correct the problem and press INDEX and <strong>ENTER</strong> to reset.</td>
</tr>
<tr>
<td><strong>A-ER (Alternates with PV when near)</strong></td>
<td>This message appears if the ambient temperature of the control is near or out of range or RJC sensor is broken.</td>
<td>Set point outputs active</td>
<td>Correct the ambient temperature conditions. Ventilate the area of the cabinet or check for clogged filters. If RJC broken, return to factory for service.</td>
</tr>
</tbody>
</table>

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## DIAGNOSTIC ERROR MESSAGES

<table>
<thead>
<tr>
<th>DISPLAY</th>
<th>MEANING</th>
<th>SP OUTPUTS</th>
<th>ACTION REQUIRED</th>
</tr>
</thead>
<tbody>
<tr>
<td><em><em>UFL</em> or OFL</em>**</td>
<td>Underflow or Overflow: Process value has exceeded input range ends.</td>
<td>Set point outputs active</td>
<td>Input signals may normally go above or below range ends. If not, check input and correct.</td>
</tr>
<tr>
<td><strong>Bad</strong>*</td>
<td>UFL or OFL will sequence to display one of these messages if the InPt is set for a time value. For RTD inputs RTD is open or shorted.</td>
<td>Set point output(s) inactive</td>
<td>To reset use the INDEX &amp; ENTER keys. When InPt (input fault timer) has been set for a time, the outputs will be turned off after the set time. Setting the time to OFF causes the outputs to remain active, however UFL or OFL will still be displayed. Correct or replace sensor. To reset use the INDEX &amp; ENTER keys.</td>
</tr>
<tr>
<td><strong>Open</strong>*</td>
<td>For THERMOCOUPLE inputs thermocouple is open.</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Loop</strong>*</td>
<td>The sensor may be defective, heater fuse open, heater open, or the final power output device is bad.</td>
<td>Set point output(s) inactive.</td>
<td>Correct or replace sensor, or any element in the control loop that may have failed. Correct the problem, and reset the control by pressing the INDEX and ENTER keys, or index to LPbr and press ENTER.</td>
</tr>
<tr>
<td><strong>CheC Cal 1</strong> or <strong>CheC Cal 2</strong>*</td>
<td>Message appears when input group is selected other than the one provided from the Factory. Check calibration appears as an alternating message if the instrument calibration nears tolerance edges. Check calibration appears as a flashing message if the instrument calibration exceeds specification.</td>
<td>Set point outputs inactive. Set point outputs active.</td>
<td>Calibrate the specified input before putting Instrument in to service. Remove the instrument for service and / or recalibration. To reset use the INDEX &amp; ENTER keys. Remove the instrument for service and / or recalibration. To reset use the INDEX &amp; ENTER keys.</td>
</tr>
</tbody>
</table>

* Message appears in the display of the affected zone. The output for that zone will be inactive.
### Input Ranges (Field Selectable)

#### Thermocouple Types

<table>
<thead>
<tr>
<th>Input Type</th>
<th>Type J or L*</th>
<th>Type K*</th>
<th>Type T*</th>
<th>Type E*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Range</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1°F 1°C</td>
<td>-100 to +1600</td>
<td>-200 to +2500</td>
<td>-350 to +750</td>
<td>-100 to +1800</td>
</tr>
<tr>
<td></td>
<td>-73 to +871</td>
<td>-129 to +1371</td>
<td>-212 to +398</td>
<td>-73 to +982</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input Type</th>
<th>Type R</th>
<th>Type S</th>
<th>Type B</th>
<th>Type C</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Range</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1°F 1°C</td>
<td>0 to 3200</td>
<td>0 to 3200</td>
<td>+75 to 3308</td>
<td>0 to 4208</td>
</tr>
<tr>
<td></td>
<td>-17 to +1760</td>
<td>-17 to +1760</td>
<td>+24 to 1820</td>
<td>-17 to 2320</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input Type</th>
<th>Type N*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Range</strong></td>
<td></td>
</tr>
<tr>
<td>1°F 1°C</td>
<td>-100 to +2372</td>
</tr>
<tr>
<td></td>
<td>-73 to +1300</td>
</tr>
</tbody>
</table>

*These Input Types can be set for 0.1° display. If temperature goes above 999.9° or less than -199.9° the display will return to whole degree resolution.

#### RTD Types

<table>
<thead>
<tr>
<th>Input Type</th>
<th>1000 Ohm Platinum 0.00385 DIN Curve*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Range</strong></td>
<td></td>
</tr>
<tr>
<td>1°F 1°C</td>
<td>-328 to +1607</td>
</tr>
<tr>
<td></td>
<td>-200 to +875</td>
</tr>
</tbody>
</table>

### Process Input Types

The 0 to 20 mA dc, 4 to 20 mA dc, 0 to 10 V dc, and 2 to 10 V dc inputs are fully scalable from a minimum of 100 counts span placed anywhere within the within the range of -1999 to +9999. Decimal point position is adjustable from the zero place (9999), tenths (999.9), hundredths (99.99), or thousandths (9.999).
DIMENSIONS

ALL DIMENSIONS IN MILLIMETERS (INCHES)

PANEL CUT OUT: 45 +0.6 X 22.2 +0.3 (1.772 +0.02 X 0.874 +0.012)