Installation and Operating Instructions

Series 401-800
Site Programmable Receiver
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Series 401-800
Site Programmable Receiver
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Introduction...

This is the users' manual for Drexelbrook's SPR Site-Programmable process Alarm. The SPR is a device that monitors a process input or inputs and provides up to four, fully user-configurable, contact closure outputs whenever that input falls outside a user-set, high or low trip point. SPRs are typically used to activate a warning light, bell or buzzer; or to initiate a system shutdown, thus acting as simple, but highly reliable and effective means of safe-guarding a process.
**Programmable Alarms**

The SPR contains 4 contact closure alarms. Each installed alarm can be individually programmed for a different trip point, deadband, delay, high or low alarming, latching or non-latching, and failsafe or non-failsafe operation.

If an input source is either unavailable or inconvenient, the unit's front panel push buttons and integral liquid crystal display (LCD) can be used to "enter" the desired trip point by ramping up or down to the value.

When an input source is available, the SPR can "capture" trip points by setting the input to the desired trip and pressing the appropriate button.

**Programmable Outputs**

The SPR family can provide isolated, scalable, analog output ("re-transmission" of input) in several ways.

The SPR comes standard with transmitter excitation capability, and can be equipped with a fully scalable analog output option with the capacity of being switched by the user to either 0-20mA (source or sink), or 0-5V.

**Programmable Displays**

**Two Display Modes**

With the Current/Voltage Input SPR, the user can choose between the Linear Function mode and the Custom Function mode.

In its Linear Mode, the SPR behaves much like a simple input meter. The display is set by the user to show the input in either mA or volts. Its scaling is tied to any input scaling performed. (If equipped with the AO option, the SPR's output can be scaled independent of the input.)

The Custom Mode sets the unit up for independent programming of input scaling, display scaling, and, if equipped with the AO option, output scaling. In Custom Mode, the user selects % of scale, Blank (for raw display).

**Programmable Alarms**

SPR alarm setup is quick, intuitive, and flexible. Most unit operating parameter controls can be viewed and/or set using push buttons and a series of simple, "plain English" menu prompts displayed on the integrated front panel LCD.

Failsafe or Non-failsafe alarm functioning and source/sink settings for the optional analog output are controlled by DIP switches that, together with a security jumper, are located behind an easy-to-use access panel inside the unit housing. Unit dis-assembly is unnecessary.

**Universal Mounting**

The SPR is housed in a "universal" DIN case that can be mounted on both 32mm G-type (EN50035) and 35mm Top Hat (EN50022) DIN rail. The Installation section of this manual gives the dimensions of the housings for the various alarm configurations.
Specifications

The tables on the following pages summarize the specifications for the SPR. These listings are followed by information useful when ordering additional or replacement SPRs.

<table>
<thead>
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<th>Performance</th>
<th>Repeatability: Trip point repeats within 50% of the specified input accuracy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accuracy - Display: ±1 digit. When scaling the display, high input-to-display span ratios decrease display accuracy. Refer to notes in &quot;Scaling the Display&quot;, later in this manual.</td>
<td></td>
</tr>
<tr>
<td>Accuracy - Input: ±5μA; voltage inputs, ±1mV.</td>
<td></td>
</tr>
<tr>
<td>Accuracy - Output (AO/AOZ-equipped units only): ±0.03% of output span; Defined as overall unit error, equal to the input accuracy (see Table 1), plus the output error, plus the cold junction compensation error (if applicable), including the combined affects of linearity, hysteresis, repeatability, and adjustment resolution; does not include ambient temperature affect.</td>
<td></td>
</tr>
<tr>
<td>Deadband: 11.5V or 57.5mA, maximum (max), in Linear mode; equivalent of maximum input range in user-set engineering units in Custom mode.</td>
<td></td>
</tr>
<tr>
<td>Response Time*: 700 milliseconds (msec), maximum (max), for RTD, TC, y, or mV inputs; 500 msec, max, for mA or V inputs. *Defined as time from step change on input to alarm state change when trip point is set to step mid-point.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Performance (continued)</th>
<th>Stability: ±0.1% of calibrated span, max, over six months.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Line Voltage Effect: ±0.005% of span for a 1% change in line voltage (ac or dc).</td>
<td></td>
</tr>
<tr>
<td>Isolation: 1000Vrms between case, input, output (AO/AOZ-equipped units), and power terminals.</td>
<td></td>
</tr>
<tr>
<td>NOTE: For temperature, mV, and resistance inputs to TPRG SPAs, high voltage as defined of ±0.001% of span/V possible with prolonged exposure to ac voltages above 200Vac. For mA and V inputs, effect is ±0.005% of output span/V above 200Vac.</td>
<td></td>
</tr>
<tr>
<td>Power Consumption: 2.3-5.5W, nominal; 8.25W, max.</td>
<td></td>
</tr>
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<table>
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<tr>
<th>Ambient Conditions Ratings</th>
<th>RF/EMI Protection: 30V/M - ABC - 0.5% error in reading, when tested according to SAMA standard PMC 33.1</th>
</tr>
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<tbody>
<tr>
<td>Noise Rejection: For temperature, mV, and y inputs, 120dB @ 60Hz, common mode; 30dB @ 60Hz, normal mode; For mA and V inputs, 100dB @ 60Hz, common mode; 40dB @ 60Hz, normal mode (measured w/ current input)</td>
<td></td>
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<table>
<thead>
<tr>
<th>Ambient Conditions Ratings (continued)</th>
<th>Operating Temperature Range: -25°C to +65°C (-13°F to +149°F)</th>
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<td>Storage Temperature Range: -40°C to +80°C (-40°F to +176°F)</td>
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<td>Humidity Range: 0-95%, non-condensing</td>
<td></td>
</tr>
<tr>
<td>Effect of Ambient Temperature Accuracy*: ±0.005% of output span per °C, max, ±15ppm of input signal</td>
<td></td>
</tr>
<tr>
<td>On Reference Junction Compensation: ±0.5% per 50°C change in ambient temperature</td>
<td></td>
</tr>
</tbody>
</table>

| Adjustments | Four, front panel push buttons control settings for Zero, Span, Alarm Trip point, etc. Easy-access, internal settings select current or voltage output and high/low alarm function; Internal jumper and menu password protect parameter settings |

<table>
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<tr>
<th>Display</th>
<th>LCD: 2x4 character, backlit, alphanumeric readout accurate to the nearest digit.</th>
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<td>Range: -9999 to 9999; user-set decimal point position on HLPGR in Custom Mode.</td>
<td></td>
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<tr>
<td>LEDs: Dual-color TRIP light shows green for non-alarm, red for alarm (dual color); READY light indicates normal operation, extinguishes in the event of any internal failure; Dual-color INPUT light shows green for input within rated range, red for sensor/wire failure or overrange (TPRG units only).</td>
<td></td>
</tr>
<tr>
<td>Weight: 456 to 513 g (16.1 to 18.1 oz)</td>
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NOTE: Refer to description of AO Option, later in this section, for output specifications including input-to-output error.
Ordering Information

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<th>Options</th>
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<td>SPR</td>
<td>Accepts high-level input signals. Current: user-set to any range between 0 and 50mA. Voltage: user-set to any range between 0 and 10V</td>
<td>4PRG - Quad relay, relays are single-pole/double-throw (SPDT), 1 form C, rated 5A @ 250V 50/60Hz, non-inductive; user-set for: Normally Open or Normally Closed High or Low Faultsafe or Non-failsafe</td>
<td>U - Universal Power, 22-300Vdc or 90-260Vac, automatically switches to appropriate power, Consumption 2-3.5W, nominal; 8.25W, max</td>
<td>-AO - Auxiliary analog output</td>
<td>DIN - Universal DIN-style housing mounts on both 32 mm G-type (EN50035), and 35 mm (EN50022) Top Hat DIN rail</td>
</tr>
</tbody>
</table>

Options

The following list gives details on the options in the Ordering Information table, above. For information on the availability of unit options not listed here, or for help in selecting the type of SPR best suited to your application, consult with your Moore Industries Sales Representative, or call the factory.

**AO - Auxiliary Analog Output Option.** A proportional output set by the user to provide 1-5Vdc, or to source or sink 4-20mA of current (transient protected). Factory default is sourcing 4-20mA. Internal DIP switches are accessed through a convenient panel in the unit housing.

- Output Limiting: 125% of span, typical; 140% of span, max.
- Response Time: 500 msec, max, to reach 90% of full scale in response to a 100% step change on input.
- Ripple: 15mV, peak-to-peak, maximum, for voltage output; 10mV, peak-to-peak, maximum, when measured across a 250 ohms load for current output.
- Compliance Voltage: 40Vdc, maximum.

- Accuracy: (±0.03% of span) + (±0.25°C) + (rated input accuracy for the sensor and range selected). Refer to Table 1 for input accuracy information corresponding to the sensor type and range selected.

- Maximum load: 1200 ohms in source mode, 2000 ohms in sink.

- Load Effect: ±0.01% of span from 0 to max load resistance on current output.
**SPR Model Numbers**

If service assistance is ever required for the SPR, make a note of the unit model number before contacting the factory. This assists the factory representative in providing you with the answers you need as efficiently as possible. If possible, and for fastest assistance, also note the unit serial number.

On the SPR, look for the model and serial numbers on a tag affixed to one of the housing side panels. Figure 1 shows a typical SPR model number with a "break out" of the various fields.

**Models Available**

```
401-0804-001-0
```

- **Power Requirement**
  - 0 = 120, 240VAC or 24VDC auto switching

- **Relays**
  - 4 = 4 SPDT relays

- **Approvals**
  - 0 = General purpose (CSA)

- **Mounting**
  - 1 = Chassis only Din rail mounting
  - 7 = NEMA 4X Housing

- **Output**
  - 0 = Relays Only
  - A = Analog Output

*Figure 1*
Alarm Terminology

Before setting up the SPR, or incorporating the unit in your application, Moore Industries suggests that all users take a few moments to become familiar with some of the terms associated with the use of process instrumentation alarms.

Figure 2 illustrates the way the SPR alarms operate. For more in depth information, contact the factory for a copy of the publication "Alarm Trips: The Ups and Downs".

Trip Point...
...is the process input level at which the user wants an alarm relay to change state, typically going into an alarm condition, or "tripping". In the SPR, the user sets the trip point for each installed relay.

High Alarms..
...trip when the process input goes above the trip point. Low Alarms trip when the process input drops below the trip point. Each of the SPR outputs can be set by the user to function independently as either high or low alarms.

Latching and Non-latching Alarms.
Once tripped, a latching alarm remains in alarm until the input returns to a non-alarm level AND is manually reset. Non-latching alarms return to a non-alarm state whenever the process input returns to the Reset Point. The SPR relays can be set by the user to function as either latching or non-latching.

Reset Point...
...is the process input level at which the user wants an alarm relay to change state, typically going from alarm to non-alarm. The reset point is not necessarily the same as the trip point, because most applications call for a buffer zone or "Deadband" around the trip point to allow for minute fluctuations in the process input. In the SPR, the reset point is determined by the deadband setting. Latching SPR alarms will not "clear" unless the reset point has been reached or passed AND the manual reset contacts have been shorted.

Figure 2
Deadband...
...is the range in which an alarm remains tripped even after the process input has returned to or passed the trip point. Deadband is not required. When it is not incorporated into an alarm application, the trip point and reset point are the same. The deadband of the SPR is set by the user.

Failsafe Alarms...
...are de-energized when tripped, energized when the process input is at a non-alarm level. Non-failsafe Alarms are energized whenever tripped, de-energized with the process input is at an alarm level. The relays in the SPR can be switched from failsafe to non-failsafe at any time by the user.

Normal...
is the term used to describe the "shelf-state" of relay contacts. The contacts of a Normally Open relay are open (infinite resistance) when the relay is not energized. The contacts of a Normally Closed relay are open when the relay is energized (closed when not energized).

NOTE:
Sometimes a non-alarm input level is referred to as being in a "normal" condition. This practice is intentionally avoided in this manual.
Do not confuse the term "normal", as in Normally Open or Normally Closed, with a non-alarm input condition. In this manual, "normal" is an exclusive reference to the shelf state or quiescent state of an alarm's relay contacts, whether open or closed.
**Internal Settings**

The Failsafe/Non-failsafe relay and the password security functions of the SPR are controlled by means of simple DIP switches and a single jumper inside the unit housing.

If the unit is equipped with the AO option, voltage and current sink/source selection is also inside.

The SPR housing is fitted with a sliding access door in its bottom panel. Figures 3, 4, and 5 show the panel and the location of each of the controls for setting:

- Password Security ON/OFF (Figure 3)
- Failsafe/Non-failsafe Alarm Function (Figure 4)
- Current Source/Sink or Voltage (Figure 5) (Available in AO-equipped SPRs only)
- Standard Ranged Zero and Full Scale (AO/AOZ-equipped units only)

and

- Actual Output Trim (AO/AOZ-equipped units only)

**Main Menu/View Settings**

Figure 6 gives an overview of the first level of menus used to configure the SPR.

Press the up or down arrow buttons to return to “55 PASS” from “READ ONLY”.

---

**Figure 3**

![Diagram showing password security settings](image)

**NOTE:** THE THREE PINS TOWARD THE LEFT SIDE OF THE COMPARTMENT ARE FOR FACTORY TESTING ONLY. DO NOT INSTALL JUMPERS ON THESE PINS.
Figure 4

SET FAILSAFE/NON-FAILSAFE

MEANS

MEANS NON-FAILSAFE

MEANS FAILSAFE

EXAMPLES:

ALL ALARMS FAILSAFE

ALARMS 1 & 2 FAILSAFE
ALARMS 3 & 4 NON-FAILSAFE
Figure 5
Programming the SPR

The High Level Input SPR operating parameters are set, and the settings are stored in on-board, non-volatile EEPROM. There are four push buttons on the unit front panel; VIEW, SELECT, an UP arrow, and a DOWN arrow. Together with the prompting messages displayed on the LCD, these are used to access menus, and to view and change the settings for:

- Select Input Type: current (I) or voltage (V)
- Select Functional Setting (Linear Mode or Custom Mode) and, if selected, set Custom Mode Engineering units.
- Scale Input — Smart Scaling
- Apply Input — Bench Scaling
- Scale Display readout
- Set Linearization Curve (Custom Mode only)
- Scale Analog Output (AO-equipped units only)
- Trim Actual Output (AO-equipped units only)
- Configure Alarm Functions (Trip points, etc.) and
- Change/View Password
The SPR receiver by Drexelbrook is pre-configured to accept a 4 to 20 mA input. The display is pre-set for 0 to 100%. The four alarm relays are pre-set to the following trip points:

- Trip 1 = 25%
- Trip 2 = 50%
- Trip 3 = 75%
- Trip 4 = 100%

To change the display, do the following:

Push Select button. Continue to push select until screen display =

**Engineering Units**

**Percent**

**Blank**

Push Select again. Screen display =

**Scale Display**

Push Select until screen display =

**Set Decimal Point**

Push Select again. Screen display =

**Decimal Point**

Push Select again. Screen display =

**Display Zero**

Push Select again. Screen display =

**Display Full**

Push Select again. Screen display =

**100.0**

Push Select again. Screen display =

**Exit Display**

Continue to Push Select until CONF ALRM (configure alarm) is reached. To change alarm set points go to next page. If pre-set alarms are acceptable, continue to push select until CONF EXIT (configure exit) is reached. Push Select one more time to return to normal display.
To change alarms, do the following:

- **Push Select button.**
  - **Continue to push select until screen display =** CONFIG ALRM
  - **Configure Alarm**

- **Push Select again.**
  - **Screen display =** AL1 CONF
  - **Alarm 1**

- **Push Select until screen display =** ENTR TRIP
  - **Enter Trip**

- **Push Select again.**
  - **Screen display =** 025.0 PCT
  - **Set trip Point**
  - Use the up down arrows to change trip point

- **Push Select again.**
  - **Screen display =** ENTR DB
  - **Enter Dead Band**
  - Dead Band is the range in which an alarm remains tripped even after the process input has returned to or passed the trip point. Dead Band is not required.

- **Push Select again.**
  - **Screen display =** 000.0 PCT
  - Use the up down arrows to enter dead band

- **Push Select again.**
  - **Screen display =** ENTR DLY
  - **Enter time delay**
  - Time delay is the time in seconds that the alarm is delayed from tripping. Time delay is not required.

- **Push Select again.**
  - **Screen display =** 00 SECS
  - Use the up down arrows to add time delay

- **Push Select again.**
  - **Screen display =** SET HILO
  - **Set high low**

- **Push Select again.**
  - **Screen display =** HIGH ALRM
  - High Alarm
  - Use the up down arrows to toggle between high or low level

---

Continued on next page
To change alarms, continued:

Push Select again.
Screen display = SET LAT
Set Latching

Push Select again.
Screen display = LAT OFF
Latching Off

Use the up down arrows to toggle between latching on or off

Push Select again.
Screen display = EXIT ALRM
Exit Alarm

Go back to step #1. Repeat procedure for alarms 2, 3, and 4 as required.

Push Select again.
Screen display = AL2 CONF
Alarm 2

Push Select again.
Screen display = EXIT ALRM
Exit Alarm

Continue to push select until CONF EXIT (configure exit) is reached. Push Select one more time to return to normal display.
Main Menu/View Settings

Figure 6 gives an overview of the first level of menus used to configure the SPR.

On power-up, the SPR defaults to a display of the measured value. Pressing the VIEW button accesses a series of displays that show, in succession, the settings currently stored in unit memory (see Figure 7).

Depending upon whether or not the Security Jumper has been installed (see Figure 3), SELECT will access either the first screen in the main configuration menu, "SEL V/I", or the password code query screen, "ENTR PASS".

Once the Main Menu has been accessed, the up and down arrow buttons are used to move through all of the sub-menus in a loop. Pressing the SELECT button accesses the first screen of the sub-menu shown on the LCD.
Password
This menu is bypassed if the Password Security Jumper is not installed (see Figure 3). If the jumper is installed, the menu comes up when SELECT is pressed from the display of the process variable input. The flow chart is shown as part of Figure 6.

1. If the jumper is installed, pressing SELECT from the display of the process variable input will bring up the “ENTR PASS” screen.

2. Use the up or down arrow buttons, or press SELECT again to access “55 PASS”, the default screen for this point in the menu.

3. Use the up or down arrow buttons to display the correct password.

When the correct password number is displayed, press SELECT.

NOTE:
If the correct password is not known, the unit settings can be viewed, but not changed, as shown in Figure 7.

4. If you have entered the correct password, the Select Input Type menu, “SEL V/I”, will be accessed. If not, the display will show a “READ ONLY” message.

5. From “READ ONLY”, press SELECT to view the settings in the various menus. READ ONLY mode locks out any attempt to make changes to the settings.

Press the up or down arrow buttons to return to “55 PASS” from “READ ONLY”.

NOTE:
The menu to set or change the Password stored in SPR memory is presented later in this section of the manual.
Select Input Type

The menu for selecting the input type for the High Level SPR is shown in Figure 8.

If the Password Jumper is not installed, the password sub-menu is bypassed, and the Select V/I menu is accessed by pressing SELECT from the display of the measured input value.

1. From the "SEL V/I" display, press SELECT.

2. Use the up or down arrow buttons to scroll through the two options for input type. The default display for this menu is always the last setting.

3. When the display shows the type of input, current or voltage, that is to be used with the SPR, press SELECT.

4. The next display is the menu for the selection of functional options, "CONF OPTS". To skip the rest of the configuration menus and return to the display of the measured input value, press the up arrow button 2 times (to "CONF EXIT"), and press SELECT.
Configure Function Option — SPR

This menu allows the user to choose between Linear and Custom modes of functioning.

Linear Functioning. In its Linear Mode, the SPR behaves much like a simple input meter. The display is set by the user to show the input in either mA or volts. Its scaling is tied to any input scaling performed (set in another menu). If equipped with one of the AO options, SPR output also can be scaled independently with respect to the input.

Custom Function. The Custom Mode sets the unit up for independent programming of input scaling, display scaling, and, if equipped with the AO or AOZ options, output scaling. In Custom Mode, the user can select °C, °F, % of scale, or Blank (for raw display); or a user-specified, 4-place engineering unit, set at the factory.

Also, if Custom Mode is selected, the user can select either linear or non-linear display scaling, which enables a user-programmed, 20-point linearization set in a separate menu.

**NOTE:**
The SPR's Linear Mode and its linearizing of the Custom Mode functioning are not the same. Refer to Figure 9.

Figure 9 gives an overview of the SPR Configure Options menu.

---

1. From the "SEL V/l" screen of the Main Menu, press SELECT.
   This brings up "SET FUNC", which is the access screen for choosing between Linear and Custom Function Modes.

2. Press SELECT again, or use the arrow buttons to move to "EXIT OPT" and abort the HLPRG Select Options procedure and return to the Main Menu.

   Note that, depending upon the Mode setting, it may be necessary to bypass "SET LIN" screen.

3. With "SET FUNC" showing on the LCD, use the arrow buttons to toggle between "CUST FUNC" and "LINR FUNC". Refer to the explanation above for information about each of the operating modes.

4. When the LCD shows the desired mode, press SELECT.

5. If "CUST FUNC" was selected, go to step 7.

6. If "LINR FUNC" was selected, the LCD will now show "EXIT OPTS".

   Use the arrow buttons to return to "SET FUNC" (step 3), or press SELECT to return to the Main Menu.

7. Press SELECT to begin the process of setting the desired engineering units to be displayed during operation.

8. Use the arrow buttons to "scroll" through the available options.

9. When the appropriate units are showing on the LCD, press SELECT.

   This brings up a sub-menu that allows the user to choose between a linearized or non-linearized display of the selected, custom engineering units.

10. Use the arrow buttons to toggle linearization on or off, then press SELECT to go to "EXIT OPTS".

11. Press SELECT again (from "EXIT OPTS") to return to the Main Menu, or to correct any mistake, go to step 2.
FROM THE MAIN MENU:

SELECT VIEW SELECT
CONFIG OPTS

CHOSE CURRENT OR VOLTAGE (DEFAULTS TO mA)

SELECT VIEW SELECT
SEL V/I

WHAT IS THE CONFIGURATION OF THE UNIT?

SELECT VIEW SELECT
SET FUNC

RETURN TO THE MAIN MENU

SELECT VIEW SELECT
EXIT OPTS

SELECT VIEW SELECT
LIN ON

SELECT VIEW SELECT
LIN OFF

SELECT VIEW SELECT
EXIT OPTS

SELECT VIEW SELECT
SET EGU

Figure 9
Scaling Input —
"Smart Scaling"
This feature of the SPR allows users to set the zero and full scale values of the input from the intended application without having to connect the unit to any calibration equipment.

With Smart Scaling, the LCD and menus are used to enter the value for zero and full scale, in either milliamps or volts.

Once these two input parameters are set, the SPR automatically routes the user to the next appropriate menu; Scale the Display, for Custom Mode users; Scale the Output, for Linear Mode users (with AO-equipped SPRs); or Configure Alarms, for Linear Mode users whose units are not equipped with analog output.

Figure 10 shows the Smart Scaling menu.

1. From the readout of “SCLE INPT” on the Main Menu, press SELECT.

2. Use the arrow buttons to “scroll” from “SET ZERO” to “SET FULL”, or to “EXIT SCLE” to abort Smart Scaling and return to the Main Menu.

3. When the desired parameter shows on the LCD, press SELECT.

   The LCD will show the engineering units selected in Configure Options menu, discussed previously in this section.

4. Use the arrow buttons to set the display to show the known zero or full scale input from the intended application. Holding the push button in accelerates the display change.

5. When the LCD shows the correct setting, press SELECT.

6. If "EXIT SCLE" is showing and both zero and full scale have not been set, go to step 2.

7. If both the zero input and full scale input parameters have been entered into the SPR memory, go to step 9.


9. Use the arrow buttons to “scroll” to “EXIT SCLE” and press SELECT.

   If the SPR Custom Mode was selected in the Configure Options menu, the next menu shown will be Scale the Display, since in Custom Mode the input, display, and output (if present) are independent.

   If the SPR Linear Mode was selected in the Configure Options menu, the next menu shown will either be Scale Analog Output, for units equipped with an AO option, or Configure Alarms.
Figure 10

FROM THE MAIN MENU:

SET LINEAR OR CUSTOM ENGINEERING UNITS

DEFUALTS TO LAST SELECTED

INCREMENT XXXX (ZERO)

DECREMENT XXXX (FULL)

EXIT INPUT SCALING AND RETURN TO MAIN MENU

WAS SELECTED IN PREVIOUS?
Applying Input — Bench Ranging the SPR

With this method of calibrating input to the SPR, the unit is incorporated into a calibration setup and inputs are “captured” at their zero and full scale levels.

Figure 11 shows the setup required for applying and capturing input scaling for the SPR. After the connections shown in the diagram have been made, apply appropriate power and allow approximately 5 minutes for unit warm-up/stabilization.

Figure 12 shows the SPR menu used in this procedure.

1. From the “APLY INPT” point of the SPR Main Menu, press SELECT.

2. Use the arrow buttons to bring up the desired parameter, Save Zero, Save Full, or Exit Input to abort the Bench Ranging procedure.

3. When the appropriate display for the parameter to be input is showing on the LCD, press SELECT.

The display will show the engineering units selected in the Configure Options menu, discussed earlier in this section.

4. Vary the input to either the zero or full scale level from the intended application.

5. When the display shows the appropriate readout, press SELECT to capture the value in the SPR memory.

6. Repeat steps 2 through 5 until both the zero and full scale values from the intended application have been captured.

7. If the SPR being configured has been set up to operate in Linear Mode and no analog output option is present, go to step 10.

8. If the SPR being configured has been set up to operate in Linear Mode and an analog output option is present, go to step 11.

9. If neither step 7 or 8 apply, use the arrow buttons to bring up the “EXIT INPT” display from step 5, and press SELECT to return to the Main Menu at the Scale Display point.

10. Use the arrow buttons to bring up the “EXIT INPT” display from step 5, and press SELECT to return to the Main Menu at the Configure Alarm(s) point.

11. Use the arrow buttons to bring up the “EXIT INPT” display from step 5, and press SELECT to return to the Main Menu at the Scale Output point.
Scaling the Display —
Setting the Engineering Units in Custom Mode

This is the menu with which the SPR user can further "customize" unit operations. This menu is available only in units where the “CUST FUNC” Custom Mode selection has been made in the Configure Options menu, earlier.

**NOTE:**
The settings for decimal place and zero and full scale display that are entered into SPR memory are saved as numeric values as opposed to percentages.
They are independent of settings for input scaling and trip points.

If changes are made to the Input Scaling or Trip Points (in the Configure Alarms menu), this menu must be accessed and the values changed appropriately in order to carry any scaling changes through to the display.

Figure 13 shows the menu for this procedure.

---

1. From the “SCLE DSPL” screen of the Main Menu, press SELECT.
2. Use the arrow buttons to "scroll" through the parameters for scaling the display:
   - Set the decimal position
   - Set the displayed zero
   - Set the displayed full scale
   - Exit the Display Scaling procedure and return to the Main Menu
3. When the parameter that is to be set is showing on the LCD, press SELECT.
4. Refer to Figure 24 for information on the function of the up and down arrow buttons for each of these parameters.
5. When the parameter has been set appropriately for the intended application, make a note of the scaling for future reference, and press SELECT.
6. Repeat steps 2 through 5 until all parameters for the display have been set as required.
7. With “EXIT DSPL” showing on the LCD, press SELECT to return to the Main Menu.
NOTE: MAXIMUM DISPLAY RANGE = \[
\text{INPUT RANGE} \div \text{INPUT ACCURACY}
\]

(1mV FOR VOLTAGE INPUTS, 5µA FOR CURRENT INPUTS)

*DISPLAY FULL SETTING – DISPLAY ZERO SETTING
Programming SPR Linearization - Entering Segment Endpoints in Custom Mode

Using this menu the user can program up to 20 linearization points into non-volatile SPR memory. This capability works exclusively with the unit's Custom Mode to make the SPR display linear with respect to its scaled input. When enabled (in the "CONF OPTS" menu, discussed earlier), the SPR's Custom Mode sets the unit to display the linearized input value in the user-set engineering units.

As mentioned, the "ENTR CURV" menu is active only when the SPR's "CUST FUNC" Custom Mode selection has been made in the Configure Options menu.

**IMPORTANT:**
Input zero and full scale as well as display zero and full scale must be programmed prior to programming the linearization curve.

The procedure consists of defining the number of points that are to constitute the linearization curve, then specifying first the input, then its corresponding display value at each point. Figure 14 shows the menu.

1. Make sure that the zero and full scale values have been entered into memory for:
   - Input scaling ("smart" scaling) or input capturing (bench scaling)
   - Display scaling
   - Analog Output (if present)

2. From the "ENTR CURV" point of the main, SPR menu, press SELECT.

3. Press SELECT from the next screen, "NUMB PNTS", to bring up a screen for entering the number of points to be used in the linearization curve.
   
   or
   
   Press the down arrow button to bring up the "PNT ##" screen, which is a prompt the particular point to be changed/added, assuming that the curve has been entered previously.

4. When the display shows the point number that is to be programmed, press SELECT.

5. Use the arrow buttons to set the desired INPUT VALUE for the first point. Note that the default units are those selected in the "SEL V/ I" menu, mA or V.

The "rules" for entering points are:

- Xz < Xn < Xn+1 < Xn+2 < ... < Xn+19 < Xf
  Where Xz=Input zero, in this case, 0mA; and Xf=Input full scale, in this case, 50mA;
  Xn, Xn+1 through Xn+19 = Input curve

- Yz < Yn < Yn+1 < Yn+2 < ... < Yn+19 < Yf
  Where Yz=Display zero, in this case, 0%; and Yf=Display full scale, in this case, 100%;
  Yn, Yn+1 through Yn+19 = Display curve

**NOTE:**
The endpoints of the curve must fall within a range defined by the zero and full scale values for both the input and the display (see the graph, below).
6. When the display shows the desired value, press SELECT.

7. The next screen prompts for the value that the DISPLAY is to show at the input level just programmed (steps 5 and 6).

   Use the arrow buttons to program the desired value. Note that the default units here are those that were set in the "CONF OPTS" menu.

8. When the display shows the desired value, press SELECT.

9. The SPR automatically brings up the screen "PNT ##" for the next point to be programmed (if the "NUMB PNTS" value was changed), or returns to the "ENTR PNT" screen to allow the user to select the next point. From "ENTR PNT" the user can also exit to the main menu.

    **NOTE:**
    When programming linearization points, the LCD will flash if an attempt is made to enter an "illegal" point.

10. Refer to the following example for further clarification.
EXAMPLE - Programming an Linearization Curve

Following the instructions is step 1 on the preceding page, an SPR is set up with the following parameters:

- 0-50mA input
  ("SEL V/I", and "SCLE INPT" or "APLY INPT")

- 0-100% LCD readout
  ("PCT" in "CUST FUNC" under "CONF OPTS", and 000.0 for zero, 100.0 for full scale in "SCLE DSPL")

Use a graph to show the relationship between INPUT and DISPLAY:

\[ \begin{array}{c|cccc}
\text{100%} & \text{full} & \text{scale} \\
90 & \text{90} \\
80 & \text{80} \\
70 & \text{70} \\
60 & \text{60} \\
50 & \text{50} \\
40 & \text{40} \\
30 & \text{30} \\
20 & \text{20} \\
10 & \text{10} \\
0 & \text{0} \\
\end{array} \]

As shown, plot the INPUT points along the X axis, and the DISPLAY points along the Y axis.

The "rules" for inputting linearization points are as follows:

- \( X_z < X_n < X_{n+1} < X_{n+2} < \ldots < X_{n+19} < X_f \)
  Where \( X_z \) = Input zero, in this case, 0mA; and \( X_f \) = Input full scale, in this case, 50mA;
  \( X_n, X_{n+1} \) through \( X_{n+19} = \) Input curve

- \( Y_z < Y_n < Y_{n+1} < Y_{n+2} < \ldots < Y_{n+19} < Y_f \)
  Where \( Y_z \) = Display zero, in this case, 0%: and \( Y_f \) = Display full scale, in this case, 100%;
  \( Y_n, Y_{n+1} \) through \( Y_{n+19} = \) Display curve

From steps 2 and 3 of the procedure, 5 points between 0 and 50mA are chosen.

"5" is entered in the "NUMB PNTS" screen. When SELECT is pressed, the "PNT 01" screen appears. Pressing select, the arrow buttons are used to enter the first input point, which, in this example is to be 10mA.

When SELECT is pressed, we are prompted for the DISPLAY at point 01, which, in this example, we want to be 20%. Our graph would look like this for point 01:
Following the menu prompts for each of the five points, the graph would look like this:

![Graph Image]

Notice that the 5 points create 4 segments. The end segments, shown by the dashed lines are defined by the coordinates of the input scale and the display scale and the adjacent curve points.

Any inputs that fall outside the input scale are defined by the same slope and offset of the dashed segments in the graph.

A 20-point curve can therefore define 21 segments.

**If more points are to be added...**

the SPR menu automatically takes the user to the point that has not yet been defined. The user cannot exit the curve programming until all points are defined.

**NOTES:**

If INPUT SCALING (X axis) is changed, during SPA operation, to fall within the curve values (violation of the "rules" on the preceding page), a TABLE ERROR message will be returned.

If the DISPLAY SCALING (Y axis) is changed, the curve coordinates automatically change to proportionally fall within the new display scale.

If the display scaling in our example were changed, the following would be implemented automatically by the unit:

<table>
<thead>
<tr>
<th>INPUT</th>
<th>INITIAL DISPLAY SCALE</th>
<th>0-750 UNITS</th>
<th>500-1000 UNITS</th>
</tr>
</thead>
<tbody>
<tr>
<td>10mA</td>
<td>20%</td>
<td>150</td>
<td>600</td>
</tr>
<tr>
<td>20mA</td>
<td>40%</td>
<td>300</td>
<td>700</td>
</tr>
<tr>
<td>30mA</td>
<td>60%</td>
<td>450</td>
<td>800</td>
</tr>
<tr>
<td>40mA</td>
<td>80%</td>
<td>600</td>
<td>900</td>
</tr>
</tbody>
</table>

**NOTE:**

When a TABLE ERROR occurs, change the INPUT SCALE to "follow the rules".

The change will not be processed by the SPR until the Configuration menu is exited, or until power is recycled.
Scaling the Analog Output - SPRs with AO
This menu is only applicable to those SPRs equipped with an analog output option.

Scaling for the analog output of the SPR is stored as numerical values in unit memory. They are not stored as percentages of scale.

**NOTE:**
*If either Input Scaling or Display Scaling is changed, any existing scaling operating on the analog output (if present) must also be changed.*

Figure 15 shows the menu for this procedure.

1. From the "SCLE AO" display of the Main Menu, press SELECT.
2. Use the arrow buttons to "scroll" through the parameters for scaling the output:
   - Set the zero value
   - Set the full scale value
   - Exit the Output Scaling procedure and return to the Main Menu
3. When the parameter that is to be set is showing on the LCD, press SELECT.
4. Use the arrow buttons to increment and/or decrement the displayed parameter. Holding the arrow button in accelerates changes.
5. When the parameter has been set appropriately for the intended application, make a note of the scaling for future reference, and press SELECT.
6. Repeat steps 2 through 5 until all parameters for the display have been set as required.
7. With "EXIT Z/FS" showing on the LCD, press SELECT to return to the Main Menu.

Trim Output
This procedure is only required on those SPRs equipped with the AO option.

Figure 16 shows the setup needed. Figure 17 shows the menu.

Connect the unit as shown, apply the appropriate power, and allow 5 minutes for stabilization/warm-up.

1. Access the configuration menus, and use the arrow buttons to scroll to "TRIM OUT".
2. Press SELECT to access the menu. The "TRIM ZERO" screen will be displayed.
3. Use the arrow buttons to choose the level, zero or full scale, that is to be trimmed.
4. Press SELECT to begin the trim process. The display will begin to flash the "TRIM ZERO" or "TRIM FULL" screen, depending upon the option chosen in step 3.
5. While monitoring the reading on the meter, use the arrow buttons to adjust the output to the desired level. Use the meter in the setup to monitor the output as the output is adjusted.
6. When the output is set as desired, press SELECT. This sets the adjustment into SPA memory, and brings up either the next output level to be adjusted (repeat steps 3, 4, and 5), or "EXIT OUT" if both zero and full scale output have been adjusted.
7. To exit the menu, press SELECT when "EXIT OUT" is displayed. The unit will return to the Main Menu.
NOTE: RE-RANGING THE UNIT NULLIFIES ANY OUTPUT TRIM. RE-TRIM AFTER ANY RE-RANGING.
Configure Alarm(s)

This menu sets:

- Trip point(s)
- Deadband(s)
- Trip delay(s)
- High alarm or Low alarm function
- Latching or Non-latching operation

Figure 18 gives the menu overview.

1. From the “CONF ALRM” screen of the Main Menu, press SELECT.

2. Press SELECT again to access the settings for the first installed alarm, or use the arrow buttons to access the “ALRM EXIT” screen. Pressing SELECT from “ALRM EXIT” returns to the Main Menu at “PASS WORD”.

3. Use the arrow buttons to scroll through the alarm operation parameters. Press SELECT to access the settings for the displayed parameter.

For convenience, it is recommended that the settings be entered into SPR memory in the order that they come up in this step (shown in Figure 17 from top to bottom):

- Enter Deadband
- Enter Delay
- Set High Alarm or Low Alarm functioning
- Set Latching or Non-latching
- Exit

NOTES:

There are two options for setting the trip points of the installed alarms, “ENTR TRIP” and “APLY TRIP”.

In the “ENTR TRIP” menu, the user employs the Smart Ranging feature of the SPR, entering the desired trip point with the front panel push buttons. (Steps 4 through 6)

In the “APLY TRIP” menu, the SPR must be set up with calibration equipment (see Figure 22, page 42). In this, the Standard Ranging procedure, the unit “captures” its trip point from the input of an adjustable source. (Steps 7 through 14)

ENTER TRIP

If the value of the trip point is known, use this, the Smart Ranging feature, of the SPR to program the value into SPR memory. If the trip point is not known, or cannot be entered numerically, skip to step 7, APPLY TRIP.

4. From “ENTR TRIP” in step 3, press SELECT.

NOTE:

When the SPR is in Linear Mode, the display will show either mA or V.

When in Custom Mode, the display will show the engineering units set in the CONF OPTS menu, page 35.

5. Use the arrow buttons to ramp the display to the trip point value, and press SELECT. This enters the displayed value into SPR memory, and brings up the “ENTR DB” (enter deadband) display.

Figure 18
**APPLY TRIP**

A signal can be applied to the input terminals of the SPR, using the setup shown in Figure 22, on page 42. With this setup and the following procedure, the unit can "capture" the desired trip point.

7. Install the SPR being configured into the setup shown in the figure, apply appropriate power, and allow approximately 5 minutes for stabilization/warm-up.

8. Access the configuration menus, and use the down arrow to access the "CONF ALRM" menu.

9. Press SELECT.

10. Use the arrow buttons to access "APLY TRIP".

11. Press SELECT. The display will flash the input level present at the terminals.

12. Adjust the input to the desired trip point level.

13. Press SELECT when the flashing value on the display reaches the desired trip point value. This stores the value in SPR memory and returns the unit to the Alarm Configuration menu at the "ENTR DB" (enter deadband) screen.

Disconnect the SPR from the input.

14. Press SELECT to access the deadband setting screen, or use the arrow buttons to scroll through the other alarm operating parameters. Press SELECT to access the screen(s) for the parameter displayed, or scroll to "EXIT ALRM" and press SELECT to access the menus for another alarm (if installed), or to return to the Main Menu.

**ENTER DEADBAND**

15. From the "ENTR DB" screen, press SELECT.

16. Use the arrow buttons to increase or decrease the deadband around the trip point in SPR memory. The display will show the value in the engineering units selected in the "CONF OPTS" menu, discussed earlier.

17. Press SELECT when the display shows the desired deadband value. This returns the unit to the Alarm Configuration menu at the "ENTR DLY" (enter response delay) screen.

18. Press SELECT to access the delay setting screen, or use the arrow buttons to scroll through the other alarm operating parameters. Press SELECT to access the screen(s) for the parameter displayed, or scroll to "EXIT ALRM" and press SELECT to access the menus for another alarm (if installed), or to return to the Main Menu.

**ENTER DELAY**

19. From the "ENTR DLY" screen, press SELECT.

20. Use the arrow buttons to increase or decrease the amount of delay time between the input's exceeding the trip point setting and the actual state change of the alarm. Settings from 0 to 60 seconds are available in 1 second increments.

21. Press SELECT when the display shows the desired delay setting. This returns the unit to the Alarm Configuration menu at "SET HILO" (choose high or low alarm function).

22. Press SELECT to access the high/low setting screen, or use the arrow buttons to scroll through the other alarm operating parameters. Press SELECT to access the screen(s) for the parameter displayed, or scroll to "EXIT ALRM" and press SELECT to access the menus for another alarm (if installed), or to return to the Main Menu.
SET HI/LO

23. From the “SET HILO” screen, press SELECT.

24. Use the arrow buttons to toggle the alarm function between high alarm operation (trips when input exceeds the trip point setting) and low alarm operation (trips when input drops below the trip point).

25. Press SELECT when the display shows the desired setting. This returns the unit to the Alarm Configuration menu at “SET LAT” (choose latching or non-latching alarm function).

26. Press SELECT to access the latch/no latch setting screen, or use the arrow buttons to scroll through the other alarm operating parameters. Press SELECT to access the screen(s) for the parameters displayed, or scroll to “EXIT ALRM” and press SELECT to access the menus for another alarm (if installed), or to return to the Main Menu.

SET LATCHING/NON-LATCHING

27. From the “SET LAT” screen, press SELECT.

28. Use the arrow buttons to toggle the alarm function between latching (alarm stays tripped until input returns to normal (allowing for any deadband) AND unit is manually reset) and non-latching (alarm returns to normal as soon as input returns to normal, allowing for any deadband) function.

29. Press SELECT when the display shows the desired setting. This returns the unit to the Alarm Configuration menu at “EXIT ALRM”.

30. Press SELECT to bring up the menu for the next installed alarm. If no additional alarms are installed, or to return to the Main Menu, press SELECT from “EXIT ALRM”.

To set the operating parameters for the next installed alarm, use the arrow buttons from the “EXIT ALRM” screen to display the next alarm, “AL2 CONF”, for example, and press SELECT, and return to step 3.

When all of the alarm parameters for all of the installed alarms have been set as desired, press SELECT from “EXIT ALRM”, and press SELECT again from “ALRM EXIT”. This returns the unit to the Main Menu at “PASS WORD”
Change the Security Password Code
This menu is active when the Security Jumper is NOT installed, or when the jumper is installed and a correct password has been entered. When the jumper is installed, unless the correct password is entered, accessing this menu causes the "PASS LOCK" message to appear. Any attempt to make changes will be "locked out" (READ ONLY mode).

Figure 19 shows the menu.

1. From the "PASS WORD" screen, press SELECT to access "## PASS".

2. Use the arrow buttons to increment or decrement the password number to be stored in unit memory.

3. Press SELECT when the desired password number is displayed. This returns the user to the Main Menu.

**NOTES:**
The password can be any number between 00 AND 99.

When the security jumper (Figure 3) is NOT installed, pressing SELECT from "PASS WORD" shows the current password setting.
Installation

The SPR is housed in a universal DIN-style case. Its back panel is equipped with fittings that make it possible to mount the unit on both G-type and Top Hat rails.

Figure 20 shows the unit dimensions, including the sizes for dual- and triple/quad-alarm SPRs.

Mounting

To mount the SPR on Top Hat DIN rail, seat the upper extrusion on the unit back panel over the top lip of the rail and pivot downward until the housing locks into place.

To mount the unit on G-type rail, seat the extrusion under the top lip of the rail and again, pivot downward.

When mounting SPRs in multiple unit scenario like a rack or cabinet, make sure to allow adequate vertical spacing for pivoting the units.

Figure 20
Connections
Figure 21 shows SPR input connections. Table 3 gives terminal designations.

Operation
Once connected to sensors, annunciators (or other discrete devices), and appropriate power, the SPR begins to function according to its internal switch settings and the configuration stored in its non-volatile internal memory.

Configuration data, stored in memory, is monitored continuously. Changes can be made at any time. Any changes made to operating parameters controlled by choices made in the SPR menu system take effect immediately.

The settings of the internal DIP switches and security jumper may also be changed at any time. Changes to the security jumper setting, however, do not take effect until unit power is cycled off and on.

The settings for failsafe/non-failsafe and source/sink (see Figures 4 and 5, respectively), once made, take effect right away.
Table 3. Terminals for the SPR

<table>
<thead>
<tr>
<th>Top Row Terminals</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>T4</th>
<th>T5</th>
<th>T6</th>
<th>T7</th>
<th>T8</th>
<th>T9</th>
</tr>
</thead>
<tbody>
<tr>
<td>High Level SPR</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Middle Row Terminals</td>
<td>10</td>
<td>11</td>
<td>12</td>
<td>13</td>
<td>14</td>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 and 2 Relays</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(1PRG and 2PRG)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Relays (3PRG)</td>
<td>NC3</td>
<td>CM3</td>
<td>NC3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Relays (4PRG)</td>
<td>NC3</td>
<td>CM3</td>
<td>NC3</td>
<td>NO4</td>
<td>CM4</td>
<td>NC4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 DPDT Relay</td>
<td>NC2</td>
<td>CM2</td>
<td>NC2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 DPDT Relays</td>
<td>NC2</td>
<td>CM2</td>
<td>NC2</td>
<td>NO2</td>
<td>CM2</td>
<td>NC2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bottom Row Terminals</td>
<td>B1</td>
<td>B2</td>
<td>B3</td>
<td>B4</td>
<td>B5</td>
<td>B6</td>
<td>B7</td>
<td>B8</td>
<td>B9</td>
</tr>
<tr>
<td>1 Relay (1PRG)</td>
<td>NO</td>
<td>CM</td>
<td>NC</td>
<td>NO</td>
<td>CM</td>
<td>NC</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Relays (2PRG)</td>
<td>NO1</td>
<td>CM1</td>
<td>NC1</td>
<td>NO2</td>
<td>CM2</td>
<td>NC2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Relays (3PRG)</td>
<td>NO1</td>
<td>CM1</td>
<td>NC1</td>
<td>NO2</td>
<td>CM2</td>
<td>NC2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Relays (4PRG)</td>
<td>NO1</td>
<td>CM1</td>
<td>NC1</td>
<td>NO2</td>
<td>CM2</td>
<td>NC2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 DPDT Relay</td>
<td>NO1</td>
<td>CM1</td>
<td>NC1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 DPDT Relays</td>
<td>NO1</td>
<td>CM1</td>
<td>NC1</td>
<td>NO1</td>
<td>CM1</td>
<td>NC1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

NOTES:
1. Reference polarity when connecting TC's or other mV sources only.
2. Not used with TC inputs.
3. When AO or AO2 option is installed.
4. Use only when employing the SPA to power the input (2-wire, loop-powered inputs).
**LEDs**

There are at least three, and as many as six LEDs on the front panel of the SPR. Each is labeled, and provides a quick reference for input condition during normal unit operations.

- **READY**  This LED shows green during normal operation. Green indicates that the SPR has run its startup diagnostic and that all internal circuitry is functioning properly.

  The LED goes out if internal errors occur.

- **INPUT**  This LED shows green during normal operation. Green indicates that an input sensor or sensors has/have been connected, and that they are functioning properly.

  The LED turns red if there is a problem with the sensor inputs.

- **TRIP #**  These LEDs, one per installed relay, show green when the connected input is in a non-alarm condition relative to the trip point setting. A red LED indicates alarm.

**NOTE:**

The state of the SPR relays in alarm or non-alarm is determined by the failsafe/non-failsafe setting of the unit's internal DIP switches (see Figure 4, earlier in this manual). Do not confuse the state of the LED with the state of its associated relay.

Failsafe relays are ON (energized) when input is in a non-alarm condition (green LED), OFF (de-energized) in alarm (red LED).

Non-failsafe relays are ON (energized) when input is in an alarm condition (red LED), OFF (de-energized) in non-alarm (green LED).

This design scheme means that the LEDs associated with relays will always show red when the corresponding input is in an alarm condition, green in non-alarm.
Manual Reset

There are two connections labeled "MR + -" on the SPR top terminal block. These terminals work in conjunction with the latching/non-latching alarm function.

When an SPR is configured with latching alarms (refer to the description of the "CONF ALRM" menu, earlier in this manual), an alarm condition will not "clear", that is, the relay will not change state, until the input returns to a non-alarm state AND these manual reset terminals are shorted and then opened.

Shorting and then opening the MR terminals "clears" all alarms.

Error Codes

Every SPR is subjected to an exhaustive battery of operational checks and tests prior to its shipment. Occasionally, however, units can sustain damage getting from the factory to the user.

As a safeguard, the unit is equipped with a full set of internal diagnostics that check operation and configuration on power-up. If there are problems with the microprocessor, or with conflicting operating parameter settings, the LCD will show an error code upon unit start-up.

Table 4 lists the error codes.

<table>
<thead>
<tr>
<th>LCD Error Message</th>
<th>What it Means</th>
<th>What to Do</th>
</tr>
</thead>
<tbody>
<tr>
<td>EE FLT</td>
<td>EPROM Error - The internal processor has failed</td>
<td>Cycle power to the unit, and if the error occurs again, return the unit to the factory for service.</td>
</tr>
<tr>
<td>RAM ERR</td>
<td>RAM (memory) Error - The internal memory has failed.</td>
<td></td>
</tr>
<tr>
<td>ROM ERR</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CAL ERR</td>
<td>Calibration error - The factory-set calibration of the unit has failed to initialize</td>
<td></td>
</tr>
<tr>
<td>DATA ERR</td>
<td>Data Error - There are conflicts in the settings entered into unit memory. This can be caused by power loss or fluctuation during power-up.</td>
<td>Cycle power to the unit, then run through the configuration menus to ensure that the correct sensor selections have been made for the range settings, etc.</td>
</tr>
<tr>
<td>PACT ERR</td>
<td>Memory Packet Failure - Internal memory failure</td>
<td>Cycle power to the unit, and if the error occurs again, return the unit to the factory for service.</td>
</tr>
<tr>
<td>CONF ERR</td>
<td>Data Error - There are conflicts in the settings entered into unit memory. This can be caused by power loss or fluctuation during power-up.</td>
<td>Cycle power to the unit, then run through the configuration menus to ensure that the correct sensor selections have been made for the range settings, etc.</td>
</tr>
<tr>
<td>RJC OPEN</td>
<td>Reference Junction Compensation Resistor Burnout.</td>
<td>Cycle power to the unit, and if the error occurs again, return the unit to the factory for service.</td>
</tr>
<tr>
<td>TABL ERR</td>
<td>Internal Table Error - The linearization curve programming is not correct.</td>
<td>Make sure that the endpoints of the programmed curve are within the selected INPUT SCALING</td>
</tr>
</tbody>
</table>
**Service**
If you are experiencing difficulty with your Drexelbrook equipment and attempts to locate the problem have failed:
- contact your local Drexelbrook representative,
- call the Service department toll-free at 1-800-527-6297 (in US and Canada) or 1-215-674-1234 (International),
- fax the following information to the Service department at 1-215-674-5117.

To expedite assistance, please provide the following information:
- Instrument Model Number
- Sensing Element Model Number and Length
- Coax Cable Length (remote systems)
- Original Purchase Order Number
- Material being measured
- Temperature
- Pressure
- Agitation
- Brief description of the problem
- Checkout procedures that have failed

In order to provide the best service, any equipment being returned for repair or credit must be pre-approved by the factory.

**Return**
To obtain a return authorization (RA#), contact the Service department at 1-800-527-6297 (US and Canada) or 1-215-674-1234 (International). Please provide the following information:
- Model Number of Return Equipment
- Serial Number
- Original Purchase Order Number
- Process Materials that equipment has been exposed to MSDS sheets for any hazardous materials
- Billing Address
- Shipping Address
- Purchase Order Number for Repairs

Please include a purchase order even if the repair is under warranty. If repair is covered under warranty, you will not be charged.

Ship equipment freight prepaid to:
DREXELBROOK ENGINEERING CO.
205 KEITH VALLEY ROAD
HORSHAM, PA 19044
COD shipments will not be accepted.

**Training**
Trained field service personnel are available on a time-plus-expense basis to assist in start-ups, diagnosing difficult application problems, or in-plant training of personnel. Preventative Maintenance and Calibration Certification service contracts are also available to maintain plant efficiency. Contact the Service department for further information.

Instrument Training Seminars for customers are conducted at the factory. These sessions, guided by Drexelbrook engineers and specialists, provide detailed information on all aspects of level measurement, including theory and practice of instrument operation. Contact the Training Department for further information.
Low Voltage Directive
The following guidelines must be followed in order to comply with EN 61010-1 (Low Voltage Directive). These items affect the AC versions of the following products: DCA, DPS-240, DPS1200, ECA, ECS, ECT, FCA, FDT, IST, PIT-4W, PWT, RBA, SCT, SMP, SPA-CE. If these products are to be used in a non-CE environment, this supplement may be disregarded.

**WARNING:**
If this unit is used in a manner not specified by Drexelbrook the protection provided by the equipment may be impaired.

Switches and Circuit Breakers
A switch or circuit breaker must be wired in series with the AC power conductors. This switch or circuit breaker must be located within three meters of the unit.

**WARNING:**
Terminals on this unit may be connected to hazardous voltages. Before making ANY connections to this unit, ALL hazardous voltages must be de-energized.

The circuit breaker or switch will only remove power to the unit, hazardous voltages may still be connected to other terminals on the unit.

Installation Category
All terminals are rated CAT II, except for terminals with the -RF option. These terminals are rated CAT I.

Equipment Ratings
Drexelbrook transmitters do not generate hazardous voltages. They measure voltage or current inputs, and generate low voltages and currents (<42Vdc and <50mA). Products connected to Drexelbrook transmitters should be designed to receive these inputs.

Drexelbrook alarms do not generate any hazardous voltages. Alarm contacts are wired in series with power sources and their intended loads. The correct load should be selected for the power source.

Supply Wiring
All power connections shall be made with 14 or 16 AWG (.083mm or .064mm) wire.

The end of each conductor should be stripped no more than 8mm. The end of the stripped wire should be tinned with solder or inserted into a ferrule and crimped before being placed into a terminal block.

Conductors connected to screw type connections must have a ring or spade lug crimped on the end of the wire.

Protective Earth Conductor
The Protective Earth Conductor shall be of equal or larger size wire than the other two power conductors.

The Protective Earth Conductor shall be the first conductor connected to the unit when the unit is being wired. It shall be the last conductor removed when the unit is being un-wired.
Maximum Working Voltage
Table 1-1 shows the maximum working voltage for Drexelbrook low voltage products.

<table>
<thead>
<tr>
<th>Input Type</th>
<th>Maximum Working Voltage</th>
</tr>
</thead>
<tbody>
<tr>
<td>DC Voltage Inputs</td>
<td>48Vdc</td>
</tr>
<tr>
<td>AC Voltage Inputs</td>
<td>264Vac</td>
</tr>
<tr>
<td>Analog Outputs</td>
<td>48Vdc</td>
</tr>
<tr>
<td>Relay Contacts</td>
<td>264Vac</td>
</tr>
<tr>
<td>117Vac Power Terminals</td>
<td>129Vac</td>
</tr>
<tr>
<td>240Vac Power Terminals</td>
<td>264Vac</td>
</tr>
<tr>
<td>Contact Closure Outputs</td>
<td>30Vdc</td>
</tr>
</tbody>
</table>

Symbols
Table 2-1 shows the symbols used on Drexelbrook products, the corresponding IEC/ISO symbol, and its definition.

<table>
<thead>
<tr>
<th>IEC/ISO Symbol</th>
<th>Symbol on Hour Industries Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>+PS</td>
<td>Direct Current</td>
</tr>
<tr>
<td>-PS</td>
<td>DCC</td>
</tr>
<tr>
<td>AC</td>
<td>Alternating Current</td>
</tr>
<tr>
<td>AC or DC</td>
<td>Direct and Alternating Current</td>
</tr>
<tr>
<td>GND</td>
<td>Protected Earth Terminal</td>
</tr>
<tr>
<td></td>
<td>Protected Conductor Terminal</td>
</tr>
<tr>
<td></td>
<td>Equipment protected throughout by double insulation or reinforced insulation (equivalent to Class II of IEC 536)</td>
</tr>
<tr>
<td></td>
<td>Caution (See manual for information)</td>
</tr>
</tbody>
</table>

Accessories
Contact Drexelbrook for information on suitable accessories for our products.

Mounting
When mounting the unit or installing it into an application, ensure that the unit can be easily removed for maintenance or repairs.

Cleaning and Maintenance
Maintenance on Drexelbrook products is limited to keeping the unit clean and the wire terminals free of oxidation. This is best accomplished by installing the unit in an area protected from dust, heat, moisture, and corrosive atmospheres. Yearly visual inspections should be performed to ensure that the unit is clean and the electrical connections are in good repair.

Replacement of Consumable Materials
No consumable materials are used in the Drexelbrook products covered by EN 61010-1.