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2-1 GENERAL INFORMATION

The 423 Series Instruments are a Microprocessor-Based Digital Process Indicator for thermocouples and RTD’s. The instrument has no potentiometers for calibration. All calibration is done from the front panel and stored in non-volatile memory. The program menu has been secured at the factory by the use of a password which prevents unauthorized users from entering the calibration mode.

Thermocouple and RTD inputs can be changed through the pushbuttons as well. Calibration for these are also prompted through pushbutton commands. Again, there are no potentiometers for calibration. Fahrenheit and Celsius and decimal point conversions are made through menu commands.

Menu program lockout is available through pushbutton commands. This lockout is a specified codeword which prevents personnel from entering the menu if desired. There is a universal codeword which will over-ride any user specified codeword. This is maintained in case the user loses or forgets the specified codeword.

2-2 LIMITED WARRANTY

THE MODEL 423 SERIES DIGITAL INDICATOR SOLD BY OR PURCHASED FROM PYROMATION, INC. OR FROM AN AUTHORIZED PYROMATION DISTRIBUTOR, OR AGENT IS SUBJECT TO THE FOLLOWING LIMITED WARRANTY.

This product is warranted to be free from functional defects in materials and workmanship at the time the product leaves the Pyromation, Inc. factory, and to conform at that same time to the specifications set forth in the relevant Pyromation, Inc. installation, wiring, operation manual for this product for a period of one year after shipment from the Pyromation, Inc. factory.

Pyromation’s exclusive and sole obligation, and Buyer’s exclusive and sole remedy under the above Limited Warranty is limited to either repair or replacement of such product, at Pyromation’s option, free of charge to Buyer. Pyromation shall have no obligation to repair or replace unless the claimed defect in material or workmanship is reported in writing to Pyromation at 5211 Industrial Road, Fort Wayne, Indiana 46825 within ten (10) days after delivery to the Buyer from Pyromation or an authorized Pyromation distributor, representative or reseller. If so requested by Pyromation, the product shall be returned to a designated facility during normal business hours, transportation prepaid.

Any action for breach of this warranty or other action arising out of this contract must be commenced within one year after delivery.

Pyromation shall not be liable for any warranty, express or implied, other than the warranty stated above, and in the event of a breach of the above stated warranty, Pyromation shall not be liable for any incidental, consequential, special, or other damages, costs, or expenses other than repair or replacement as described above. Pyromation excludes any and all warranties of merchantability or fitness for a particular purpose. The above stated warranty extends only to the original Buyer from Pyromation, Inc. or from an authorized Pyromation distributor or agent, and may not be transferred or assigned.
3-1 SPECIFICATIONS

- STANDARD -

Power Supply: 120 or 240VAC +10%/-15%
50/60HZ
External Fuse Required - .5A

DC Isolation: @ 500 Vp

Ambient Temperature: 32 to 122°F (0 - 50°C)

Overall Accuracy: RTD or Thermocouple: ± 1°F
4 - 20 mA: ± .1%

Input Impedance: 47M Ohm (Millivolt inputs only)

RTD Excitation Current: .25mA

Error Due to Lead Resistance: 0.1uV per Ohm (T/C Inputs Only)

Conversion Rate: 2.5 per Second

Filtering: Digital: Average of 16 conversions per update
Analog: 2.2K in parallel with 0.1uf

Resolution: .1 or 1 Degree
(Automatic 1 Deg., Resolution above 999.9)

Display: .54” High LED, High Intensity Alpha Numeric

Display Readouts: UNDR - Underrange
OVER - Overrange
OPEN - Open Input

Physical Dimensions: 48 x 96 x 148mm (overall dimensions)
(1.89” x 3.78” x 5.83”)

- OPTIONS -

Power Supply: 12 or 24 Vdc +20/-10%
External Fuse Required - .5A

Auxiliary Power Supply: 24 Vdc (30 mA Maximum)

Relays: 250 VAC (8A Maximum)
30 Vdc (8A maximum)
Example Order Number:

423 - 1 1 - 42 R1 - 04 - S (0-5000)

**Table 1**

<table>
<thead>
<tr>
<th>ORDER CODE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Input Selectable for T/C or RTD’s with Fixed Range or 4-20 mA/DC with Scaleable Display</td>
</tr>
</tbody>
</table>

**Table 2**

<table>
<thead>
<tr>
<th>ORDER CODE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>120 VAC (Field Selectable)</td>
</tr>
<tr>
<td>2</td>
<td>240 VAC (Field Selectable)</td>
</tr>
<tr>
<td>3</td>
<td>24 VDC (Factory Installed)</td>
</tr>
<tr>
<td>4</td>
<td>12 VDC (Factory Installed)</td>
</tr>
</tbody>
</table>

**Table 3**

<table>
<thead>
<tr>
<th>ORDER CODE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>Customer Configured *</td>
</tr>
<tr>
<td>85</td>
<td>100 Ohm Plt. RTD, .00385 T.C.</td>
</tr>
<tr>
<td>42</td>
<td>4 - 20 mA/DC</td>
</tr>
<tr>
<td>4J</td>
<td>Type J Thermocouple</td>
</tr>
<tr>
<td>4K</td>
<td>Type K Thermocouple</td>
</tr>
<tr>
<td>4T</td>
<td>Type T Thermocouple</td>
</tr>
<tr>
<td>4E</td>
<td>Type E Thermocouple</td>
</tr>
<tr>
<td>4N</td>
<td>Type N Thermocouple</td>
</tr>
</tbody>
</table>

* Meters are shipped calibrated for Type K thermocouples, degrees F, and 1° resolution

**Table 4**

<table>
<thead>
<tr>
<th>ORDER CODE</th>
<th>T/C or RTD INPUTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>Customer Configured</td>
</tr>
<tr>
<td>F1</td>
<td>1° F</td>
</tr>
<tr>
<td>F2</td>
<td>.1° F</td>
</tr>
<tr>
<td>C1</td>
<td>1° C</td>
</tr>
<tr>
<td>C2</td>
<td>.1° C</td>
</tr>
</tbody>
</table>

4 to 20 mA INPUTS

<table>
<thead>
<tr>
<th>ORDER CODE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>Customer Configured</td>
</tr>
<tr>
<td>F1</td>
<td>1° F</td>
</tr>
<tr>
<td>F2</td>
<td>.1° F</td>
</tr>
<tr>
<td>C1</td>
<td>1° C</td>
</tr>
<tr>
<td>C2</td>
<td>.1° C</td>
</tr>
</tbody>
</table>

**Table 5**

<table>
<thead>
<tr>
<th>ORDER CODE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>No Options</td>
</tr>
<tr>
<td>01</td>
<td>Splash Proof Panel Gasket Seal</td>
</tr>
<tr>
<td>02</td>
<td>Meter Mounted 12 Pt. Sel. Switch</td>
</tr>
<tr>
<td>03</td>
<td>One SPDT Process Alarm</td>
</tr>
<tr>
<td>04</td>
<td>Two SPDT Process Alarms</td>
</tr>
<tr>
<td>05</td>
<td>24 VDC Power Supply Output</td>
</tr>
</tbody>
</table>

**Table 6**

<table>
<thead>
<tr>
<th>ORDER CODE</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>S</td>
<td>Factory Scaled 4-20 mA Inputs Only *</td>
</tr>
</tbody>
</table>

* Insert actual scaling desired as per examples below
  0 - 5000, 50 - 150, -100 to 100, 500-0
5-1 **UNPACKING**

Unpack the instrument immediately upon receipt, and visually inspect for shipping damages. If the instrument was damaged in transit, note any damage and file a claim with the carrier.

5-2 **LOCATION**

Install the instrument in an area where it will not be subjected to excessive shock, vibration, dirt, oil, and where the temperature will not exceed 0-50°C (32-122°F). The instrument should not be installed in an area where rapid temperature changes may occur (e.g. near heating or cooling ducts).

5-3 **MOUNTING**

Figure 1 thru figure 4 below shows panel cutout dimensions and case dimensions. (For units with 12 position selector, cutout dimensions are 3.67" high by 3.56" wide). Remove slide retaining screws and slides. Insert the instrument through the cutout from the front side of the panel and re-insert slides and screws. Do not over-tighten screws.

5-4 **MOUNTING ILLUSTRATIONS**

![Figure 1 Illustration](image1)

![Figure 2 Illustration](image2)

![Figure 3 Illustration](image3)

![Figure 4 Illustration](image4)
6-1 LINE SUPPLY WIRING

Figure 5
120 or 240 VAC Line Supply

Figure 6
12 or 24 VDC Line Supply

NOTES: RTD input extension wire should not be run in the same conduit as line voltage, nor should they be exposed to excessive electrical noise.

6-2 AC LINE SUPPLY CONVERSION

The 423 Series meter can be field changed from 120 to 240 VAC or back. This is accomplished by changing the jumper on the PC board. The jumpers are located in the rear next to the transformer. See figures below. (This change will not void the limited warranty).

Figure 7
Figure 8

6-3 RTD INPUT WIRING

Figure 9
3 Wire RTD Hookup

Figures 10 and 11
2 Wire and 4 Wire RTD Hookup

NOTE: RTD input extension wire should not be run in the same conduit as line voltage, nor should they be exposed to excessive electrical noise.
7-1  THERMOCOUPLE INPUT WIRING

Figure 12

Note: Thermocouple input extension wire should not be run in the same conduit as line voltage, nor should they be exposed to excessive electrical noise. Always use compensated leadwire when wiring for thermocouple inputs.

7-2  RELAY WIRING

Figure 13  * See note on Page 11

7-3  AUXILLARY POWER SUPPLY WIRING

Figure 14

7-4  4-20mA INPUT with and without INTERNAL LOOP POWER

Figure 15 - with Loop Power  Figure 16 - without Loop Power

See note on Page 11
8-1 12-POSITION SELECTOR SWITCH WIRING ILLUSTRATIONS

Figure 17
RTD Selector Switch Connections

Figure 18
Thermocouple Selector Switch Connections

8-2

Note: Always use compensated leadwire when wiring for thermocouple inputs.

8-3 UNIT REPAIRS

If returning instrument, contact the factory or local representative for a Return Authorization Number. Include the reason for the return with your shipment.
## 9-1 TROUBLE SHOOTING

<table>
<thead>
<tr>
<th>PROBLEM</th>
<th>POSSIBLE CAUSES</th>
</tr>
</thead>
</table>
| 'OPEN'  | - Sensor not connected  
         |   - Damaged sensor |
| 'OVER'  | - Sensor is over temperature range  
         |   - Incorrect sensor |
| 'UNDR'  | - Sensor is under temperature range  
         |   - Incorrect sensor  
         |   - Wrong polarity on connection |

### Erratic Readings
- Loose connection on sensor input
- Damaged sensor
- AC noise on sensor connections

### POSSIBLE WIRING ERRORS

**Destructive Errors**
- Do not connect power to the sensor input. This could destroy the panel meter.
- Do not connect power to the sensor itself.
- Incorrect line power on the unit; check options.

**Non-Destructive Errors**
- Reversing the polarity on line power input.
- Reversing the polarity on sensor input.
10-1 MAIN MENU

Below is a block diagram showing the basic menu program. Specific menu breakdowns are described on the following pages. The middle button is used as the enter key. This will move you through the program. The buttons allow you to view and change variables to the program. Please note, to eliminate changes made, simply disconnect power before you come to the PWRD YES/NO prompt.

Figure 20

[Diagram of menu program with instructions for entering password, changing variables, and navigating through the program]

Page 10
11-1 RELAY MENU

Figure 21

Note 1: Recommend using MOVs on Relay Terminals. Metal-oxide varistors (MOV) are variable resistors for protecting electronic circuits against AC (alternating-current) voltage transients.

Note 2: They must be operated within their ratings or they will be destroyed.
12-1 4 - 20 mA MENU

Figure 22

SNSR

MAMP

DP

UNIT

ZERO

CONNECT 4mA SOURCE

CONNECT 20mA SOURCE

WAIT

SPAN

UNDR

OVER

RLY 1
4 - 20mA CALIBRATION PROCEDURES (All steps must be completed)

\[
\begin{align*}
\triangle &= \text{UP} & \circ &= \text{ENTER} & \triangledown &= \text{DOWN}
\end{align*}
\]

{Step 1} Power panel meter for at least 30 minutes.

{Step 2} Enter menu program, go to the SNSR menu. Press the ENTER button. MAMP should appear on the display. If not, press the down button until MAMP is displayed. Press the ENTER button.

{Step 3} Select proper resolution for the decimal point by pressing the down button. When proper resolution has been selected press the ENTER button.

{Step 4} Select proper scale indication by pressing the down button. If °F or °C is not desired, select OFF. Press the ENTER button. (Note: If OFF was selected, scale indication stickers have been supplied for the front display)

{Step 5} Now that ZERO appears, press the down or up button, then select the desired display reading.

{Step 6} Once the display reading has been established, connect a 4mA source to the input of the meter. Refer to Figure 16 for proper connections. Press the ENTER button. Wait until SPAN appears.

{Step 7} Now that SPAN appears, press the down or up button, then select the desired display reading.

{Step 8} Once the display reading has been established, connect a 20mA source to the input of the meter. Refer to Figure 16 for proper connection. Press the ENTER button, WAIT until UNDR appears.

{Step 9} Now that UNDR appears, press the down or up button, then select the desired display reading for the under indication. Press the ENTER button.

{Step 10} Now that OVER appears, press the down or up button, then select the desired display reading for the over indication. Press the ENTER button. Calibration is now complete.

Refer to 4 - 20mA menu on page 12 for the above steps (fig. 22)
14-1 PASSWORD MENU
Described below is the menu for selecting menu passwords. Figure 23

NEW PWRD

Figure 24

14-2 CALIBRATION MENU
The calibration routine is for thermocouples and RTD’s only. Described below is
the menu program for calibration. Each calibration can be independently done
using the down arrow \( \downarrow \) to scroll to the next routine. Push the up arrow \( \uparrow \)
anywhere to exit the calibration routine.

CAL

WAIT

NEW PWRD

fig. 24

Equipment Needed for Calibration

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>50.040 mV</td>
<td>+ .005 Power Source</td>
</tr>
<tr>
<td>100.03 Ω</td>
<td>+ .01 Ω Resistor</td>
</tr>
<tr>
<td>+ .1°F Thermometer</td>
<td></td>
</tr>
</tbody>
</table>

Note: Adjust a potentiometer to achieve 100.03 Ω.
15-1  THERMOCOUPLE CALIBRATION PROCEDURE

\[ \triangle = \text{UP} \quad \odot = \text{ENTER} \quad \nabla = \text{DOWN} \]

{Step 1} Power panel meter for at least 30 minutes.

{Step 2} Enter menu program, go to the CAL mode. Press the down button and hold for approximately 1.5 seconds until the meter reads SHRT, then release the button. Failure to hold the button for 1.5 seconds will terminate the calibration process.

{Step 3} Install jumpers between terminals 5, 6, and 7 using copper wire. Press and release the enter button. Wait until 50mV appears. Disconnect jumpers.

![Jumper Diagram]

{Step 4} Now that 50mV appears, connect the leads from the 50mV source to the meter using terminals 5 and 6, remembering that terminal 5 is negative. Set the voltage supply for 50.040mV, then press and release the enter button. This simulates a thermocouple input. Wait until 100 ohm appears. Disconnect supply.

{Step 5} Press the down button to skip 100 ohm input.

{Step 6} Now that CJC appears, place the thermometer across the terminal strip and do not remove until the temperature stabilizes. The reading from the thermometer is going to be the new CJC temperature. Press and release the enter button. Use the up or down button to set the value, then press the enter button three times until V3.1 appears. Calibration is now complete.

![CJC Compensation Diagram]

Note: If calibration is off due to the CJC, refer to CJC Calibration on page 17
16-1 RTD CALIBRATION PROCEDURES

\[ \triangle = \text{UP} \quad \bigcirc = \text{ENTER} \quad \bigtriangledown = \text{DOWN} \]

{Step 1} Power panel meter for at least 30 minutes.

{Step 2} Enter menu program, go to the \textit{CAL} mode. Press the \textit{down} button and hold for approximately 1.5 seconds until the meter reads \textit{SHRT}, then release the button. Failure to hold the button for 1.5 seconds will terminate the calibration process.

{Step 3} Install jumpers between terminals 5, 6, and 7 using copper wire. Press and release the \textit{enter} button. Wait until 50mV appears. Disconnect jumpers.

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{figure27.png}
\caption{Figure 27}
\end{figure}

{Step 4} Press the \textit{down} button to skip 50mV input.

{Step 5} Now that 100 ohm appears, install jumper between terminals 6 and 7, and insert the 100Ω resistor into terminals 5 and 6. Then press and release the \textit{enter} button. This simulates a 3 wire RTD. Wait until \textit{CJC} appears. Disconnect jumper and resistor.

\begin{figure}[h]
\centering
\includegraphics[width=0.5\textwidth]{figure28.png}
\caption{Figure 28}
\end{figure}

{Step 6} Press the \textit{up} button to save and exit calibration, then press the \textit{enter} button three times until V3.1 appears. Calibration is now complete.
17-1 CJC CALIBRATION PROCEDURES

△ = UP  ○ = ENTER  ▼ = DOWN

{Step 1} Power panel meter for at least 30 minutes.

{Step 2} Enter menu program, go to the CAL mode. Press the down button and hold for approximately 1.5 seconds until the meter reads SHRT, then release the button. Failure to hold the button for 1.5 seconds will terminate the calibration process.

{Step 3} Press the down button until CJC appears.

{Step 4} Now that CJC appears, place the thermometer across the terminal strip and do not remove until the temperature stabilizes. The reading from the thermometer is going to be the new CJC temperature. Press and release the enter button. Use the up or down button to set the value, then press the enter button three times until V3.1 appears. Calibration is now complete.

Figure 29