

# **$IPH^2$ & $IPX^2$**

Current-to-Pressure  
(I/P) Transmitters



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# **$IPH^2$ & $IPX^2$**

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## Introduction

This users' manual for Moore Industries' IPH<sup>2</sup> and IPX<sup>2</sup> Current-to-Pressure Transmitters contains all of the information that is needed to calibrate, install, operate, maintain, and troubleshoot this family of transmitters.

The following guidelines are used in this manual:

**WARNING** - Hazardous procedure or condition that could injure the operator.

**Caution** - Hazardous procedure or condition that could damage or destroy the unit.

**Note** - Information that is helpful for a procedure, condition, or operation of the unit.

## About this Manual

Wherever you see a "**WARNING**", "**Caution**" or "**Note**" pay particular attention.

**WARNING** - Hazardous procedure or condition that could injure the operator.

**Caution** - Hazardous procedure or condition that could damage or destroy the unit.

**Note** - Information that is helpful for a procedure, condition, or operation of the unit.

## IPH<sup>2</sup> & IPX<sup>2</sup>

The rugged IPH<sup>2</sup> and IPX<sup>2</sup> Current-to-Pressure (I/P) Transmitters are designed specifically for extended duty in harsh field environments. Being Type 3X/4X- and IP56/IP66-rated, the extruded aluminum housings, for both the IPH<sup>2</sup> and IPX<sup>2</sup>, offer water and dust protection and are also highly resistant to corrosion and chemicals. In addition, while the air and natural gas versions of the IPX<sup>2</sup> are explosion-proof, the later offers an increased ingress protection of IP66.

These 2-wire (loop-powered) transmitters convert a current signal to a pneumatic signal so that an electronic-based system such as a DCS, PLC, or PC can control a pneumatic actuator, valve, or damper drive. Available models accept a wide range of current inputs (4-20mA, 4-12mA, and 12-20mA) and provide a proportional pneumatic signal (3-15psig, 0.2-1Bar, 20-100kPA, etc.). A reverse pneumatic output option is available for the IPH<sup>2</sup>. Reverse output is switch selectable on new versions of the IPX<sup>2</sup> (introduced in 2013).

The high-performance line of I/P transmitters utilizes an internal feedback loop to ensure accurate operation. The feedback loop consists of an internal pressure transducer that samples the unit's output pressure and compares it to the input signal. This allows the unit's output to track the input signal. Other I/P transmitters, such as our original IPT, IPH and IPX models, rely solely on mechanical positioning.

Since the feedback loop requires power to operate, when there is no input power to the unit, the pneumatic output will be shut off. Units that use mechanical positioning only, will typically still have a pneumatic output when power is removed. By example, a unit (IPT, IPH and IPX) with an output range of 15 - 3PSIG will output approximately 18PSIG when the input signal is removed. This is not an issue except for those users that rely on this elevated output (18PSIG) to maintain a valve's position upon the unexpected loss of input signal (4-20mA). In such cases, the IPT<sup>2</sup>, IPH<sup>2</sup> and IPX<sup>2</sup> units react differently by shutting off the pneumatic output.

Both units are available with an optional coalescing filter/regulator that combines an air filter and miniature supply line regulator with a pressure gauge that reads in both psi and Bars.

# IPH<sup>2</sup> & IPX<sup>2</sup>

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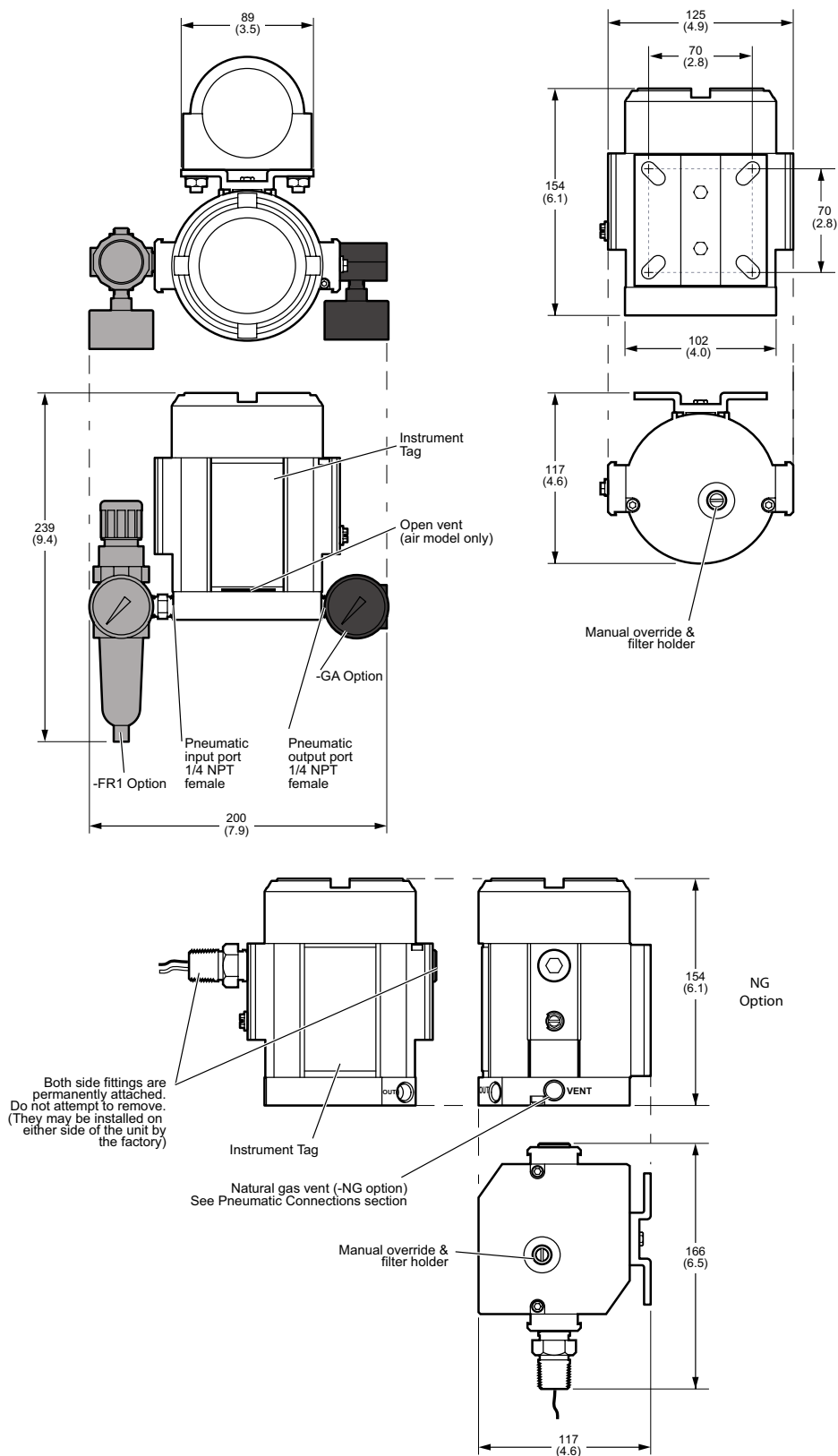
## Specifications

<p><b>Performance Accuracy:</b> <math>\leq \pm 0.25\%</math> of span including the combined effect of linearity, hysteresis and repeatability (between 0 and 3psig output, error will not exceed <math>\pm 1.0\%</math> of span)</p> <p><b>Stability:</b> Not to degrade from stated accuracy for six months</p> <p><b>Step Response:</b> <math>&lt; 0.2</math> seconds into 100ml load (6 in<sup>3</sup>) from 10% to 90% of span; Not guaranteed below 3psig output</p> <p><b>Supply Pressure Effect:</b> Negligible from 20-40psig, steady pressure</p> <p><b>Air Capacity:</b> 5.0SCFM minimum (20psig supply, 0psig output)</p> <p><b>Relief Capacity:</b> 2.5SCFM minimum (15psig output)</p> <p><b>Air Supply:</b> Instrument air only, 20-40psig.</p> <p><b>Gas Supply with -NG1 or -NG2 Option:</b> 17-40psig. Same cleanliness as instrument air. H<sub>2</sub>S not to exceed 20ppm</p> <p><b>Maximum Input:</b> 80psig without damage for units with output pressure rating of <math>&gt; 15</math>psig; 45psig without damage for units with output pressure rating of <math>\leq 15</math>psig</p>	<p><b>Performance (Continued) Voltage Drop:</b> 5V, maximum</p> <p><b>Air Consumption (Dead-ended):</b> At 3-15psig output 20psig supply, average steady state consumption* of 4.7SCFH (min 4.2SCFH@ 3psig, max 5.2SCFH@15psig); 40psig supply, max 9SCFH @15psig output; 40psig supply, max 10SCFH @30psig output</p> <p><b>Natural Gas Consumption (Dead-ended):</b> At 3-15psig output 20psig supply, average steady state consumption* of 5.7SCFH, (min 5.1SCFH@ 3psig, max 6.2SCFH@15psig); 17psig supply, max 5.9SCFH @15psig output; 40psig supply, max 12SCFH @30psig output;</p> <p><b>Mounting Position Effect:</b> Negligible, unit can be mounted in any position; refer to user manual for special conditions of use with natural gas supply or outdoor environments.</p>	<p><b>Ambient Conditions</b></p> <p><b>Operating &amp; Storage Range:</b> -40°C to +85°C (-40°F to +185°F)</p> <p><b>Ambient Temperature Effect:</b> <math>\leq \pm 0.025\%</math> of span/°C, maximum from -20°C to 80°C; <math>\leq \pm 0.1\%</math> of span/°C, maximum</p> <p><b>RFI/EMI Effect:</b> <math>\leq \pm 0.25\%</math> of span change at in field strengths of 10V/m@ frequencies of 20-1000MHz</p> <p><b>Vibration Effect: Meets ANSI/ISA-75 13.01-1996 (R2007) 5.3.5 as follows:</b> 5-15Hz, 2mm peak-to-peak; 15-150Hz, 1g; 150-2000Hz, 0.5g</p> <p><b>Relative Humidity:</b> 0-100%, non-condensing</p> <p><b>Adjustment</b></p> <p><b>Zero &amp; Span:</b> Screw adjusts zero or span by <math>\pm 10\%</math> minimum, non-interactive</p> <p><b>Weight</b></p> <p><b>IPH<sup>2</sup>:</b> 1.14kg (2.5 lbs) <b>IPX<sup>2</sup>:</b> 2.4kg (5.3 lbs)</p>
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\*Average flow rate determined at 9 psig output

Specifications and information subject to change without notice.

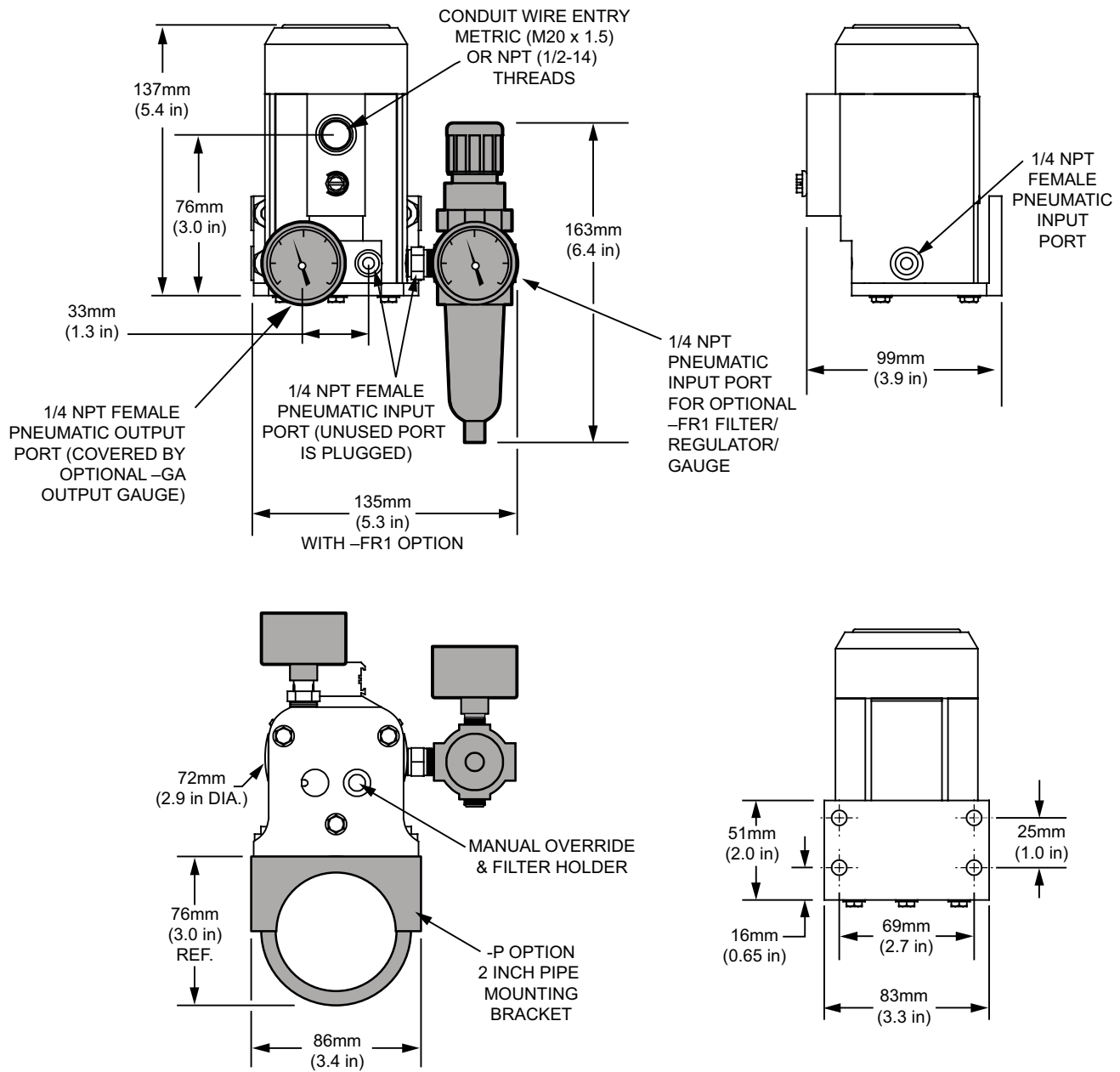
**Figure 1.** IPX<sup>2</sup> Current-to-Pressure Transmitter Housing Dimensions



# IPH<sup>2</sup> & IPX<sup>2</sup>

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Figure 2. IPH<sup>2</sup> Current-to-Pressure Transmitter Housing Dimensions



## Calibration

Every IPH<sup>2</sup> and IPX<sup>2</sup> is fully tested and calibrated at the factory prior to shipment. However, before installation, your IPH<sup>2</sup> or IPX<sup>2</sup> should be bench-checked to verify the desired unit zero and unit span. Calibration should be conducted in an appropriate testing environment.

## Necessary Equipment

Table 1 lists the equipment required to calibrate the unit. This equipment is not supplied by Moore Industries, but should be available in most labs or maintenance areas.

**Table 1.** IPH<sup>2</sup> & IPX<sup>2</sup> Calibration Equipment

Equipment	Description
Adjustable current source	4-20mA output
DC Multimeter	Accurate to $\pm 0.05\%$
Instrument air supply	Filtered
Air pressure gauge #1	Accurate to $\pm 2\%$
Air pressure gauge #2	Accurate to $\pm 0.1\%$
Pneumatic load	Volume of 7.5 cubic inches (approx. 120 milliliters)

## Preparing for Calibration

To prepare the IPH<sup>2</sup> or IPX<sup>2</sup> for calibration, remove the screw-on cap and connect the unit to your configuration equipment as shown in Figures 3 and 4.

**Unit Connections and Controls.** The IPH<sup>2</sup> and IPX<sup>2</sup> each have two labeled terminals on their faceplate, located under the top protective cover of the housing. The terminal labeled “+PS” is for connection of the positive current input, and the terminal labeled “-PS” is for the negative connection.

The two controls are also located inside the unit housing under the screw-on cap. They consist of two potentiometers, each accessed through the front panel. They are labeled “zero” and “span”. The zero potentiometer provides a control range for offsets of  $\pm 10\%$  of rated unit span, while the span potentiometer adjusts unit full-scale output to 100 percent of rated span.

Each potentiometer requires approximately 20 turns to move its wiper from one extreme to the other: clockwise for maximum, or counterclockwise for minimum values. Each is equipped with a slip clutch to prevent damage if the adjustment is turned beyond the wiper stop.

### Note:

*Always use clean, dry, instrument air when calibrating or operating the IPH<sup>2</sup> or IPX<sup>2</sup>.*

All pneumatic lines used in calibration and operation must be “blown down” (purged) prior to connection to the unit. Any condensation or oil residue in the lines, if introduced into the pneumatic chambers of the unit, may result in poor unit performance.

## Calibration Process

To perform the recommended bench-check for the IPH<sup>2</sup> or IPX<sup>2</sup>, first perform the setup as described in the next section. See Figures 3 and 4 for illustrations of the Calibration Setup, then follow the steps under Calibration Setup and Calibrating the IPH<sup>2</sup> or IPX<sup>2</sup>.

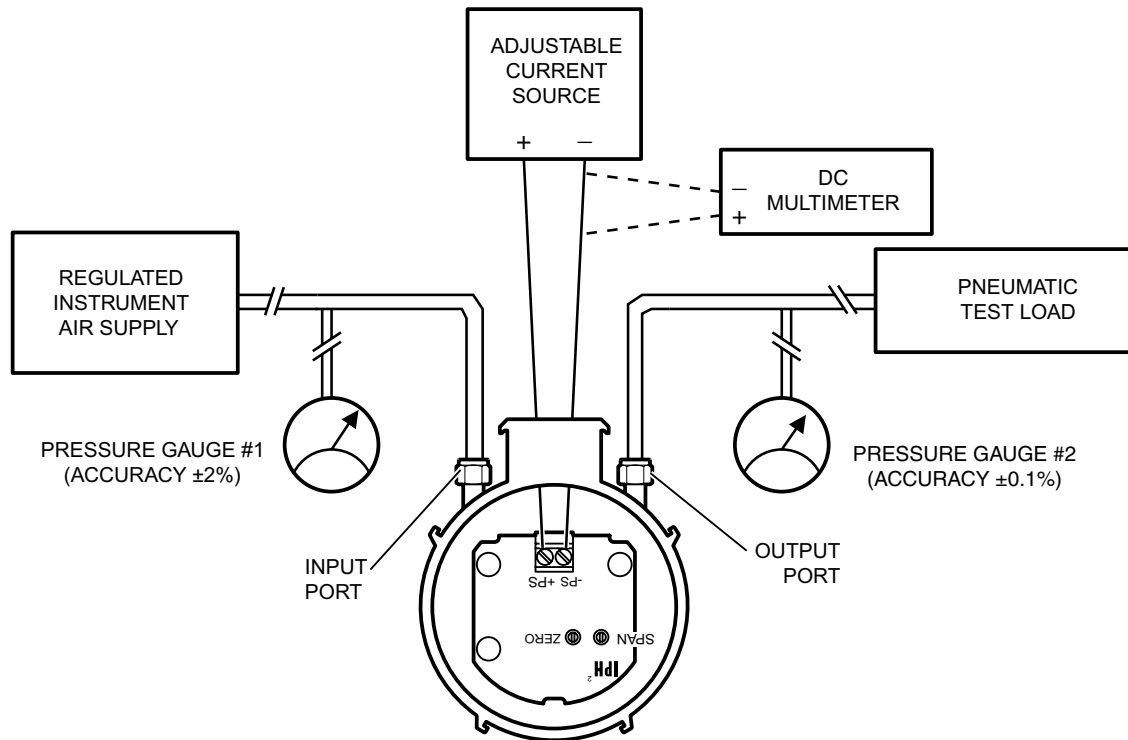
### Calibration Setup

1. Connect 1/4-inch pneumatic tubing between the appropriate output port of the regulated instrument air supply and the pressure gauge #1 (accuracy of  $\pm 2\%$  of span). Connect another tube from the pressure gauge to the port labeled “IN” on IPH<sup>2</sup> or IPX<sup>2</sup>.
2. Connect 1/4-inch pneumatic tubing between the port labeled “OUT” and the appropriate port of pressure gauge #2 (accuracy of  $\pm 0.1\%$  of span), then from gauge #2 to the appropriate pneumatic load.
3. Run current source wiring through conduit opening in housing, and to the front panel of the IPH<sup>2</sup> or IPX<sup>2</sup>. (Not necessary for IPX<sup>2</sup> –NG models.)
4. Connect positive lead of adjustable current source to the +PS terminal of unit. Connect negative source lead to the –PS terminal. (For IPX<sup>2</sup> –NG, connect the positive lead of the current source to the red wire, and the negative lead of current source to the black wire.) A multimeter may also be connected to verify level of current input.
5. When connections are complete, apply an input current of 0% of span. (i.e. 4mA for a 4-20mA unit)
6. Apply appropriate filtered, instrument-quality air to supply line: 20 or 35psi (1.4Bar to 2.4Bar). Verify appropriate supply pressure by checking Supply Pressure field of unit model number.
7. Allow approximately 30 seconds for calibration setup to stabilize.

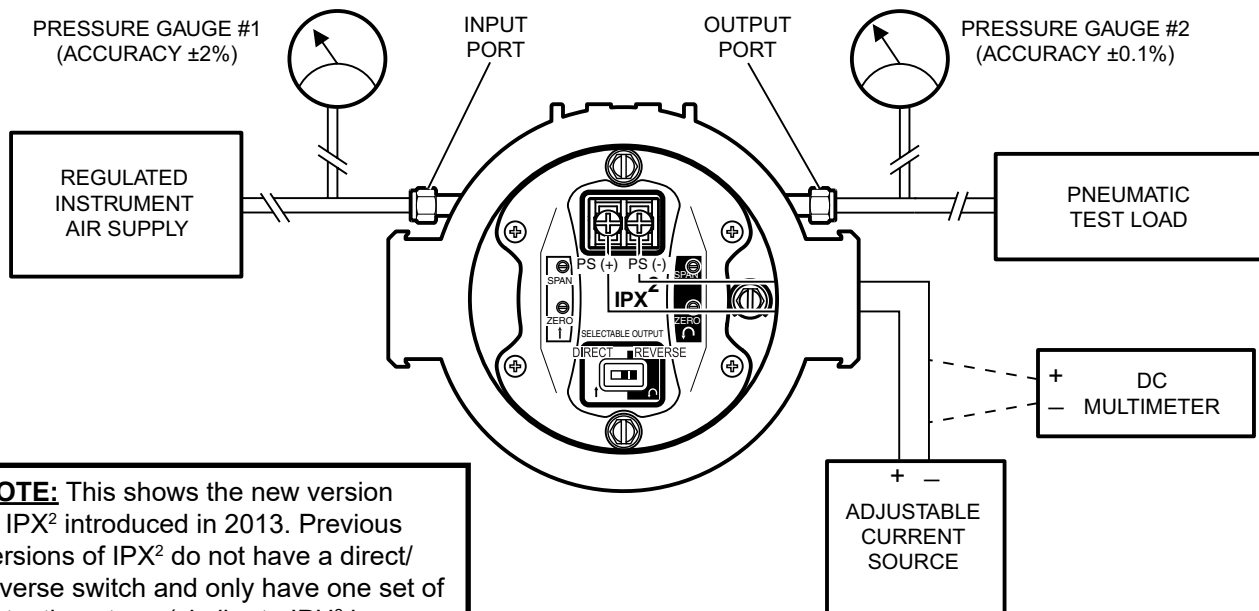
# IPH<sup>2</sup> & IPX<sup>2</sup>

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**Figure 3.** IPH<sup>2</sup> Calibration Setup



**Figure 4.** IPX<sup>2</sup> Calibration Setup



**NOTE:** This shows the new version of IPX<sup>2</sup> introduced in 2013. Previous versions of IPX<sup>2</sup> do not have a direct/reverse switch and only have one set of potentiometers. (similar to IPH<sup>2</sup> in Figure 3)



## Calibrating the IPH<sup>2</sup> or IPX<sup>2</sup>

This calibration procedure consists of a basic check and adjustment of unit zero and span, based on the reading of pressure gauge #2. To calibrate a direct output unit, perform the following:

1. For IPX<sup>2</sup> new versions (introduced in 2013) only, check switch is set to "Direct"- see Figure 5.
2. Check unit zero setting. Monitor reading of pressure gauge #2 (output), and turn zero potentiometer counterclockwise to lower output, clockwise to raise output. Set zero potentiometer so that pressure output is at 0% of span when a current input of 0% of span is applied. (i.e. 3psi for a 3-15psi unit)
3. Check unit span setting. Increase input to 100% of rated span (i.e. 20mA for a 4-20mA unit).
4. Monitor reading of pressure gauge #2 (output), and adjust span potentiometer so that reading is at 100% of span for your unit (i.e. 15psi for a 3-15psi unit).
5. Repeat steps 1 through 4 until the unit outputs 0% of rated pressure range at 0% current input, and 100% of output pressure range at 100% of span.
6. Verify the accuracy of your adjustments by inputting 0%, 25%, 50%, and 75% of span inputs, and monitoring the output.

To calibrate a reverse output unit, perform the following:

7. For IPX<sup>2</sup> new versions (introduced in 2013) only, check switch is set to "Reverse" - see Figure 5.
8. Check unit zero setting. Monitor reading of pressure gauge #2 (output), and turn zero potentiometer counterclockwise to lower output, clockwise to raise output. Set zero potentiometer so that pressure output is at 100% of span when a current input of 0% of span is applied. (i.e. 15 psi for a 3-15 psi unit).
9. Check unit span setting. Increase input to 100% of rated span (i.e. 20mA for a 4-20mA unit).

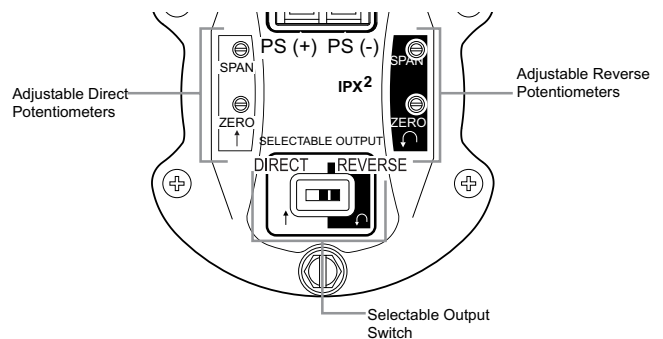
10. Monitor reading of pressure gauge #2 (output), and adjust span potentiometer so that reading is at 0% of span for your unit (i.e. 3 psi for a 3-15 psi unit).
11. Repeat steps 8 through 10 until the unit outputs 100% of rated pressure range at 0% current input, and 0% of output pressure range at 100% of span.
12. Verify the accuracy of your adjustments by inputting 0%, 25%, 50%, and 75% of span inputs, and monitoring the output.

### **Note:**

*New versions of the IPX<sup>2</sup> (introduced in 2013) have a selectable output switch. Be sure to set this switch to the required output mode, direct or reverse, and use the corresponding set of pots accordingly.*

*See Figure 5.*

**Figure 5.** IPX<sup>2</sup> Output Switch



# IPH<sup>2</sup> & IPX<sup>2</sup>

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## Installation

The installation of the IPH<sup>2</sup> or IPX<sup>2</sup> is carried out in three phases: the physical mounting of the unit, the electrical connections phase, and the pneumatic connections phase. It is strongly suggested that each unit be calibrated according to the instructions in this manual before being placed into service.

Installation in hazardous 'Classified' locations and potentially explosive atmospheres must adhere to the instructions in the Hazardous Location Applications section which can be found at the end of this Installation section.

### Phase One: Mounting

Figures 1 and 2 give the dimensions of the IPX<sup>2</sup> and IPH<sup>2</sup>, respectively. The illustrations also give the dimensions of the available option hardware, which is recommended for most installations. After placing the unit in the desired location and orientation, secure the housing with the optional pipe mounting hardware or other appropriate fasteners.

The IPH<sup>2</sup> or IPX<sup>2</sup> will operate when installed at any angle—either surface-mounted or attached to pipe or round conduit. However, there are other considerations in selecting the ideal mounting position. If the IPH<sup>2</sup> is in an area which may be exposed to rain or water, it should be mounted within 45° of vertical. In natural gas applications, where liquid remnants are possible in the supply, the vent port of the IPX<sup>2</sup> needs to be in a position that would allow for sufficient draining. Please also consider the requirements in Pneumatics Connections on the next page before determining the ideal mounting configuration.

### Phase Two: Electrical Connections

To complete the electrical connections, route the wiring through the conduit port to the terminal block, then use a screwdriver to loosen the terminal screws. (Not necessary for IPX<sup>2</sup> –NG1 or –NG2 installation.)

For all units except the IPX<sup>2</sup> –NG1 or –NG2, connect positive lead (+) to the +PS terminal, and negative lead (–) to the –PS terminal. Tighten the terminal screws until snug.

#### **Caution:**

*When connecting the IPX<sup>2</sup> Natural Gas (–NG1 or –NG2) model, use an appropriately certified conduit box and wire connectors. Do not attempt to remove the seal fitting, as it is necessary for natural gas certification. Connect the positive lead (+) to the red wire from the seal fitting, and the negative lead (–) to the black wire from the seal fitting.*

Use shielded, twisted-pair wiring for low-level input. Ground the shielding wire as close as possible to the installed unit.

## Recommended Ground Wiring Practices

Moore Industries recommends the following ground wiring practices:

- Any Moore Industries product in a metal case or housing should be grounded.
- The protective earth conductor must be connected to a system safety earth ground before making other connections.
- All input signals to, and output signals from, Moore Industries' products should be wired using a shielded, twisted pair wiring technique. Shields should be connected to an earth or safety ground.
- For the best shielding, the shield should be run all the way from the signal source to the receiving device. (see Note below)
- The maximum length of unshielded input and output signal wiring should be 2 inches.

#### **Note:**

*Some of Moore Industries' instruments can be classified as receivers (IPT<sup>2</sup>, IPX<sup>2</sup>, etc.) and some can be classified as transmitters (TRX, TRY, etc.) while some are both a receiver and a transmitter (SPA<sup>2</sup>, HIM, etc). Hence, your shield ground connections should be appropriate for the type of signal line being shielded. The shield should be grounded at the receiver and not at the signal source.*

### CE Conformity

Installation of any Moore Industries' products that carry the CE marking must adhere to the guidelines in the Recommended Ground Wiring Practices section in order to meet the EN 61326 requirements set forth in the applicable EMC directive.

## Phase Three: Pneumatic Connections

To complete the final phase of installation, connect the supply line to the 1/4-inch NPT female port labeled "IN". Connect the output line to the 1/4-inch NPT female port labeled "OUT". All tubing must have at least 6mm (1/4-inch) inside diameter or the maximum flow will be limited.

### **Note:**

*Seal all fittings with Teflon<sup>®</sup> tape, or equivalent. Always "blow down" (purge) all tubing and the controlled device before connecting the IPH<sup>2</sup> or IPX<sup>2</sup>.*

### **Manual Override Screw**

If you are in a potentially explosive environment and do not want to apply electric power to the unit with the cover removed, the pneumatic installation may be tested by loosening the manual override screw on the bottom of the unit. The output pressure will go to the supply pressure. Be sure to tighten the manual override screw after test.

### **WARNING:**

*IPX<sup>2</sup> units installed in a natural gas application **must** have the natural gas vent properly connected. Follow the directions below to install an IPX<sup>2</sup> with –NG1 or –NG2 options into a natural gas application.*

### **Natural Gas Applications**

Customers using the IPX<sup>2</sup> with –NG1 or –NG2 options to regulate a sweet natural gas application (H<sub>2</sub>S levels are not to exceed 20ppm) must also make the vent port connections. Connect the Natural Gas Vent (shown in Figure 1) to a device prepared to receive natural gas. After connection, the fittings, cover, and filter/test screw should be tested for leaks.

For an outdoor system, ventilation should consist of a weather-proofed connection between the transmitter exhaust and a riser, six feet above the transmitter and control valve assembly. The riser should be shepherd-crooked to prevent rain or incident water from accumulating at the base. In accordance with local safety regulation, an in-line flame arrestor should be applied to the riser to prevent flash back to the transmitter from an external, spontaneous flame source.

For an indoor system, ventilation must consist of a leak-proof connection from the exhaust of the transmitter to a process vent. The process vent should already be dedicated for natural gas excursions and should conform to all standards for flaring or after-burn, and flame arrest, as dictated by local environmental and safety regulations.

Indoor natural gas operations are typically monitored to maintain safety conformance outside the lower and upper explosion limits (LEL and UEL). To add a natural gas operated transmitter in these cases, consideration should be made as to the extent of natural gas leak detection legacy to the installed transmitter. Placement of the transmitter should be such that detection and alarming surround any critical connections between the transmitter and the natural gas process.

If the natural gas driven transmitter is to be installed indoors with no legacy monitoring capabilities, additional consideration must be made to ensure the operating area is well-ventilated and the transmitter can be exhausted to process vent. Furthermore, monitoring with remote annunciation within LEL and UEL should be projected as an upgrade to the facility, concurrently with this installation. The transmitter installation must adhere to local environmental and safety regulations.

### **WARNING:**

*IPX<sup>2</sup> units installed in a natural gas application must have the natural gas vent properly connected. Failure to do so may result in an explosion. The –FR1 option should not be used with a flammable gas because it has a vent to atmosphere. A filter-regulator without a vent may be used. For natural gas certification to be valid, the vent system must be able to maintain <1psig.*

**Filters.** The IPH<sup>2</sup> and IPX<sup>2</sup> requires filtered, dry, regulated, instrument-quality air to prevent clogging and to ensure extended periods of maintenance-free operation. Moore Industries suggests the following levels of filtering protection:

- Pre-filter – A general purpose "rough" filter, used to reduce particulate matter to 5 microns in size. Also removes bulk liquids. Although not required, this filter is especially recommended to protect the 0.01 micron final filter when used.
- Final Filter – A second, final filter is recommended to remove particulate matter in sizes down to 0.01 micron. This filter removes virtually all condensable liquids from the air stream as well.
- Filter/Regulator Module Option – A combined filter/regulator assembly, the -FR1 Option, offered as an accessory for either the IPH<sup>2</sup> or IPX<sup>2</sup>, removes particles down to 0.01 microns, supplying regulated, instrument-quality air to the unit. This space-saving module is affixed to the supply port, and comes with a pressure gauge scaled in both psi (0-60) and Bars (0-4).

# IPH<sup>2</sup> & IPX<sup>2</sup>

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## Hazardous Location Applications

This section contains important information regarding installation of IPX<sup>2</sup> in hazardous locations.

Classification of the area and installation of the IPX<sup>2</sup> should be done in accordance with applicable electrical codes such as the United States National Electrical Code (NEC), and/or any other equivalent/ applicable internationally adopted standards and installation codes (CEC & IEC).

Refer to the Special Conditions outlined below before proceeding with installation.

## Safety Concerns

For your safety, read the following information carefully before proceeding with installation.

**WARNING:**  
**EXPLOSION HAZARD –**  
*For Division 2 Hazardous locations. **DO NOT** Disconnect equipment when a flammable atmosphere is present.*

**WARNING:**  
*Substitution of components is not allowed, as it may impair the intrinsic safety (Zones 0 & 1, Division 1) of the unit and/or the non-incendive/Type N (Division 2, Zone 2) circuit. **DO NOT** open the unit when either energized or when an explosive gas/dust atmosphere is present. Disconnect power before servicing. Read and understand the Manufacturer's installation and Operating procedures, and adhere to all applicable electrical codes, safety instructions and regulations.*

**Avertissement:**  
*Ouvrir le circuit avant d'enlever le couvercle. La substitution de composants peut compromettre la sécurité intrinsèque. Un scellement doit être installé à moins de 457mm du boîtier. En Classe 1, Division 2, ce produit doit être installé conformément 170-775-00.*

## Special Conditions of Use

The following instructions must be adhered to when the Model IPX<sup>2</sup> is used in hazardous locations and potentially explosive atmospheres.

### cCSAus Installations

#### Intrinsically Safe Applications

Class I, Div. 1 & 2, Groups A, B, C & D  
Class II & III, Div 1 & 2, Groups E, F, & G  
Class1, Zone 0, AEx ia IIC, Ex ia IIC

The Model IPX<sup>2</sup> shall be supplied by a Class 2 or SELV Limited Circuit as defined by CAN/CSA # 1010.1 Annexes F.2.1 and H.

The Model IPX<sup>2</sup> must be installed by drawing 100-100-78.

#### Explosion/Flame Proof Applications

Class I, Division 1, Groups A, B, C & D  
Class II & III, Div 1 & 2, Groups E, F, & G  
Class I, Zone 1, AEx d IIC, Ex d IIC

The Model IPX<sup>2</sup> shall be supplied by a Class 2 or SELV Limited Circuit as defined by CAN/CSA # 1010.1 Annexes F.2.1 and H.

#### Nonincendive, Type n Applications

Class I, Division 2, Groups A B, C & D  
Class1, Zone 2, AEx nA IIC, Ex nA IIC

The Model IPX<sup>2</sup> shall be supplied by a Class 2 or SELV Limited Circuit as defined by CAN/CSA # 1010.1 Annexes F.2.1 and H.

Installation of Model IPX<sup>2</sup> with the –NG Option in a Class I, Division 2 classified area requires the use of wiring and venting methods applicable for Class I, Division 1 Hazardous 'Classified' Locations. Venting the IPX<sup>2</sup> with the –NG Option to an approved continuous ignition flare system, or to a Class I, Division 1 Hazardous 'Classified' Area which provides minimum back-pressure to the device, must be utilized. Vent piping and electrical conduits must be designed and installed using approved good engineering practices.

## European Union Installations

(ATEX 2014/34/EU Directive)

### Intrinsically Safe Applications - Zone 0

#### II 1 G Ex ia IIC T4 Ga

The enclosure is manufactured from 6063-T5 Aluminum alloy. In rare cases, ignition sources due to impact and friction sparks could occur. This shall be considered during installation, particularly if the equipment is installed in a Zone 0 location.

The IPX<sup>2</sup> has the the following safety parameters when input terminals are connected to a linear, resistive barrier:

Ui = 30Vdc, Ii = 110mA, Pi = 0.825W, Ci = 720pF, Li = 5.12μH.

The IPX<sup>2</sup> is to be installed per Field Installation Drawing, 100-100-78.

### Flame Proof Applications - Zone 1

#### II 2 G Ex d IIC T4 Gb

#### II 2 D Ex tb IIIC T127°C Db

The stopping plugs must not be used with a thread adapter/reducer.

Model IPX<sup>2</sup> with the –NG Option (Natural Gas as the input medium) is excluded.

### Type n Applications - Zone 2

#### II 3 G Ex nA IIC

On installation, the Model IPX<sup>2</sup> shall be provided with supply transient protection external to the apparatus such that the voltage at the supply terminals of the IPX<sup>2</sup> does not exceed 119V peak or 119Vdc.

Model IPX<sup>2</sup> with the –NG Option (Natural Gas as the input medium) is excluded.

## Australia New Zealand ANZEx Installations

When the apparatus is used in a Zone 0 environment it is a condition of safe use that the apparatus shall

be protected from impact.

### Intrinsically Safe Applications

Certificate No.: ANZEx 09.3000X

Standards:

AS/NZS 60079.0:2005 Explosive atmospheres - Equipment - General requirements

AS/NZS 60079.11:2006 Explosive atmospheres - Equipment protection by intrinsic safety 'i'

### Type n Applications

Certificate No.: ANZEx 09.3000X

Standards:

AS/NZS 60079.0:2005 Explosive atmospheres - Equipment - General requirements

AS/NZS 60079.15:2006 Explosive atmospheres - Equipment protection by type of protection 'n'

## Operation

Once the unit has been configured and installed, it operates unattended with the exception of the minor maintenance procedures that are described in the next section.

If the unit is determined to be the cause of a loop irregularity, carry out the maintenance procedure in the next section of this manual. If problems persist, refer to the Troubleshooting Section.

**Instrument-quality Air.** Air from the application continuously flows through the IPH<sup>2</sup>/IPX<sup>2</sup> during operation. Depending upon the purity of the air supply, the unit's internal assembly may have to be removed and cleaned to ensure continued optimum performance.

Initially, random checks can help establish a satisfactory internal maintenance geared to the user's air supply cleanliness. Refer to the next section for instruction on the disassembly and cleaning of your unit.

## Maintenance

For most applications, no maintenance outside of routine inspection and calibration of the IPH<sup>2</sup> or IPX<sup>2</sup> will be necessary. These units are designed to work unattended for up to six months with little change in accuracy.

# IPH<sup>2</sup> & IPX<sup>2</sup>

Current-to-Pressure  
(I/P) Transmitters

## Troubleshooting the IPH<sup>2</sup> & IPX<sup>2</sup>

If a problem is suspected with the IPH<sup>2</sup> or IPX<sup>2</sup>, review the following steps:

1. Verify that bench instruments used to take measurements have the proper range and accuracy and are within current certification period limits.
2. If a change in the relationship between the input and output is detected, attempt a re-calibration of the unit.
3. If the response time lengthens, or if the span drops, check the system for a blockage due to air supply contamination. Please refer to Maintenance section for details of replacing filters, electronic modules and drain checking.

If the unit needs to be returned for service, the complete valve assembly can be removed from the housing for replacement without disturbing the connections to the housing. Contact customer service for details.

## Drain Check

System filters (not IPX<sup>2</sup>/IPH<sup>2</sup> filters) have automatic drains that depend on the fluctuation of system pressure to induce drainage. A stable system may not drain efficiently. Check periodically for clogs and drain system's filters by pushing the drainage valve with a small probe or wire.

## IPX<sup>2</sup> Replacement Modules\*

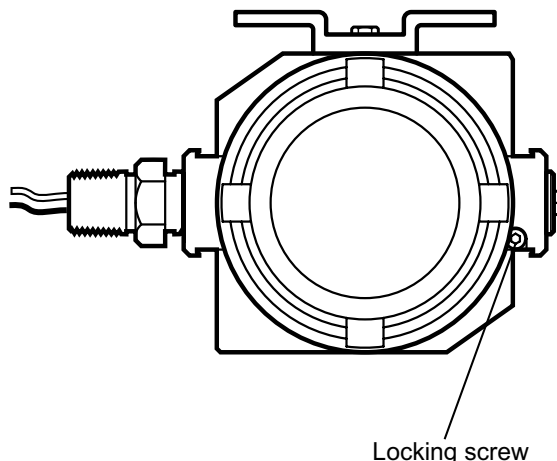
\*This applies only to new versions of the IPX<sup>2</sup> introduced in 2013.

In abnormal operating conditions in which a slug (liquid) is present in the IPX<sup>2</sup> air/ gas supply, the electronic module may be removed. This can help in

the recovery of the unit, by allowing any accumulated liquid to drain out more effectively. To remove the module follow these steps:

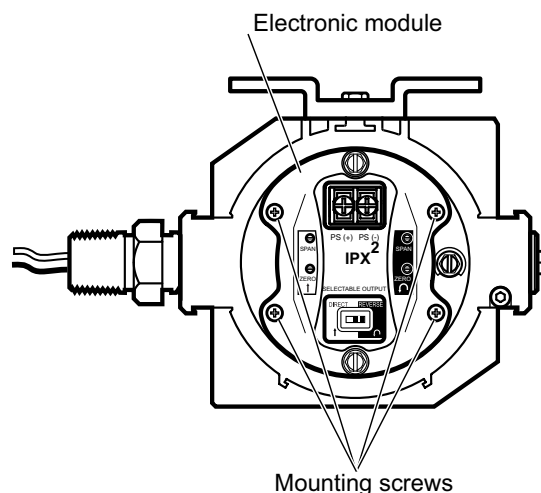
1. Use a 3mm Allen wrench to unlock the cover. Drive the Allen screws clockwise until the cover is allowed to rotate freely. Remove the cover by accessing the locking screw shown in Figure 6.

Figure 6. Unlocking the IPX<sup>2</sup> Cover



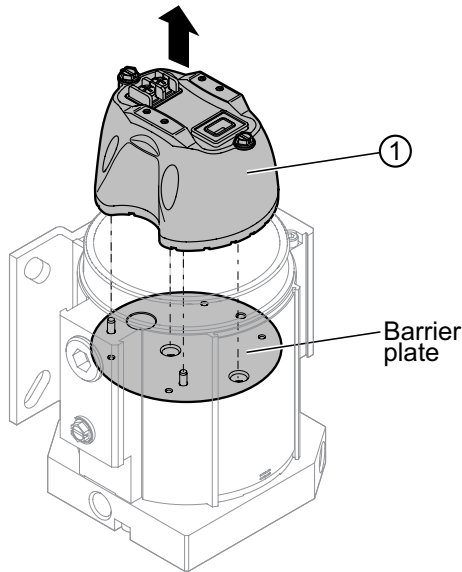
2. Use a Phillips head screw driver to remove the four module mounting screws shown in Figure 7.

Figure 7. Removing Mounting Screws



3. Carefully, pull the module from the housing. The pneumatic stem, found on the bottom of the module, is fragile; handle with care. See Figure 8.

**Figure 8.** Removing Module from Housing



Item	P/N	Description	Qty
①	208-876-00	Module	1

4. Inspect the module and the barrier plate for any signs of contamination. Remove any excess liquid and allow to dry before replacing. The electronic module is not field-serviceable. If irreparable damage is found, it may be replaced. See Data Sheet for ordering information.
5. To re-assemble, replace the module using locating pins (see step 3), tighten the 4 module screws (see step 2), replace the cover and secure with the locking screw (step 1).
6. Recalibrate the unit before returning to service. Refer to the Calibration Section of this manual for instructions.

## Customer Service

Moore Industries is recognized as the industry leader in delivering top quality to its customers in products and services. We perform a battery of stringent quality assurance checks on every unit we ship. If any Moore Industries product fails to perform up to rated specifications, call us for help. Our highly skilled staff of trained technicians and engineers pride themselves on their ability to provide timely, accurate and practical answers to your process instrumentation questions.

Factory phone numbers are listed on the back cover of this manual.

If problems involve a particular IPH<sup>2</sup>/IPX<sup>2</sup>, there are several pieces of information that can be gathered **before you call the factory** that will help our staff get the answers you need **in the shortest time possible**. For fastest service, gather the complete model and serial number(s) of the problem unit(s) and the job number of the original sale.

# IPH<sup>2</sup> & IPX<sup>2</sup>

Current-to-Pressure  
(I/P) Transmitters



## DO NOT SCALE DRAWING

TOLERANCES (UNLESS NOTED)	DRAWN	CHECKED	ENGINEER	SCALE
DECIMALS = ±1/100 .X .XX .XXX HOLES ANGLES	C. Whon	V. Garcia	R. Toledo	NONE
±.1 / 2.54 ±.01 / 0.25 ±.005 / 0.125 ±.003 / 0.080 ±.1 / 2°	2/12	2/12	2/12	

CATEGORY CONTROL DRAWING

DRAWING NUMBER 100-100-78 SHEET 1 of 3 REVISION D

### Field Installation Diagram: IPX2 Air (Standard) Intrinsically Safe System

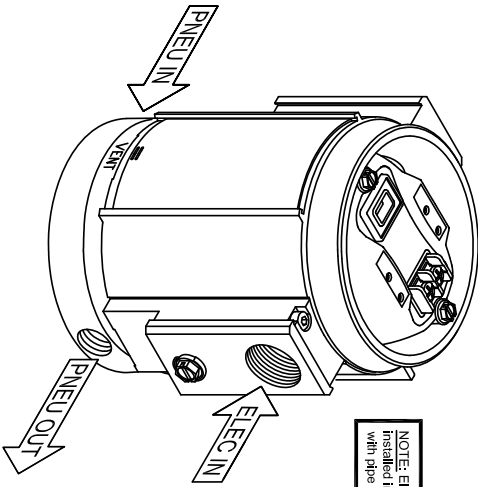
REVISION BY DATE APPROVAL  
ECO 17671 08/15 CW CR

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Hazardous Area / Explosive Atmosphere

### Model IPX2 (Air - Standard)

Cover removed for clarity

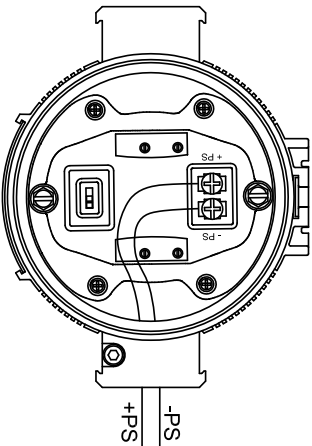


NOTE: Electrical Connection may be installed in either IPX2 conduit port with pipe plug installed in opposite.

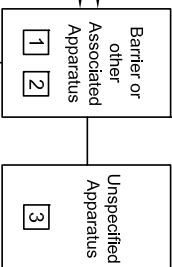
### -- WARNING --

Substitution of components may impair Intrinsic Safety.  
To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.

Cover removed for clarity



Non-Hazardous Area



Ground/Earth Path Resistance  
Must Not Exceed 1 Ω  
(Barrier must be Agency approved)

### -- NOTE --

SEE SHEET 3 FOR INSTALLATION NOTES  
Installation may only be carried out by suitably trained personnel and in accordance with national wiring regulations or codes of practice.

Entity Parameters	Ca or Co, 2, CI + Ccable La or Lo, 2, LI + Lcable UI or Vmax, 2, Voc or VI PI, 2, Po
Associated Apparatus	

NOTE: If Ca of the Associated Apparatus is greater than 3µF, then the total cable capacitance shall be limited to 3µF.

Must use +95°C suitable wiring  
North America installations only:  
Seal all conduits within 18"

Environmental Protection	Air / Standard	IP66 & Type 3X
--------------------------	----------------	----------------

### Entity Parameters

ccSaus	ANZEX Scheme
--------	--------------

Vmax or UI = 30 Vdc  
Imax or II = 110 mA  
Pmax or PI = 0.825 W  
CI = 720 pF  
LI = 5.12 µH

### ATEX Directive Entity Parameters

Vmax or UI = 30 Vdc  
Imax or II = 110 mA  
Pmax or PI = 0.825 W  
CI = 720 pF  
LI = 5.12 µH

### Certified Product

This is a controlled 'Related' or 'Schedule' drawing. No modifications are permitted without the notification and final approval of the Certification Engineer (related dwgs.) or the Certifying Agency (schedule dwgs.)





DO NOT SCALE DRAWING			
TOLERANCES (UNLESS NOTED)	DRAWN	C. Whelan	2/12
	CHECKED	See Sht. 1	
	ENGINEER	See Sht. 1	
	SCALE	NONE	
	ANGLES	±1/2°	

CATEGORY	TITLE
CONTROL DRAWING	Field Installation Diagram: IPX2 -NG Option Intrinsically Safe System

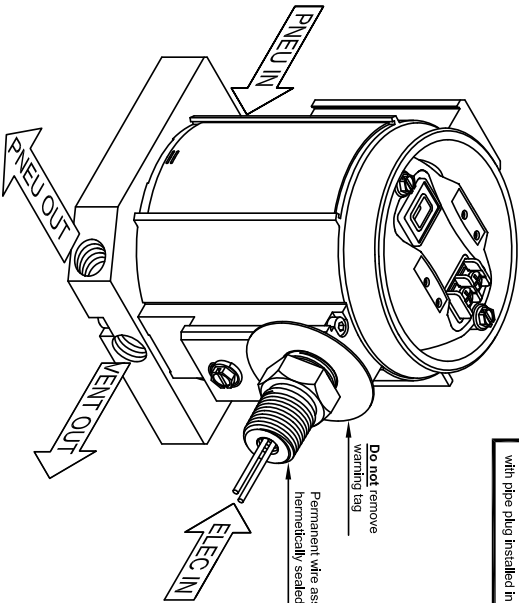
DRAWING NUMBER	SHEET 2 of 3		REVISION
100-100-78			D
REVISED BY	DATE	BY	APPROVAL
SEE SHEET 1			

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Hazardous Area / Explosive Atmosphere

Model IPX2-NG Option (Natural Gas)

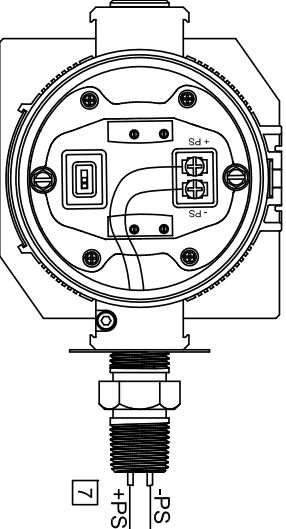


Cover removed for clarity

\*NOTE: The N-NG seal fitting may be installed in either IPX2 conduit port with pipe plug installed in opposite.

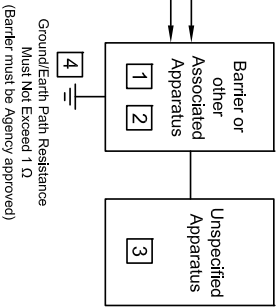
-- WARNING --

Substitution of components may impair intrinsic safety. To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.



Cover removed for clarity

Non-Hazardous Area



Ground/Earth Path Resistance  
Must Not Exceed 1 Ω  
(Barrier must be Agency approved)

Entity Parameters	Ca or Co ≥ Ci + Ccable
Associated Apparatus	Li or Lo ≥ Li + Lcable
Associated Apparatus	Uo or Vmax ≥ Vcc or Vi
Associated Apparatus	PI ≥ Pto

NOTE: If Ca of the Associated Apparatus is greater than 3µF, then the total cable capacitance shall be limited to 3µF.

Entity Parameters	Entity Parameters
ccSaus	ANZEX Scheme
Vmax or Ui = 30 Vac	Ui = 30 V
Imax or Ii = 110 mA	Ii = 110 mA
Pmax or Pi = 0.825 W	PI = 0.825 W
CI = 720 pF	CI = 5.7 µF @ 7.14 V
LI = 5.12 µH	LI = 0 mH

Environmental Protection	ATEX Directive Entity Parameters
-NG Option	Natural Gas
IP66 & Type 4X	Vmax or Ui = 30 Vac
	Ii = 110 mA
	Pmax or Pi = 0.825 W
	CI = 720 pF
	LI = 5.12 µH

SEE SHEET 3 FOR INSTALLATION NOTES	SEE SHEET 3 FOR INSTALLATION NOTES
Installation may only be carried out by suitably trained personnel and in accordance with national wiring regulations or codes of practice.	Installation may only be carried out by suitably trained personnel and in accordance with national wiring regulations or codes of practice.
-NG Option (Natural Gas) Area Classification	"T" Rating
Intrinsically Safe	Class I, II, III Div. 1, 182 Gps. A-G T4/T5/T6
Ex ia IIC T4/T5	Zone 0, AEx ia IIC / Ex ia IIC T4/T5/T6
Ex ia IIC T4/T5	Zone 1, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 2, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 3, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 4, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 5, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 6, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 7, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 8, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 9, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 10, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 11, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 12, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 13, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 14, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 15, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 16, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 17, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 18, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 19, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 20, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 21, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 22, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 23, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 24, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 25, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 26, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 27, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 28, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 29, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 30, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 31, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 32, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 33, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 34, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 35, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 36, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 37, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 38, AEx ia IIC T4/T5
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Ex ia IIC T4/T5	Zone 40, AEx ia IIC T4/T5
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Ex ia IIC T4/T5	Zone 47, AEx ia IIC T4/T5
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Ex ia IIC T4/T5	Zone 72, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 73, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 74, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 75, AEx ia IIC T4/T5
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Ex ia IIC T4/T5	Zone 98, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 99, AEx ia IIC T4/T5
Ex ia IIC T4/T5	Zone 100, AEx ia IIC T4/T5

This is a controlled 'Related' or 'Schedule' drawing. No modifications are permitted without the notification and final approval of the Certification Engineer (related drawings) or the Certifying Agency (schedule drawings).

# IPH<sup>2</sup> & IPX<sup>2</sup>

Current-to-Pressure  
(I/P) Transmitters

		<b>DO NOT SCALE DRAWING</b>		CATEGORY		DRAWING NUMBER		REVISION	
		TOLERANCES (UNLESS NOTED) DECIMALS = ±0.01 mm FRACTIONS = ±1/32" HOLES = ±0.0031" / 0.080 ANGLES = ±1/2°		DRAWN C. Whan 2/12		TITLE <b>Field Installation Diagram: IPX2 (Air &amp; -NG Option) Intrinsically Safe System</b>		REVISED BY SEE SHEET 1 DATE BY APPROVAL	

## Installation Notes:

1. The Associated Apparatus must be Agency Approved for installations in the U.S.; Canadian Approved for installations in Canada and ATEX Certified for installations in Europe.
2. Associated apparatus manufacturer's installation drawing must be followed when installing this equipment.
3. The control room equipment (unspecified apparatus) connected to the Associated Apparatus must not generate more than 250 Vrms or Vdc, or the marked Um on the associated apparatus, whichever is less.
4. Installations in the U.S. shall be in accordance with ANSI/ISA RP12.06.01 "Installation of Intrinsically Safe Systems for Hazardous (Classified) Locations" and the latest edition of the National Electrical Code (ANSI/NFPA 70). Resistance between Intrinsically Safe Ground and earth ground must be less than 1.0 Ohm.
5. Installation in Canada shall be in accordance with the latest edition of the C22.1 Canadian Electrical Code, Part I.
6. Installation in Europe shall be in accordance with the latest editions of the wiring practices for the country of origin and EN 60079-14.
7. The Entity Concept allows interconnection of associated apparatus and intrinsically safe apparatus when the following is true: Uo ≤ Ui, Io ≤ Ii, Po ≤ Pi, Co Ci + Ccable; Lo Li + Lcable.
8. No revision is allowed to this drawing without prior SIRPA Approval.

## -- WARNING --

Substitution of components may impair Intrinsic Safety.  
To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.

Where English is not a language of the Country in which the equipment is being used, please apply to Moore Industries International, Inc. (MII) for a suitable translation.

Installation may only be carried out by suitably trained personnel and in accordance with national wiring regulations or codes of practice.

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## Certified Product

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## RETURN PROCEDURES

**To return equipment to Moore Industries for repair, follow these four steps:**

1. Call Moore Industries and request a Returned Material Authorization (RMA) number.

### Warranty Repair –

If you are unsure if your unit is still under warranty, we can use the unit's serial number to verify the warranty status for you over the phone. Be sure to include the RMA number on all documentation.

### Non-Warranty Repair –

If your unit is out of warranty, be prepared to give us a Purchase Order number when you call. In most cases, we will be able to quote you the repair costs at that time. The repair price you are quoted will be a "Not To Exceed" price, which means that the actual repair costs may be less than the quote. Be sure to include the RMA number on all documentation.

2. Provide us with the following documentation:
  - a) A note listing the symptoms that indicate the unit needs repair
  - b) Complete shipping information for return of the equipment after repair
  - c) The name and phone number of the person to contact if questions arise at the factory
3. Use sufficient packing material and carefully pack the equipment in a sturdy shipping container.
4. Ship the equipment to the Moore Industries location nearest you.

The returned equipment will be inspected and tested at the factory. A Moore Industries representative will contact the person designated on your documentation if more information is needed. The repaired equipment, or its replacement, will be returned to you in accordance with the shipping instructions furnished in your documentation.

#### WARRANTY DISCLAIMER

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#### RETURN POLICY

For a period of thirty-six (36) months from the date of shipment, and under normal conditions of use and service, Moore Industries ("The Company") will at its option replace, repair or refund the purchase price for any of its manufactured products found, upon return to the Company (transportation charges prepaid and otherwise in accordance with the return procedures established by The Company), to be defective in material or workmanship. This policy extends to the original Buyer only and not to Buyer's customers or the users of Buyer's products, unless Buyer is an engineering contractor in which case the policy shall extend to Buyer's immediate customer only. This policy shall not apply if the product has been subject to alteration, misuse, accident, neglect or improper application, installation, or operation. THE COMPANY SHALL IN NO EVENT BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES.



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