### Cecomp® Programmable 4-Wire Digital Pressure Transmitters

**F16DR, F16DRN**

**Ranges and Resolution**
See table below. Consult factory for special engineering units. Resolution is fixed as indicated in table.

**Accuracy**
Includes linearity, hysteresis, repeatability
Standard: ±0.25% of full scale ±1 least significant digit

**HA option ±0.1% FS ±1 LSD, see table below for availability**

<table>
<thead>
<tr>
<th>PSI</th>
<th>Res inHg</th>
<th>PSI</th>
<th>Res mmH2O</th>
<th>Res kPa</th>
<th>Res cmH2O</th>
<th>Res Torr</th>
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</thead>
<tbody>
<tr>
<td>3PSIG</td>
<td>.001</td>
<td>30VPSIG</td>
<td>.1</td>
<td>2100MMH20G</td>
<td>1</td>
<td></td>
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<tr>
<td>5PSIG</td>
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<td>3500MMH20G</td>
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<tr>
<td>15PSIA</td>
<td>.01</td>
<td>30V20PSIG</td>
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<td>cmH2O</td>
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<tr>
<td>±15PSIG</td>
<td>.01</td>
<td>85INH2O</td>
<td>.01</td>
<td>350INH2O</td>
<td>1</td>
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</tr>
<tr>
<td>15PSIG</td>
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<td>.1</td>
<td>1000INH2O</td>
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<tr>
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<td>400INH2O</td>
<td>.1</td>
<td>1000INH2O</td>
<td>1</td>
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<tr>
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<td>1000INH2O</td>
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<tr>
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<td>.1</td>
<td>1000INH2O</td>
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<tr>
<td>100PSIG</td>
<td>.1</td>
<td>85INH2O</td>
<td>.1</td>
<td>2100MMH20G</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

**Output Characteristics**
Updated approximately 16 times per second
User scalable pressure range to correspond to output

- Current output, 4-20 mA DC
- Output drive (compliance) determined by power source
- 6,553 counts over sensor range
- Voltage output, 0-2 VDC into 5k ohm or greater
- 6,553 counts over sensor range
- Bipolar voltage output (-2 to 0 to 2 V) for bipolar ranges
- ±2 VDC into 5k ohm or greater
- 13,107 counts over sensor range

**Power**
8-24 VAC/50/60 Hz or 9-32 VDC

**Display**
4 readings per second nominal display update rate
4 digit LCD, 0.5” H and 5 character 0.25” H alphanumeric

**Controls**
**SEL**
Select display for setup
**A**
Up: Increase when in test or calibration mode
**D**
Down: Decrease when in test or calibration mode
Zero/tare function can be enabled or disabled

**Calibration**
User settable pass code 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

**Environmental**
Storage temperature: –40 to 233°F (–40 to 95°C)
Operating temperature: 32 to 185°F (0 to 70°C)
Compensated temperature: 32 to 185°F (0 to 70°C)

**How to Specify**

<table>
<thead>
<tr>
<th>Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>F16DR</td>
<td>range - output - options</td>
</tr>
<tr>
<td>F16DRBL</td>
<td>range - output - options</td>
</tr>
<tr>
<td>F16DRN</td>
<td>range - output - options</td>
</tr>
<tr>
<td>F16DRNBL</td>
<td>range - output - options</td>
</tr>
</tbody>
</table>

**Accessories**
- Polycarbonate bezel (aluminum bezel optional), front and rear
- Housing, NEMA 4X housing
- Panel mount, 4.1” x 4.1”. Not avail. with NEMA models.
- Metal front cover. Not available with NEMA models.
- 3.38” Standard
- 3.0” NEMA 4X

**Calibration Data**
- 5 test points and date
- Moisture resistant circuit board conformal coating
- Voltage output, 0-2 VDC into 5k ohm or greater
- Backlit display

**Options**
- Add to end of model number
- HA
  - High accuracy, ±0.1% FS ±1 LSD. Not available with 3 psi, bipolar, absolute, or vacuum sensors
  - Some 3.5 digit display ranges. See table at left for availability.
- PM
  - Panel mount, 4.1” x 4.1”. Not avail. with NEMA models.
- MC
  - Metal front cover. Not available with NEMA models.
- CC
  - Moisture resistant circuit board conformal coating
- TP
  - Top gauge port. Not available with NEMA models.

**Examples**
- F16DR100PSIG-HA: 100 psi, high accuracy
- F16DRB1-100V700KPA: NEMA 4X, backlit display
  - –100 to 700 KPa
Installation Precautions

- Read these instructions before using the gauge. Configuration may be easier before installation. Contact the factory for assistance.
- These products do not contain user-serviceable parts. Contact us for repairs, service, or refurbishment.
- Gauges must be operated within specified ambient temperature ranges.
- Outdoor or wash down applications require a NEMA 4X gauge or installation in a NEMA 4X housing.
- Use a pressure or vacuum range appropriate for the application.
- Use fittings appropriate for the pressure range of the gauge.
- Due to the hardness of 316 stainless steel, it is recommended that a thread sealant be used to ensure leak-free operation.
- For contaminated media use an appropriate screen or filter to keep debris out of gauge port.
- Remove system pressures before removing or installing gauge.
- Install or remove gauge using a wrench on the hex fitting only. Do not attempt to turn gauge by forcing the housing.
- Good design practice dictates that positive displacement liquid pumps include protection devices to prevent sensor damage from pressure spikes, acceleration head, and vacuum extremes.
- Avoid permanent sensor damage! Do not apply vacuum to non-vacuum gauges or hydraulic vacuum to any gauges.
- Avoid permanent sensor damage! NEVER insert objects into gauge port or blow out with compressed air.
- Gauges are not for oxygen service. Accidental rupture of sensor diaphragm may cause silicone oil inside sensor to react with oxygen.
- NEVER connect the gauge wires directly to 115 VAC or permanent damage will result.

Types of Gauges

Gauge reference models read zero with the gauge port open. Bipolar ranges read positive pressure and vacuum in the same units, and zero with the gauge port open. 1000 psi and higher sensors are a sealed reference type. They read zero with the gauge port open. Absolute reference gauges read zero at full vacuum and atmospheric pressure with the gauge port open. Note that readings of atmospheric pressure vary continuously.

Display and Keypad

- Numeric display
- Alpha-numeric display
- Down
- Up
- Select
- Minus Sign
- Test

Electrical Connections—continued

- Do not allow the gauge supply voltage fall below 9 VDC or 8 VAC RMS. Operation below these values may cause erratic or erroneous readings or output. Models with 4-20 mA output power the current loop. Use a power source with sufficient voltage to operate the current loop.
- Connect power as shown below. When using low voltage AC power, either polarity may be used. Use the correct polarity with a DC supply.
- Note that standard 24 VAC transformers with small loads may operate at voltages over the 24 VAC limit.

Output

- If the analog output is not required, the transmitter will function as a low voltage powered gauge. Protect the output wires to prevent a short circuit.
- NEVER connect retransmission output wires together or an external power source or permanent damage will result.
- Use of the shield (drain) wire is optional. It is not generally needed for 4-20 mA current loops unless very long cable lengths are used in electrically noisy environments.
- The 4 version with 4-20 mA output provides power to the current loop. Use a gauge power source with sufficient voltage to operate the current loop.
- For long cable runs, 4-20 mA output model provides better performance.

The power supply (-) lead is tied to the retransmission output ground. If a DC supply is used, the power supply (-) lead is common with regard to the retransmission output (-) connection.

For 4-20 mA output models, be sure to observe the output compliance (voltage drive) capabilities of the gauge. The compliance, and therefore the maximum loop resistance the output can drive, is a function of the supply voltage to the gauge. Too large a loop resistance will cause the gauge output to "limit" or saturate before reaching its full 20 mA output.

When using the 0-2 volt retransmission output, do not allow the resistive load on the output to fall below 5k ohms. Avoid large capacitive loads (greater that 1000 pF) such as those caused by long runs of shielded cable. For long cable runs, use a 4-20 mA output model.

The retransmission output corresponds to the applied pressure, except when in zero/tare mode, test mode, or during setup. Characteristics of the output types are listed below.

See specifications for output resolution.

Note that analog output resolution is always over the entire sensor range and is updated approximately 16 times per second.

Table: Range Type

<table>
<thead>
<tr>
<th>Range Type</th>
<th>Output Option</th>
<th>Full Vacuum</th>
<th>&quot;0&quot; on display</th>
<th>Full pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gauge reference pressure</td>
<td>-I</td>
<td>n/a</td>
<td>4 mA</td>
<td>20 mA</td>
</tr>
<tr>
<td>Gauge reference vacuum</td>
<td>-V</td>
<td>0 V</td>
<td>0 V</td>
<td>0 V</td>
</tr>
<tr>
<td>Absolute reference</td>
<td>-I</td>
<td>4 mA</td>
<td>4 mA</td>
<td>20 mA</td>
</tr>
<tr>
<td>Vacuum/pressure ranges</td>
<td>-I</td>
<td>4 mA</td>
<td>12 mA</td>
<td>20 mA</td>
</tr>
<tr>
<td>Compound inHg/psi</td>
<td>-I</td>
<td>4 mA</td>
<td>20 mA</td>
<td></td>
</tr>
<tr>
<td>Vacuum/pressure ranges</td>
<td>-I</td>
<td>0 V</td>
<td>0 V</td>
<td>2 V</td>
</tr>
<tr>
<td>Compound inHg/psi</td>
<td>-I</td>
<td>0 V</td>
<td>2 V</td>
<td></td>
</tr>
</tbody>
</table>

Operation

- When power is first applied, the gauge proceeds through a startup sequence. During the startup sequence the retransmission output is low (~2.5 VDC or 0 mA).
- The firmware version number is displayed briefly.
- All active display segments are turned on for approx. 1 second.
- The full scale pressure is indicated for approx. 1 second while the engineering units and FS (full scale) are indicated for 1/2 second on the character display.
- The display is tested again for approximately 1 second.
- The gauge then proceeds to the normal operating mode.
- The retransmission output corresponds to the applied pressure, except when in zero/tare mode, test mode, or during setup.
- The gauge is powered on whenever a supply voltage is applied. Warm-up time is negligible.
- The gauge may be left on at all times.
- All configuration information is stored in non-volatile memory.

Output Test Mode

- From the normal operating mode, press and hold the TEST button and press the SEL button. Release both buttons when the display indicates ______ or ______.
- If pass code protection is enabled, the display indicates ______ with the left-most underscore blinking, and TSTP.
- Enter the pass code as described in the Pass Code Entry section.
- While in the Test mode with no buttons pressed, the display will indicate the pressure with the engineering units blinking at a slow rate.
- When the TEST button is pressed, the display will indicate the preset test value with TEST on the lower display, and the retransmission output will correspond to the test value.
- Pressing the A or the V button while holding the TEST button 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.
- When the TEST button is released, the display will correspond to the applied pressure.
- Press and release the SEL button to exit the Output Test mode and return to normal operation.

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.
- The zero tare function may be enabled or disabled in User Configuration. It is disabled for absolute reference gauges. If disabled, it may be enabled in User Configuration.
- Note that this procedure can only be used with absolute pressure gauges if a full vacuum is applied to the gauge port using a vacuum pump capable of creating at least 100 millitorr.
- From the normal operating mode with applied pressure equal to zero, press and hold both the A and V buttons and press the SEL button.
- The retransmission output will hold the last value.
- Release all buttons when the display indicates ______.
- The display will initially indicate a newly calculated zero tare value with 2 OFF on the character segments. Note: If within approximately 3% of zero, Err0 will be displayed.
- Press the SEL button to clear the error 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 V button.
- The display will indicate zero.
- To restore the newly calculated zero tare value, press and release the A button.
- To exit the Zero/Tare mode, press and release the SEL button.
- The gauge will return to the normal mode. The display and the retransmission output will correspond to applied pressure.

Display and Keypad

- Numeric display
- Alpha-numeric display
- Down
- Up
- Select
- Minus Sign
- Test

Electrical Connections

Connection is made with the four conductor cable at the gauge rear. This cable accommodates both the gauge power supply and retransmission output.

Route the wires away from heat sources and moving equipment. See wiring diagram.

Power

The F16DR series can be powered by any 9 to 32 VDC or 8 to 24 VAC 50/60 Hz power source. An inexpensive unregulated low voltage source can be used. The magnitude of the supply voltage has negligible effect on the gauge calibration as long as it is within the stated voltage ranges.
Upon successful pass code entry, follow the steps in the appropriate section of this manual.

Note: To store the calibration parameters and exit calibration mode, press and release the SEL button to save the configuration parameters and restart the unit. Note: The configuration parameters will not be saved if the procedure is interrupted before completion.

### Calibration Preparation

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 100 microns (0.1 torr or 100 million) or lower is required for vacuum and absolute gauges.

Use an accurate volt meter or millivolt meter for calibration. Allow the gauge to equalize to normal room temperature (about 20 minutes minimum) before calibration.

### Calibration Pass Code

To enter the calibration mode from the normal operating mode with applied pressure being displayed, press and hold the TEST button. Release all but- ton(s) when the display indicates CAL.

When the gauge enters the calibration mode, the display initially indicates -- -- -- -- with the first underscore blinking. Apply 50% full-scale positive pressure.

When the display indicates -- -- -- --, with the first underscore blinking, and with CFPC on the lower display.

The gauge will exit the calibration mode when all buttons are released.

### Zero Tare 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.

### 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.

### Analog Output Range Lower Limit Adjust

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

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

Press and release the SEL button to move 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 RNGHI.

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

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

### Test Adjust Mode Pass Code Protection

The upper display will be blank, and the lower display will display either TSTPC or NOTPC.

To enable Test Adjust Mode pass code protection, press and release the ▲ button. The lower display will indicate TSTPC.

To disable Test Adjust Mode pass code protection, press and release the ▼ button. The lower display will indicate NOTPC.

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

### 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.

Exit Calibration Mode

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

Pass Code Configuration

Configuration Pass Code

From the normal operating mode, press and hold the TEST and the ▲ buttons. Then press the SEL button. Release all buttons when the display indicates CFG.

Calibration Pass Code

From the normal operating mode, press and hold the TEST and the ▼ buttons. Then press the SEL button. Release all buttons when the display indicates CAL.

Test and Set Point Adjust Pass Code (optional)

From the normal operating mode, press and hold the TEST button. Then press the SEL button. Release all buttons when the display indicates – – – – .

Before the unit enters the view or change pass code mode, the display will indicate , with the first underscore blinking, and with CFGPC, CALPC, or TSTPC on the lower display.

Note: during pass code entry, the LEDs will extinguish and the gauge will not respond to changes in applied pressure. The output relays will maintain their prior states and the retransmission output will maintain its prior value. 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 pass code with CFGPC, CALPC, or TSTPC on the character segments.

Note: while in the pass code change mode, the LEDs will extinguish and the unit will not respond to changes in applied pressure and the output relays will be de-energized.

Operate the ▲ or ▼ button to select the first character of the calibration password.

When the correct first character is being displayed, press and release the SEL button to proceed to the next password character.

Repeat 1 and 2 above until the entire password is complete.

To exit the User-Defined Pass Code change mode, press and hold the SEL button.

Release the button when the display indicates – – – – and restarts in the normal operating mode.

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