Cecomp® Programmable 4-Wire Digital Pressure Transmitters

**Ranges and Resolution**

<table>
<thead>
<tr>
<th>PSI</th>
<th>inHg/PSI Res</th>
<th>mmH2O Res</th>
<th>cmH2O Res</th>
</tr>
</thead>
<tbody>
<tr>
<td>3PSIG</td>
<td>±0.001</td>
<td>±0.001</td>
<td>±0.001</td>
</tr>
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<td>5PSIG</td>
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<td>±0.001</td>
<td>±0.001</td>
</tr>
<tr>
<td>15PSIA</td>
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<td>±0.001</td>
<td>±0.001</td>
</tr>
<tr>
<td>±15PSIG</td>
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<td>±0.002</td>
<td>±0.002</td>
</tr>
<tr>
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<td>±0.002</td>
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<td>60V0PSIG</td>
<td>±0.001</td>
<td>±0.001</td>
<td>±0.001</td>
</tr>
</tbody>
</table>

**Accuracy**

- Accuracy includes linearity, hysteresis, repeatability.
- Standard accuracy: ±0.25% of full scale ±1 least significant digit
- HA accuracy option: ±0.1% FS ±1 LSO, see ranges for availability
- Sensor hysteresis: ±0.01% FS, included in accuracy
- Sensor repeatability: ±0.01% FS, included in accuracy

**Display**

- 4 readings per second nominal display update rate
- 4 digit LCD, 0.5" H and 0.25" H alphanumeric
- DR16 Red LED backlight on when gauge is on

**Controls**

- SEL: Select display for setup
- TEST: Set output to test level when in test mode
  - Up: Increase when in test or calibration mode
  - 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

**Output Characteristics**

- Updated approximately 16 times per second
- Usable pressure range to correspond to output
  - Current output, 4-20 mA DC
  - Output drive (compliance) determined by power source
  - Voltage output, 0-2 VDC into 5k ohm or greater
- 6,553 counts over sensor range
- -BV: Bipolar voltage output (+2 - 0 - 2 V) for ±15 psig sensor only
  - ±2 VDC into 5k ohm or greater
  - 6,553 counts over sensor range

**Power**

- 8-24 VAC 50/60 Hz or 9-32 VDC
- Gauge is on when power is on. Designed for continuous operation.
- DR: 30 mA maximum
- DBL: Approximately 40 mA maximum

**Weight**

- 9.5 ounces (approx.), shipping wt 1 pound (approx.)

**Housing**

- F16DR: Extruded aluminum case, epoxy powder coated, ABS/polycarbonate bezel (aluminum bezel optional), front and rear gaskets, polycarbonate label
- F16DRN: ABS/polycarb. NEMA 4X case, rear gasket, polycarb. label

**Connection, Material, and Electrical Compatibility**

- 1/4” NPT male fitting. All wetted parts are 316L stainless steel.
- Under-range display (non-vacuum sensors): 100 psig, 100 psia, 200 psig sensors
- Vacuum service: 15 psia, ±15 psig, 15 psig, 30 psia
- Overpressure, Burst, Vacuum

**Environmental**

- Storage temperature: –40 to 203°F (–40 to 95°C)
- Operating temperature: –4 to 203°F (–40 to 95°C)
- Compensated temperature: 32 to 158°F (0 to 70°C)

**Output Drive (Compliance) Determined by Power Source**

- Current output, 4-20 mA DC
- Bipolar voltage output (+2 - 0 - 2 V) for ±15 psig sensor only
- ±2 VDC into 5k ohm or greater

**Operating Characteristics**

- Update approximately 16 times per second
- Usable pressure range to correspond to output

**How to Specify**

- Standard accuracy: ±0.25% of full scale ±1 least significant digit
- HA accuracy option: ±0.1% FS ±1 LSO, see ranges for availability
- Sensor hysteresis: ±0.01% FS, included in accuracy
- Sensor repeatability: ±0.01% FS, included in accuracy

**Type**

- Standard housing
- Standard housing, backlit display
- NEMA 4X housing
- NEMA 4X housing, backlit display

**Range**

- F16DR: 0-250 inH2O, 0-2500 mmH2O
- F16DRN: 0-250 inH2O, 0-2500 mmH2O
- F16DRNBL: 0-250 inH2O, 0-2500 mmH2O

- See table at left

**Output**

- Specify: I = 4-20 mA
- V = 0-2 V
- ±2 V for ranges using ±15 psig sensor only

**Options**

- High accuracy, ±0.1% FS ±1 LSO. See table at left for availability.
- PM: Panel mount, 4.1" x 4.1", n/a NEMA 4X
- CC: Moisture resistant circuit board conformal coating
- CD: Calibration data, 5 test points and date
- NC: NIST traceability documentation, 5 points and date

**Accessories**

- WMPSK: Wall mount power supply kit, 115 VAC/12 VDC
- SCR14S: Filter screen fitting keeps debris out of gauge sensor. Use for food vacuum packaging applications. 303 SS body, 100 micron 304 SS screen.
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.

Tips of Gauges

Gauge reference models read zero with the gauge port open. Atmospheric pressure readings of atmospheric pressure vary continuously. To make accurate pressure measurements, always close the gauge port and never pressurize the gauge port to zero. This changes the sensor to zero with a vacuum pump capable of creating at least 100 millitorr. To ensure accurate readings, be sure gauge pressures are at zero before zeroing. 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 \( \Delta \) and \( \nabla \) button. The retransmission output will hold the last value. Release all buttons when the display indicates \( \sim \sim \sim \sim \) or \( \sim \sim \sim \sim \).

Display and Keypad

- Numeric display
- Alpha-numeric display
- Minus sign
- Select button
- Output test button

Electrical Connections—continued

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.

<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></td>
<td>-V</td>
<td>n/a</td>
<td>0 V</td>
<td>2 V</td>
</tr>
<tr>
<td>Gauge reference vacuum</td>
<td>-I</td>
<td>20 mA</td>
<td>4 mA</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td>-V</td>
<td>2 V</td>
<td>0 V</td>
<td>n/a</td>
</tr>
<tr>
<td>Absolute reference</td>
<td>-I</td>
<td>4 mA</td>
<td>20 mA</td>
<td>n/a</td>
</tr>
<tr>
<td></td>
<td>-V</td>
<td>0 V</td>
<td>0 V</td>
<td>n/a</td>
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<tr>
<td>Vacuum/pressure ranges</td>
<td>-I</td>
<td>4 mA</td>
<td>12 mA</td>
<td>20 mA</td>
</tr>
<tr>
<td>using ( \pm 15 ) psi</td>
<td>-V</td>
<td>0 V</td>
<td>1 V</td>
<td>2 V</td>
</tr>
<tr>
<td>Pressure ranges</td>
<td>-I</td>
<td>4 mA</td>
<td>6.1 mA</td>
<td>20 mA</td>
</tr>
<tr>
<td>using ( \pm 5 ) psi</td>
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<td>0 V</td>
<td>0.26 V</td>
<td>2 V</td>
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<td>Pressure ranges</td>
<td>-I</td>
<td>4 mA</td>
<td>5.1 mA</td>
<td>20 mA</td>
</tr>
<tr>
<td>using ( \pm 20 ) psi</td>
<td>-V</td>
<td>0 V</td>
<td>0.14 V</td>
<td>2 V</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 F5 (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 \( \sim \sim \sim \sim \) or \( \sim \sim \sim \sim \).

From the normal operating mode, press and hold the TEST button and press the SEL button. Release both buttons when the display indicates \( \sim \sim \sim \sim \) or \( \sim \sim \sim \sim \).

Pressing the \( \Delta \) or the \( \nabla \) 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 zero 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 \( \Delta \) and \( \nabla \) buttons and press the SEL button.

The retransmission output will hold the last value. Release all buttons when the display indicates \( \sim \sim \sim \sim \). The display will indicate zero. Release all buttons when the display indicates \( \sim \sim \sim \sim \). The display will indicate zero. Repeat the procedure to restore the readings to zero when zeroing. Release the \( \Delta \) and \( \nabla \) buttons and press the SEL button.

The display will indicate zero. Release all buttons when the display indicates \( \sim \sim \sim \sim \). The display will indicate zero. Repeat the procedure to restore the readings to zero when zeroing. Release the \( \Delta \) and \( \nabla \) buttons and press the SEL button.

The display will indicate zero. Release all buttons when the display indicates \( \sim \sim \sim \sim \). The display will indicate zero. Repeat the procedure to restore the readings to zero when zeroing. Release the \( \Delta \) and \( \nabla \) buttons and press the SEL button.

The display will indicate zero. Release all buttons when the display indicates \( \sim \sim \sim \sim \). The display will indicate zero. Repeat the procedure to restore the readings to zero when zeroing. Release the \( \Delta \) and \( \nabla \) buttons and press the SEL button.
Instructions

Pass Code Entry

A pass code is required to calibrate and configure the gauge. Additional levels of security may be enabled by defining separate pass codes for calibration, user configuration, and output test.

To enter the calibration mode from the normal operating mode, press and release the TEST and FCTRY buttons. Press and release the SEL button to move to the next parameter. 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. Note: The configuration parameters will not be saved if the procedure is interrupted before completion.

User Configuration

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. Before the gauge enters the Configuration mode, the display initially indicates - - - - - with the first underscore blinking, and with CFGPC on the lower display.

Enter the pass code as described in the Pass Code Entry section.

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.

Zero Tare Configuration

The upper display will be blank, and the lower display will indicate either ZTARE or NOZTR.

If ZTARE is selected, the user will be able to manually zero the gauge from the normal operating mode. To select ZTARE, press and release the ▲ button. The lower display will indicate ZTARE.

If NOZTR is selected the user will be prevented from zeroing the gauge from the normal operating mode. This is default setting for absolute reference ranges.

User Configuration—continued

To select NOZTR, press and release the ▼ button. The lower display will indicate NOZTR.

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 RNGLO.

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

Output Calibration

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 with an accurate mA or Volt meter.

Retransmission Output Lower 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 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 alternate between CAL and 20 mA or +2 VDC depending on retransmission option. Use the ▲ and ▼ buttons to adjust the actual retransmission output to its high value.

Press the SEL button briefly to proceed to pressure calibration or hold the SEL button for 2 seconds to save and exit.

Pressure Calibration

The pressure calibration procedure adjusts 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.

Continued on next page....
Pressure Calibration—continued

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 initially indicates _ _ _ _ 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.