



PIT

Pressure-to-Current Transmitter

USER'S MANUAL

October 1992

No. 218-703-00 K

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Introduction

The version of Moore Industries' Pressure-to-Current Transmitter, packaged in the DIN-style or our Standard (STD) housing is called the PIT. The PIT is used to effect proportional changes in the current of a 4-20 mA process instrumentation loop, based on changes in pneumatic input.

This manual contains the information necessary to calibrate, install, operate, maintain, and troubleshoot the PIT. It includes a brief description, a table of performance and operational specifications, and an explanation of Moore Industries' model/serial number-based product data tracking system.

An appendix provides information needed for installing the PIT in hazardous environments. Such installations require one of the available Intrinsic Safety (IS) options, described later.

Where they appear in text or figures, "NOTES" are used to draw attention to practices that could otherwise result in inconveniences to the user. "CAUTIONS" call out information that, if ignored, could result in damage to the unit, and "WARNINGS" point out aspects of installation or operation that require special attention. Unheeded warnings could result in personal injury.

Description

The PIT is available in either a 2-wire or 4-wire configuration. It accepts variable, instrument-quality, pneumatic input and converts it proportionally to current output in a 4-20 mA range. As input pressure increases, output increases proportionally toward 20 mA. Inversely, as pressure decreases, output drops.

The unit is configured at the factory, according to customer specification, to accept pneumatic input in any one of several ranges. It can function in a single-instrument loop or together with several PIT's inter-connected in a pneumatic system.

The available housing styles for the PIT, which include several versions of both the Hockey-puck (HP) and Standard (STD) type, afford the user with a wide variety of mounting options.

Contact your Moore Industries' Sales Representative for more information on available mounting hardware and options.

The DIN-style PIT. This type of PIT is a compact, 2-wire unit in an all-aluminum, DIN-style package. It mounts on 35 mm, G-type DIN rail (EN50035), and is ideal for use in applications where mounting space is limited.

An interlocking, self-sealing, pneumatic mounting block is available with the DIN-style PIT, to allow the user to remove the unit without having to disconnect the supply line. When used, the supply line is connected to the mounting block, the block snaps on to the DIN rail, and the unit's transmitter section plugs in to the block.

The mounting block can be ordered with its pneumatic port machined into either its bottom or rear surfaces. The port is female, and measures 1/4-14 NPT. The dimension of the pneumatic orifice inside the port, and the male fitting on the back panel of the transmitter itself, is approximately 3.2 mm (1/8 in).

The connection terminals for the 4-20 mA process throughput (loop power) consist of screw-secured sockets on the front panel of the transmitter section.

The STD PIT. As its name suggests, this PIT is packaged in Moore Industries' standard, aluminum housing, the STD. It is typically ordered when the application calls for a 4-wire unit, although a loop-powered (2-wire, 12-42 Vdc) STD PIT is also available.

The 4-wire version of the STD PIT requires an external source of power. Units are factory-configured according to customer order, and are rated for 117, 220, or 240 Vac power.

The pneumatic input connection is located on the bottom of the STD PIT. It is a female port measuring 1/4-14 NPT.

The unit's electrical connection terminals are located on the front panel of the housing in two, screw-type terminal strips.

Table 1 lists the PIT operational and performance specifications.

Table 1. PIT Operational and Performance Specifications

Characteristic	Specifications
Input	<p>Factory-configured. Instrument-quality air input only.</p> <p>0-15 psig 3-15 psig 3-27 psig 6-30 psig 0-100 psig 20-100 kPa (0.2-1 bar, 0.2-1 kg/cm²) 20-186 kPa</p> <p>Input Pressure Maximum: 150% of rated full-scale input without damage.</p>
Output	<p>4-20 mA</p> <p>Output Limit: 130% of output span.</p>
Power	<p>Factory-configured.</p> <p>12-42 Vdc (standard for 2-wire, loop-powered PIT) 12-24, 12-28, or 12-30 Vdc (required for units equipped with some intrinsic safety options) 117, 220, or 240 Vac (AC-powered units available in 4-wire, STD housing only)</p>
Controls	<p>Zero: Multiturn pot electronically provides offsets of $\pm 10\%$ of span.</p> <p>Span: Multiturn pot electronically provides adjustability to full-scale for 100% of output span.</p> <p>Zero and Span pots are non-interactive.</p>
Performance	<p>Accuracy: Error less than $\pm 0.2\%$ of unit span, including the combined effects of independent linearity. Independent linearity defined per SAMA standard PMC 20.1-1973.</p> <p>Repeatability: $\pm 0.1\%$ of input span.</p> <p>Resolution: $\pm 0.05\%$ of input span.</p> <p>Response Time: 10 milliseconds to reach 98% of output for each step change on input.</p> <p>Load Capability: 600 at 24 Vdc nominal.</p> <p>Load Effect: $\pm 0.01\%$ of rated span from zero to maximum rated load.</p> <p>Output Ripple: Negligible.</p> <p>Power Supply Line Voltage Effect: Less than $\pm 0.01\%$ of rated span per volt of change in line voltage at power input terminals for 2-wire units. Less than $\pm 0.005\%$ per 1% of voltage change for 4-wire units.</p> <p>RFI/EMI Effect: Less than $\pm 0.1\%$ of rated span with field strengths of 10 V/m, at frequencies of 20-500 MHz. Options for additional RFI/EMI protection available for STD units.</p> <p>Vibration Effect: Negligible. Unit has no internal moving parts.</p> <p>Effect of Ambient Temperature: Less than $\pm 2\%$ of full-scale input over the specified ambient temperature operating range.</p>
Environmental Ratings	<p>Ambient Temperature Operating Range: -1 to 54 °C (30 to 130 °F).</p>
Weight	<p>DIN-style: Approximately 275 g (9.7 oz) with pneumatic block installed, approximately 204 g (7.2 oz) as a stand-alone unit.</p> <p>STD: Approximately 354 g (12.5 oz) with angle bracket (AB housing option), approximately 156 g (5.5 oz) as a stand-alone unit.</p>
NOTES:	<p>1. Not all listed specifications are standard. Consult your Moore Industries' Sales Representative for information on pricing and availability.</p> <p>2. Refer to the Installation Section for PIX outline dimensions.</p>

Controls and Indicators

Both housing styles of the PIT have labeled potentiometers (pots) on their front panels for controlling unit zero and span.

The DIN-style PIT has a front panel LED that lights to indicate the presence of input pressure in the unit. This LED is also useful during calibration and unit operation. Refer to the Calibration Section of this manual for information regarding its use.

Options

The following list provides an overview of some of the PIT options. Complete information on mounting hardware and functional options, or currently available certifications and approvals is available from your Moore Industries Sales Representative. Users may also contact the factory directly at 1-800-999-2900 in the U.S.A.

IS(x) Option(s) – Intrinsic Safety. Units can be configured to comply with the requirements of several, independent IS certifications. Contact the factory, or your local Moore Industries' Sales Representative for information on the specific approvals available. The appendix of this manual provides information on the installation of some IS-equipped PIT's in applications calling for IS.

FA(x) Option(s) – Pneumatic Input Connection Location. Customer can specify the desired location, unit rear or bottom, for the pneumatic input port on the mounting block of the DIN-style PIT. FA1 and FA3 signify bottom panel, FA2 and FA4 mean the rear of the block. When units are equipped with the FA7 or FA8 Options, no terminal block is included. The pneumatic fitting is "male", with an approximate O.D. of 3.2 mm (1/8 in).

Available as part of the FA3, FA4, and FA8 Options, the jack allows the user to connect pneumatic testing or monitoring equipment (not included) to the DIN-style PIT without interrupting unit operation. Comes with Test Coupler for 6.4 mm (0.25 in) pneumatic line.

RF Option – Radio Frequency Interference (RFI) Protection. Filtered terminal block to provide RFI/EMI immunity in field strengths of 50 V/m – ABC = $\pm 0.1\%$ (tested according to SAMA Standard PMC 33.1). Available with STD units only.

RO Option – Reversed Output. Relationship between pressure input and current output is reversed. As pressure increases, current decreases proportionally.

RTB Option – Removable Terminal Block. Replaces the standard terminals on DIN-style units only.

Unit Data Tracking – Model/Serial Number. Moore Industries keeps a record of product information on every unit sold or serviced. This record is keyed to the unit model and serial numbers.

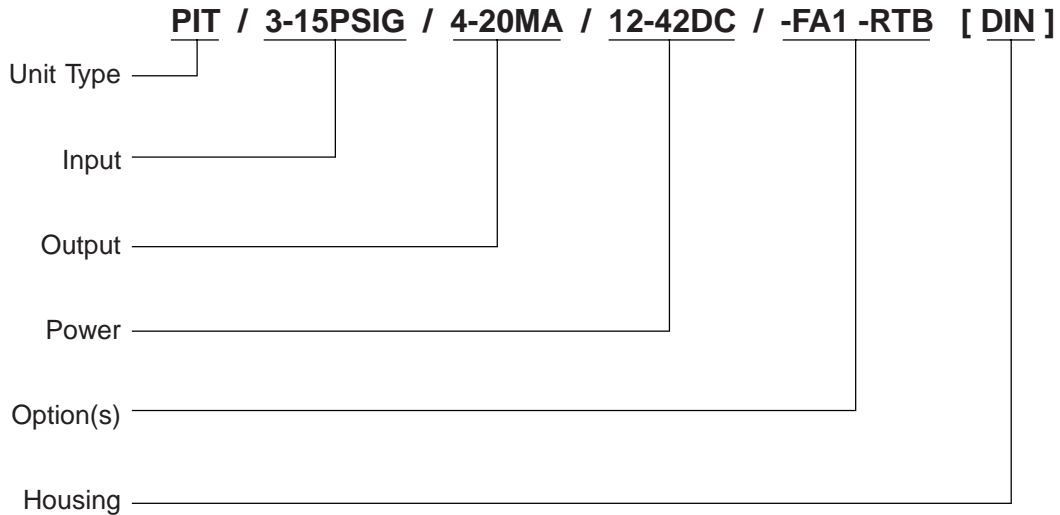
The serial and model numbers for the DIN-style PIT are printed on an adhesive label on the side panel of the housing. The numbers for the STD PIT are etched onto the L-shaped, metal tag located at the top of the terminal strips on the front panel of the housing.

The example on the following page shows a typical PIT model number, breaking out its data fields for illustration purposes. Refer to the example in deciphering the model number on your PIT.

If service assistance is ever required, make a note of the unit model number before contacting the factory. For fastest assistance, also note the unit serial number, job number, and the purchase order number under which it was shipped. This information assists the factory representative in providing you with the answers you need as efficiently as possible.

PIT

EXAMPLE



Calibration

Prior to shipment, every PIT is fully tested to ensure compliance with Moore Industries' strict quality control guidelines. Before installation, however, your PIT(s) should be bench checked in order to set and verify the desired operating levels.

The following procedures should be conducted in an environment considered appropriate for general testing of electronic and pneumatic equipment. It is recommended that the procedures in this section not be carried out in the field. Use a technician's bench or in a similar lab-type setup, so that any unit damage that may have occurred during shipment can be discovered safely, i.e., separated from the intended process or application.

Calibration Setup

Table 2 lists the equipment required to calibrate the PIT. This equipment is not supplied by Moore Industries, but should be available in most labs or maintenance areas.

Figure 1 shows the setup for 2-wire PIT's. Figure 2 shows the setup for 4-wire units.

WARNING

Do not supply power to 4-wire units until prepared to begin the procedures described in the next section. Always remember that potentially harmful voltages are present at the PIT's AC input terminals once power is present in the calibration setup.

Table 2. PIT Calibration Equipment

Equipment	Characteristics
Air Supply	Calibrated, adjustable, regulated, instrument-quality. Must be capable of discrete output levels within the appropriate, rated range of the unit under test. Refer to table 1, and to unit model number, for appropriate maximum/minimum specifications.
Air Pressure Gage	Calibrated. Accuracy of $\pm 0.05\%$, scaled as appropriate for the specified input of the unit being calibrated.
Power Source	Calibrated. 12-42 Vdc, capable of 4-20 mA output.
DC Voltmeter	Calibrated. Accuracy of $\pm 0.005\%$, minimum.
Precision Resistor	250 , $\pm 0.01\%$
Screwdriver	Slotted-tip. Head width of 2.54 mm (0.1 in), maximum.

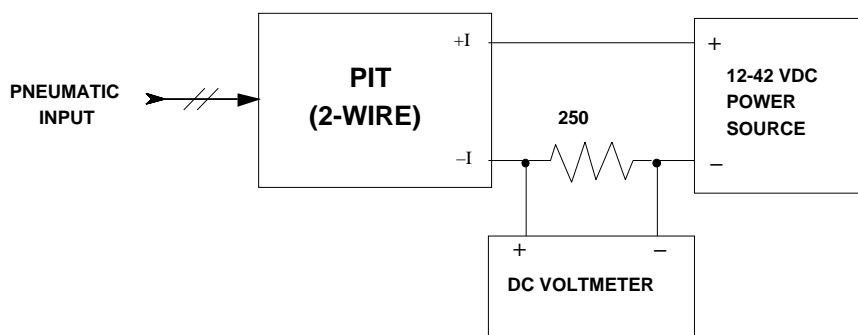


Figure 1. Calibration Setup for 2-Wire PIT's

If the unit being checked is equipped with a Test Jack (FA3, FA4, and FA8), the input pressure may be monitored during calibration. Note that connecting the appropriate measurement instrument to the PIT test jack fitting has no effect on pneumatic load.

When the setup is complete, apply appropriate input pressure and dc power (refer to table 1 and unit model number for specifications). Allow approximately 5 minutes for setup stabilization.

Calibration Procedure

The calibration of the PIT consists of the measurement of the voltage drop across a precision resistor when the input pressure in the setup is varied within the unit's rated span.

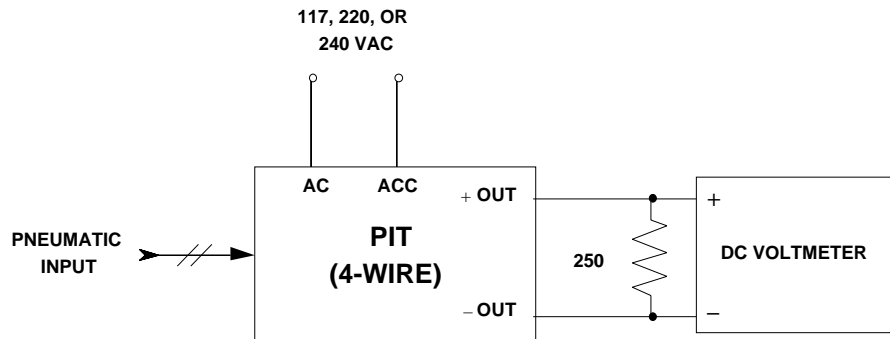
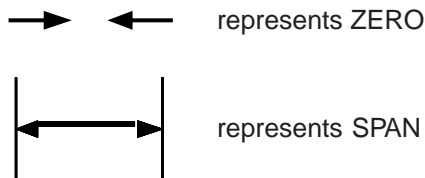


Figure 2. Calibration Setup for 4-Wire PIT's

Controls and Indicators. In both the DIN and STD housing styles, the zero and span adjustment pots are located on the unit front panel. The words “ZERO” and “SPAN” are used as labels for the pots on the STD unit front panel. In the case of the DIN PIT, they are represented symbolically with the following:



The Zero pot provides for offsets as great as $\pm 10\%$ of rated span. The Span pot adjusts unit full-scale to 100-percent at maximum input pressure.

The adjustment pots are not interactive. Neither setting is effected during the adjustment of the other.

To calibrate the PIT, make sure that the setup has been completed as described in the preceding section. Turn both adjustment pots fully counterclockwise (approximately 15 turns), then 7.5 turns clockwise. This approximates the mid-scale setting. They are each equipped with slip clutch mechanisms to prevent damage in case of over-turning.

The Front Panel LED. This indicator, part of the standard, DIN-style PIT, serves two functions. When the unit is supplied with power, it lights to show that pneumatic input is present. Also, the intensity of its light can be used as a simple indication of pressure level. When pressure is relatively low, the light is dim. Increasing pressure increases LED brightness.

It is recommended that the user become familiar with the location and manipulation of the PIT controls and indicators before performing unit calibration. Refer to the information discussed in the preceding paragraphs, and make sure to set up the calibration equipment as shown in the appropriate figure.

1. Set adjustable instrument air supply to 0% of rated input range. Refer to input field of unit model number, and explanation of model numbering system in Description Section, earlier in this manual.
2. Apply dc power.
3. Monitor voltmeter, and adjust ZERO pot for reading of 1 V.

CAUTION

Use of a screwdriver larger than that specified may damage the PIT housing.

4. Set adjustable instrument air supply to 100% of rated input range.

5. Monitor voltmeter, and adjust SPAN pot for reading of 5 V.
6. Verify correct settings by varying pneumatic input between 0 and 100%. Monitor voltmeter, noting a 1 V reading at 0% pneumatic input, and 5 V at 100% pneumatic input.
7. Verify proper operation of DIN-style LED. At lower input pressures, light is dim. As pressure increases, light brightens.

NOTE

DIN-style PIT's have front panel test jacks labeled "+T" and "-T". Once the unit is installed, a dc milliammeter may be connected to these terminals to verify proper current output, as indicated in the unit's model number, without removing the unit from the application.

Installation

Installation of the PIT is presented in this manual in three phases. The first phase is the physical mounting of the unit. Next is the pneumatic connections phase. Finally, electrical connections can be made. Information on multiple-unit hookups is included in this section.

Before installation, it is strongly recommended that each unit be bench checked. Refer to the instructions for this procedure in the Calibration Section, earlier in this manual.

Also, any requirements for intrinsic safety in the intended application must be considered.

Intrinsic Safety Considerations

Several of the available housing and enclosure options in which the PIT is available have been certified Intrinsically Safe by third party certifying agencies. Consult your Sales Representative for information on the specifics of each approval and with which configurations each is available.

When installing Moore Industries Intrinsically Safe (IS) devices in areas classified as "hazardous", adhere to the guidelines outlined in the appendix of this manual.

Physical Mounting of the PIT

The housing styles available for the PIT present a number of mounting options. The PIT should always be mounted in an area that is free of dust, moisture, and corrosive contaminants. The unit is designed to operate in high ambient temperatures, but when possible, mount it on a surface that will dissipate heat.

The DIN-style PIT. Figure 3 shows the outline dimensions for the DIN-style PIT. It is possible to mount the pneumatic block section of this type of PIT separately from the transmitter. In some cases this may be more convenient for the user.

The block is equipped with a self-sealing valve. If possible, install it in position on the DIN rail, then make the required pneumatic connections, and finally, clip the transmitter section into the block.

The STD PIT. This type of unit can make use of hardware for surface mounting, or bracketing inside several types of NEMA-style protective enclosures. Figure 4 shows the outline dimensions for the STD unit equipped with Angle Bracket hardware.

Pneumatic Connections

Before connecting a pneumatic input line to the PIT, ensure that the line is free of debris. To do this, separate the block and the transmitter, and apply high input pressure (up to 60 psig) to the line, then slowly open each valve to force loose debris out. Small pieces of foreign matter may flow out the valve while clearing the line. It may be necessary to remove the valve to clear larger objects like loose tape or pipe compound.

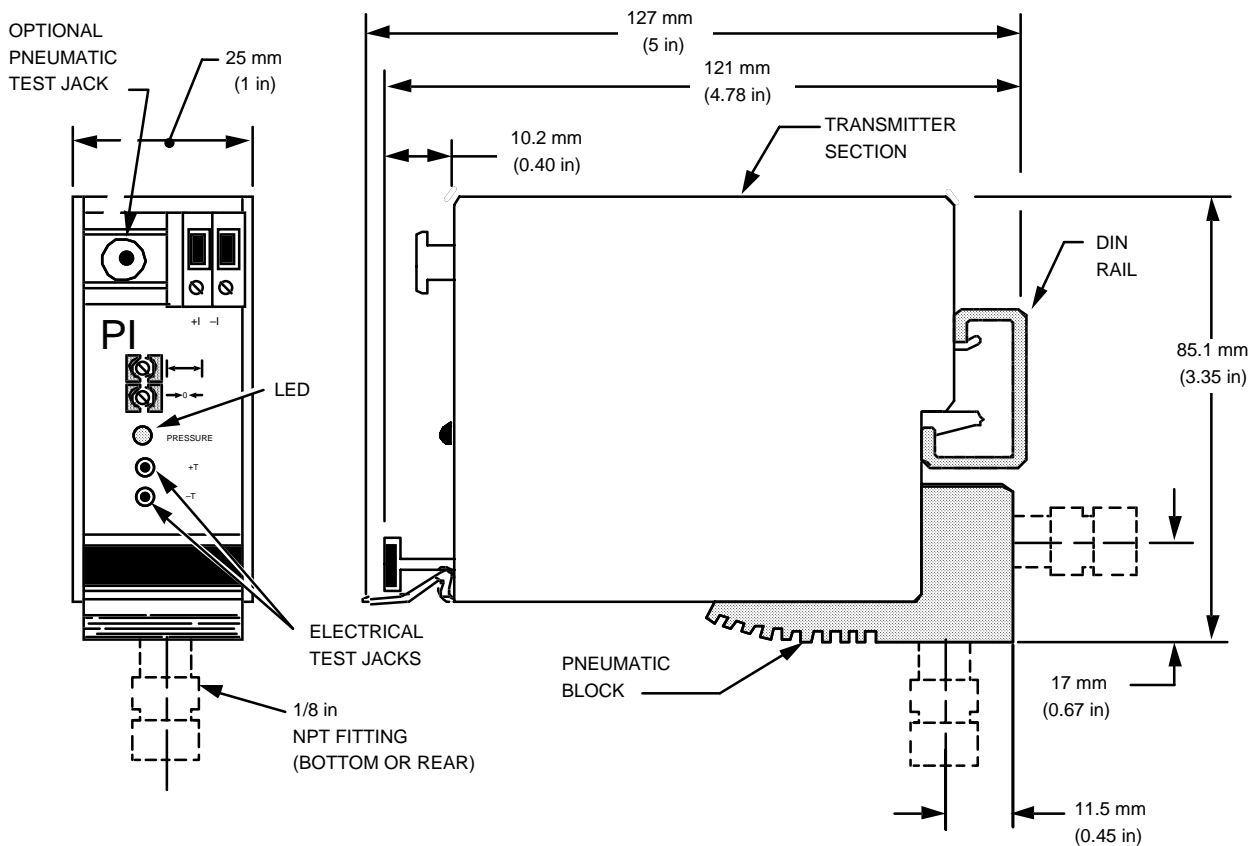


Figure 3. Mounting Dimensions for the DIN-style PIT

CAUTION

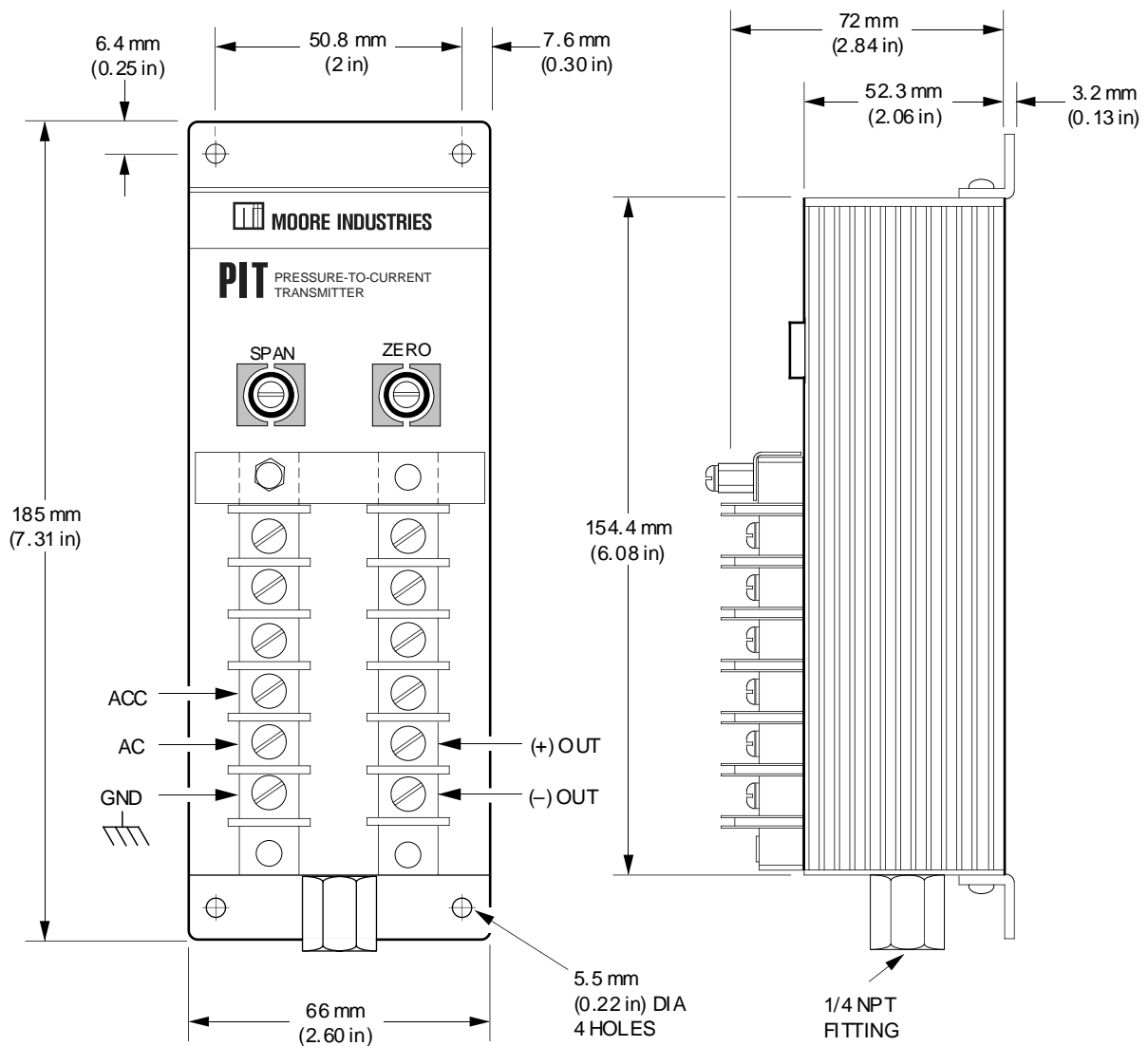
Air nozzles and valves should be lubricated before installation. Teflon® spray lubricant is recommended. If grease is used, exercise extreme care to ensure that it is kept out of the unit's air passage.

Electrical Connections

The electrical terminals on the PIT are clearly marked on the front panel of each unit. A medium-sized, slotted-tip screwdriver is required to complete the electrical connections.

For the DIN-style PIT use wire between 12 and 30 AWG for the electrical connections. Terminal lugs CANNOT be used with these units.

The electrical connections for the STD PIT can be made with terminal lugs of the appropriate size with wire sizes of 12 to 30 AWG.



NOTE: Output terminals on 2-wire units are labeled +I and -I, and the ACC and AC terminals are not used.

Figure 4. Mounting Dimensions for the STD-style PIT with Angle Bracket Mounting Hardware

The 2-wire PIT is loop-powered by 12-42 Vdc, standard. This loop-power is connected to the +I and -I terminals on the unit. The +I terminal is connected to the positive (+) side of the source. The -I terminal is connected in series with other loop-powered devices to the negative (-) side of the source.

CAUTION

Transmitters configured for intrinsic safety require a particular power source rating. Check model number of unit for appropriate dc power requirements.

PIT

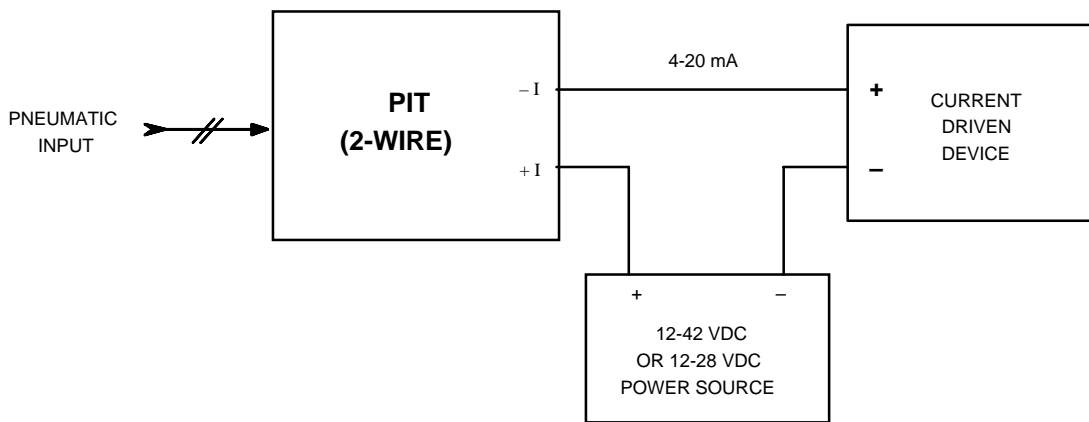
Figure 5 illustrates a typical 2-wire, hookup configuration. Make sure that units installed in IS applications are equipped with the appropriate IS Option.

The 4-wire PIT requires an external, ac power source of 117, 220, or 240 volts, specified when units are ordered. The model number shows the ac configuration for which the unit is set up.

Figure 6 illustrates a typical, 4-wire PIT hookup.

NOTE

The use of shielded, twisted-pair wiring is recommended for all low-level signal connections. Ground the shielding wire as close to the unit as possible.



NOTE: Refer to unit model number to verify power source requirement for IS installations.

Figure 5. 2-Wire PIT Hookup Diagram

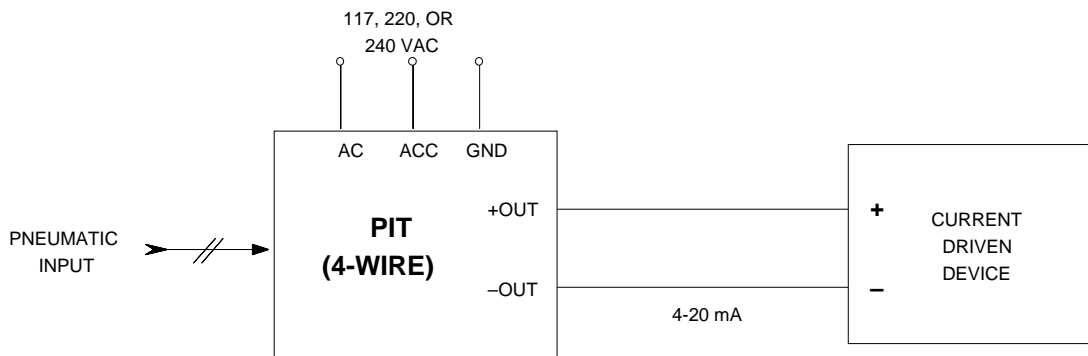


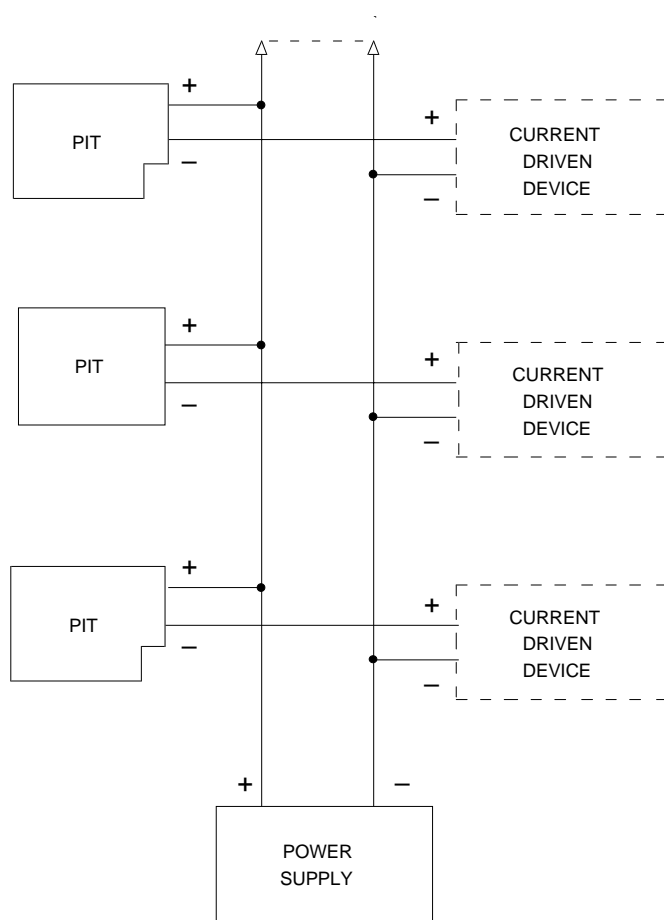
Figure 6. 4-Wire PIT Hookup Diagram

Multiple PIT Hookups

Some precautions must be taken when powering more than one 2-wire PIT with a single power source (loop-power). One side of the power source must be common to all PIT's in the system. The other side of the power source must be common to all loads.

Figure 7 is a diagram showing a typical hookup for multiple 2-wire units powered by a common source.

When using a single source to power multiple units, care must be taken to avoid ground loop problems due to the loads being at different potentials. If separate power supplies cannot be employed, contact your Moore Industries Sales Representative for assistance in selecting a compatible signal isolator.



NOTE: Refer to unit model number to verify power source requirement for IS installations.

Figure 7. Multiple Transmitter Hookup Diagram

PIT

Operation

Once properly installed, supplied with pneumatic input, and connected to load instrumentation in the process loop, PIT transmitters operate unattended.

If a unit is determined to be the cause of a loop discrepancy or malfunction, refer to the Troubleshooting Section of this manual for instructions.

Maintenance & Troubleshooting

PIT transmitters are built with highly reliable components and contain no moving parts. These two aspects ensure that these units operate reliably for extended periods of time.

Once installed and operating, the PIT requires no field maintenance other than an occasional visual inspection of the unit connection terminals and pneumatic connection. This inspection is recommended at least once every six months, or more frequently in those installations where the unit is subjected to extremes in vibration or dust and dirt.

Field troubleshooting of the PIT is limited to visual inspection of the housing, the pneumatic connections, and verification of specified signal response.

If problems arise in the function of the unit in its application,

- Make sure that input and output connections are clean and tight.
- Remove the unit from service and recalibrate, making sure that bench instruments used are properly calibrated.
- Verify loop power levels.

If, after re-calibration, the PIT fails to perform up to specifications, contact the factory Customer Service Department. Phone numbers of your local STAR Center are listed inside the front cover of this manual. Instructions for the return of the unit to the factory for further testing or rehab can be found on the back cover of this manual.

When calling for assistance, always remember to provide the Customer Service Representative with the model and serial number of the offending unit, and if possible, with the job number and the purchase order number under which the unit was ordered.



Declaration of Conformity

EMC Directive 89/336/EEC



Manufacturer's Name: Moore Industries-International, Inc.
Manufacturer's Address: 16650 Schoenborn Street
 North Hills, CA 91343-6196
 USA

Declares that the product(s):

Product Name: PIT [DIN]

MODEL	INPUT	OUTPUT	POWER	OPTIONS	HOUSING
-------	-------	--------	-------	---------	---------

Model Number(s): [DIN]	PIT	*	*	*	*-CE ¹	*
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*Indicates any input, output, power, option and housing as stated in the product data sheet.

Conforms to the following EMC specifications:

EN50081-2, 1993, Generic Emissions Standard, Industrial Environment.
 EN50082-2, 1995, Generic Immunity Standard, Industrial Environment.

Supplemental Information:

¹ RF filters are required for the CE option.

June 10, 1997

 Date

Fred Adt
 Quality Assurance Director

Robert Stockham
 Moore Industries-International, Inc.

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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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ANY CAUSE OF ACTION FOR BREACH OF ANY WARRANTY BY THE COMPANY SHALL BE BARRED UNLESS THE COMPANY RECEIVES FROM THE BUYER A WRITTEN NOTICE OF THE ALLEGED DEFECT OR BREACH WITHIN TEN DAYS FROM THE EARLIEST DATE ON WHICH THE BUYER COULD REASONABLY HAVE DISCOVERED THE ALLEGED DEFECT OR BREACH, AND NO ACTION FOR THE BREACH OF ANY WARRANTY SHALL BE COMMENCED BY THE BUYER ANY LATER THAN TWELVE MONTHS FROM THE EARLIEST DATE ON WHICH THE BUYER COULD REASONABLY HAVE DISCOVERED THE ALLEGED DEFECT OR BREACH.

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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