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Model 3311 and Model 846 Current-to-Pressure Transducers

FISHER-ROSEMOUNT™

Managing The Process Better.™

Model 3311 and Model 846 Current-to-Pressure Transducers

NOTICE

Read this manual before working with these products. For personal and system safety, and for optimum product performance, make sure you thoroughly understand the contents before installing, using, or maintaining these products.

For assistance with Model 3311 or Model 846 Transducers in Europe, the Middle East, Africa, Asia, and Latin America please contact:

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Technical questions

For assistance with Model 3311 or Model 846 Transducers in the United States and Canada please contact your local Fisher Controls Representative.

⚠CAUTION

The products described in this document are NOT designed for nuclear-qualified applications.

Using non-nuclear qualified products in applications that require nuclear-qualified hardware or products may cause inaccurate readings.

For information on Rosemount nuclear-qualified products, contact your local Rosemount Sales Representative.

SNF-0004

Rosemount Model 3311 or Fisher Controls Model 846 Current-to-Pressure Transducers may be protected by one or more of the following U.S. Patent Nos. 4,481,967; 4,534,376; 4,638,830;4,665,938; 4,901,756; and Des. 316,975. May depend on model. Other foreign patents issued and pending.

Cover Photo 3311-001AC

CE Fisher-Rosemount satisfies all obligations coming from legislation to harmonize product requirements in the European Union.

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Section 1

Introduction

The instruction manual for the Rosemount® Model 3311 and Fisher Controls Model 846 Current-to-Pressure (I/P) Transducers is divided into six sections:

- Section 1 - Introduction
- Section 2 - Installation
- Section 3 - Maintenance
- Section 4 - Calibration
- Section 5 - Troubleshooting
- Section 6 - Specifications

Section 1 presents a general description of the transducer. It describes major features of the I/P transducer, common applications, and principles of transducer operation.

⚠WARNING

Attempting to install and operate the Current-to-Pressure Transducer without reviewing the instructions contained in this manual could result in personal injury or equipment damage.

INSTRUMENT OVERVIEW

The Current-to-Pressure (I/P) Transducer accepts an electrical input signal and produces a proportional pneumatic output. Typically, 4–20 mA is converted to 3–15 psi (0.2–1.0 kg/cm^2). Models are available in direct or reverse action and field-selectable full or split range inputs. See **Section 4 Calibration** for more information on input/output combinations.

The most common application of the transducer is to receive an electrical signal from a controller and produce a pneumatic output for operating a control valve actuator or positioner. The transducer may also be used to transduce a signal for a pneumatic receiving instrument.

The Model 3311 and 846 is an electronic I/P transducer. It has a single electronic circuit board, as shown in Figure 1-1. The circuit contains a solid-state pressure sensor that monitors output pressure and is part of an electronic feedback network. The self-correcting ability provided by the sensor/circuit combination allows the transducer to produce a very stable and responsive output signal.

All active mechanical and electrical components are incorporated into a single, field-replaceable module called the module final assembly, shown in Figure 1-1. The module final assembly contains the electronic circuit board, pilot/actuator assembly, and booster stage. The module final assembly is easily removed by unscrewing the module cover. Its design minimizes parts and reduces the time required for repair and troubleshooting.

The terminal compartment and module compartment are separated by a sealed compartment wall. The dual compartment housing protects the electronics.

FIGURE 1-1.
Modular Construction
of the Models 3311 and 846.

PRINCIPLES OF OPERATION

The following paragraphs describe the functional parts of the Models 3311 and 846. Figure 1-2 shows the block diagram.

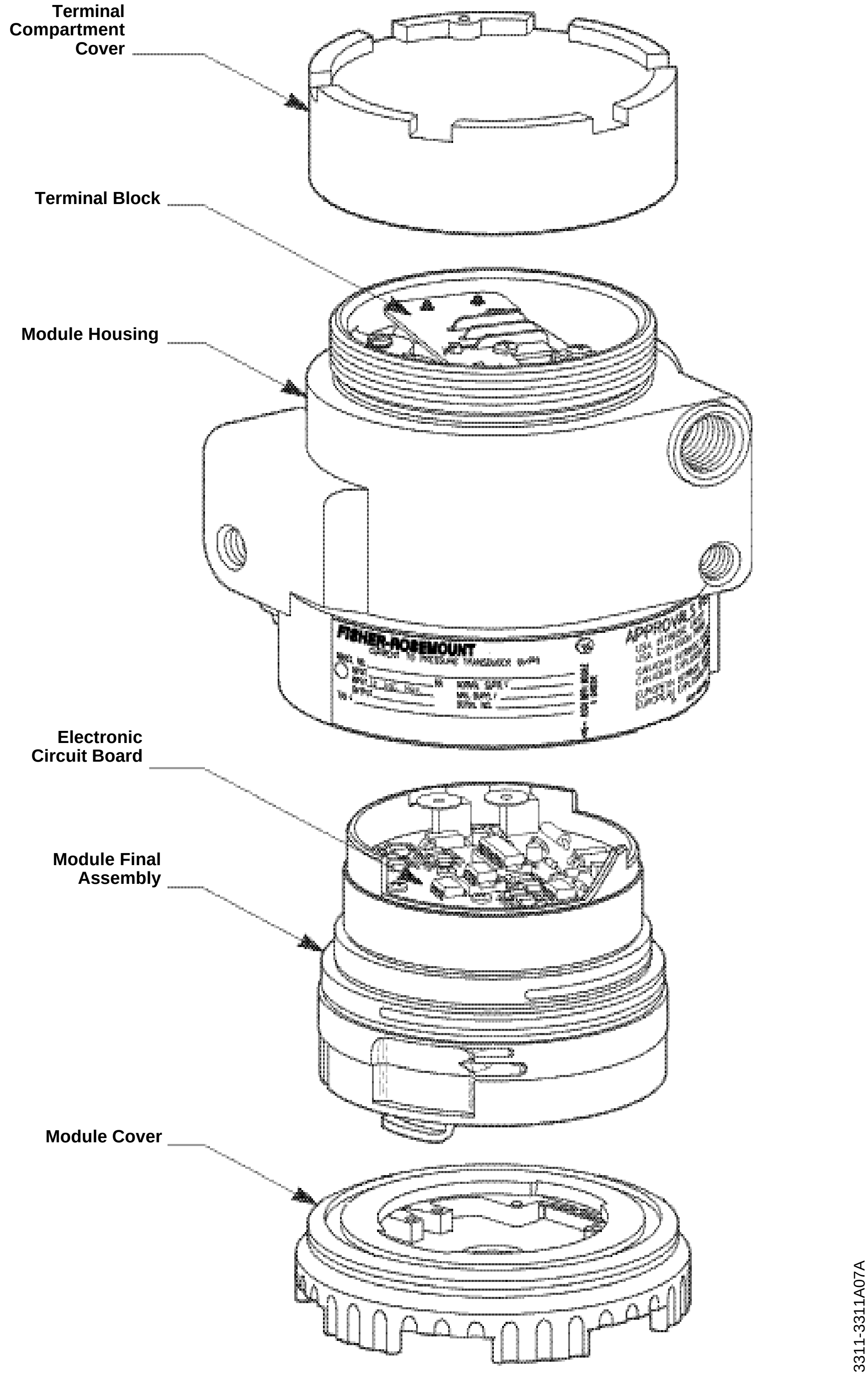
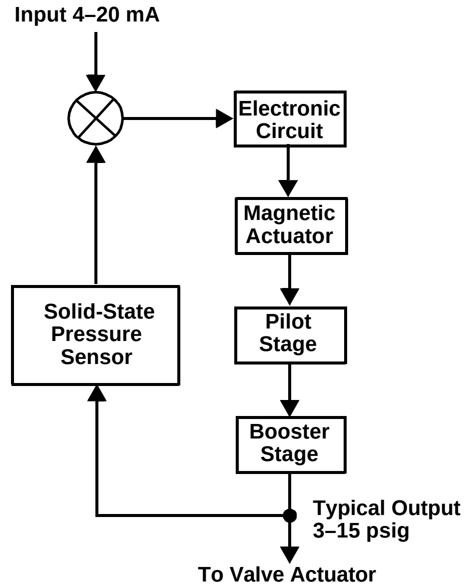


FIGURE 1-2.
Functional Parts Block Diagram.



Electronic Circuit

During operation, the input current signal is received by the transducer’s electronic circuit and compared to the output pressure from the booster stage. A solid-state pressure sensor is part of the electronic circuit and monitors the booster stage output. The silicon-based sensor uses strain gage thin film technology.

The sensor’s pressure signal is fed to a simple internal control circuit. By using this patented technique, the transducer’s performance is set by the sensor/circuit combination. Changes in output load (leaks), variations in supply pressure, or even component wear are sensed and corrected by the sensor/circuit combination. Electronic feedback control allows crisp dynamic performance and readily compensates for output changes induced by vibration.

NOTE
Because the transducer is electronic in nature, it is not well modeled in the loop as a simple resistor in series with an inductor. Also, it is better thought of as a 50-ohm resistor in series with a 6.0 V voltage drop, with negligible inductance.

This is important when calculating the loop load. When the transducer is used in series with a microprocessor-based transmitter, the noninductive nature of the transducer allows digital signals to successfully pass through undistorted.

Magnetic Actuator

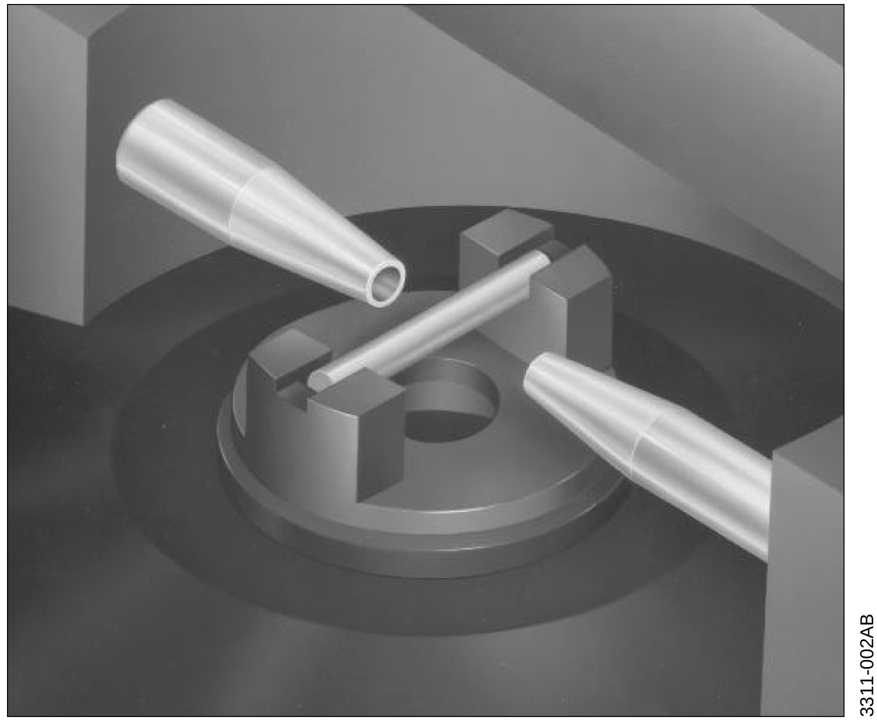
The electronic circuit controls the level of current flowing through the actuator coil, which is located in the pilot/actuator assembly. A change to the level of coil current is made by the electronic circuit when it senses a discrepancy between the pressure measured by the sensor and the pressure required by the input signal.

The actuator performs the task of converting electrical energy (current) to motion. It uses a patented, coaxial moving magnet design optimized for efficient operation and is highly damped at its mechanical resonance. A silicone rubber diaphragm protects its working magnetic gaps from contamination.

Pilot Stage

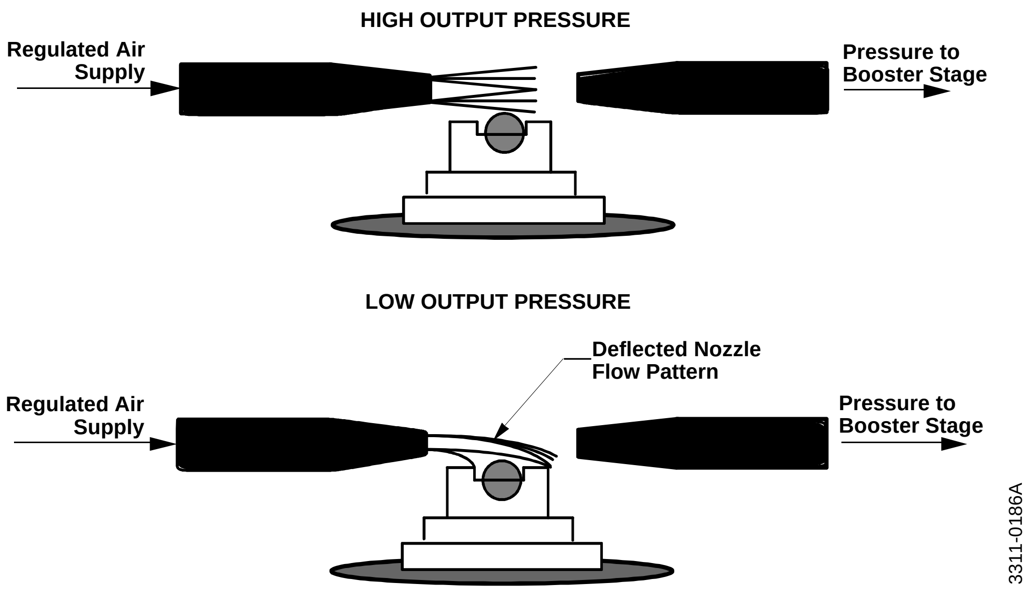
The patented pilot stage contains two opposed fixed nozzles: the supply nozzle and the receiver nozzle. It also contains the deflector, which is the moving element. See Figures 1-3 and 1-4. The supply nozzle is connected to the supply air and provides a high-velocity air stream. The receiver nozzle captures the air stream and converts it back to pressure. The receiver nozzle pressure is the output pressure of the pilot stage.

FIGURE 1-3.
Detail of Deflector/Nozzle Pilot Stage.



To vary the pilot output pressure, the high-velocity stream is diverted away from the receiver nozzle by the deflector, which is a cylindrical, aerodynamic body located between the two nozzles.

FIGURE 1-4.
Deflector/Nozzle Pilot Stage Operation (Direct Action).



In response to a change in actuator coil current, the deflector is repositioned between the nozzles. There is a linear relationship between the coil current and the pilot stage output pressure.
For direct action units the power-off, or fail-safe, position of the top of the deflector is near the center of the stream and results in nearly zero pilot output pressure. As the coil is energized, the deflector is drawn out of the stream.

For reverse action units, the power-off or fail-safe position of the deflector is completely out of the stream. The result is maximum pilot output pressure. As the coil is energized, the deflector moves into the stream, resulting in a decreased pilot output pressure.

The deflector material is tungsten carbide, and the nozzles are 316 stainless steel. The nozzles have a large bore of 0.016 inches (0.41 mm), which provides good resistance to plugging.

Booster Stage

The receiver nozzle pressure controls the booster stage, which has a poppet valve design. An increase in receiver nozzle pressure positions the valving in the booster stage to produce an increase in the transducer output signal. A decrease in the receiver nozzle pressure positions the valving in the booster stage to allow exhaust to occur, decreasing the output signal.

The booster stage operates using a 3:1 pressure gain from the pilot stage. High flow rate capability is achieved by large flow area poppet design and internal porting having low flow resistance. The booster stage design provides very good stability in high vibration applications, and the poppet valve technology provides resistance to plugging.

Section 2

Installation

This section presents information on installing the Models 3311 and 846. Figures 2-1, 2-2, 2-3, and 2-4 can be used as references for instructions contained in this section.

MOUNTING

The I/P transducer is designed for mounting on a control valve, 2-inch pipe, wall, or panel. Figures 2-2 and 2-3 show recommended mounting configurations. The mounting positions shown allow any moisture buildup in the terminal compartment to drain to the signal wire conduit entrance. Any moisture in the pilot stage area will be expelled through the stroke port without affecting pilot stage operation. In applications with excessive moisture in the supply air, vertical mounting allows the most effective drainage through the stroke port.

Mounting is accomplished with an optional universal mounting bracket (Option Codes B1 or B2). Before mounting the transducer, note the following recommendations:

- Ensure that all bolts are fully tightened. The recommended torque is 16 ft-lb.
- Bolts that connect to the transducer and to a valve actuator should have the lock washer placed directly beneath the bolt head and the flat washer placed between the lock washer and bracket. All other bolts should have the lock washer next to the nut, and the flat washer placed between the lock washer and bracket.
- Do not mount the transducer in a location where foreign material may cover the stroke port or exhaust port. See the descriptions of the stroke port and exhaust port later in this section.

CONNECTIONS

Clean, dry, noncorrosive air is recommended as an air supply. An output span of 3–15 psi (0.2–1.0 kg/cm^2) requires a nominal supply pressure of 20 psi (1.4 kg/cm^2) and a flow capacity not less than 4 SCFM (6.7 Nm^3/h). For multirange performance units with higher output spans, the supply pressure should be at least 3 psi (0.2 kg/cm^2) greater than the maximum calibrated output pressure.

Air Supply Port

The air supply line can be connected to the ¼–18 NPT supply port, or to the supply port of a filter-regulator that is mounted directly to the transducer. Figure 2-4 shows all the installation options.

⚠ WARNING

Explosions may cause death or serious injury.
Don’t operate the transducer with the CENELEC or JIS flameproof options (E9 or E4) at a supply pressure in excess of 20 psi (1.4 kg/cm^2). Doing so **invalidates** the CENELEC and JIS flameproof certifications, and could allow flames to spread from the unit potentially igniting and causing an explosion.

The mounting boss for the air supply connection contains two 5/16–18 UNC tapped holes that are 2¼ inches apart. The tapped holes allow direct connection of a filter-regulator having a matching through-bolt pattern. A filter-regulator with mounting hardware (Option Codes F1 or F2) is available. The mounting hardware consists of two 5/16–18 x 3½-inch grade 5 bolts and one O-ring. See Table 3-1 for the O-ring size.
The O-ring is positioned in the O-ring gland of the filter-regulator mounting boss.

The filter-regulator contains a ¼–18 NPT output port for a supply gage (Option Codes G1, G3, or G7). A threaded plug must be installed in the gage port when a gage is not used.

Output Gage Port

The output gage port allows connection of an output gage (Option G2, G4, or G8) to provide local output signal indication. The output gage port is ¼–18 NPT. If an output gage is not specified, a threaded plug is shipped with the transducer. The plug must be installed in the output gage port when the port is not used. Figure 2-3

⚠CAUTION

The following conditions may cause failure of the output gage resulting in personal injury, and damage to the transducer and other equipment:

- pressure beyond the top of the gage scale.
- excessive vibration.
- pressure pulsation.
- excessive instrument temperature.
- corrosion of the pressure containing parts.
- other misuse.

Refer to ANSI B40.1-1980. Do not use on oxygen service.

shows the output gage.

The output signal line is connected to the output signal port. The output signal port is ¼–18 NPT, as shown in Figure 2-1. The output gage port can be used as an alternate signal port. If the gage port is used as a signal port, a threaded plug must be installed in the output signal port.

Electrical Connections

Signal wiring is brought to the terminal compartment through a ½–14 NPT housing conduit connection, shown in Figure 2-1. Where condensate is common, use a conduit drip leg to help reduce liquid buildup in the terminal compartment and avoid shorting of the input signal. Electrical connections are made at the terminal block. An internal grounding lug is provided to facilitate a separate ground when required. The use of shielded cable will ensure proper operation in electrically noisy environments.

Connect the positive signal lead to the positive terminal, marked “+”. Connect the negative signal lead to the negative terminal, marked “–”.

⚠CAUTION

Excessive current can damage the transducer. Do not connect an input current of more than 100 mA to the transducer.

⚠ WARNING

Unscrewing the module cover removes power from the electronics and the output signal will be 0.0 psi. An uncontrolled process may result in death or serious injury. Before removing the module cover, ensure the device is properly controlled.

⚠ WARNING

Explosions may result in death or serious injury. In explosive atmospheres, remove power and shut off the air supply to the I/P unit before attempting to remove the terminal compartment cover or module cover. Failure to do so could result in electrical spark or explosion.

STROKE PORT

The constant bleed of supply air from the pilot stage is directed out the stroke port, which is a screened hole located at the center of the module cover. Figure 2-1 shows the location of the stroke port. Before installing the transducer, ensure the stroke port is clear. Do not mount the transducer in a location where foreign material may cover the stroke port. For information on using the stroke port, refer to Section 5 Troubleshooting.

EXHAUST PORT

The transducer exhausts through a screened port located beneath the instrument nameplate. Figure 2-1 shows the location of the exhaust port. The nameplate holds the screen in place. Exhaust will occur with a reduction in output pressure. The transducer should not be mounted in a location where foreign material may clog the exhaust port.

⚠WARNING

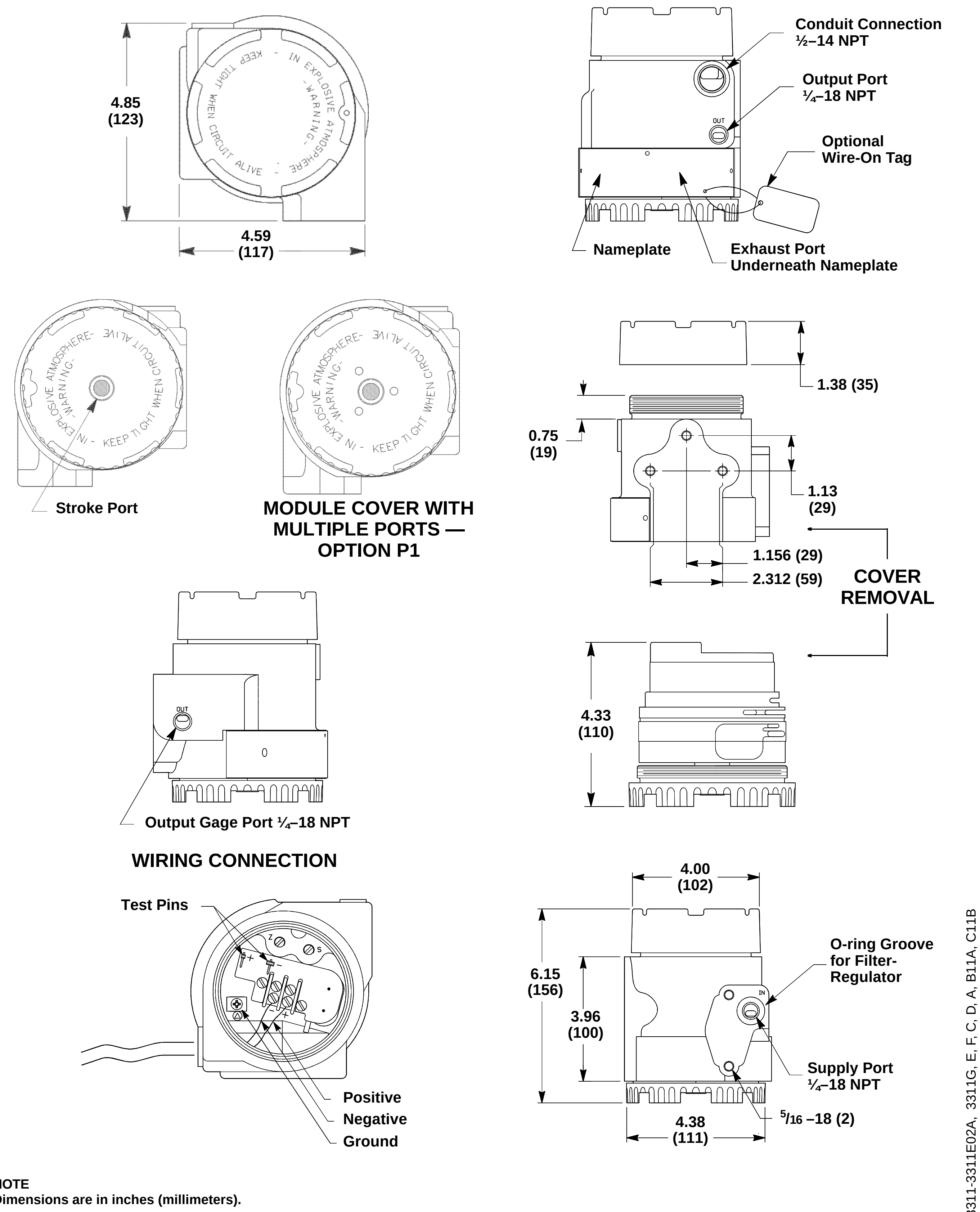
Personal injury and property damage could result from fire or explosion of accumulated gas. During normal operation, supply air is vented to the atmosphere through the stroke port in module cover and exhaust port (located under the nameplate). If a flammable gas is used as supply air, the area into which it is vented must be classified as a Division I hazardous area. Adding a remote vent to the stroke port is not sufficient to permit safe operation in a hazardous area.

SIGNAL INTERRUPTION

Upon loss of input current, or if input current decreases below 3.3 mA ±0.3 mA, the output of the direct action unit will decrease to less than 1 psi (0.1 kg/cm^2).

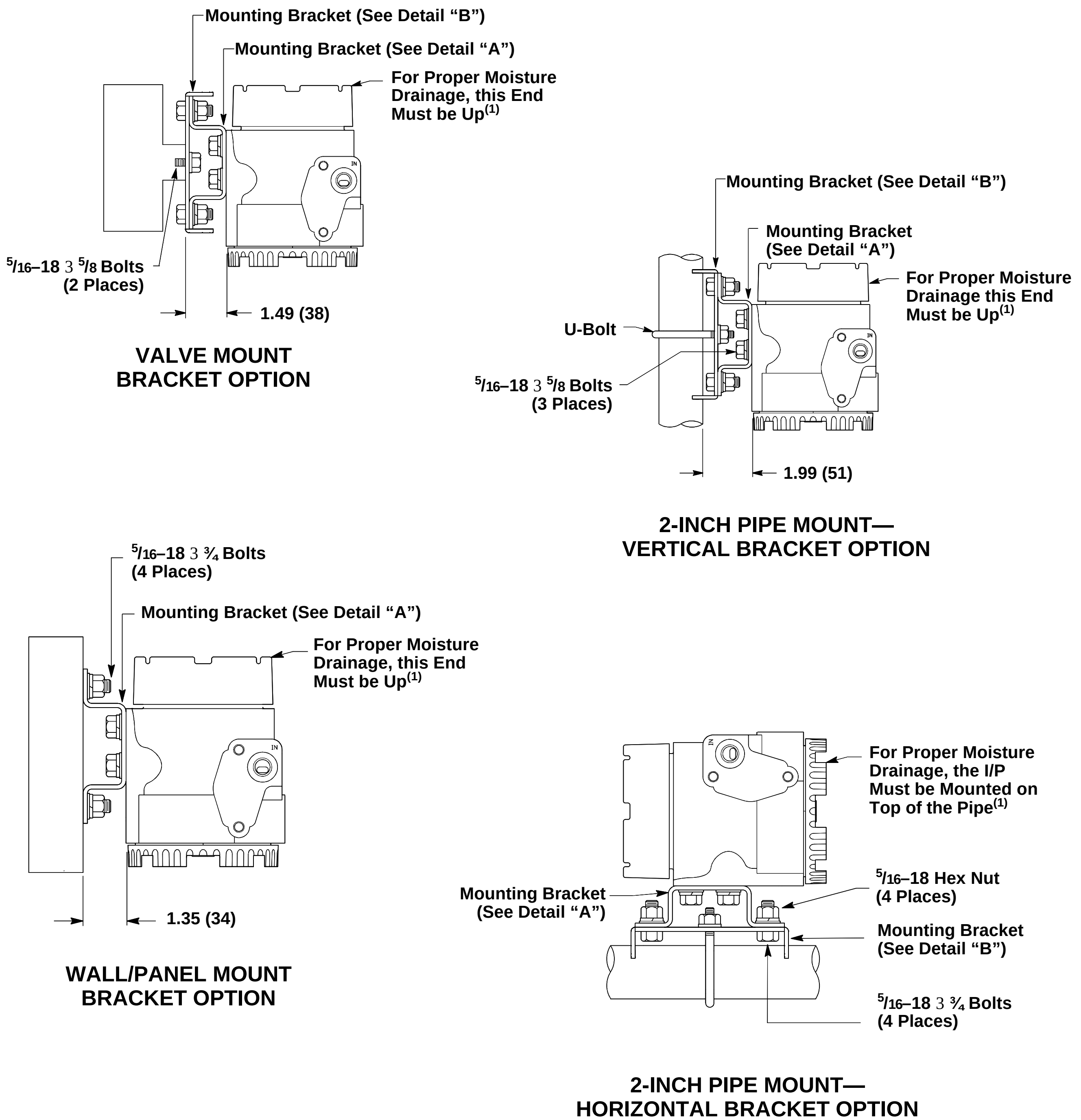
In the same situation, the output of the reverse action unit will increase to near supply pressure.

FIGURE 2-1.
Installation Drawing—
Dimensions.



NOTE
Dimensions are in inches (millimeters).

FIGURE 2-2.
Installation Drawing—
Mounting Brackets.

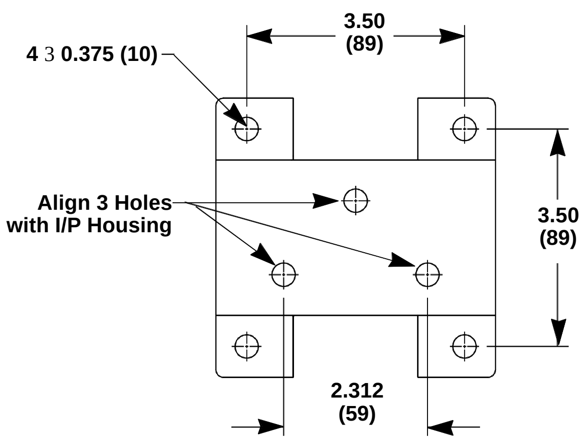


NOTE
Dimensions are in inches (millimeters).

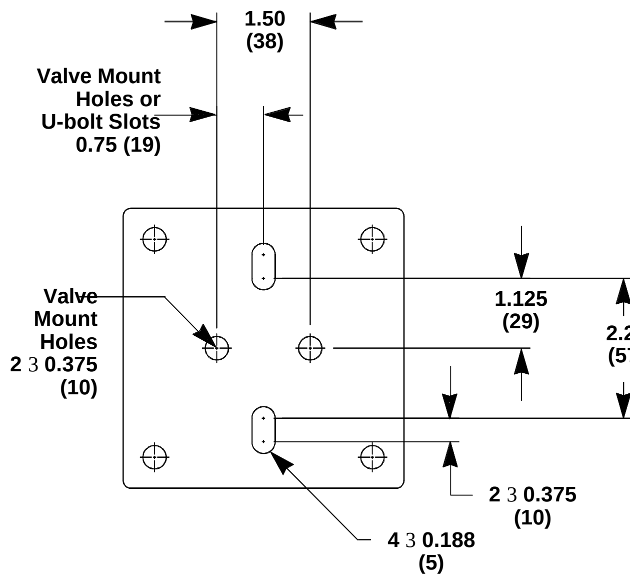
(1) The mounting positions shown allow any moisture buildup in the terminal compartment to drain to the signal wire conduit entrance. Do not mount the transducer with the terminal compartment cover on the bottom; moisture may accumulate in the terminal compartment or pilot stage, preventing proper operation. The vertical mount is most effective for moisture drainage in wet applications.

FIGURE 2-2. (continued).

Universal Mounting Bracket (Option B1 or B2) Valve or Pipe Mount
1. Attach the bracket, shown in detail “A,” to the transducer. 2. Attach the bracket, shown in detail “B,” to the valve or pipe. 3. Connect the two pieces.



DETAIL “A”
WALL MOUNT BRACKET



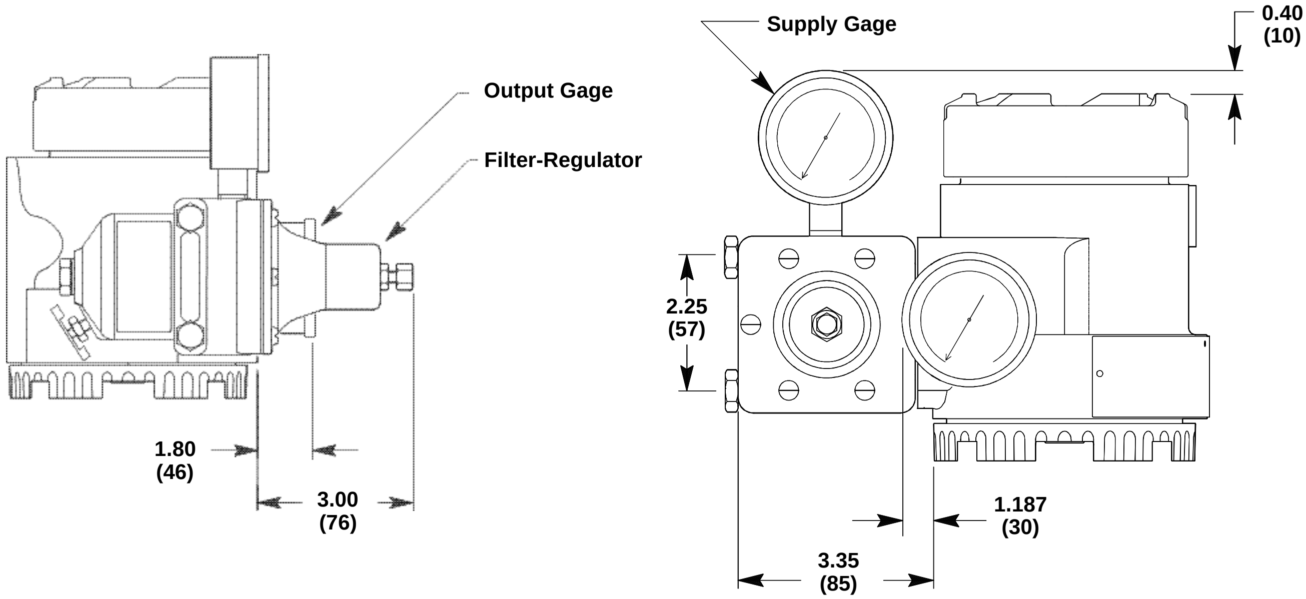
DETAIL “B” VALVE/PIPE MOUNT
ADAPTER PLATE

3311-3311C13A

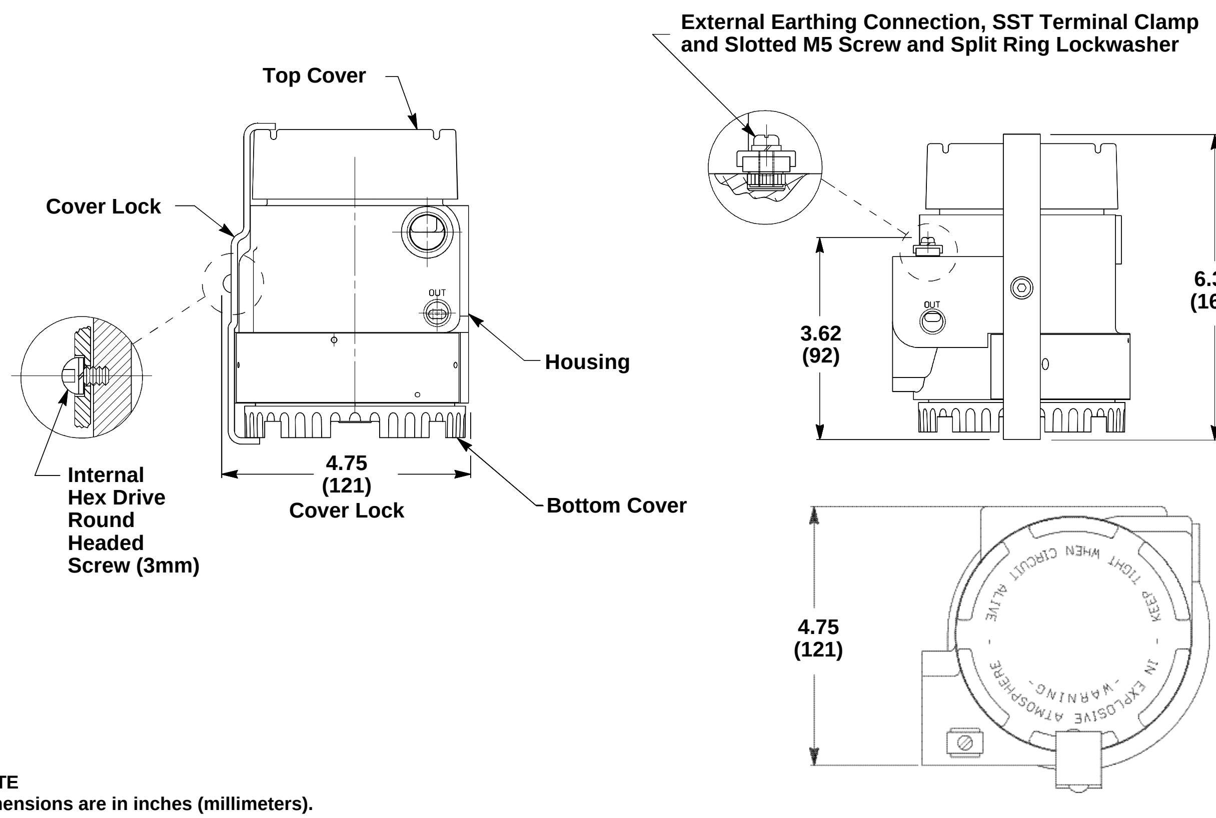
NOTE
Dimensions are in inches (millimeters).
If you are installing a unit with a Stainless Steel housing,
refer to insert 0003 for special mounting bracket instructions.

FIGURE 2-3. Installation Drawing—
Options.

OPTION F1, F2, G1, G2, G3, G4, G7, G8, G9, P1



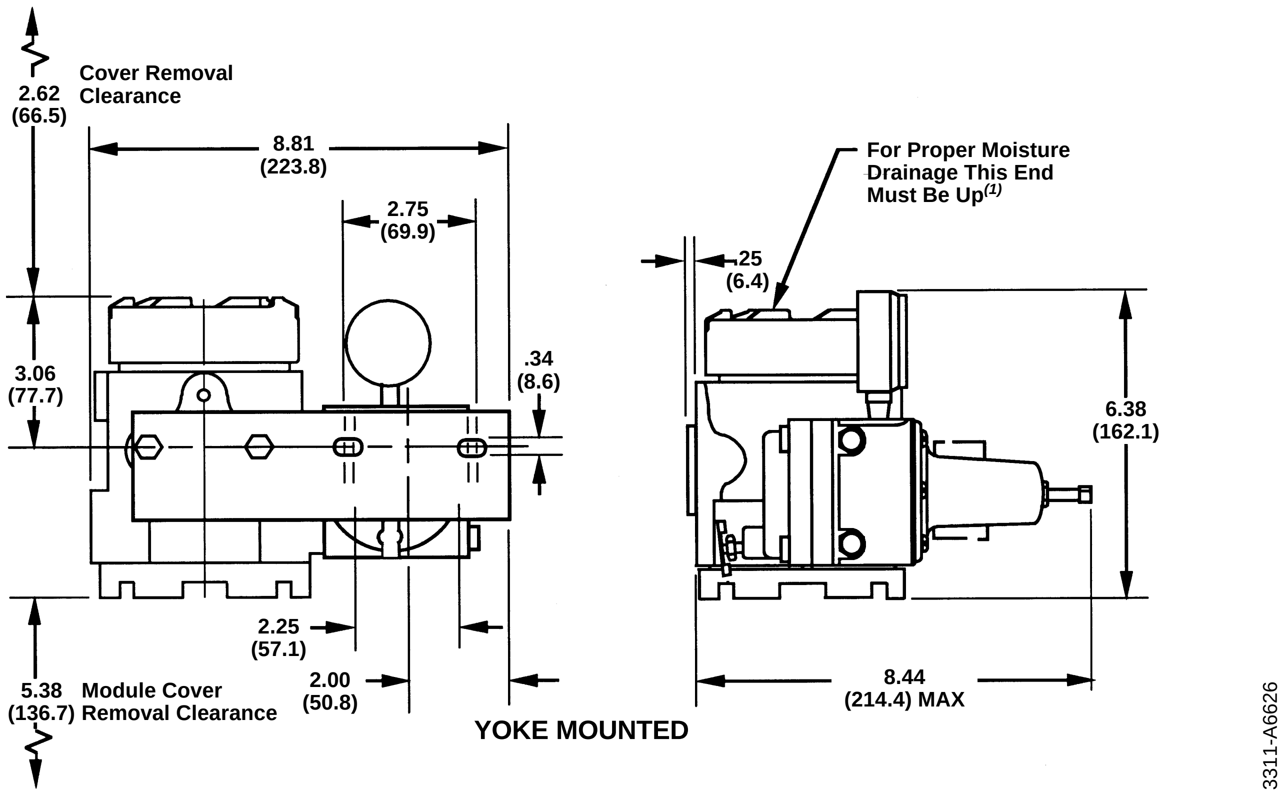
OPTION E9, E4



3311-3311C, A, B10A, 3311C11B, B, A13B

NOTE
Dimensions are in inches (millimeters).

FIGURE 2-4. Typical Model 3311 and Model 846 Dimensions with Type 67AFR Filter/Regulator and Gauges.



NOTE
Dimensions are in inches (millimeters).

(1) The mounting positions shown allow any moisture buildup in the terminal compartment to drain to the signal wire conduit entrance. Do not mount the transducer with the terminal compartment cover on the bottom; moisture may accumulate in the terminal compartment of pilot stage, preventing proper transducer operation. The vertical mount is most effective for moisture drainage in wet applications.

Section **3**

Maintenance

Section 3 describes the major components, assembly, and disassembly of the Model 3311 and Model 846 Current-to-Pressure Transducers. It also gives instructions for returning equipment.

⚠WARNING

Use only the procedures and new parts specifically referenced in this manual. Unauthorized procedures or parts can affect product performance and the output signal used to control a process, and may render the instrument dangerous. Direct any questions concerning these procedures or parts to Rosemount Inc.

MODULE FINAL ASSEMBLY

The active mechanical and electrical components of the transducer are incorporated into a single, field-replaceable module called the module final assembly, as shown in Figure 3-1. Electrical connection between the terminal compartment and module final assembly is made by electrical feedthroughs that extend into the module compartment. The feedthroughs enter sockets on the electronic circuit board. The span and zero screws extend through the terminal compartment wall into the module compartment. Connection to the span and zero potentiometers on the electronic circuit board is made by Velcro®.

The module final assembly has three separate radial ports. The upper port is for supply air, the middle port for the output signal, and the lower ports for exhaust. Three O-rings separate the ports. The two lower O-rings are the same size, and the upper O-ring is slightly smaller. Table 3-1 shows the O-ring sizes.

NOTE
If the transducer will be operated in regions where the temperature will be below 0 °F (–18 °C), ensure that Fisher-Rosemount-supplied O-rings are used. They have been selected to provide cold temperature operation.

TABLE 3-1.
O-ring Sizes.

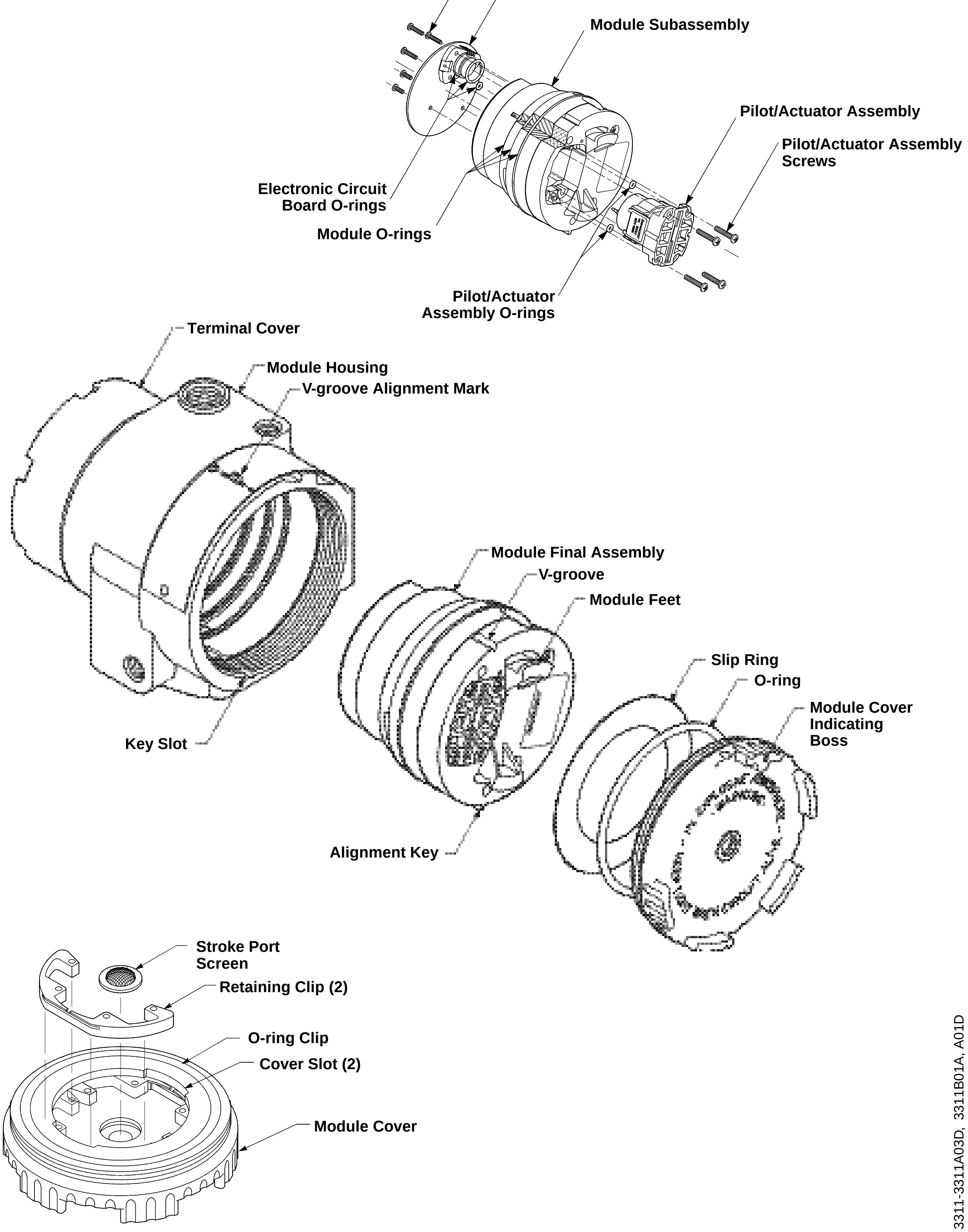
Description	Qty.	Size
Module O-rings	1 2	043 042
Pilot/Actuator O-rings	2	006
Circuit Board O-rings	2 1	016 005
Module Cover O-ring	1	238
Terminal Cover O-ring	1	238
Filter-Regulator O-ring	1	208

The module final assembly is attached to the module cover, which allows insertion and removal, and can be separated from the module cover for further disassembly.

A module cover O-ring provides a seal between the module cover and module final assembly. Table 3-1 shows the O-ring sizes. A slip ring is located around the module feet. It allows the module cover to turn easily when the module final assembly is being removed from the housing

The module final assembly consists of three major subassemblies, as shown in Figure 3-1. They are the electronic circuit board, pilot/actuator assembly, and module subassembly.

FIGURE 3-1.
Model 3311 and Model 846
Exploded View.



Removing the Module Final Assembly

The module final assembly is attached to the module cover. Removing the module cover automatically removes the module final assembly from the housing. When the module cover is unscrewed, the electrical feedthroughs and span and zero adjustments automatically disengage. The internal air ports are also disengaged. The air supply to the I/P should be turned off to prevent uncontrolled air loss through the housing.

⚠WARNING

Unscrewing the module cover removes power from the electronics and the output signal will be 0.0 psi. An uncontrolled process may result in death or serious injury. Before removing the module cover, ensure the device is properly controlled.

⚠WARNING

Explosions may result in death or serious injury. In explosive atmospheres, remove power and shut off the air supply to the I/P unit before attempting to remove the terminal compartment cover or module cover. Failure to do so could result in electrical spark or explosion.

Use the following steps to remove the module final assembly from the housing and module cover:

1. Shut off the air supply. For units with Option E9 (CENELEC Flameproof Approval), remove the cover lock and screw (3 mm) to allow access to the terminal compartment cover. Unscrew the module cover. When the module cover threads clear the housing, slowly pull on the cover, and the module final assembly will gradually come out of the housing.

NOTE
The module and the housing are designed for minimal clearance; therefore, patience may be required while pulling on the cover. Time must be allowed for release of the vacuum effect between the housing and module. If the module becomes tilted and cannot be removed, reinsert it completely into the housing and fully engage the module cover threads. Then proceed again with removal, ensuring that you pull slowly in a straight line.

Support both the module cover and the module final assembly as it comes out of the housing. This is to prevent dropping them, should they become detached accidentally.

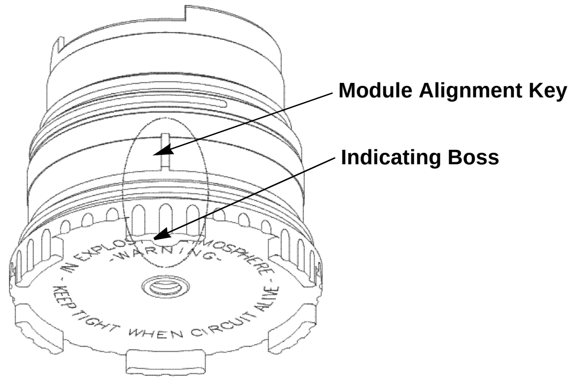
⚠CAUTION

Do not grip the module cover threads. The threads are sharp and may cause minor injury. Wear gloves when removing the module cover.

2. Prepare to remove the module final assembly from the module cover. Align the module feet with the two interior cover slots.
   To accomplish this, identify the indicating boss on the module cover, shown in Figure 3-1.

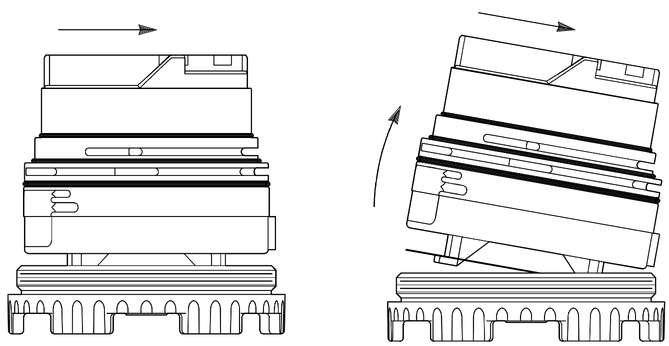
Grasp the module cover with one hand and the module final assembly with the other hand. Rotate the module final assembly so that the module alignment key is directly above the indicating boss on the module cover. Figure 3-2 shows the module alignment key and the indicating boss. The module feet are now aligned with the cover slots.

FIGURE 3-2.
Alignment Key Above Module Cover Indicating Boss.



3. Remove the module final assembly from the module cover. To accomplish this, hold the cover steady, and push the module final assembly in the direction of the module cover indicating boss. At the same time, lift the opposite foot of the module final assembly.

FIGURE 3-3.
Removing the Module Final Assembly from the Module Cover.

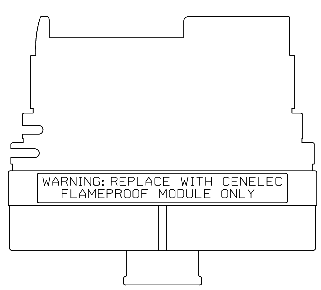


Replacing the Module Final Assembly

Use the following procedure to attach the module cover and replace the module final assembly:

1. Ensure that the electronic circuit board and the pilot actuator assembly provide the desired action (direct or reverse). See the “Electronic Circuit Board” and “Pilot/Actuator Assembly Action” descriptions later in this section.

FIGURE 3-4.
CENELEC Flameproof (Option E9) and JIS Flameproof (Option E4) Module.



2. Ensure that the slip ring is in place around the feet of the module final assembly. The module cover O-ring should be lightly lubricated with silicone grease and placed in the O-ring gland. The stroke port screen should be clean and in place.

⚠WARNING

Explosions may result in death or serious injury.
Don't operate the transducer with the CENELEC or JIS flameproof options (E9 or E4) at a supply pressure in excess of 20 psi (1.4 kg/cm^2). Doing so **invalidates** the CENELEC and JIS flameproof certifications, and could allow flames to spread from the unit potentially igniting and causing an explosion (See Figure 3-4).

NOTE
The module cover O-ring must be in the O-ring gland, not down on the threads of the cover. This will ensure proper sealing of the pilot pressure area.

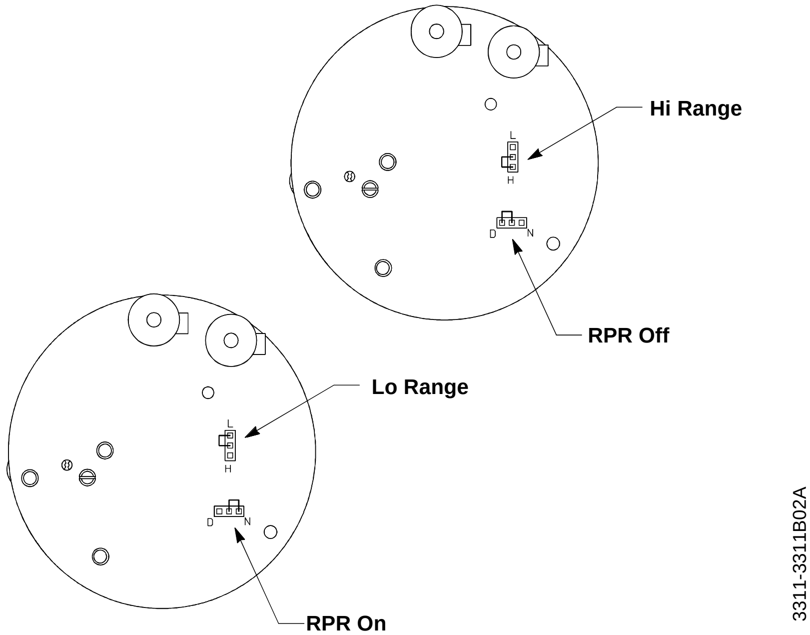
3. Position the retaining clips in the module cover so they are ready to accept the feet of the module final assembly. Ensure the leaves on the retaining clips are facing up. Figure 3-1 shows the correct orientation.
4. Insert one of the module feet into a cover slot, and push on the module final assembly to compress the retaining clip. Insert the opposite foot into the opposite cover slot, and rotate the module 90 degrees in the module cover to secure it in place.
5. Ensure that the three module O-rings are in the O-ring glands and are lightly lubricated with silicone grease. Inspect the O-rings to ensure that they are not twisted or stretched.
6. Ensure that the module cover threads are lubricated with Low Temperature Lubriplate®.
7. Prepare to insert the module into the housing. Align the V-groove located on the module final assembly with the indicating mark located on the nameplate. This positions the alignment key with the key slot. Figure 3-1 shows the location of the V-groove and the indicating mark.
8. Insert the module, engage the module cover threads, and screw on the module cover. The module final assembly will automatically engage the electrical feedthroughs and span and zero screws.
9. Hand tighten the module cover as much as possible. Use a wrench or long screwdriver shaft to tighten the module cover an additional ¼ to ½ turn (18 to 20 ft-lb). For units with Option E9 (CENELEC Flameproof Certification), make sure the cover lock and screw have been securely reinstalled. The screw accepts a 3-mm hex drive.

NOTE
When the module cover is tightened, connection is made with the electrical feedthroughs and span and zero screws, and the module final assembly O-rings become seated. Failure to fully tighten the module cover may prevent the transducer from operating properly.

ELECTRONIC CIRCUIT BOARD

The electronic circuit board is located on top of the module final assembly, as shown in Figure 3-1. Beneath the circuit board and permanently attached to it is the pressure sensor. Two jumpers on the circuit board control various functions of the transducer. Figure 3-5 shows the location of these jumpers.

FIGURE 3-5.
Circuit Board Jumper Positions.



Optional Remote Pressure Reading (RPR) Jumper—Option R1

Remote Pressure Reading (RPR) is an optional diagnostic feature that enables the operator to determine the transducer output signal from any location along the signal wire path. The transducer generates a frequency signal that can be received by the Rosemount Model 268 SMART FAMILY® Interface or a frequency counter. Operation of the RPR feature is jumper-selectable. The RPR feature operates when the jumper is located in the "N" position on the circuit board. With the jumper in the "D" position, the RPR feature will not operate. At the time of shipment, the RPR jumper is placed in the "N" position unless otherwise specified. For more information about the RPR feature, refer to **Optional Remote Pressure Reading (RPR)—Option R1** on Page 5-1.

NOTE
When operating Model 3311 and Model 846 transducers in series, only one unit may be configured for Remote Pressure Reading. Activating the RPR feature in two units will result in an unusable RPR signal.

Range Jumper

The range jumper is positioned according to the calibration specified. All full span calibrations and some split range calibrations can be accomplished with the range jumper in the "Hi" position. Some split range calibrations require the jumper to be in the "Lo" position.
For more information about the range jumper, refer to **Standard Performance: Split Range Input, Direct Action** on Page 4-4.

Action

For direct action units, output changes directly with a corresponding change in input. For example, a 4–20 mA input produces a 3–15 psi (0.2–1.0 kg/cm^2) output. Direct action circuit boards are green in color.

For reverse action units, output changes inversely with a change in input. For example, a 4–20 mA input produces a 15–3 psi (1.0–0.2 kg/cm^2) output. Reverse action circuit boards are red in color.

Upon loss of input current, or if input current decreases below 3.3 mA ±0.3 mA, the output of the direct action unit (Model 3311D or Model 846D) will decrease to less than 1 psi (0.1 kg/cm^2). In the same situation, the output of the reverse action unit (Model 3311R or Model 846R) will increase to near supply pressure.

Removing the Electronic Circuit Board

The electronic circuit board is connected to the module final assembly by five mounting screws. The circuit board must be removed to inspect the pressure sensor located beneath it. To remove the circuit board, disengage the five mounting screws and pull upward on the plastic board standoff (black = multirange; white = standard).

⚠CAUTION

Standard electronic assembly handling procedures apply. Do not attempt to remove the circuit board by pulling on the components. Doing so could weaken the connections and disable the electronics.

Be careful when handling the pressure sensor located beneath the circuit board. The pressure sensor lead frame is bent to allow the pressure sensor to fit properly in the sensor cavity of the module final assembly, and to maintain flush contact with the pressure sensor manifold.

Three O-rings accompany the pressure sensor. Two O-rings of the same size are located on each side of the pressure sensor. A third, smaller O-ring is positioned in the beveled O-ring gland of the module subassembly. Table 3-1 shows the O-ring sizes. It is acceptable to gently bend the pressure sensor away from the pressure sensor manifold to access the sensor O-ring and confirm that the pressure ports are clear.

Product Change

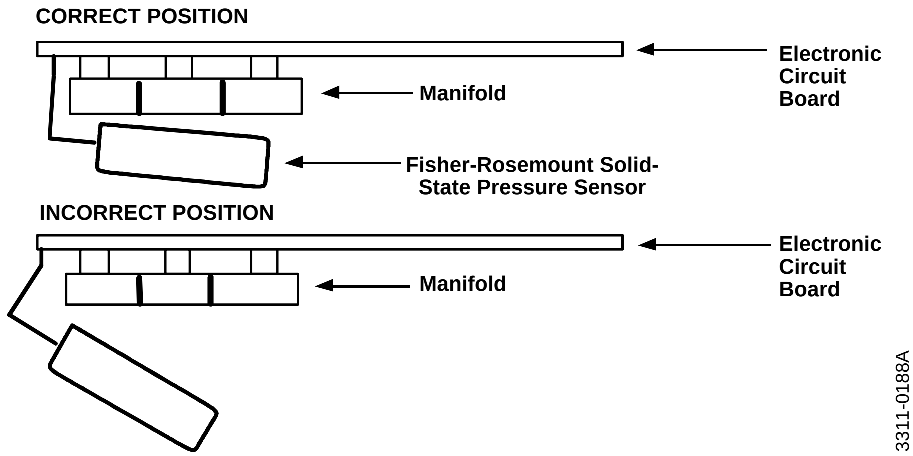
Previous electronic circuit boards have the two sensor O-rings positioned on the shoulders of the sensor. They also have a sensor seal washer that is positioned in the bottom of the pressure sensor cavity of the module subassembly. Both the previous and the current designs are compatible with the cavity in the module subassembly. The current design does not require the sensor seal washer; therefore, the sensor seal washer may be discarded when switching from the previous design electronic circuit board to the current design.

Assembling the Electronic Circuit Board

1. Verify that the circuit board is green for assembly into a direct action unit, or red for assembly into a reverse action unit.
2. Ensure that the three O-rings are in the proper position. The small O-ring is positioned in the beveled O-ring gland of the module subassembly. The two sensor O-rings are each positioned on the shoulders of the sensor. They should be lightly lubricated with silicone grease.
3. Ensure that the pressure sensor is correctly positioned against the manifold. The pressure sensor should be centered and in contact with the manifold, as shown in Figure 3-6.

4. Position the circuit board on the module subassembly. Ensure that the circuit board mounting holes match those on the module subassembly. Place the three long screws in the mounting holes adjacent to the pressure sensor.
5. Place the two short screws in the remaining mounting holes. Tighten the three long screws first, then tighten the remaining two screws.

FIGURE 3-6.
Positioning the Pressure Sensor.



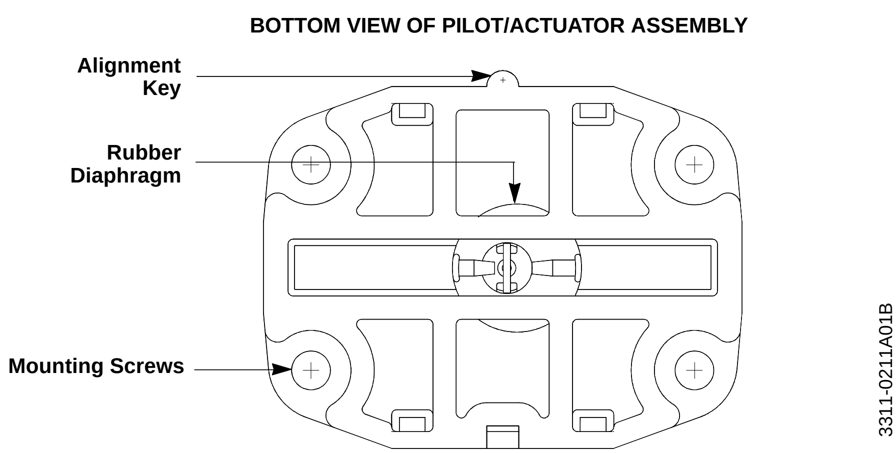
PILOT/ACTUATOR ASSEMBLY

The pilot/actuator assembly is located at the bottom of the module final assembly, as shown in Figure 3-1. It is a unitized assembly consisting of the coil, magnet, and spring of the actuator, and the deflector and nozzles of the pilot stage. Two O-rings are part of the pilot/actuator assembly. Table 3-1 shows the O-ring sizes. They are located in the beveled O-ring glands of the module subassembly, adjacent to the nozzles. The pilot/actuator assembly is held in place by four mounting screws.

Action

A blue rubber diaphragm under the deflector bar and nozzle area identifies the direct action pilot/actuator assembly. A red diaphragm under the nozzle area identifies the reverse action pilot/actuator assembly. Figure 3-7 shows the bottom view of the pilot/actuator assembly.

FIGURE 3-7.
The Pilot/Actuator Assembly.



Removing the Pilot/ Actuator Assembly

To remove the pilot/actuator assembly, disengage the four mounting screws, and gently pull the assembly out of the module subassembly.
It is useful to gently grip the pilot/actuator framework with a pair of pliers.

⚠WARNING

An uncontrolled process may result in death or serious injury. Do not attempt to remove the pilot/actuator assembly by gripping or pulling on the deflector or nozzles. Doing so could alter the alignment or disable the deflector/nozzle mechanism.

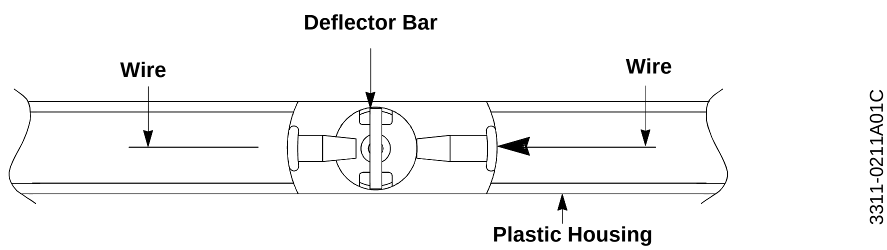
The assembly can be inspected for a buildup of foreign material. The nozzle passage-ways should be clear, and the deflector should be clean. The deflector can be cleaned by spraying it with LPS® Electro Contact Cleaner. The nozzles can be cleaned by gently inserting a wire with a maximum diameter of 0.015 inches (0.38 mm).

- Insert the wire into each nozzle **separately** from the outside as shown in Figure 3-8.
- **Do not** try to put the wire through both nozzles simultaneously.
- **Do not** push the wire on the deflector bar.

⚠CAUTION

Do not apply force to the deflector bar while cleaning the nozzles. Doing so could alter the alignment or disable the deflector bar mechanism.

FIGURE 3-8. Cleaning the Nozzles.



⚠CAUTION

Do not use chlorinated solvents for cleaning the pilot/ actuator assembly. The chlorinated solvents will deteriorate the rubber diaphragm.

Reinserting the Pilot/ Actuator Assembly

1. Verify that the rubber diaphragm under the nozzle area is blue for pilot/ actuators inserted into a direct action unit, or red for pilot/actuators inserted into a reverse action unit.
2. Inspect the pilot/actuator assembly cavity in the module final assembly to ensure that it is clean.
3. Lightly lubricate the two O-rings with silicone grease, and place them in the beveled O-ring glands. O-rings between the pilot/actuator assembly and the module should be installed justified to the lower portion of the O-ring gland. The air passageway should be visible through the O-ring inside diameter if properly positioned.
4. Prepare to insert the assembly by aligning the key on the pilot/actuator assembly with the key slot in the module subassembly.
5. Insert the assembly into the module subassembly, and engage the four mounting screws.

MODULE SUBASSEMBLY

The module subassembly, shown in Figure 3-1, consists of the module final assembly with both the electronic circuit board and pilot/actuator assembly removed. The module subassembly contains the porting and valving for the booster stage.

NOTE
The module subassembly is aligned at the factory and should not be further disassembled. Disassembling the module subassembly may result in performance outside specifications. The modular design of the Model 3311 and Model 846 makes it easy to replace or send the module subassembly to Fisher-Rosemount Inc. for service.

TERMINAL COMPARTMENT

The terminal compartment contains the terminal block, terminal block connection board, span and zero screws, electrical feedthroughs, and internal grounding lug, as shown in Figure 3-9. The terminal block connection board is attached to the terminal block and to the electrical feedthroughs.

Separate test points are provided that have a 10-ohm resistor in series with the signal negative (–) terminal. The test points allow the input current to be determined with a voltmeter without disconnecting a signal lead. A 4 to 20 mA span produces a 40 to 200 mV dc voltage drop across the 10-ohm resistor. The test points can accommodate different connections, including alligator clips and E-Z hooks.

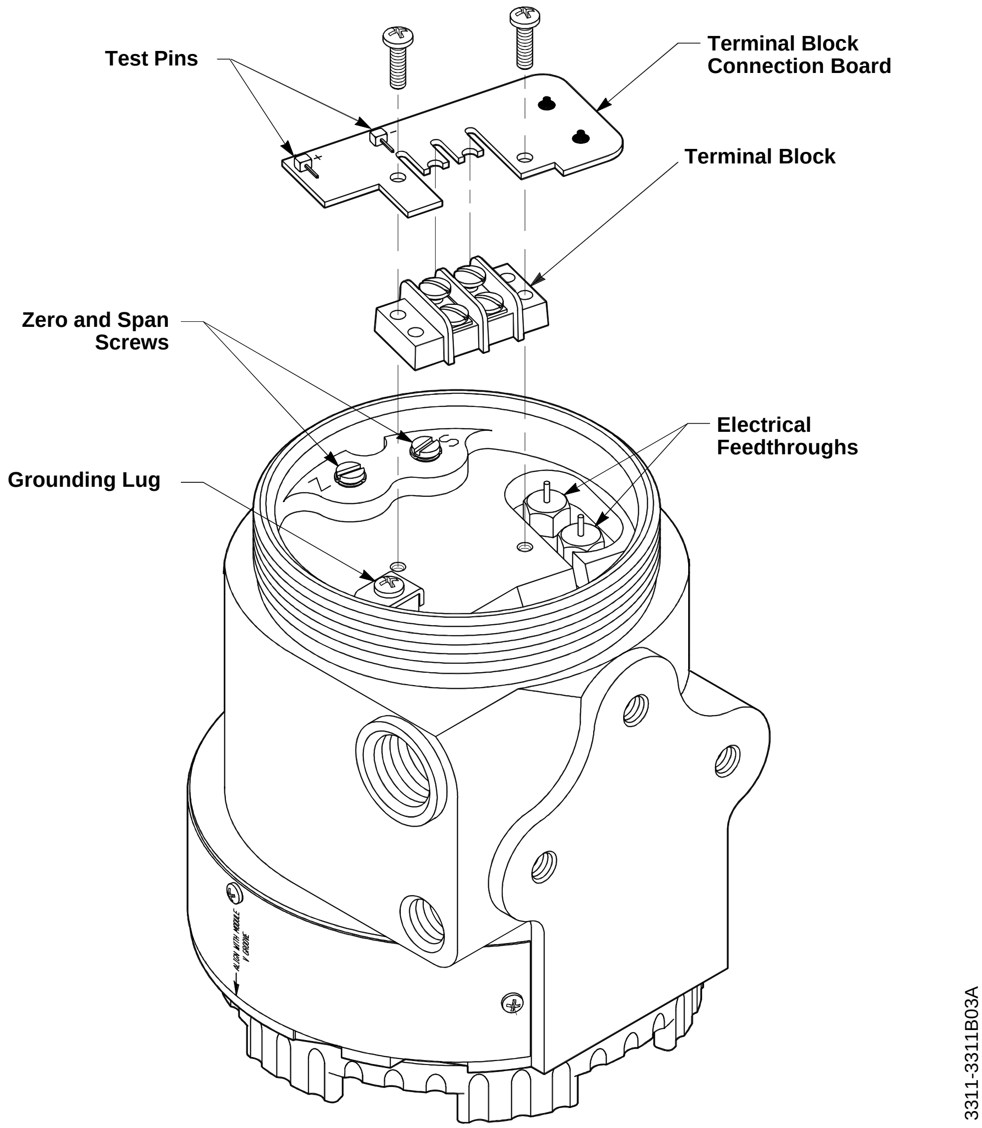
The terminal block and terminal block connection board can be removed by disengaging the two terminal block mounting screws. Lubricate the terminal compartment cover threads with CICO® Anti-Seizing Paste 1200, Never-Seez® Compound, or Low Temperature Lubriplate. See Table 3-1 for the size of the terminal compartment cover O-ring.

EXHAUST AND STROKE PORT SCREENS

Two identical screens, the exhaust port screen and the stroke port screen, allow air to vent to the outside environment. The exhaust port screen is located behind the nameplate. Removing the two nameplate screws and rotating the nameplate to the side allows access to the exhaust port screen. Figure 6-1 shows an exploded parts view.

The stroke port screen is located at the center of the module cover. Removing the module final assembly from the housing and then from the module cover allows access to the stroke port screen. “Removing the Module Final Assembly” earlier in this section describes this procedure. Figure 6-1 shows an exploded parts view.

FIGURE 3-9.
Terminal Compartment Exploded View.



RETURN OF MATERIAL

To expedite the return process please use the following contacts:

Outside the United States:

For questions concerning the Model 3311 Transducer contact the nearest Rosemount representative. For questions concerning the Model 846 Transducer contact the local Fisher Controls sales office.

Within the United States and Canada:

For questions concerning either the Model 3311 Transducer or the Model 846 Transducer contact the local Fisher Controls representative.

⚠CAUTION

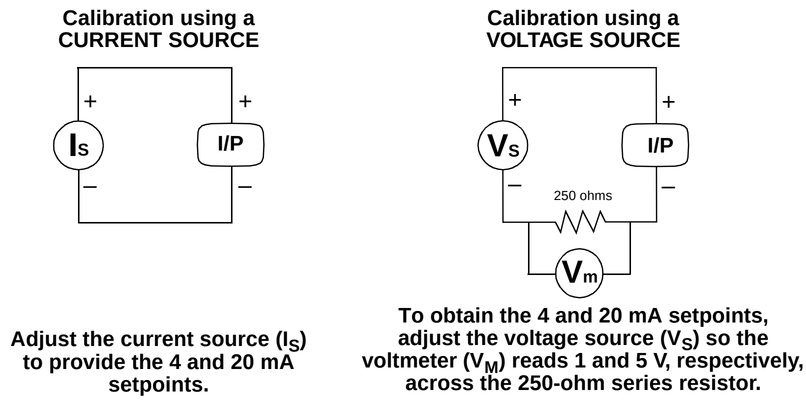
People who handle products exposed to a hazardous substance can avoid injury if they are informed and understand the hazard. If the product being returned was exposed to a hazardous substance as defined by OSHA, a copy of the required Material Safety Data Sheet (MSDS) for each hazardous substance identified must be included with the returned goods.

You will be given detailed information on the procedures necessary to return goods that have been exposed to hazardous substances.

Section 4 Calibration

Calibration of the Model 3311 and Model 846 requires either an accurate current generator or an accurate voltage generator with a precision 250-ohm, ½-watt resistor. Figure 4-1 shows how to connect either device.

FIGURE 4-1.
Connecting a Current or Voltage Source for Calibration.



Calibration also requires a precision output indicator and a minimum nonsurging air supply of 3 SCFM (5.0 Nm^3/hr) at 20 psi (1.4 kg/cm^2) for standard performance units. For multirange performance units, the air supply must be at least 3 psi greater than the maximum calibrated output pressure, up to 35 psi maximum.

For ease of calibration, the output load volume, including the output tubing and output indicator, should be a minimum of 2 cubic inches. Review the information under **Signal Interruption** on Page 2-4 before beginning the calibration procedure.

Before calibration, it is necessary to determine the type of **input** (full or split range), and the type of output action (direct or reverse). Consult the factory for split range **output** calibration. It is also necessary to determine if the unit offers standard or multirange performance. The unit supports eight basic input/output combinations:

Standard Performance

- Full Range Input, Direct Action
- Split Range Input, Direct Action
- Full Range Input, Reverse Action
- Split Range Input, Reverse Action

Multirange Performance

- Full Range Input, Direct Action
- Split Range Input, Direct Action(1)
- Full Range Input, Reverse Action
- Split Range Input, Reverse Action(1)

Table 4-1 lists the various input and output ranges over which the unit may be calibrated.

The input range is selected by changing the position of a jumper located on the electronic circuit board. Refer to **Electronic Circuit Board** on Page 3-7 and Figure 3-5 for the location and instruction on placement.

⚠CAUTION

Excessive current can damage the transducer. Do not connect an input current of more than 100 mA to the transducer.

TABLE 4-1. Model 3311 and Model 846 I/P Rangeability Matrix.

	OUTPUT PRESSURE RANGE (Performance Code)															
	Common Ranges					Misc.		Std. Split		High Range Splits						
	psi															
mA Range	3–15 (S,M)	.5–30 (M)	3–27 (M)	6–30 (M)	5–25 (M)	.5–6 (S,M)	.5–18 (S,M)	3–9 (S,M)	9–15 (S,M)	.5–15 (S,M)	15–30 (M)	15–27 (M)	6–18 (S,M)	18–30 (M)	5–15 (S,M)	15–25 (M)
4–20	✓	✓	✓	✓	✓	D	✓	D	D	✓	U	U	✓	U	✓	U
4–12	✓	✓	✓	✓	✓	D	✓	D	D	✓	U	U	✓	U	✓	U
12–20	✓		J	J	J	D	J	D	D	J	✓	✓	✓	✓	✓	✓
4–8	✓					✓		✓	✓				✓		✓	
8–12	✓					✓		✓	✓				✓		✓	
12–16	J					J		J	✓				J		J	
16–20	J					J		J	J				J		J	
10–50	Consult I/P Marketing at (515) 754-2213															

S = Standard Performance Unit
M = Multirange Performance Unit
✓ = Available in Direct or Reverse Action
D = Available in Direct Action Only
J = Available, but if the desired calibration cannot be achieved by adjusting the zero/span screws, unit may require Hi/Lo jumper to be moved. The jumper is located on the circuit board assembly, and is usually in the "Hi" position. Disengaging the master module and moving the jumper to the "Lo" position will allow calibration to the desired range.
U = Special Build Required; #U0005 is for High Range Split Outputs

(1) Consult factory for calibration of multirange performance units with split range input, or split range output, or both.

STANDARD PERFORMANCE: FULL RANGE INPUT, DIRECT ACTION

Use the following procedure to achieve a standard 3–15 psi (0.2 to 1.0 kg/cm²) output span for a 4–20 mA input signal:

1. Remove the module final assembly from the housing. Refer to **Removing the Module Final Assembly** on Page 3-4 for an explanation of how to disengage the module final assembly.
2. Confirm that the unit is direct acting. A green electronic circuit board identifies direct-acting units. Refer to “Action” under the heading **Electronic Circuit Board** on Page 3-7 for more information on direct acting units.
3. Position the range jumper in the “Hi” position. Figure 3-5 shows the circuit board jumper positions.
4. Replace the module final assembly in the housing. Refer to **Replacing the Module Final Assembly** on Page 3-5 for an explanation of how to engage the module final assembly.
5. Connect the air supply to the air supply port.
6. Connect a precision output indicator to the output signal port.
7. Make sure that the output gage port has an output gage or a threaded plug installed. A threaded plug is provided for I/P units shipped without output gages.
8. Remove the terminal compartment cover.
9. Connect the current source (or voltage source) positive lead (+) to the terminal block positive (+) and the current source (250-ohm resistor lead) negative lead (–) to the terminal block negative (–). Refer to Figure 4-1.

⚠CAUTION

Excessive current can damage the transducer. Do not connect an input current of more than 100 mA to the transducer.

10. Apply a 4.0 mA (V_m = 1.0 V) signal, and adjust the zero screw to achieve a 3.0 psi (0.2 kg/cm²) output. The output will increase with clockwise rotation of the zero screw.
11. Apply a 20.0 mA (V_m = 5.0 V) signal, and adjust the span screw to achieve a 15.0 psi (1.0 kg/cm²) output. The output will increase with clockwise rotation of the span screw.
12. Repeat Steps 10 and 11 to verify and complete the calibration.

MULTIRANGE PERFORMANCE: FULL RANGE INPUT(1), DIRECT ACTION

Use the following procedure with a multirange performance unit to achieve the desired direct action output span for a 4–20 mA input signal:

1. Perform steps 1 through 9 of the calibration procedure for **Standard Performance: Full Range Input, Direct Action** on Page 4-3**.**
2. Apply a 4.0 mA (V_m = 1.0 V) signal, and adjust the zero screw to achieve the desired lower psi limit of the output range. The lower limit must be between 0.5 psi (0.03 kg/cm²) and 9.0 psi (0.6 kg/cm²). The output will increase with clockwise rotation of the zero screw.

(1) Consult factory for calibration of multirange performance units with split range input.

3. Apply a 20.0 mA (V_m = 5.0 V) signal, and adjust the span screw to achieve the desired upper psi limit of the output range. The span must be at least 6.0

psi (0.4 kg/cm^2). The maximum upper limit is 30.0 psi (2.0 kg/cm^2). The output will increase with clockwise rotation of the span screw.

4. Repeat steps 2 and 3 to verify and complete the calibration.

STANDARD PERFORMANCE: SPLIT RANGE INPUT, DIRECT ACTION

4–12 mA Input Signal

Use the following calibration procedure to produce a 3–15 psi (0.2–1.0 kg/cm^2) output span for a 4–12 mA input signal:

1. Perform steps 1 through 9 of the calibration procedure for **Standard Performance: Full Range Input, Direct Action** on Page 4-3.
2. Apply an input of 4.0 mA (V_m = 1.0 V), and adjust the zero screw to achieve an output of 3.0 psi (0.2 kg/cm^2).
3. Apply an input of 12.0 mA (V_m = 3.0 V), and adjust the span screw to achieve an output of 15.0 psi (1.0 kg/cm^2).
4. Repeat steps 2 and 3 to verify and complete the calibration.

12–20 mA Input Signal

Use the following calibration procedure to produce a 3–15 psi (0.2–1.0 kg/cm^2) output span for a 12–20 mA input signal:

NOTE
There may be some span interaction with zero in this range, and the following steps compensate for this.

1. Perform steps 1 through 9 of the calibration procedure for **Standard Performance: Full Range Input, Direct Action** on Page 4-3.
2. Apply an input of 4.0 mA (V_m = 1.0 V), and adjust the zero screw to achieve an output of 3.0 psi (0.2 kg/cm^2).
3. Apply an input of 12.0 mA (V_m = 3.0 V), and adjust the span screw to achieve an output of 15.0 psi (1.0 kg/cm^2).
4. Maintain the input of 12.0 mA (V_m = 3.0 V), and adjust the zero screw to achieve an output of 3.0 psi (0.2 kg/cm^2). The unit may not turn down this low; if it does not, go to step 7.
5. If the output reaches 3.0 psi (0.2 kg/cm^2) in Step 4, apply an input of 20.0 mA (V_m = 5.0 V) and note the error (the actual reading versus 15.0 psi). Adjust the span screw to overcorrect the error by a factor of two. For example, if the reading was 14.95 psi (0.9 kg/cm^2), adjust the span screw to achieve an output of 15.05 psi (1.1 kg/cm^2).
6. Repeat steps 4 and 5 to verify and complete the calibration.
7. Turn off the air supply. Remove the module final assembly from the housing. Place the range jumper in the “Lo” position, as indicated in Figure 3-5. Replace the module final assembly.
   Turn on the air supply.
8. Apply an input of 12.0 mA (V_m = 3.0 V), and adjust the zero screw to achieve an output of 3.0 psi (0.2 kg/cm^2).
9. Apply an input of 20.0 mA (V_m = 5.0 V), and note the error (the actual reading versus 15.0 psi). Adjust the span screw to overcorrect the

error by a factor of two. For example, if the reading was 14.95 psi (0.9 kg/cm²), adjust the span screw to achieve an output of 15.05 psi (1.1 kg/cm²).

10. Repeat steps 8 and 9 to verify and complete the calibration.

STANDARD PERFORMANCE: FULL RANGE INPUT, REVERSE ACTION

Use the following procedure on reverse action units to achieve a 15–3 psi (1.0–0.2 kg/cm²) output span for a 4–20 mA input signal:

1. Perform steps 1 through 9 under **Standard Performance: Full Range Input, Direct Action** on Page 4-3, except for step 2. In place of step 2, confirm that the unit is reverse acting. A red electronic circuit board identifies reverse-acting units. Refer to "Action" under the heading **Electronic Circuit Board** on Page 3-7 for more information on reverse acting units.
2. Apply an input of 4.0 mA (V_m = 1.0 V), and adjust the zero screw to achieve an output of 15.0 psi (1.0 kg/cm²).
3. Apply an input of 20.0 mA (V_m = 5.0 V), and adjust the span screw to achieve an output of 3.0 psi (0.2 kg/cm²).
4. Repeat steps 2 and 3 to verify and complete the calibration.

MULTIRANGE PERFORMANCE: FULL RANGE INPUT[1], REVERSE ACTION

Use the following procedure with a multirange unit to achieve the desired reverse action output span for a 4–20 mA input signal:

1. Perform steps 1 through 9 of the calibration procedure for **Standard Performance: Full Range Input, Direct Action** on Page 4-3, except for step 2. In place of step 2, confirm that the unit is reverse acting. A red electronic circuit board identifies reverse-acting units. Refer to "Action" under the heading **Electronic Circuit Board** on Page 3-7 for more information on reverse acting units.
2. Apply an input of 4.0 mA (V_m = 1.0 V), and adjust the zero screw to achieve the desired upper psi limit of the output range. The 4 mA point must be between 9.0 psi (0.6 kg/cm²) and 30.0 psi (2.0 kg/cm²). The output will increase with clockwise rotation of the zero screw.
3. Apply an input of 20.0 mA (V_m = 5.0 V), and adjust the span screw to achieve the desired lower psi limit of the output range. The span must be at least 11.0 psi (0.7 kg/cm²) span. The lower limit of the 20.0 mA setting is 0.5 psi (0.03 kg/cm²). The output will increase with clockwise rotation of the span screw.
4. Repeat steps 2 and 3 to verify and complete the calibration.

(1) Consult factory for calibration of multirange performance units with split range input.

STANDARD PERFORMANCE: SPLIT RANGE INPUT, REVERSE ACTION

Use the following procedure on reverse action units to achieve a 15–3 psi (1.0– 0.2 kg/cm^2) output signal for a 4–12 mA input signal:

4–12 mA Input Signal

1. Perform steps 1 through 9 of the calibration procedure for **Standard Performance: Full Range Input, Direct Action** on Page 4-3, except for step 2. In place of step 2, confirm that the unit is reverse acting. A red electronic circuit board identifies reverse-acting units. Refer to “Action” under the heading **Electronic Circuit Board** on Page 3-7 for more information on reverse acting units.
2. Apply an input of 4.0 mA (V_m = 1.0 V), and adjust the zero screw to achieve an output of 15.0 psi (1.0 kg/cm^2).
3. Apply an input of 12.0 mA (V_m = 3.0 V), and adjust the span screw to achieve an output of 3.0 psi (0.2 kg/cm^2).
4. Repeat steps 2 and 3 to verify and complete the calibration.

12–20 mA Input Signal

Use the following procedure on reverse action units to achieve a 15–3 psi (1.0–0.2 kg/cm^2) output signal for a 12–20 mA input signal:

NOTE
There may be some span interaction with zero in this range.
The following steps compensate for this.

1. Perform steps 1 through 9 of the calibration procedure for **Standard Performance: Full Range Input, Direct Action** on Page 4-3, except for step 2. In place of step 2, confirm that the unit is reverse acting. A red electronic circuit board identifies reverse-acting units. Refer to “Action” under the heading **Electronic Circuit Board** on Page 3-7 for more information on reverse acting units.
2. Apply an input of 4.0 mA (V_m = 1.0 V), and adjust the zero screw to achieve an output of 15.0 psi (1.0 kg/cm^2).
3. Apply an input of 12.0 mA (V_m = 3.0 V), and adjust the span screw to achieve an output of 3.0 psi (0.2 kg/cm^2).
4. Maintain the input of 12.0 mA (V_m = 3.0 V), and adjust the zero screw to achieve an output of 15.0 psi (1.0 kg/cm^2). The unit may not turn up this high; if it does not, go to step 7.
5. If the output reaches 15.0 psi in step 4, apply an input of 20 mA, and adjust the span screw to achieve a 3.0 psi output. Apply an input of 20 mA (V_m = 5.0 V), and note the error (the actual reading versus 3.0 psi). Adjust the span screw to overcorrect the error by a factor of two. For example, if the reading was 2.95 psi, adjust the span screw to achieve an output of 3.05 psi.
6. Repeat steps 4 and 5 to verify and complete the calibration.
7. If the 12.0 mA (V_m = 3.0 V) output cannot be adjusted to 15.0 psi (1.0 kg/cm^2) in step 4, turn off the air supply. Remove the module final assembly from the housing. Place the range jumper in the “Lo” position, as shown in Figure 3-5. Replace the module final assembly. Turn on the air supply.
8. Apply an input of 12.0 mA (V_m = 3.0 V), and adjust the zero screw to achieve an output of 15.0 psi (1.0 kg/cm^2).

9. Apply an input of 20 mA (V_m = 5.0 V), and note the error (the actual reading versus 3.0 psi). Adjust the span screw to overcorrect the error by a factor of two. For example, if the reading was 2.95 psi, adjust the span screw to achieve an output of 3.05 psi.
10. Repeat steps 8 and 9 to verify and complete the calibration.

10–50 mA Input Option

Use the previous procedures and replace 4–20 mA references with the appropriate 10–50 mA numbers; for example:

- 4 mA = 10 mA
- 12 mA = 30 mA
- 20 mA = 50 mA

NOTE
10–50 mA available only with direct acting units.

TRANSPORTING THE MODULE FINAL ASSEMBLY

The transducer allows the module final assembly to be removed while the housing is in its installed position. In the event the transducer does not function properly, an operational module final assembly can be taken to the field and exchanged with the nonfunctional module.

After the transducer is calibrated in the shop, the module final assembly can be removed from the housing. At the time the span and zero screws disengage, there will be minimal effect on the calibrated span. The calibrated module can now be taken to the field. Ensure that the span and zero potentiometers are not moved from their calibrated positions.

Section 5

Troubleshooting

The modular design and unitized subassemblies of the Model 3311 and Model 846 transducers allow for quick and easy troubleshooting and repairs. This section presents information on the diagnostic features and procedures for troubleshooting both models in service or in the shop.

DIAGNOSTIC FEATURES

If a control loop does not perform properly and the cause of malfunction has not been determined, two features of the transducer can be used to determine if the transducer is at fault: the stroke port and Remote Pressure Reading.

Stroke Port

The stroke port provides a way to quickly increase the transducer output, giving a rough measure of the unit's functionality. A hole in the module cover vents the constant bleed from the pilot stage. When the hole is covered, pressure at the pilot stage receiver nozzle increases, which in turn increases the output. Output pressure will increase to within 2 psi of supply pressure for either direct or reverse action. If output pressure does *not* increase to this level, it may indicate that supply air is not reaching the pilot stage or that a pilot stage nozzle is plugged.

NOTE
If the stroke port diagnostic feature is not desired, cover option P1 is available. Option P1, shown in Figure 2-1, is a module cover containing multiple ports. This does not allow the output to be increased by covering the stroke port.

Optional Remote Pressure Reading (RPR)—Option R1

Remote Pressure Reading (RPR) is an optional diagnostic feature that enables the user to determine the output pressure from any location along the signal wire path. For loop troubleshooting, this allows the user to confirm the functionality of the transducer from a remote location.

A frequency signal directly proportional to the output pressure is superimposed on the input signal loop. The frequency range of the RPR function is 5,000 to 8,000 Hz.

A jumper on the circuit board activates the Remote Pressure Reading function. Section 3 Maintenance provides instruction on positioning the jumper. The jumper, shown in Figure 3-5, has two positions: "N" for ON, or "D" for OFF. At the time of shipment, the RPR jumper is in the "N" (ON) position, unless otherwise specified.

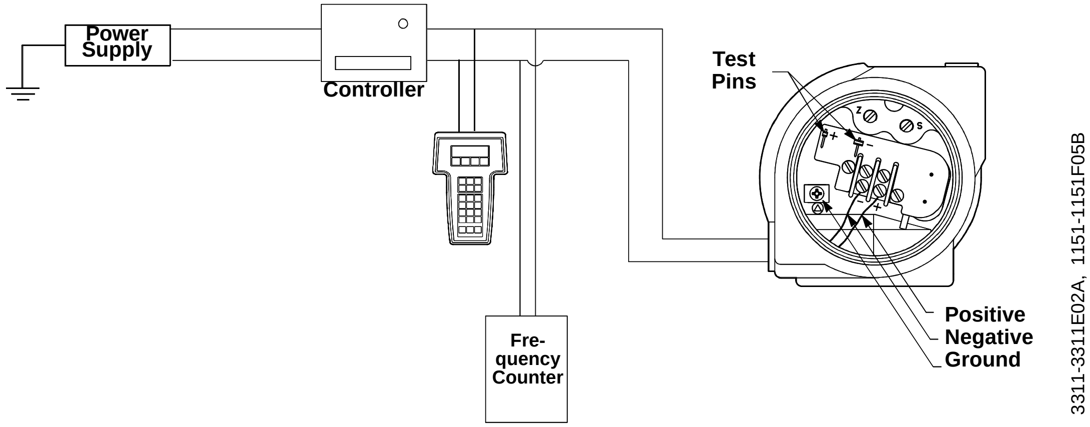
Using the Model 268 and the Model 275 HART® Communicator to Read the RPR Signal

The RPR frequency signal can be measured at any location along the two input wires using the Rosemount Model 268 Interface or the Model 275 HART Communicator. They can also be used to display both the output frequency in hertz and the transducer output pressure in psi. Figure 5-1 shows the wiring connections. The actual screens displayed on the Model 268 and the HART Communicator for reading the frequency and output pressure appear later in this section.

FIGURE 5-1.
Wiring Connections for the Rosemount Model 268 or a Frequency Counter.

Only a Model 268 with a software revision number of 3.0 or greater is capable of measuring the RPR frequency signal of the Model 3311 or Model 846 transducer.

The transducer is not a microprocessor-based transmitter and therefore does not identify itself to the Model 268 or the HART Communicator. For this reason, the



Model 268 and the HART Communicator display a screen telling the user it cannot verify that the transducer is on the loop.

Neither the Rosemount Model 268, the HART Communicator, nor the Remote Pressure Reading function are intended to be used for calibration. They are intended as a diagnostic feature. The accuracy of the Remote Pressure Reading function when used in conjunction with the Model 268 or the HART Communicator is typically ±3% of span and guaranteed to be a maximum of ±6% of span.

NOTE
When the output of a smart transmitter is used as the input to the Model 846 or Model 3311 I/P, the Model 268 or the HART Communicator will not recognize the frequency signal of the I/P. Enabling the RPR feature on the I/P can also cause errors when trying to communicate with a smart transmitter using a Model 268 or HART Communicator. For these reasons, it is recommended that you disable the RPR feature on the I/P when using this type of loop.

Using a Frequency Counter to Read the RPR Signal

A frequency counter also can be used for Remote Pressure Reading. The frequency counter displays the RPR output in the same manner as the Model 268 or HART Communicator, but the output frequency must be converted to output pressure using a simple mathematical formula. To determine the output pressure, subtract 5,000 Hz from the frequency displayed on the frequency counter, and then divide by 100.

Conversion Formula:

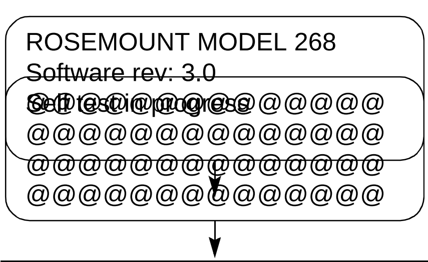
$$\frac{\text{Display Hz} - 5{,}000\text{ Hz}}{100} = \text{psi}$$

Example:

$$\frac{5{,}311\text{ Hz} - 5{,}000\text{ Hz}}{100} = 3.11\text{ psi}$$

NOTE
The Remote Pressure Reading (RPR) frequency signal has an amplitude of 0.4–1.0 V peak-to-peak. If other noise (frequency) with a comparable or greater amplitude is present on the line, it may make the RPR frequency signal unreadable.

Model 268 Screens— Revision 3.0.



Press “ON/OFF” to turn on the Model 268. During the start-up sequence, the Model 268 tells the user what software revision is currently installed and starts a self-test.

The Model 268 illuminates all pixels to ensure the working condition of the display.

```
268 test: PASS
```

When the diagnostics test is complete, the Model 268 indicates if it has passed the test.

```
Checking for Xmtr
-WAIT-
```

The Model 268 checks the signal lines to determine if a smart transmitter is connected.

```
WARNING – Xmtr is
not communicating
Re-   OFLN   268    Othr
try   Conf   Test   Xmtr
```

The smart transmitter search is concluded. The Model 3311 or Model 846 is classified as “Other Transmitter.” Press OTHR XMTR (F4) to continue.

```
Check loop for other
devices?
      Freq   Mult   Exit
      ency   Drop
```

Press FREQUENCY (F2) to tell the Model 268 to check for a frequency superimposed on the signal wires.

```
Frequency detected
5311 Hz
             Modl   End
             3311
```

The Model 268 has detected a frequency. The user should ensure the frequency is within the range of the transducer output. To read the output in psi, press MODL 3311 (F3).

```
WARNING - 268 cannot
verify 3311 in loop
```

The Model 268 warns the user that it does not know the source of the frequency.

```
Model 3311 output:
3.1 psi
                    End
```

The Model 268 displays the transducer output in psi. The output is displayed to the nearest 0.1 psi.

**Model 268 Screens—
Revision 4.0 and Above.**

```
MODEL 268 - SMART
FAMILY INTERFACE
Software rev: 4.0
Self Test in progress
```

Press ON/OFF to turn on the Model 268. During the start-up sequence, the Model 268 tells the user what software revision is currently installed and starts a self-test.

```
@@@@@@@@@@@@@@@
@@@@@@@@@@@@@@@
@@@@@@@@@@@@@@@
@@@@@@@@@@@@@@@
```

The Model 268 illuminates all pixels to ensure the working condition of the display.

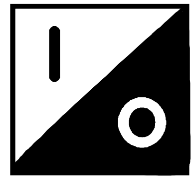
Display	Description
268 test: PASS	When the diagnostics test is complete, the Model 268 indicates if it has passed the test.
Checking for Xmtr -WAIT-	The Model 268 checks the signal lines to determine if a smart transmitter is connected.
WARNING – Xmtr/268 not in communication Re-try | Mult Drop | | Off-line	When the smart transmitter search is concluded, the Model 268 indicates that no smart transmitter is found. To continue, press OFF-LINE (F4).
Offline: 268 operates without communicating 268 Test | Ofln Conf | Freq ency | Exit	The Model 268 tells the user that in this mode, it will not communicate with a smart transmitter. Press FREQUENCY (F3) to tell the Model 268 to check for a frequency superimposed on the signal wires.
Frequency detected 5311 Hz | | Modl 3311 | End	The Model 268 detects a frequency. The user should make sure the frequency is within the range of the transducer output. To read the output in psi, press MODL 3311 (F3).
WARNING - 268 cannot verify 3311 in loop	The Model 268 warns the user that it does not know the source of the frequency.
Model 3311 output: 3.1 psi | | | End	The Model 268 displays the transducer output in psi. The output is displayed to the nearest 0.1 psi.

Using the Model 275 HART Communicator to Read the RPR Signal

ON/OFF Key

Use this key to turn the HART Communicator on and off. When the communicator is turned on, it searches for a HART-compatible device on the 4–20 mA loop. If a device is not found, then the communicator displays the message, "No Device

Found. Press OK.” Press OK (F4) to display the **Main** menu.



275-0332A

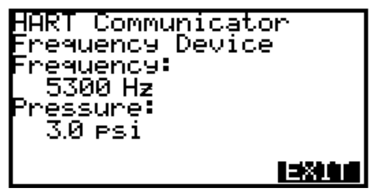
If a HART-compatible device is found, the communicator displays the **Online** menu.

Main Menu

When the HART Communicator is not connected to a device, the first menu to appear after powering is the **Main** menu.

Frequency Device Menu

From within the **Main** menu, you can access the **Frequency Device** menu by pressing the **4** key.



IN-SERVICE TROUBLESHOOTING

A number of simple checks can be made on the transducer while the unit is in service. Figure 5-2 shows a troubleshooting flowchart.

1. Make sure that the module cover is tight. The cover should be hand-tightened and then advanced ¼ to ½ turn (18 to 20 ft-lb).
2. Confirm the general functionality of the unit by using the diagnostic features described earlier in this section.

3. Confirm that the filter-regulator is not full of water or oil and that supply air is reaching the unit. The air supply pressure should be at least 3 psi (0.2 kg/ cm^2) greater than the maximum calibrated output pressure.
4. Confirm that there are no major leaks in the output signal line or from the output gage port.
5. Confirm that there are no obstructions and the screens are clean in the stroke port or the exhaust port.

⚠WARNING

An uncontrolled process may result in death or serious injury. Unscrewing the module cover removes power from the electronics and the output signal will be 0.0 psi. Before removing the module cover, ensure the device is properly controlled.

⚠WARNING

In explosive atmospheres, remove power and shut off the air supply to the I/P unit before attempting to remove the terminal compartment cover or module cover. Failure to do so could result in electrical spark or explosion.

6. For units with Option E9 (CENELEC Flameproof Approval) or Option E4 (JIS Flameproof Approval), remove the cover lock and screw to allow access to the terminal compartment cover.
7. Remove the terminal compartment cover (see the warning above), and use a milliammeter, such as the Rosemount Model 262 Field Calibrator, or a digital voltmeter to confirm that proper input current is supplied to the transducer.
8. Remove the terminal compartment cover (see the warning above), and short the loop across the positive (+) and the negative (–) terminals to check the output. Output should be nearly 0 psi. If the output is not 0 psi, replace the module final assembly.
9. Remove the terminal compartment cover (see the warning above), and, using a digital voltmeter, check the voltage between the transducer positive (+) and negative (–) terminals. The voltage should measure 6.0–8.2 V. A lower voltage can indicate a short in the input wires or defective controller. No voltage can indicate an open circuit in the control loop. A voltage of greater than 8.5 volts indicates a problem with the transducer, a faulty or corroded connection at the transducer, or an overcurrent condition. Replace the module final assembly. If the voltage is still not in the proper range (6.0–8.2 V), remove the terminal block and terminal block connection board. Apply power to the electrical feedthroughs. (Note the polarity of the feedthroughs, shown in Figure 3-9.) Recheck the voltage. If the voltage is in the proper range, replace the terminal block and terminal block connection board. If the voltage is still not in the proper range, replace the housing.

10. Prepare to remove the module final assembly from the housing, or to remove the transducer from its mounting bracket. Refer to **Module Final Assembly** on Page 3-1 for instruction on removing the module final assembly from the module housing.

> **⚠WARNING**
>
> An uncontrolled process may result in death or serious injury. Unscrewing the module cover removes power from the electronics and the output signal will be 0.0 psi. Before removing the module cover, ensure the device is properly controlled.

With the module final assembly removed from the housing, the following checks can be made.

1. Review the position of the Remote Pressure Reading jumper, action jumper (if so equipped), and range jumper to confirm that they are placed in the desired position. Refer to **Electronic Circuit Board** on Page 3-7, and Figure 3-5 for the location of this jumper and instruction on placement.
2. Observe the position and condition of the three module O-rings to confirm they make a tight seal.
3. Verify that the O-ring is correctly positioned in the groove on the flat face of the module cover. Refer to Figure 3-1 for an exploded view.
4. Inspect the porting on the module final assembly to determine if large amounts of contaminants have entered the transducer.

Before making the following checks, disconnect both signal wires from the transducer, and ensure the module final assembly is removed from the housing.

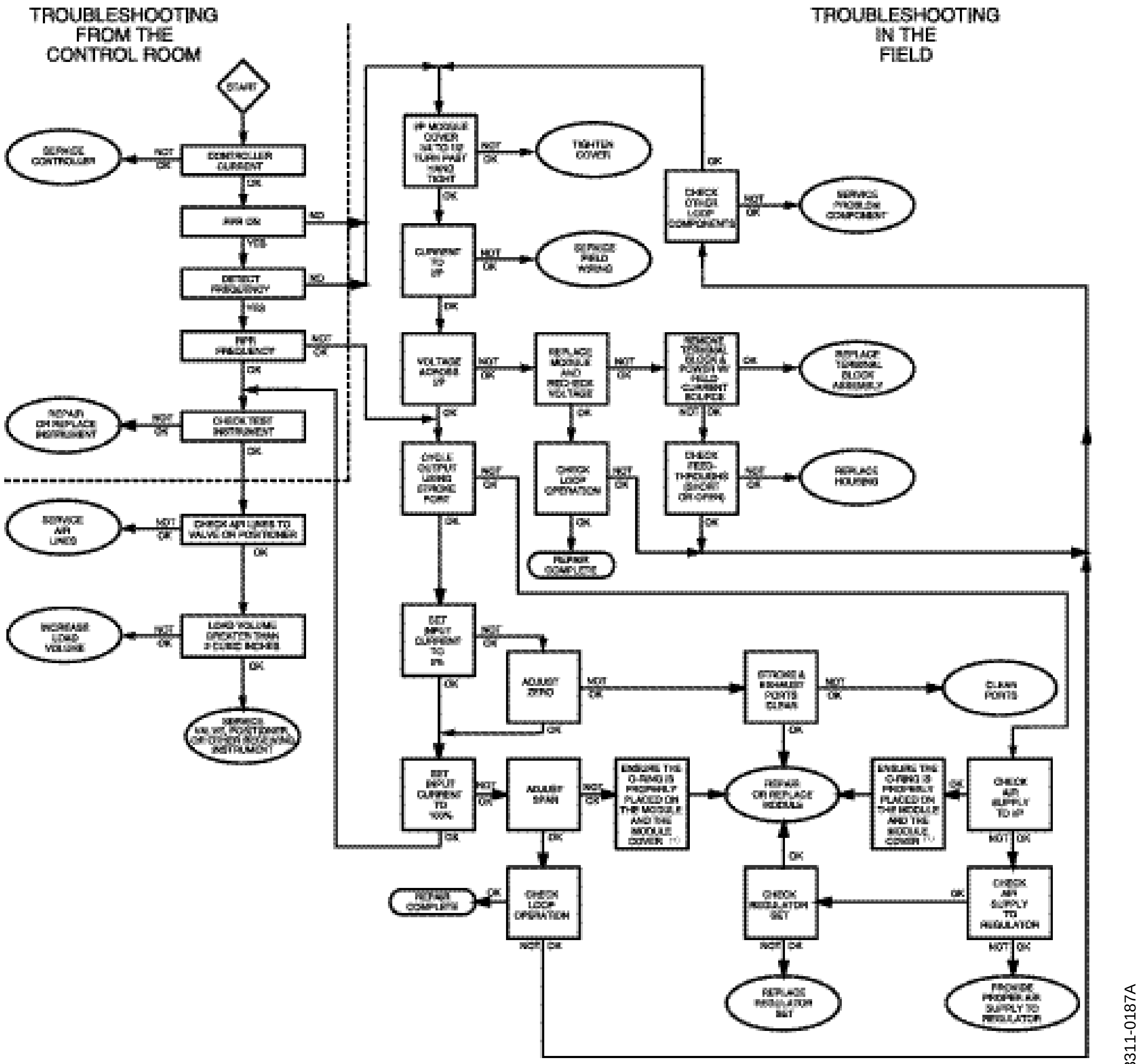
1. Using an ohmmeter, check the electrical connections in the housing terminal compartment. The circuit should show "open" between the positive (+) and negative (–) terminals. If not, replace the housing or terminal block and connection board.
2. Use a wire jumper to connect the two electrical feedthroughs located in the module compartment. The resistance between the positive (+) and negative (–) terminals in the terminal compartment should be 10 ohms. If not, check the electrical feedthroughs for short or open circuits. If a short or open circuit is found, replace the housing.
3. With the electrical feedthroughs jumpered as stated above, connect the ohmmeter to either the positive (+) or negative (–) terminal and the grounding lug. The circuit should show "open." If not, check for a short to the housing.
4. Remove the module from the module cover and inspect the pilot/actuator assembly for damage or clogging.

Some of the previous troubleshooting steps may be inconvenient to perform in the field. It may be best to make use of the modular design of the Model 3311 or Model 846, and keep a spare, calibrated module final assembly available for exchange. If the module final assembly is to be transported to the shop for repair, first remove it from the module cover. Attach the spare module final assembly to the module cover. Refer to **Module Final Assembly** on Page 3-1 for complete instructions. The nonfunctioning module can then be returned to the shop for troubleshooting.

TROUBLESHOOTING IN THE SHOP

If the entire transducer is brought to the shop for troubleshooting, then the preceding sequence applies. If only the module final assembly has been brought to the shop,

FIGURE 5-2.
Model 3311 and Model 846 Field
Troubleshooting Flowchart



NOTE
After final corrective action, check loop operation.
If not OK, restart troubleshooting procedure.

(1) Refer to “Replacing the Module Final Assembly” in Section 3.

then use another Model 3311 or Model 846 housing as a test fixture. Insert the module into the test fixture. Perform the previous steps (as they apply) of the In-service "Troubleshooting" procedure.

To further aid troubleshooting, the module final assembly can be broken down into three subassemblies. The troubleshooting sequence consists of exchanging the subassemblies with known working ones to determine which is at fault. The three subassemblies are the pilot/actuator assembly, the electronic circuit board, and the module subassembly. The module subassembly consists of the module final assembly with both the pilot/actuator assembly and electronic circuit board removed.

1. Remove the pilot/actuator assembly. Refer to **Pilot/Actuator Assembly** on Page 3-9 for complete removal information.
   a. Inspect the nozzles and deflector. If they show a buildup of contaminants, clean the nozzles by **gently** inserting a wire with a maximum diameter of 0.015 inches (0.38 mm). Clean the deflector, if necessary, by spraying with LPS® Electro Contact Cleaner.

⚠CAUTION

Do not apply force to the deflector bar while cleaning the nozzles. Doing so could alter the alignment or disable the deflector bar mechanism.

⚠CAUTION

Do not use chlorinated solvents for cleaning the pilot/actuator assembly. The chlorinated solvents will deteriorate the rubber diaphragm.

   b. Make sure the O-rings are lightly lubricated with silicone grease and properly seated.
   c. Reassemble and check operation.
   d. If after cleaning the transducer does not function, replace the pilot/actuator assembly with a new one.
   e. Reassemble and check operation.
2. Remove the electronic circuit board from the module final assembly. Section 3 Maintenance describes how to remove the board.
   a. Inspect the O-rings around the sensor for damage and replace them if necessary.
   b. Check the sensor port and areas around the sensor for foreign material, and clean if necessary.
   c. Reassemble and check operation.
   d. If the transducer does not function, replace the electronic circuit board with a new one. Refer to **Electronic Circuit Board** on Page 3-7 for complete removal information.
   e. Reassemble and check operation.

3. The module subassembly is aligned at the factory and should **not** be further disassembled. If the above steps fail to produce a working unit, the module subassembly is faulty and should be replaced.

Section 6

Specifications

FUNCTIONAL SPECIFICATIONS

(Reference Conditions: 4–20 mA Input, 3–15 psig Output, and 20-psig Supply Pressure)

Input

Standard Performance

4–20 mA dc, 4–12 mA dc, and 12–20 mA dc. Field-adjustable split ranging.

10–50 mA dc. Consult factory for split range input. Direct action only.

Multirange Performance

4–20 mA dc. Consult factory for split range input.

10–50 mA dc. Consult factory for split range input. Direct action only.

Output(1)

Standard Performance

(Consult factory for split range output)

Direct Action (Minimum span of 6 psi)

Typical outputs: 3–15 psi, 0.2–1.0 kg/cm^2, or 0.2–1.0 bar.
Wide rangeability between 1 and 18 psi.

Reverse Action (Minimum span of 11 psi)

Typical outputs: 15–3 psi, 1.0–0.2 kg/cm^2, or 1.0–0.2 bar.
Wide rangeability between 18 and 1 psi.

Multirange Performance

Direct Action (Minimum span of 6 psi)

Typical outputs: 3–27 psi, 6–30 psi, and 5–25 psi.
Wide rangeability between 0.5 and 33 psi.

Reverse Action (Minimum span of 11 psi)

Typical outputs: 27–3 psi, 30–6 psi, and 25–5 psi.
Wide rangeability between 33 and 0.5 psi.

Supply Pressure

Standard and Multirange Performance

Minimum

3(2) psi (0.2 kg/cm^2) greater than the maximum calibrated output pressure.

Maximum

35 psi (2.4 kg/cm^2).

Units with Option E9—CENELEC or E4 JIS Flameproof Approval

20-psi maximum.

Output Air Capacity

Standard

4.0 SCFM (6.7 Nm^3/hr) at 20-psi (1.4-kg/cm^2) supply pressure.

Multirange

6.0 SCFM (9 Nm^3/hr) at 35 psi (2.5-kg/cm^2) supply pressure.

(1) Metric calibration also available.
(2) 2 psi (0.14 kg/cm^2) for a 33 psi output.

Air Consumption

0.20 SCFM (0.3 Nm^3/hr) at 20-psi (1.4-kg/cm^2) supply pressure.

Temperature Limits

Operating

–40 to 185 °F (–40 to 85 °C).

Storage

–40 to 200 °F (–40 to 93 °C).

Span and Zero

Large-screwdriver adjustments located in terminal compartment.

Humidity Limits

0–100% condensing relative humidity.

Remote Pressure Reading (RPR)

RPR is optional—order R1 option.

Frequency Range

5,000–8,000 Hz.

Amplitude

0.4–1.0 V_{p-p}.

Required Operating Voltage with Remote Pressure Reading Off

Min. 6.0 V (at 4 mA).
Max. 7.2 V (at 20 mA).

Required Operating Voltage with Remote Pressure Reading On

Min. 6.4 V (at 4 mA).
Max. 8.2 V (at 20 mA).

Hazardous Locations Certifications

Factory Mutual (FM) Approvals

K5 Explosion-proof for Class I, Division 1, Groups B, C, and D. Dust Ignition-proof for Class II, Division 1, Groups E, F, and G and Class III, Division 1, hazardous locations. Factory Sealed.

Intrinsically safe for Class I, Division 1, Groups A, B, C, and D; Class II, Division 1, Groups E, F, and G; and Class III, Division 1, hazardous locations.

Non-incendive for Class 1, Division 2, Groups A, B, C, and D.

Canadian Standards Association (CSA) Approvals

C6 Explosion-proof for Class I, Division 1, Groups C and D; Class II, Division 1, Groups E, F, and G; and Class III, Division 1, hazardous locations. Factory Sealed.

Instrinsically safe for Class I, Division 1, Groups A, B, C, and D. Temperature Code T4.

Non-incendive for Class 1, Division 2, Groups A, B, C, and D.

BASEEFA/CENELEC Intrinsic Safety Approval

I1 EEx ia IIC T5 (T_{amb} = 40 °C).
EEx ia IIC T4 (T_{amb} = 80 °C).
Parameters: $U_{max:in}$ = 30 V dc, $I_{max:in}$ = 200 mA, $W_{max:in}$ = 0.8 W, (T5)/ 1.0W (T4), C_{eq} = 0, L_{eq} = 0.02 mH.

BASEEFA Type N Approval

N1 Ex N II T5 (T_{amb} = 70 °C).
Parameter: U_{max} = 10 V dc.

ISSep/CENELEC Flameproof Approval

E9 EEx d IIC T6.

Standards Association of Australia (SAA) Approvals

K7 Flameproof: Ex d IIB T6; Class I, Zone 1.

Intrinsic Safety: Ex ia IIC T6 (T_{amb} = 40 °C)/T5 (T_{amb} = 70 °C); Class I, Zone 0.
Parameters: U_{max} = 30 V dc, I_{max} = 200 mA,
C_i = 0, L_i = 0.

Non-sparking Ex n IIC T6 (T_{amb} = 40 °C)/T5 (T_{amb} = 70 °C);
Class I, Zone 2.
Parameter: U_{max} = 12 V dc.

Japanese Industrial Standards (JIS) Flameproof Approval

E4 Ex d IIC T6.

Russian GOST Approvals

EG Flameproof: 1 ExdIICT6X.

IG Intrinsic Safety:
0ExiaIICT5 (T_{amb} = 40 °C).
0ExiaIICT4 (T_{amb} = 80 °C).

PERFORMANCE SPECIFICATIONS(1)

NOTE
The performance of all Model 3311 and Model 846 I/Ps is verified using computer automated manufacturing systems to ensure every unit shipped meets its performance specifications.

Linearity, Hysteresis, and Repeatability

±0.3% of span. Reference SAMA PMC 31.1.

Temperature Effect
(total effect including zero and span)

±0.045%/ °F (0.07%/ °C) of span.

Vibration Effect (tested while operating)

±0.3%/g of span ***during*** the following conditions:

5–15 Hz at 4 mm constant displacement.
15–150 Hz at 2 g. 150–2,000 Hz at 1 g.
Reference SAMA PMC 31.1-1980, Sec. 5.3,
Condition 3, Steady State.

Supply Pressure Effect

Negligible.

Reverse Polarity Protection

No damage occurs from reversal of normal supply current (4–20 mA) or from misapplication of up to 100 mA.

RFI/EMI Effect

±0.1% of span at 30 V/m, Class 3 (wire in conduit), ABC.

±1.0% of span at 10 V/m, Class 2 (wire not in conduit), ABC.

Reference SAMA PMC 33.1C-1978.

(1) Reference Conditions: 4–20 mA input, 3–15-psig output, and 20-psig supply pressure.

Overpressure Effect

Less than 0.25% of span for misapplication of up to 100-psi (7.0-kg/cm^2) supply pressure for less than 5 minutes to the input port.

Shock Effect

±0.5% of span. Reference SAMA PMC 31.1, Sec. 5.4.

Leak Sensitivity

Less than 1.0% of span for up to 3.0 SCFM (5.0 Nm^3/hr) downstream leakage.

PHYSICAL SPECIFICATIONS

Enclosure Rating

NEMA 4X (FM, Factory Mutual)
CSA Enclosure Type 4X (CSA, Canadian Standards Association)
IP66 (BASEEFA)
IP65 (Standards Association of Australia)
IP65 (GOST)
Tropicalization (Fungus Test per MIL-STD-810)

Housing Material

Aluminum

Low-copper aluminum with polyurethane paint.

Stainless Steel

316 Stainless Steel.

O-Ring Material

Buna-N, except silicone for sensor O-rings.

Supply Air, Output Signal, and Output Gage Connections

¼–18 NPT.

Electrical Connection

½–14 NPT.

Weight

Aluminum

6.5 lb (2.9 kg) excluding options.

Stainless Steel

14.8 lb (6.7 kg) excluding options.

OPTION SPECIFICATIONS

Filter-Regulator

Filter-regulator can be directly mounted to transducer with two $^{15}/_{16}$–18 3 3½-inch Grade 5 bolts and one number 208 O-ring. Mounting materials are supplied with the filter-regulator.

Unless mounting is specified (Option Code A1), the filter-regulator is shipped unmounted in the same box as the transducer.

Regulated Pressure Range

0–50 psi (0–3.5 kg/cm^2).

Maximum Supply Pressure

250 psi (17.6 kg/cm^2).

Flow Capacity

6 SCFM minimum.

Temperature Range
–20 to 150 °F (–29 to 66 °C).

Connections
1/4–18 NPT (3 ports).

Body and Bonnet Material
Aluminum.

Paint
Polyurethane.

Supply and Output Gages

Case Material/Fitting Material
Stainless steel/Brass (GA, GB, GC, and GD are stainless steel).

Meter Size
2 inch diameter (GA, GB, GC, and GD are 2.5 inch diameter).

Supply Gage Connection
¼–18 NPT, bottom.

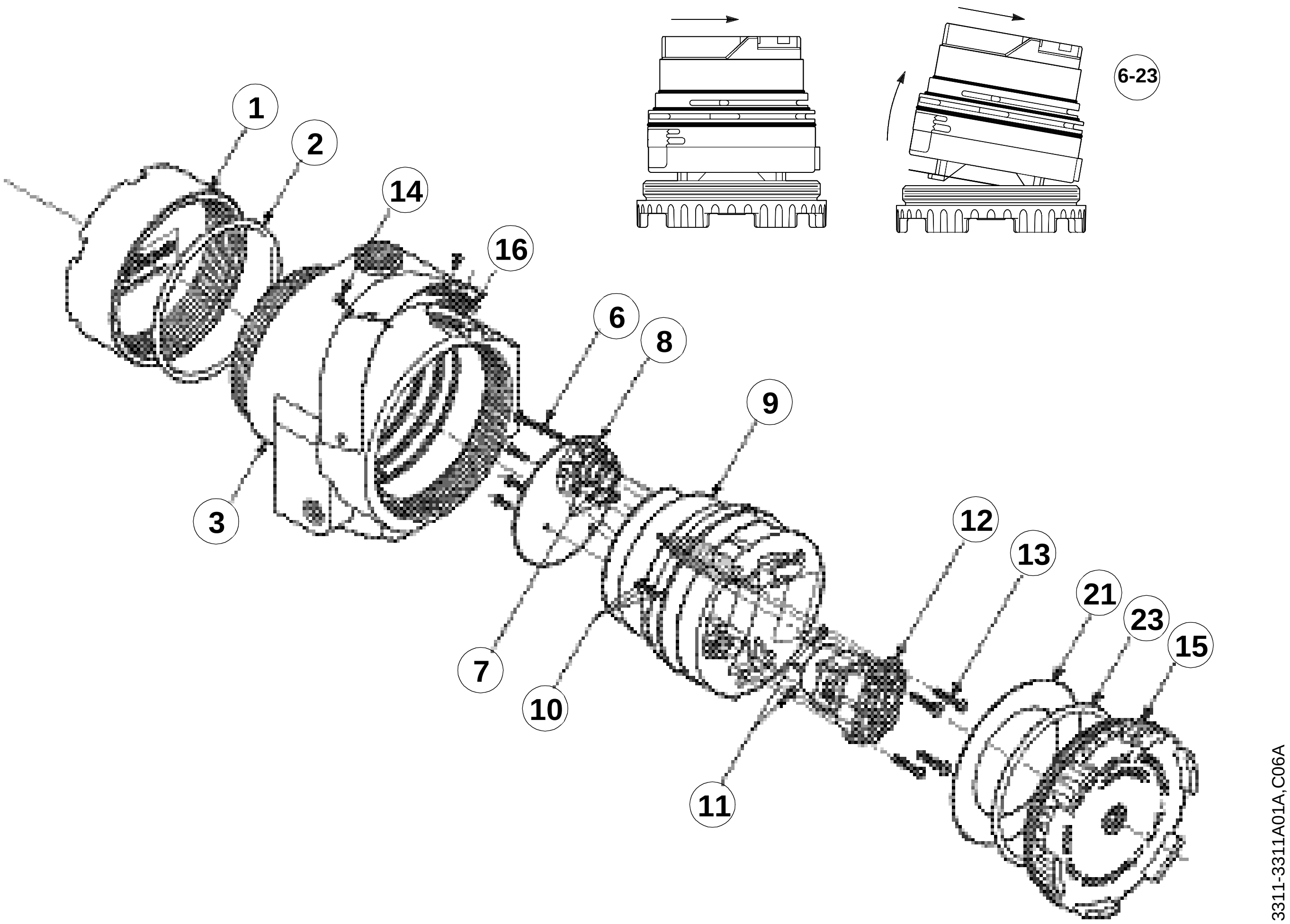
Unless mounting is specified (Option Code A1), the supply gage is shipped unmounted in the same box as the transducer (stainless steel gages are not mounted).

Output Gage Connection
¼–18 NPT, back.

The output gage is mounted to the transducer.

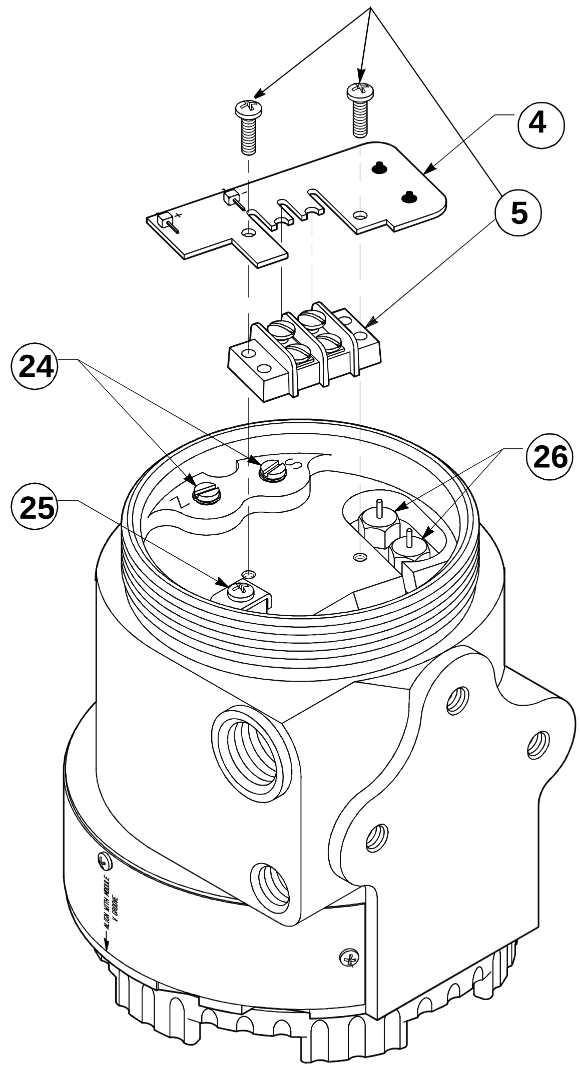
Temperature Range
–20 to 150 °F (–29 to 66 °C).

FIGURE 6-1.
Exploded Parts Drawing.



Item	Description
1	Terminal Compartment Cover
2	Terminal Compartment Cover O-ring
3	Housing
4	Terminal Block Connection Board
5	Terminal Block Kit
6	Electronic Circuit Board Screws
7	Electronic Circuit Board O-rings
8	Electronic Circuit Board Assembly
9	Module Subassembly
10	Module O-rings
11	Pilot/Actuator Assembly O-rings
12	Pilot/Actuator Assembly
13	Pilot/Actuator Assembly Screws
14	Nameplate Screws
15	Module Cover
16	Exhaust/Stroke Port Screen
18	Retaining Clip
21	Slip Ring
23	Module Cover O-ring
6–23	Module Final Assembly

FIGURE 6-1. (continued).
Exploded Parts Drawing.



3311-3311A03B

Item	Description
1	Terminal Compartment Cover
2	Terminal Compartment Cover O-ring
3	Housing
4	Terminal Block Connection Board
5	Terminal Block Kit
6	Electronic Circuit Board Screws
7	Electronic Circuit Board O-rings
8	Electronic Circuit Board Assembly
9	Module Subassembly
10	Module O-rings
11	Pilot/Actuator Assembly O-rings
12	Pilot/Actuator Assembly
13	Pilot/Actuator Assembly Screws
14	Nameplate Screws
15	Module Cover
16	Exhaust/Stroke Port Screen
21	Slip Ring
23	Module Cover O-ring
6–23	Module Final Assembly
24	Pot Shafts Assembly
25	Ground Screw
26	RFI Filters

TABLE 6-1. Model Number Table.

Model	Product Description
3311/0846	Current-to-Pressure Transducer
Code	**Action**
D	Direct—Output Changes Directly with Input
R	Reverse—Output Changes Inversely with Input
Code	**Performance**
S	Standard (Typical Output: 3–15 psi, Wide Rangeability Between 1 and 18 psi)
M	Multirange (Typical Outputs: 3–27 psi, 6–30 psi, and 5–25 psi; Wide Rangeability Between 0.5 and 33.0 psi)
Code	**Input**
1	4–20 mA dc
2	4–12 mA dc
3	12–20 mA dc
4	Specify (Consult Factory for Other Input Ranges Between 4–20 mA and 10–50 mA)
Code	**Output**
J	3–15 psi for Direct Action (15–3 psi for Reverse Action)
K	0.2–1.0 bar for Direct Action (1.0–0.2 Bar for Reverse Action)
L	0.2–1.0 kg/cm^2 for Direct Action (1.0–0.2 kg/cm^2 for Reverse Action)
M	3–27 psi for Direct Action (27–3 psi for Reverse Action) Multirange Performance Units Only
W	6–30 psi for Direct Action (30–6 psi for Reverse Action) Multirange Performance Units Only
H	Specify (Consult Factory for Other Calibration Requirements; Minimum Span is 6 psi for Direct and 11 psi for Reverse-acting Units)
Code	**Electrical Connections/Housing Material**
1	½–14 NPT/Aluminum
2	½–14 NPT/316 Stainless Steel
Code	**Options**
B1	Universal Mounting Bracket, Epoxy Painted Carbon Steel, Carbon Steel Nuts/Bolts
B2	Universal Mounting Bracket, Epoxy Painted Carbon Steel, SST Nuts/Bolts
B3	316 SST Universal Mounting Bracket, SST Nuts/Bolts for Use with SST Housing
B4	316 SST Universal Mounting Bracket, SST Nuts/Bolts for Use with Aluminum Housing
F2	Filter-Regulator, SST Bolts
F3	SST Filter Regulator, SST Bolts
G1	Supply Gage (0–60 psi/0–400 kPa)
G2	Output Gage (0–30 psi/0–200 kPa)
G3	Supply Gage (0–60 psi/0–4 bar)
G4	Output Gage (0–30 psi/0–2 bar)
G7	Supply Gage (0–60 psi/0–4 kg/cm2)
G8	Output Gage (0–30 psi/0–2 kg/cm2)
G9	Output Gage (0–60 psi/0–400 kPa)
GA	SST Supply Gage (0–60 psi/0–400 kPa)
GB	SST Output Gage (0–60 psi/0–400 kPa)
GC	SST Supply Gage (0–55 psi/0–4 bar)
GD	SST Output Gage (0–55 psi/0–4 bar)
P1	Module Cover with Multiple Ports
R1	Remote Pressure Reading Feature
A1(1)	Attach all Applicable Options at the Factory (i.e. Filter/Regulator and Gages)
Q4	Calibration Data Sheet
K5	Factory Mutual (FM) Explosion-Proof and Intrinsic Safety Approval
C6	Canadian Standards Association (CSA) Explosion-Proof and Intrinsic Safety Approval
I1	BASEEFA/CENELEC Intrinsic Safety Certification
N1	BASEEFA Type N Certification
E9(2)	ISSep/CENELEC Flameproof Certification
K7	Standards Association of Australia (SAA) Flameproof, Intrinsic Safety, and Type n Certification
E4(2)	Japanese Industrial Standards (JIS) Flameproof Certification
EG	Russian GOST Flameproof Certification
IG	Russian GOST Intrinsic Safety Certification
Typical Model Number: 3311 D S 1 J 1 B1	

(1) Not available with stainless steel housing.
(2) Hazardous location approval options E4, E9, and EG are currently not available on multirange performance units.

Remote Pressure Reading Feature (Option R1)

With Option R1, the Model 3311 and Model 846 circuit board contains the Remote Pressure Reading feature. The Remote Pressure Reading jumper is placed in the ON position prior to shipment.

Tagging

Transducer will be tagged in accordance with customer requirements. Customer tagging information (40 characters maximum) will be imprinted on the permanent stainless steel instrument nameplate. An optional stainless steel wire-on tag holding 114 characters is available.

Companion Product: Model 272 Field Calibrator

The Rosemount Model 272 Field Calibrator can be used to calibrate the I/P transducer. A battery-operated, portable calibrator designed for field use, the Model 272 features an adjustable 4–20 mA range, and selectable indication/simulation modes. See Product Data Sheet 00813-0100-4372.

TABLE 6-2. Spare Parts List.

Part Description	Item No. (See Figure 6-1)	Rosemount Part Number	Fisher Part Number	Spares Category(1)
Module Final Assembly(2)	6–13			
Standard Performance				
Direct Action 4–20 mA	–	03311-0298-0004	13B8788X012	B
Direct Action 10–50 mA	–	03311-0298-0010	14B5026X012	B
Reverse Action 4–20 mA	–	03311-0298-0005	13B8789X012	B
CENELEC Flameproof				
Direct Action 4–20 mA	–	03311-0298-0006	18B4646X012	B
Direct Action 10–50 mA	–	03311-0298-0011	18B5800X012	B
Multirange Performance				
Direct Action 4–20 mA	–	03311-0298-0008	13B8790X012	B
Direct Action 10–50 mA	–	03311-0298-0012	18B5801X012	B
Reverse Action 4–20 mA	–	03311-0298-0009	13B8791X012	B
Module Subassembly(3)(2)				
Standard (Direct or Reverse Action)	9	03311-0409-0002	13B8792X012	B
CENELEC Flameproof (Direct or Reverse Action)	–	03311-0409-0003	18B5802X012	B
Pilot/Actuator Assembly(3)				
Standard Performance Only				
Direct Action	12	03311-0410-0001	13B8793X012	B
Reverse Action	12	03311-0410-0002	13B8794X012	B
Circuit Board Assembly(3)				
Standard Performance Only				
Direct Action	8	03311-0411-0005	13B8795X012	B
Reverse Action	8	03311-0411-0006	13B8796X012	B
Direct Action 10–50 mA	8	03311-0411-0007	18B5803X012	B
Housing(4)				
Standard	3	03311-0412-0003	18B5804X012	C
CENELEC Flameproof	3	03311-0412-0004	18B5805X012	C
Module Cover				
Single Stroke Port	15	03311-0341-0001	18B5806X012	C
Multiple Ports	–	03311-0341-0002	18B5807X012	C
Threaded Stroke Port	–	03311-0434-0001	18B5808X012	
Terminal Compartment Cover	1	03311-0413-0001	18B5809X012	C
Terminal Block Kit(5)	5	03311-0414-0002	13B8801X012	B
Screens (12/pkg)	16	03311-0415-0001	13B8802X012	B
O-rings				
Module (5/kit)(6)	10	03311-0416-0001	13B8803X012	B
Pilot/Actuator (5/kit)(6)	11	03311-0417-0001	13B8804X012	B
Circuit Board (5/kit)(6)	7	03311-0418-0004	13B8805X012	B
Cover (12 O-rings, 12 Slip Rings)(6)	2, 21, & 23	03311-0421-0001	13B8806X012	B
Filter Regulator (10/kit)(6)	–	03311-0428-0001	18B5815X012	B
Screws				
Pilot/Actuator (3/kit)(6)	13	03311-0417-0002	13B8807X012	C
Circuit Board (3/kit)(6)	6	03311-0418-0001	13B8808X012	C
Nameplate (3/kit)(6)	14	03311-0419-0001	13B8809X012	C
Retaining Clips (3/kit)(6)	18	03311-0420-0001	13B8810X012	C
Module Cap (5/pkg)(6)	22	03311-0424-0001	18B5810X012	B
Filter-Regulator Direct Mounting Kit(7)				
F2 SST Bolts 20 Yr.	–	03311-0422-0002	18B5812X012	B
Filter-Regulator with Direct Mounting Kit(7)				
SST Bolts 62 Yr.	–	03311-0425-0001	18B5813X012	C

TABLE 6-2. (continued).

Part Description	Item No. (See Figure 6-1)	Rosemount Part Number	Fisher Part Number	Spares Category(1)
Universal Mounting Bracket				
Epoxy Painted Carbon Steel, Carbon Steel Nuts/Bolts	–	03311-0404-0001	18B5816X012	C
Epoxy Painted Carbon Steel, SST Nuts/Bolts	–	03311-0404-0002	18B5817X012	C
316 SST, SST Nuts/Bolts for Use with SST Housing	–	03311-0404-0003	14B4979X012	C
316 SST SST Nuts/Bolts for Use with Aluminum Housing	–	03311-0404-0004	14B4977X012	C
Gages				
0–60 psi/kPa (supply)	–	03311-0258-0001	15A8419X282	B
0–30 psi/kPa (output)	–	03311-0258-0002	15A8419X292	B
0–60 psi/bar (supply)	–	03311-0258-0003	15A8419X302	B
0–30 psi/bar (output)	–	03311-0258-0004	15A8419X312	B
0–60 psi/kg/cm^2 (supply)	–	03311-0258-0007	15A8419X322	B
0–30 psi/kg/cm^2 (output)	–	03311-0258-0008	15A8419X332	B
0–60 psi/kPa (output)	–	03311-0258-0009	15A8419X342	B
SST 0–55 psi/kPa (supply)	–	03311-0258-0010	15A8419X352	B
SST 0–55 psi/kPa (output)	–	03311-0258-0011	15A8419X362	B
SST 0–55 psi/bar (output)	–	03311-0258-0013	15A8419X382	B
SST 0–55 psi/bar (supply)	–	03311-0258-0012	15A8419X372	B

(1) Spares Categories
Category A – Recommended 1 spare part per 25 transducers.
Category B – Recommended 1 spare part per 50 transducers.
Category C – None normally required.
(2) For units with approvals other than CENELEC and JIS Flameproof, use standard mode.
(3) Includes O-rings.
(4) Includes housing, span and zero screws, electrical feedthroughs, and grounding lug.
(5) Includes terminal block, connection board, and screws.
(6) #/kit indicates number of I/Ps that may be serviced.
(7) Filter-Regulator Direct Mounting Kit includes O-ring.

FIGURE 6-2. FM Entity Concept Approvals.

FM ENTITY CONCEPT APPROVALS

The Model 3311 and Model 846 Current-to-Pressure (I/P) Transducer is FM approved as intrinsically safe for use in Classes I, II, and III, Division 1, Groups A, B, C, D, E, F, and G hazardous locations when connected in accordance with this document. The Model 3311 and Model 846 is also FM approved as nonincendive for Class I, Division 2, Groups A, B, C, and D hazardous locations.

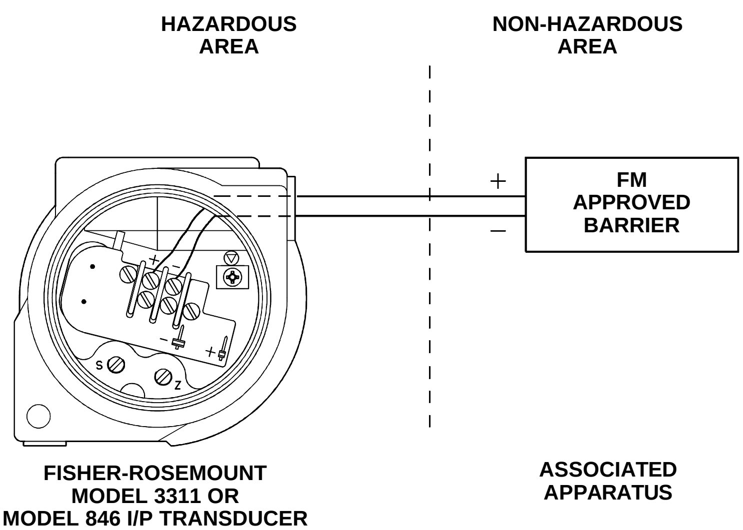
To maintain the intrinsic safety of both models they must be connected to an FM approved barrier that satisfies the following conditions:

CLASSES I, II, AND III, DIV. 1 GROUPS A, B, C, D, E, F, AND G

APPARATUS PARAMETER	BARRIER PARAMETER
V_{max} = 40 V_{dc}	V_{oc} greater than 14.7 V_{dc} and less than 40 V_{dc}
I_{max} = 185 mA	I_{sc} less than or equal to 185 mA
C_i = 0.016	C_a greater than 0 microfarads
L_i = 20 uH	L_a greater than 20 microhenries

WHERE:

- V_{max} = Maximum transducer input voltage
- I_{max} = Maximum transducer input current
- C_i = Total unprotected internal capacitance of the transducer
- L_i = Total unprotected internal inductance of the transducer
- V_{oc} = Open circuit voltage of the barrier
- I_{sc} = Short circuit current of the barrier
- C_a = Acceptable connected capacitance of the barrier
- L_a = Acceptable connected inductance of the barrier

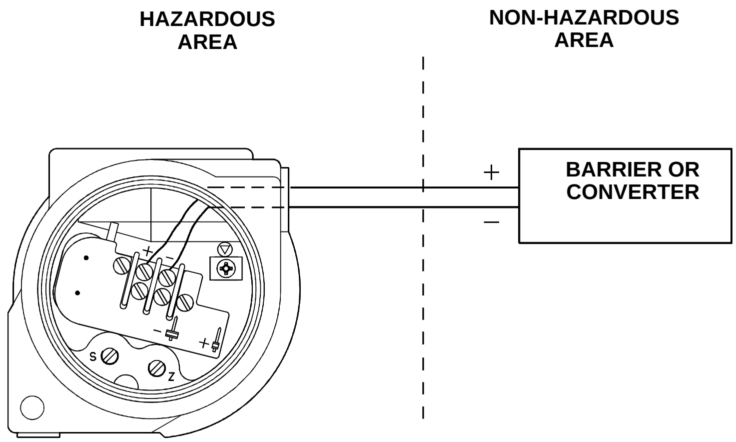


3311-3311D02A

FIGURE 6-3. CSA Intrinsic Concept Approvals.

CSA INTRINSIC SAFETY APPROVALS

MODEL 3311 AND MODEL 846 CIRCUIT CONNECTION WITH INTRISIC SAFETY BARRIERS



"Exia"

INTRINSICALLY SAFE/SECURITE INTRINSEQUE

DEVICE		PARAMETERS	APPROVED FOR CLASS I, DIV. 1
CSA Approved Safety Barrier	{	30 V or less 330 ohms or more	Groups A, B, C, & D
		28 V or less 300 ohms or more	
		22 V or less 180 ohms or more	
CSA Approved Safety Barrier		30 V or less 150 ohms or more	Groups C & D

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