



## Ranges and Resolution

abs: Absolute reference (atmospheric pressure to zero at full vacuum)  
 vac: Vacuum gauge, minus sign not used unless specified  
 Resolution is fixed as indicated in table  
 Contact factory for engineering units not listed

-30.0 inHg/15.0 psig	200.0 inHg abs	1600 mmHg	20.00 bar	2100 g/cm <sup>2</sup>
-30.0 inHg/100.0 psig	200.0 inHg	3200 mmHg	35.00 bar	1.000 kg/cm <sup>2</sup> abs
-30.0 inHg/200.0 psig	50.00 oz/in <sup>2</sup>	760.0 torr abs	70.00 bar	1.000 kg/cm <sup>2</sup> vac
3.000 psig	80.0 oz/in <sup>2</sup>	1600 torr abs	140.0 bar	±1.000 kg/cm <sup>2</sup>
5.000 psig	240.0 oz/in <sup>2</sup> abs	2100 mmH <sub>2</sub> O	200.0 bar	1.000 kg/cm <sup>2</sup>
15.00 psi abs	240.0 oz/in <sup>2</sup> vac	3500 mmH <sub>2</sub> O	350.0 bar	2.000 kg/cm <sup>2</sup> abs
15.00 psig vac	±240.0 oz/in <sup>2</sup>	210.0 cmH <sub>2</sub> O	20.00 kPa	2.000 kg/cm <sup>2</sup>
±15.00 psig	240.0 oz/in <sup>2</sup>	350.0 cmH <sub>2</sub> O	35.00 kPa	4.000 kg/cm <sup>2</sup>
15.00 psig	85.0 inH <sub>2</sub> O	1000 cmH <sub>2</sub> O	100.0 kPa abs	7.000 kg/cm <sup>2</sup> abs
30.00 psi abs	140.0 inH <sub>2</sub> O	2100 cmH <sub>2</sub> O	100.0 kPa vac	7.000 kg/cm <sup>2</sup>
30.00 psig	400.0 inH <sub>2</sub> O abs	200.0 mbar	±100.0 kPa	14.00 kg/cm <sup>2</sup>
60.00 psig	400.0 inH <sub>2</sub> O vac	350.0 mbar	100.0 kPa	20.00 kg/cm <sup>2</sup>
100.0 psi abs	±400 inH <sub>2</sub> O	1000 mbar abs	200.0 kPa abs	35.00 kg/cm <sup>2</sup>
100.0 psig	400.0 inH <sub>2</sub> O	1000 mbar vac	200.0 kPa	70.00 kg/cm <sup>2</sup>
200.0 psig	850 inH <sub>2</sub> O abs	±1000 mbar	400.0 kPa	140.0 kg/cm <sup>2</sup>
300.0 psig	850 inH <sub>2</sub> O	1000 mbar	700.0 kPa abs	200.0 kg/cm <sup>2</sup>
500.0 psig	7.000 ftH <sub>2</sub> O	2000 mbar abs	-100 to 700 kPa	350.0 kg/cm <sup>2</sup>
1000 psig	12.00 ftH <sub>2</sub> O	2000 mbar	700.0 kPa	1.000 atm abs
2000 psig	35.00 ftH <sub>2</sub> O	4000 mbar	1500 kPa	±1.000 atm
3000 psig	70.00 ftH <sub>2</sub> O	1.000 bar abs	2000 kPa	1.000 atm
5000 psig	140.0 ftH <sub>2</sub> O	1.000 bar vac	3500 kPa	2.000 atm
6.000 inHg	230.0 ftH <sub>2</sub> O	±1.000 bar	7000 kPa	4.000 atm
10.00 inHg	480.0 ftH <sub>2</sub> O	1.000 bar	3.500 MPa	7.000 atm
30.00 inHg abs	150.0 mmHg	2.000 bar abs	7.000 MPa	14.00 atm
30.00 inHg vac	260.0 mmHg	2.000 bar	14.00 MPa	20.00 atm
±30.00 inHg	760.0 mmHg abs	4.000 bar	20.00 MPa	35.00 atm
30.00 inHg	760.0 mmHg vac	7.000 bar abs	35.00 MPa	70.00 atm
60.00 inHg abs	±760 mmHg	-1.00 to 7.00 bar	1000 g/cm <sup>2</sup> abs	135.0 atm
60.00 inHg	760.0 mmHg	7.000 bar	1000 g/cm <sup>2</sup>	200.0 atm
120.0 inHg	1600 mmHg abs	14.00 bar	2100 g/cm <sup>2</sup> abs	340.0 atm

## Accuracy

Includes linearity, hysteresis, repeatability

Standard: ±0.25% of full scale ±1 least significant digit

Optional: **-HA** ±0.1% FS ±1LSD (most ranges)

**CD** Factory 5-point calibration data

**NC** NIST traceable test report and 5-point calibration data

## Display

4 readings per second nominal display update rate

4½ digit LCD, 0.5" H main display

5 character 0.25" H alphanumeric lower display for units, functions, and setup

**BL** models: Red LED backlight on whenever gauge is on.

LCD Alarm 1 and Alarm 2 indicators and bi-color (red/green) LEDs on front panel

## Controls and Functions

**SEL** Select and display alarm trip points

**TEST** Alarm acknowledge, or toggle alarm states when in test mode

▲ Increase alarm setpoint when in setpoint adjust mode

▼ Decrease alarm setpoint when in setpoint adjust mode

## Calibration

User settable passcode required to enter calibration mode

All pressure and absolute models: zero, midpoint, span

All vacuum models: -span, -midpoint, zero

Vacuum/pressure models: -span, zero, +midpoint, +span

±15 psi models: -span, -midpoint, zero, +midpoint, +span

## Alarm Outputs

Dual form C (SPDT) relay contacts; 1A/24VDC, 0.5A/115VAC, non-inductive

3 ft long 6-conductor 22 AWG cable with stripped and tinned wire ends

Available configurations: HI/LO, HI/HI, LO/LO, normal or reverse acting

120 milliseconds typical response time

User programmable hysteresis

## Retransmission Output

12,000 counts over sensor range, updated approximately 16 times per second

-I option: Current output, 4-20 mA DC,

Output drive (compliance) determined by power source.

-V option: Voltage output, 0-2 VDC into 5k ohm or greater

## Power

Gauge is on whenever power is applied. Designed for continuous operation.

Any AC source of 8 to 24 VAC 50/60 Hz or any DC source of 9 to 32 VDC

1.0 watt maximum power consumption

3 ft long 4-conductor (power & output) 22 AWG cable with stripped & tinned wire ends

Order optional **WMPSK** 12 VDC wall mount power supply kit to operate on 115 VAC

- **NEMA 4X and Display Backlighting Optional**
- **Programmable Dual SPDT Relays**
- **Bi-Color Red/Green Alarm LEDs**
- **Alarm Test Function**



## Size

**F16DAR:** 3.38" W x 2.88" H x 1.65" D housing

**F16DARN:** 3.5" W x 3.0" H x 2.0" D housing

Add approximately 0.75" to height for pressure fitting

Add approximately 1" to depth for strain relief and wire clearance

## Weight

Gauge: 9 ounces (approx.)

Shipping wt.: 1 pound (approx.)

## Housing

**F16DAR:** Extruded aluminum case, light gray epoxy powder coated, black ABS/ polycarbonate bezel (gray aluminum bezel optional), front and rear gaskets, black/gold polycarbonate label

**F16DARN:** Light gray ABS/polycarbonate NEMA 4X case, rear gasket, black/gold polycarbonate label

## Pressure/Vacuum Connection Size and Material

1/4 NPT male, all wetted parts are 316 stainless steel

## Overpressure

3000 psig range and metric equivalents: 5000 psig

5000 psig range and metric equivalents: 7500 psig

All others 2 times sensor pressure

112.5% out-of-range display: / --- or / - - - depending on model

## Burst Pressure

4 times sensor pressure rating, or 10,000 psi, whichever is less

## Environmental

Storage temperature: -40 to 203°F (-40 to 95°C)

Operating temperature: -4 to 185°F (-20 to 85°C)

Compensated temperature: 32 to 158°F (0 to 70°C)

## Models and Options

Standard	<b>F16DAR</b>	range units ref - output
Backlit	<b>F16DARBL</b>	range units ref - output
NEMA 4X	<b>F16DARN</b>	range units ref - output
NEMA 4X + Backlit	<b>F16DARNBL</b>	range units ref - output

Pressure/Vacuum Range \_\_\_\_\_

Units \_\_\_\_\_

G=Gauge, A=Absolute, VAC=Vacuum \_\_\_\_\_

Output Options \_\_\_\_\_

-I 4-20 mA

-V 0-2 V

-BV ±2 V output with bipolar ranges

Example: **F16DARBL500PSIG-1N-V** F16ADA with BL display backlighting, 500 psig, HI/LO normal action alarms, 0-2 V output

## Unit Abbreviations

psi = PSI

inHg = INHG

oz/in<sup>2</sup> = ZIN

inH<sub>2</sub>O = INH2O

ftH<sub>2</sub>O = FTH2O

mmHg = MMHG

torr = TORR

mmH<sub>2</sub>O = MMH2O

kg/cm<sup>2</sup> = KGCM

g/cm<sup>2</sup> = GCM

kPa = KPA

MPa = MPA

mbar = MBAR

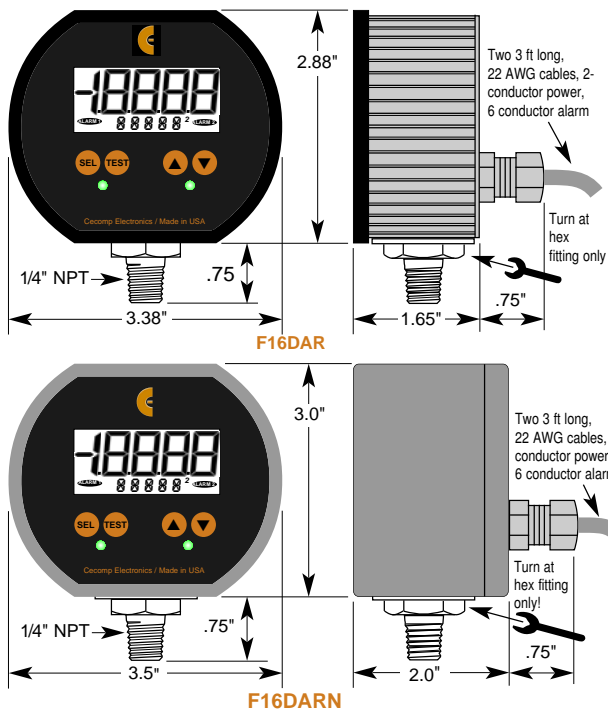
bar = BAR

cmH<sub>2</sub>O = CMH2O

atm = ATM



# F16DAR Series Instructions



## Installation Precautions

Install or remove gauge using wrench on hex fitting only. Do not turn using housing or any other part of the gauge. Use fittings appropriate for the pressure range of the gauge. Do not apply vacuum to gauges not designed for vacuum operation. Due to the hardness of 316 stainless steel, it is recommended that a thread sealant be used to ensure leak-free operation. NEVER insert objects into the gauge port or blow out with compressed air. Permanent damage will result to the sensor.

## Power Connections

NEVER connect the gauge power wires directly to 115 VAC or permanent damage will result! The F16DAR series can be powered by any AC source 8 to 24 VAC 50/60 Hz or any DC source 9 to 32 VDC

Connect power to the smaller two-conductor cable with one RED and one BLACK lead. The gauge will not operate with incorrect DC polarity. Operation with less than 8 VAC RMS if AC, or 9 VDC may cause erratic or erroneous readings or alarm operation.

## Alarm Contact Wiring

The 6-conductor cable is for the 2 SPDT relay contacts.



Contact Rating and Protection - The alarm contacts are rated at 1A/24VDC or 0.5A/115VAC. Using mechanical relay contacts above their rating, or with large inductive loads, will shorten their useful life. In circuits other than low-level switching or pilot duty, the user should consider whether external contact protection such as snubber networks or arc suppression networks are required to protect the contacts. No internal fusing is included in the alarm contact circuits. The alarm outputs should be externally fused by the user in applications where good design practice dictates.

## Power-Up

The gauge is powered on whenever a supply voltage is applied. The gauge may be left on at all times or as required. Alarm setpoints, the calibration pass code, and calibration information are stored in non-volatile memory. When power is first applied, the gauge proceeds through a startup sequence as follows:

- The firmware version number is displayed briefly
- All active display segments are turned on for approximately 1 second
- The full scale pressure is indicated for approximately 1 second while
  - Engineering units are displayed for 1/2 second on the character segments
  - FS is displayed for 1/2 second on the character segments
- All active display segments are again turned on for approximately 1 second

During the startup sequence, the relays are de-energized, the status LEDs are off, and the retransmission output is low (-2.5 VDC or 0 mA).

The gauge then proceeds to the Normal mode.

## Normal Mode (Fixed Deadband Configuration)

The display initially indicates the applied pressure with engineering units.

The retransmission output corresponds to the applied pressure.

The relevant LCD alarm icon will indicate an alarm condition.

The relevant bi-color LED will be illuminated green for a normal condition or red for an alarm condition. The LED will blink at a slow rate until the alarm is acknowledged. Alarms may be configured to be automatically acknowledged when the alarm condition clears or to be manually acknowledged. To manually acknowledge an alarm condition, press and release the TEST button.

The applied pressure, the value of Trip Point 1, and the value of Trip Point 2 may be selected for display as follows:

When the applied pressure is being displayed, press and release the SEL button. The Trip Point 1 value will be displayed with TRIP1 on the lower display.

When the Trip Point 1 value is being displayed, press and release the SEL button. The upper display will indicate the Trip Point 2 value with TRIP2 on the lower display.

When the Trip Point 2 value is being displayed, press and release the SEL button. The upper display will indicate the applied pressure with engineering units on the lower display.

## Normal Mode (Adjustable Hysteresis Configuration)

The display initially indicates the applied pressure with engineering units.

The retransmission output corresponds to the applied pressure.

The LEDs will be illuminated green for a RESET state and red for a SET state.

ALARM1 and ALARM2 will be indicated when alarm conditions exist, and the associated LEDs will blink to indicate unacknowledged alarm conditions. Alarms are acknowledged by pressing and releasing the TEST button. Alarms may be configured to be automatically acknowledged when the alarm condition clears or to be manually acknowledged.

The applied pressure, the SET trip points, and the RESET trip points may be selected for display as follows.

While the applied pressure is being displayed, press and release the SEL button. The upper display will indicate the value of set point 1 with 'SET\_1' on the lower display.

While set point 1 is being displayed, press and release the SEL button. The upper display will indicate the value of reset point 1 with 'RST\_1' on the lower display.

While reset point 1 is being displayed, press and release the SEL button. The upper display will indicate the value of set point 2 with 'SET\_2' on the lower display.

While set point 2 is being displayed, press and release the SEL button. The upper display will indicate the value of reset point 2 with 'RST\_2' on the lower display.

While the reset point 2 is being displayed, press and release the SEL button. The upper display will indicate the applied pressure and engineering units.

## Zero Tare Mode

If the gauge is not indicating zero with zero pressure applied but is within approximately 3% of full scale pressure of zero, it is possible to tare the gauge to zero as follows.

From the Normal mode with applied pressure equal to zero, press and hold both the ▲ and ▼ buttons and press the SEL button. The relay outputs and the retransmission output will hold the last value, and the visual indicators will be deactivated. Release all buttons when the display indicates 'o o o o'.

The display will initially indicate a newly calculated zero tare value with Z OFF on the lower display. Note: If not within approximately 3% of zero, Err0 will be displayed. Press the SEL button to cancel the operation and return to Normal mode without affecting any existing zero tare value.

To cancel and remove any existing zero tare value, press and release the ▼ button. The display will indicate zero. To restore the newly calculated zero tare value, press and release the ▲ button.

To exit the ZeroTare mode, press and release the SEL button. The gauge will return to the Normal mode. The visual indicators, the relay outputs and the retransmission output will correspond to applied pressure.

## Test Outputs Mode

From the Normal mode with applied pressure being displayed, press and hold the TEST button and press the SEL button. Release both buttons when the display indicates '- - - -'.

While in the Test Outputs mode with no buttons pressed, the display will indicate the applied pressure with engineering units blinking at a slow rate on the lower display, and the LED indicators and the retransmission output will correspond to the applied pressure.

When the TEST button is pressed and held, the LED indicators and the relays will toggle to their respective opposite states. The display will indicate the preset test value with TEST on the lower display, and the retransmission output will correspond to the test value displayed. Pressing the ▲ or the ▼ button while holding the TEST button pressed will raise or lower the test value. Note that the gauge will not respond to changes in applied pressure while the TEST button is held pressed.

When the TEST button is released, the display, the LED indicators, and the relay outputs will correspond to the applied pressure.

Press and release the SEL button to exit the Test Outputs mode and return to Normal mode.

Comp maintains a constant effort to upgrade and improve its products. Specifications are subject to change without notice. Consult factory for your specific requirements.

## Set Point Adjust Modes (Fixed Deadband Configuration)

“Set Point” is defined as the value of applied pressure that will result in a change of state only from a normal to an alarm condition. “Trip Point” is defined as the value of applied pressure that will result in a change of state of alarm condition, and includes the effect of deadband when returning from an alarm to a normal condition.

### Set Point 1

From the Normal mode with Trip Point 1 being displayed, press and hold the TEST button and press the SEL button. Release both buttons when the display indicates ‘- - - -’.

While in the Set Point 1 Adjust mode with no buttons pressed, the display will indicate Trip Point 1 with TRIP1 blinking at a slow rate on the lower display, and the alarm indicators and the retransmission output will correspond to the applied pressure.

To adjust the Set Point 1 value, press and hold the TEST button. The display will indicate Set Point 1 with SP1 on the lower display. Operate the ▲ and ▼ buttons to adjust Set Point 1 to the desired value. The Set Point 1 value is stored when the TEST button is released.

Note: The LEDs will be off and the gauge will not respond to changes in applied pressure while the TEST button is held pressed. The alarm relays, the LCD alarm icons, and the retransmission output will maintain their prior states until the TEST button is released.

To exit the Set Point 1 Adjust mode and return to Normal mode, press and release the SEL button.

### Set Point 2

From the Normal mode with Trip Point 2 being displayed, press and hold the TEST button and press the SEL button. Release both buttons when the display indicates ‘- - - -’.

While in the Set Point 2 Adjust mode with no buttons pressed, the display will indicate Trip Point 2 with TRIP2 blinking at a slow rate on the lower display, and the alarm indicators and the retransmission output will correspond to the applied pressure.

To adjust the Set Point 2 value, press and hold the TEST button. The display will indicate Set Point 2 with SP2 on the lower display. Operate the ▲ and ▼ buttons to adjust Set Point 2 to the desired value. The Set Point 2 value is stored when the TEST button is released.

Note: The LEDs will be off and the gauge will not respond to changes in applied pressure while the TEST button is held pressed. The alarm relays, the LCD alarm icons, and the retransmission output will maintain their prior states until the TEST button is released.

To exit the Set Point 2 Adjust mode and return to Normal mode, press and release the SEL button.

## Trip Point Adjust Mode (Adjustable Hysteresis configuration)

From the Normal mode with the desired trip point (SET\_1, RST\_1, SET\_2, or RST\_2) being displayed, press and hold the TEST button and press the SEL button. Release both buttons when the display indicates ‘- - - -’.

While in the Trip Point Adjust mode with no buttons pressed, the display will indicate the trip point value with its designator (SET\_1, RST\_1, SET\_2, or RST\_2) blinking at a slow rate on the lower display.

To adjust the displayed trip point value, press and hold the TEST button. The display will continue to indicate the trip point value. Operate the ▲ and ▼ buttons to adjust the trip point to the desired value. The trip point value is stored when the TEST button is released. Note: The relays and indicators will not correspond to the applied pressure value until the TEST button is released.

To exit the Trip Point Adjust mode and return to Normal mode, press and release the SEL button.

## User Configuration Mode

From the Normal mode with applied pressure being displayed, press and hold the TEST and the s buttons. Then press the SEL button. Release all buttons when the display indicates CFG.

Before the gauge enters the Configuration mode, the display initially indicates ‘\_ \_ \_ \_’ with the first underscore blinking, and with PASS on the lower display.

Note: During pass code entry, the LEDs will be off and the gauge will not respond to changes in applied pressure. The alarm relays and the LCD alarm icons will maintain their prior states. The gauge will automatically revert to normal operation if no buttons are operated for approximately 15 seconds.

### Enter the user-modifiable calibration pass code (3510 factory default)

Use the ▲ and ▼ buttons to set the left-most digit to 3.

Press and release the SEL button to index to the next position. The 3 will remain, and the second position will be blinking.

Use the ▲ and ▼ buttons to select 5.

Press and release the SEL button to index to the next position. 3 5 will remain, and the third position will be blinking.

Use the ▲ and ▼ buttons to select 1.

Press and release the SEL button to index to the next position. 3 5 1 will remain, and the fourth position will be blinking.

Use the ▲ and ▼ buttons to select 0.

Press and release the TEST button to proceed with calibration procedures. Note: If an incorrect pass code was entered, the gauge will exit to the normal operating mode.

## Restore Factory Configuration

The upper display will be blank, and the lower display will display either USER\_ or FCTRY\_. If USER\_ is selected, the existing user configuration will be retained and will be accessible for modification in the following steps. To select USER\_, press and release the ▼ button. The lower display will indicate USER\_.

If FCTRY is selected, the existing user configuration will be replaced by the configuration as it left the factory and will be accessible for modification in the following steps. To select FCTRY, press and release the ▲ button. The lower display will indicate FCTRY.

Press and release the SEL button to move on to the next parameter.

## Alarm Annunciator Function Selection

The upper display will be blank, and the lower display will display either A\_ACK, M\_ACK or NO\_AN.

If A\_ACK is selected, an alarm condition will be automatically acknowledged when the alarm condition clears. When an alarm condition occurs, the LED associated with that alarm will begin to blink red and will continue to blink red until it has been manually acknowledged or until the alarm condition clears. If an alarm is manually acknowledged, the LED will be illuminated steadily red while the alarm condition continues to exist. The LED will be illuminated steadily green whenever no alarm condition exists.

If M\_ACK is selected, an alarm condition must be manually acknowledged. When an alarm condition occurs, the LED associated with that alarm will blink red if the alarm condition exists or green if the alarm condition no longer exists. The LED will continue to blink until it has been manually acknowledged by a press and release of the TEST button. Once an alarm has been acknowledged, the LED will be illuminated steadily red while the alarm condition exists or green when the alarm no longer exists.

If NO\_AN is selected, the LEDs will not blink. When an alarm condition occurs, the LED associated with that alarm will be illuminated steadily red if the alarm condition exists or green if the alarm condition no longer exists. In addition, the display for ALARM1 and ALARM2 will not be displayed during alarm conditions.

To select the desired alarm annunciator action, press and release the ▲ button or the ▼ button to cycle through the three choices. When the lower display will indicate the desired annunciator action, press and release the SEL button to move on to the next parameter.

## Alarm Action Selection (Fixed Deadband configuration)

The upper display will be blank, and the lower display will display either SP1\_L or SP1\_H.

If SP1\_L is selected Alarm 1 will be a low alarm. That is, Alarm 1 will be SET when the applied pressure falls below Setpoint 1. Alarm 1 will be RESET when the applied pressure rises above Setpoint 1 plus the preset deadband. To select SP1\_L, press and release the ▼ button. The lower display will indicate SP1\_L.

If SP1\_H is selected Alarm 1 will be a high alarm. That is, Alarm 1 will be SET when the applied pressure rises above Setpoint 1. Alarm 1 will be RESET when the applied pressure falls below Setpoint 1 minus the preset deadband. To select SP1\_H, press and release the ▲ button. The lower display will indicate SP1\_H.

Press and release the SEL button to move on to Alarm 2.

The upper display will be blank, and the lower display will display either SP2\_L or SP2\_H.

If SP2\_L is selected Alarm 2 will be a low alarm. That is, Alarm 2 will be SET when the applied pressure falls below Setpoint 2. Alarm 2 will be RESET when the applied pressure rises above Setpoint 2 plus the preset deadband. To select SP2\_L, press and release the ▼ button. The lower display will indicate SP2\_L.

If SP2\_H is selected Alarm 2 will be a high alarm. That is, Alarm 2 will be SET when the applied pressure rises above Setpoint 2. Alarm 2 will be RESET when the applied pressure falls below Setpoint 2 minus the preset deadband. To select SP2\_H, press and release the ▲ button. The lower display will indicate SP2\_H.

Press and release the SEL button to move on to the next parameter.

## Relay Coil/Contact Mode Selection (Fixed Deadband Configuration)

The upper display will be blank, and the lower display will display either \_NOR\_ or \_REV\_.

If \_NOR\_ is selected, the output relay coils will be energized in the RESET state and de-energized in the SET state (normal action). To select \_NOR\_, press and release the ▼ button. The lower display will indicate \_NOR\_.

If \_REV\_ is selected, the output relay coils will be de-energized in the RESET state and energized in the SET state (reverse action). To select \_REV\_, press and release the ▲ button. The lower display will indicate \_REV\_.

Press and release the SEL button to move on to the next parameter.

## Relay Power Up State Selection (Adjustable Hysteresis configuration)

The upper display will be blank, and the lower display will display either SP1\_L or SP1\_H.

If SP1\_L is selected and the gauge is powered up while the applied pressure is between the Output 1 SET and RESET trip points, Output 1 will begin in the RESET state. To select SP1\_L, press and release the ▼ button. The lower display will indicate SP1\_L.

If SP1\_H is selected and the gauge is powered up while the applied pressure is between the Output 1 SET and RESET trip points, Output 1 will begin in the SET state. To select SP1\_H, press and release the ▲ button. The lower display will indicate SP1\_H.

Press and release the SEL button to move to Relay 2.

The upper display will be blank, and the lower display will display either SP2\_L or SP2\_H.

If SP2\_L is selected and the gauge is powered up while the applied pressure is between the Output 2 SET and RESET trip points, Output 2 will begin in the RESET state. To select SP2\_L, press and release the ▼ button. The lower display will indicate SP2\_L.

If SP2\_H is selected and the gauge is powered up while the applied pressure is between the Output 2 SET and RESET trip points, Output 2 will begin in the SET state. To select SP2\_H, press and release the ▲ button. The lower display will indicate SP2\_H.

Press and release the SEL button to move on to the next parameter.

## Relay Coil/Contact Mode Selection (Adjustable Hysteresis Configuration)

The upper display will be blank, and the lower display will display either \_NOR1 or \_REV1.



If **\_NOR1** is selected, the Output 1 relay coil will be energized in the RESET state and de-energized in the SET state (normal action). To select **\_NOR1**, press and release the **▼** button. The lower display will indicate **\_NOR1**.

If **\_REV1** is selected, the Output 1 relay coil will be de-energized in the RESET state and energized in the SET state (reverse action). To select **\_REV1**, press and release the **▲** button. The lower display will indicate **\_REV1**.

Press and release the SEL button to move on to Relay 2.

The upper display will be blank, and the lower display will display either **\_NOR2** or **\_REV2**.

If **\_NOR2** is selected, the Output 2 relay coil will be energized in the RESET state and de-energized in the SET state (normal action). To select **\_NOR2**, press and release the **▼** button. The lower display will indicate **\_NOR2**.

If **\_REV2** is selected, the Output 2 relay coil will be de-energized in the RESET state and energized in the SET state (reverse action). To select **\_REV2**, press and release the **▲** button. The lower display will indicate **\_REV2**.

Press and release the SEL button to move on to the next parameter.

### Analog Output Range Lower Limit Adjust

The upper display will indicate the pressure value corresponding to the minimum retransmission output, either 4 mA, 0 VDC, or -2 VDC depending on the particular gauge model. The lower display will display **RNGL0**.

Use the **▲** and **▼** buttons to adjust the display to the desired value.

Press and release the SEL button to move on to the next parameter.

### Analog Output Range Upper Limit Adjust

The upper display will indicate the pressure value corresponding to the maximum retransmission output, either 4 mA or +2 VDC depending on the particular gauge model. The lower display will display **RNGH1**.

Use the **▲** and **▼** buttons to adjust the display to the desired value.

Press and release the SEL button to save the configuration parameters and restart the unit. The configuration parameters will not be saved if the procedure is interrupted before completion.

## Calibration Mode

The gauge is calibrated at the factory using equipment traceable to NIST. There is no need to calibrate the gauge before putting it in service. Calibration should only be performed by qualified individuals using appropriate calibration standards and procedures. The calibration equipment should be at least four times more accurate than the gauge being calibrated. The calibration system must be able to generate and measure pressure/vacuum over the full range of the gauge. A vacuum pump able to produce a vacuum of 10 microns (0.01 torr or 10 millitorr) or lower is required for vacuum and absolute gauges.

To enter the Calibration mode from the Normal mode with applied pressure being displayed, press and hold the **TEST** and the **▼** buttons. Then press the **SEL** button. Release all buttons when the display indicates **CAL**.

When the gauge enters the Calibration mode, the display initially indicates ' \_ \_ \_ \_ ' with the first underscore blinking, and with **PASS** on the lower display.

Note: During pass code entry the LEDs will be off and the gauge will not respond to changes in applied pressure. The relays will maintain their prior state. The gauge will automatically revert to Normal mode if no buttons are operated for approximately 15 seconds.

### Enter the user-modifiable calibration pass code (3510 factory default)

Use the **▲** and **▼** buttons to set the left-most digit to 3.

Press and release the SEL button to index to the next position. The 3 will remain, and the second position will be blinking.

Use the **▲** and **▼** buttons to select 5.

Press and release the SEL button to index to the next position. 3 5 will remain, and the third position will be blinking.

Use the **▲** and **▼** buttons to select 1.

Press and release the SEL button to index to the next position. 3 5 1 will remain, and the fourth position will be blinking.

Use the **▲** and **▼** buttons to select 0.

Press and release the **TEST** button to proceed with calibration procedures. If an incorrect pass code was entered, the gauge will exit to the normal operating mode.

Upon successful calibration pass code entry, the upper display of the display will indicate the applied pressure in the configured engineering units. The lower display of the display will alternate between **CAL** and the calibration region corresponding to the applied pressure (**ZERO**, **+MID**, **+SPAN**, **MID**, or **SPAN**).

Note: To store the calibration parameters and exit calibration mode at any time, press and hold the SEL button until the display indicates ' - - - '.

## Calibration of the Retransmission Output

Calibration of the retransmission output coordinates the retransmission output to the display indication, and is performed independently of applied pressure. It requires a direct physical measurement of the retransmission output.

### Retransmission Output Low Value

Press and release the SEL button to step to the retransmission output low value calibration sequence, indicated by **LCAL** on the display.

Note: If the SEL button is held depressed for longer than 2 seconds, the display will change to indicate ' - - - ', and the gauge will exit the calibration mode when all buttons are released.

The upper display will indicate the pre-configured pressure corresponding to the retrans-

mission output low value. The lower display will alternate between **CAL** and 4 mA, 0 VDC, or -2 VDC depending on retransmission option.

Use the **▲** and **▼** buttons to adjust the actual retransmission output to its low value.

### Retransmission Output High Value

Press and release the SEL button to step to the retransmission output high value calibration sequence, indicated by **HCAL** on the display.

Note: If the SEL button is held depressed for longer than 2 seconds, the display will change to indicate ' - - - ', and the gauge will exit the calibration mode when all buttons are released.

The upper display will indicate the pre-configured pressure corresponding to the retransmission output high value. The lower display will alternate between **CAL** and 20 mA or +2 VDC depending on retransmission option.

Use the **▲** and **▼** buttons to adjust the actual loop current to its high value.

### Pressure Calibration

The pressure calibration procedure simultaneously adjusts both the display indication and the retransmission output to correspond to the actual applied pressure.

If the applied pressure is not being displayed, press and release the SEL button to step to the pressure calibration sequence, indicated by **CAL** on the display.

Note: If the SEL button is held depressed for longer than 2 seconds, the display will change to indicate ' - - - ', and the gauge will exit the calibration mode when all buttons are released.

Zero calibration: Apply zero pressure. The lower display will alternate between **CAL** and **ZERO**. Use the **▲** and **▼** buttons to adjust the upper display to indicate zero.

Span calibration: Apply full-scale pressure. The lower display will alternate between **CAL** and **+SPAN**. Use the **▲** and **▼** buttons to adjust the upper display to indicate the applied pressure value.

Midpoint Non-Linearity calibration: Apply 50% full-scale positive pressure. The lower display will alternate between **CAL** and **+MID**. Use the **▲** and **▼** buttons to adjust the upper display to indicate the applied pressure value.

Negative Span calibration (bipolar and compound ranges only): Apply full-scale negative pressure. The lower display will alternate between **CAL** and **SPAN**. Use the **▲** and **▼** buttons to adjust the upper display to indicate the applied pressure value.

Negative Midpoint Non-Linearity calibration (bipolar ranges only): Apply 50% full-scale negative pressure. The lower display will alternate between **CAL** and **MID**. Use the **▲** and **▼** buttons to adjust the upper display to indicate the applied pressure value.

To store the calibration parameters and exit calibration mode, press and hold the SEL button until the display indicates ' - - - '.

## Changing the User-Defined Calibration and Configuration Pass Code

From the Normal mode with applied pressure being displayed, press and hold the **TEST** and the **▲** buttons. Then press the **SEL** button. Release all buttons when the display indicates **CFG**.

Before the gauge proceeds to the User-Defined Calibration Pass code change mode, the display initially indicates ' \_ \_ \_ \_ ' with the left-most underscore blinking, and with **PASS** on the lower display.

While in the pass code entry mode the LEDs will be off and the gauge will not respond to changes in applied pressure. The relays will maintain their prior state. The gauge will automatically revert to normal operation if no buttons are operated for approximately 15 seconds.

### Enter factory pass code 1220

Use the **▲** and **▼** buttons to set the left-most digit to 1.

Press and release the SEL button to index to the next position. The 1 will remain, and the second position will be blinking.

Use the **▲** and **▼** buttons to select 2.

Press and release the SEL button to index to the next position. 1 2 will remain, and the third position will be blinking.

Use the **▲** and **▼** buttons to select 2.

Press and release the SEL button to index to the next position. 1 2 2 will remain, and the fourth position will be blinking.

Use the **▲** and **▼** buttons to select 0.

Press and release the SEL button to proceed. Note: If an incorrect pass code was entered, the gauge will exit to the normal operating mode.

Once the correct password has been entered, the display will indicate the existing calibration pass code with **UDPCD** on the lower display.

Note: While in the calibration pass code change mode, the LEDs will be off and the gauge will not respond to changes in applied pressure and the relays will be de-energized.

1. Operate the **▲** or **▼** button to select the first character of the calibration password.
2. When the correct first character is being displayed, press and release the SEL button to proceed to the next password character.
3. Repeat 1 and 2 above until the entire password is complete.

To exit the User-Defined Calibration Pass code change mode, press and hold the SEL button. Release the button when the display indicates ' - - - ' to restart the gauge in the Normal mode.

Pressure