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Introduction

Moore Industries' loop-powered Potentiometer Transmitter, the PTX, is a device used to convert standard, three-wire potentiometer (pot) input to proportional current output.

This manual contains all of the information needed to calibrate, operate, and maintain the PTX. It also includes a brief description of the unit and its capabilities and options, a listing of unit specifications, and an overview of Moore Industries' unit data tracking system and labeling.

An appendix at the end of the manual provides the information required for installing the PTX 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. "WARNINGS" point out practices that, unless avoided, could result in personal injury.

Description

The PTX transmitter is available in either a DIN-style, or Moore Industries' hockey-puck (HP) housing. It measures variable resistive input by comparing input millivolts with the drop across an internal, precision voltage divider. It provides constant voltage excitation to a standard, 3-wire pot, and outputs a proportional 4-20 or 10-50 mA current based on the pot's wiper position. It accepts input from any 100 to 10,000 Ω , 3-wire pot.

The unit is loop-powered (12-42 Vdc). Some IS options require 12-24 or 12-28 Vdc powering. Refer to the Installation Section of this manual for information on unit electrical connections.

The available housing styles for the PTX, the HP- or DIN-style, afford the user with a wide variety of mounting options. In addition to the stand-alone unit, mounting hardware options include flanges for use with relay track or surface mount, explosionproof enclosures, and NEMA boxes. Consult with your Moore Industries' Sales Representative for more information on available mounting hardware options.

The HP-style PTX. This style of unit is intended to function as a modular replacement in applications where conduit and enclosures may already be in place, when a special enclosure is not required, or in applications where the DIN-style unit is not otherwise appropriate.

It is also available mounted in a separate, domed, explosionproof enclosure, secured inside with spring clips; no drilling or tapping is required. Other versions include hardware for surface mount and relay track installations.

The DIN-style PTX. This style snaps on to G-type DIN rails (DIN EN50035). It is most often used in applications requiring a large number of units in a relatively small space. Test jacks on the front panel allow for basic function checks without having to remove the PTX from the process loop.

Table 1 lists the performance and operational specifications for Moore Industries' PTX. Figure 1 shows the relationship between the power source used in a PTX application and the unit's load capability.

Controls and Indicators

Labeled pots to control unit zero and span are located on the front panel of both the DIN- and HP-style PTX. The Calibration Section of this manual describes how these pots can be adjusted. Specifications for adjustability appear in table 1.

Options

The following list provides an overview of some of the PTX 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 – Intrinsic Safety. Units equipped with options such as ISB and ISC are manufactured according to the specifications of third-party certifying agencies to meet various requirements for intrinsically safe installation in hazardous environments. Refer to the PTX data sheet, or consult the factory for information on current IS certifications.

PTX

Table 1. PTX Performance and Operational Specifications

Characteristic	Specifications
Input	3-wire potentiometer rated from 0-100 Ω to 0-10,000 Ω Sensor Current: 1 mA, maximum Range: Minimum span is 15% of pot value. Maximum offset for 0% is (100%* - 0%*) - 10% * pot value
Output	Factory-set: 4-20 mA or 10-50 mA, according to customer specification at time of order Limiting: 4-20 mA units limited to 30 mA, maximum 10-50 mA units limited to 65 mA, maximum
Power	12-42 Vdc Some IS options require other power ratings. Refer to appendix, or consult with your Moore Industries' Sales Representative for details. Maximum: Unit can sustain up to 60 Vdc without damage
Controls	Zero: Labeled pot on front panel provides adjustment to 0% of output span, ±10%, with 0% input Zero Range: Minimum zero is 15% of input pot value Span: Labeled pot on front panel adjusts full-scale to 100%
Performance	Accuracy: ±0.1% of span, including linearity and repeatability Load Capability: See figure 1 Loop Load (Line Voltage) Effect: ±0.002% of span per volt change, as measured at the input terminals Ambient Temperature Effect: ±0.01% of span per °F change
Environmental Rating	Recommended Ambient Operating Temperature Range: -29 to 82 °C (-20 to 180 °F)
Weight	HP-style: Approximately 141.8 g (5 oz) DIN-style: Approximately 224 g (7.9 oz)
NOTES: 1. Consult your Moore Industries' Sales Representative for information on specifications, pricing, and availability of options. 2. Refer to the Installation Section for PTX outline dimensions.	

RF Option – Radio Frequency and Electromagnetic Interference (RF/EMI) Filtering. Filtered terminals and case provides 50 V/meter - abc = 0.1% of full-scale span, when tested according to PMC SAMA Standard 33.1.

RTB Option – Removeable Terminal Block. Provides for unit replacement without wiring disconnect. Applicable to DIN-style PTX's 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.

On DIN-style PTX's, look for the model and serial numbers on one of the housing side panels. The label on HP-style units is found either on the unit back or front panel.

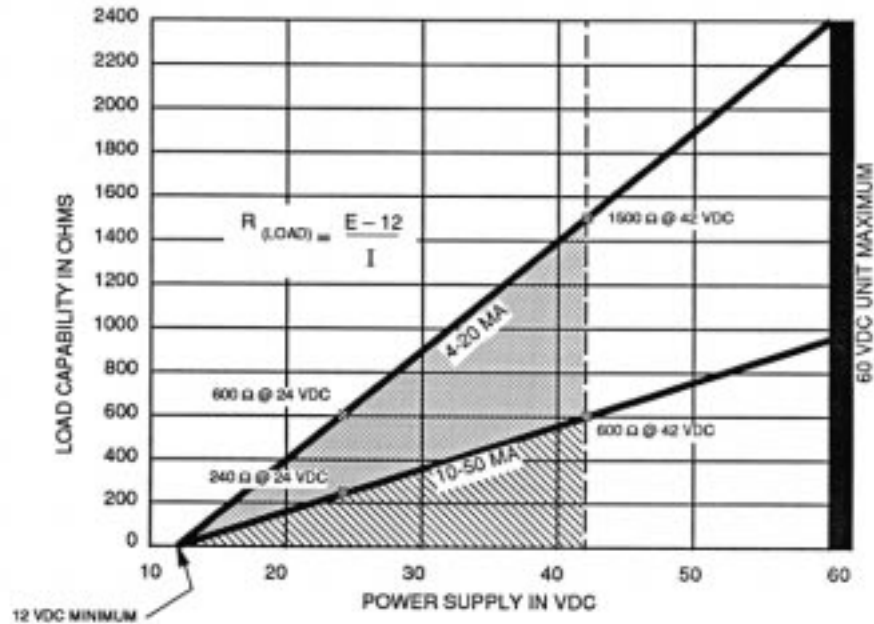


Figure 1. PTX Load Capability

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

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.

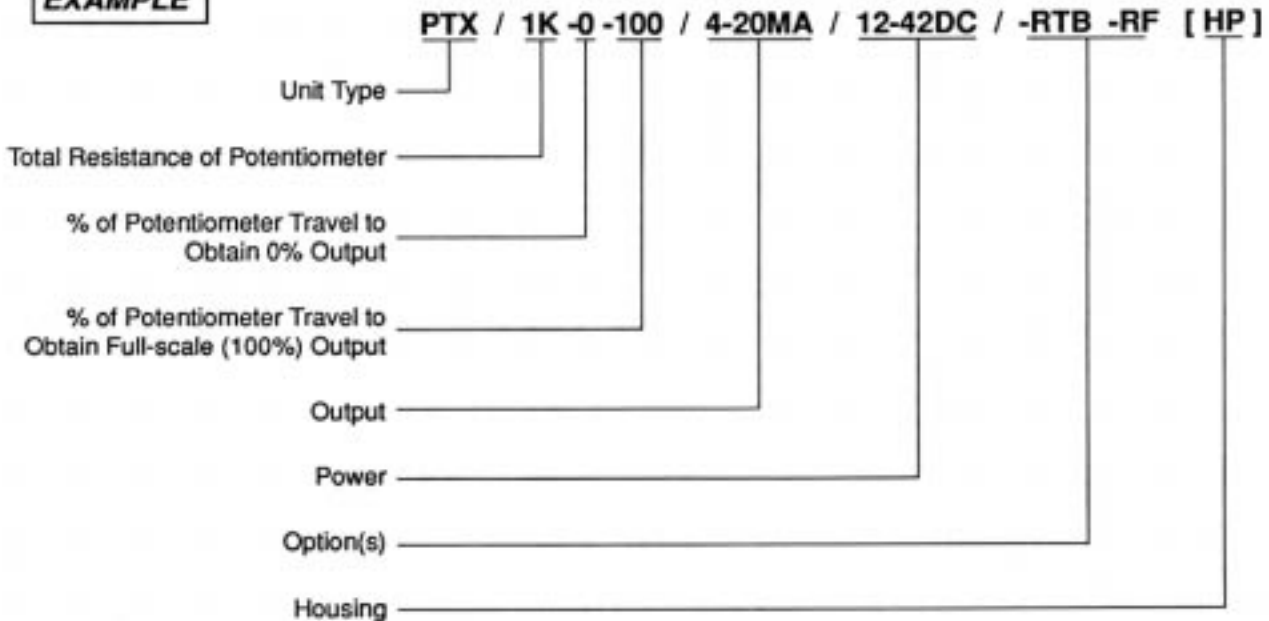
Calibration

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

This procedure 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.

PTX

EXAMPLE



Calibration Setup

Table 2 lists the equipment you will need to calibrate the PTX. These items are not supplied by Moore Industries, but should be available in environments qualified to perform the procedure.

The terminals for connection of the calibration equipment are located on the unit front panel. HP-style units use a six-place, numbered terminal block with terminal 5 inactive. DIN-style units also have a six-place terminal block with the non-labeled terminal inactive. The terminals on both types of unit are clearly labeled. Use +PS and - PS for connection of the appropriate loop power, and terminals "A", "B", and "C" for connection of pot input.

Figure 2 illustrates the hookup for standard PTX calibration. The designator "R_p" refers to the appropriate precision resistor.

Use the appropriate materials listed in table 2 in the hookup, apply appropriate power, and allow approximately 5 minutes for unit warm-up and hookup stabilization.

Calibration Procedure

With the calibration setup completed as shown, set both decade resistance boxes to provide zero ohms of resistance, apply the appropriate 10-42 Vdc power, and turn both the Zero and Span pots on the front panel of the PTX fully counterclockwise. Allow approximately five minutes for unit warm-up and setup stabilization.

1. Set decade box A to provide resistance equal to the value called out in the "% Travel for 0% Output" field of your unit model number.
2. Set box B to value specified in "% Travel for 100% Output" field of unit model number.

FOR EXAMPLE:

For a PTX with "1K-25-75" listed in model number, set decade box A to 250 Ω and box B to provide 750 Ω.

Table 2. PTX Calibration Equipment

Equipment	Specifications
Resistance Decade Boxes (2)	Calibrated. Accurate to $\pm 0.05\%$, minimum. Recommend ESDI Decabox model DB62, or equivalent.
DC Voltmeter	Calibrated. Accurate to $\pm 0.005\%$, minimum. Recommend Keithley model 197, or equivalent.
Precision Resistor	250 Ω , $\pm 0.01\%$, precision resistor for 4-20 mA units. 100 Ω , $\pm 0.01\%$ resistor for 10-50 mA units.
Power Source	Calibrated. Variable source capable of regulated output in the 12-42 Vdc range.
Screwdriver, (slotted head type)	Blade width 2.54 mm (0.1 inch), maximum.

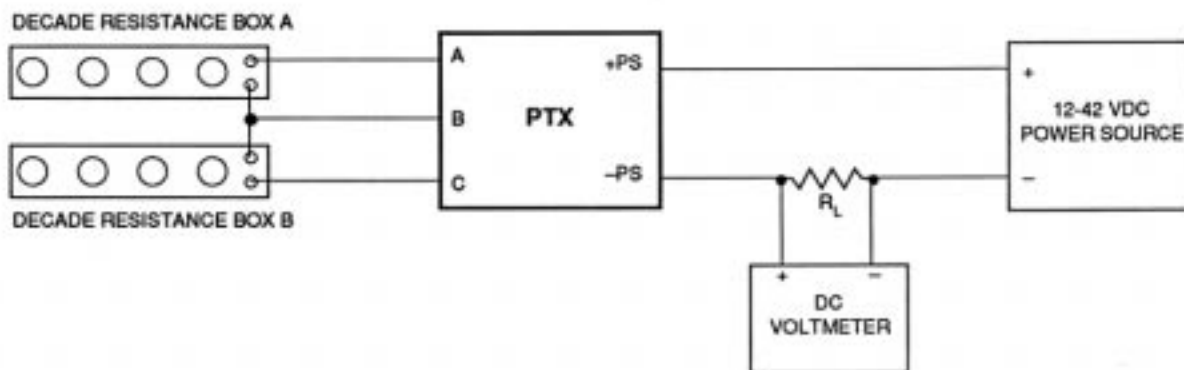


Figure 2. PTX Calibration Setup

- Turn Zero pot clockwise until voltmeter reads 1 V, ± 4 mV.
- Change setting of decade box A to provide resistance used in step 2 (% Travel for 100% Output from model number).
- Set decade box B to value from step 1 (% Travel for 0%).
- Turn Span pot clockwise until voltmeter reads 5 V, ± 4 mV.
- Repeat steps 1 through 4 until PTX output is stable at both 0% and full-scale input.
- Check linearity by calculating 25%, 50%, and 75% of rated span. With 0 Ω setting on decade box B, set box A to each level derived from these calculations. Error in unit output will not exceed 0.1% of span.

PTX

Installation

Installation of the PTX is presented in this manual in two phases. First is the physical mounting of the unit. This is followed by the electrical connections. It is recommended that installation be carried out in this order.

Before PTX 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.

Physical Mounting of the PTX

Figure 3 shows the mounting dimensions for the HP-style PTX, and the DIN-style PTX housing dimensions are shown in figure 4.

The HP illustration shows the flange mount hardware option. When using the HP PTX with explosionproof enclosures, spring clips extend from the unit front panel. Refer to the appropriate Moore Industries Catalog datasheet for enclosure dimensions.

Electrical Connections

Figure 5 is the PTX installation hookup diagram. When the units have been properly mounted, refer to figure 5 to connect them to power and other field devices.

As the PTX is a loop-powered device, no additional electrical connections are required. Check the "Power" field of your unit's model number to verify appropriate loop voltage. Refer to the explanation of the model number in the Description Section of this manual, and to the specifications listed in table 1 for more information.

As shown in the figures, connect the +PS terminal of the PTX to the positive lead from the power source in the loop. Connect the -PS PTX terminal in series with the positive terminals of the other devices in the loop and the negative terminal of the loop power supply.

The potentiometer wiring is connected to the terminals labeled A, B, and C.

Connecting wires used should be between 14 and 22 AWG. Connections are made with compression-screw sockets. Use a slotted-tip screwdriver with a head width no greater than 2.54 mm (0.1 inch).

Grounding. To ground the HP-style unit, make sure a shielded grounding lead is connected to the GND screw on the unit front panel. This screw is located to the right of the Zero adjustment pot, and is typically fitted with a wire or wire terminating lug. Typically, when HP-style units are equipped with explosionproof enclosures, the unit grounding screw is attached to the enclosure ground prior to shipment.

To ground the DIN-style PTX, the use of shielded, twisted-pair wiring, grounded as near as possible to the unit itself, is recommended.

Installation in Hazardous Locations

This section contains important information regarding the installation of the PTX in Hazardous Area Locations.

Warning

Substitution of components is not allowed, as it may impair the intrinsic safety.

Avertissement:

La substitution de composants peut compromettre la sécurité intrinsèque

Warning

To prevent ignition of flammable or combustible atmospheres, disconnect power before servicing.

Avertissement:

Risque d'explosion. Avant de déconnecter l'équipement, couper le courant ou s'assurer que débrancher tant que l'emplacement est désigné non dangereux.

Warning

Explosion hazard. Do not disconnect equipment when a flammable or combustible atmosphere is present.

Avertissement

Risque d'explosion. Ne pas débrancher tant que le circuit est sous tension, à moins qu'il ne s'agisse d'un emplacement non dangereux.

Specific Conditions of Use CSA Installations

Installation of the Model PTX into a Class 1 Division 1 location requires the use of a CSA Certified Intrinsic Safety Barrier with the following output parameters.

$U_z = 27V$, $I_{max\ out} = 100mA$, $W_{max\ out} = 0.68W$ or $U_z = 28V$, $I_{max\ out} = 93mA$, $W_{max\ out} = 0.67W$.

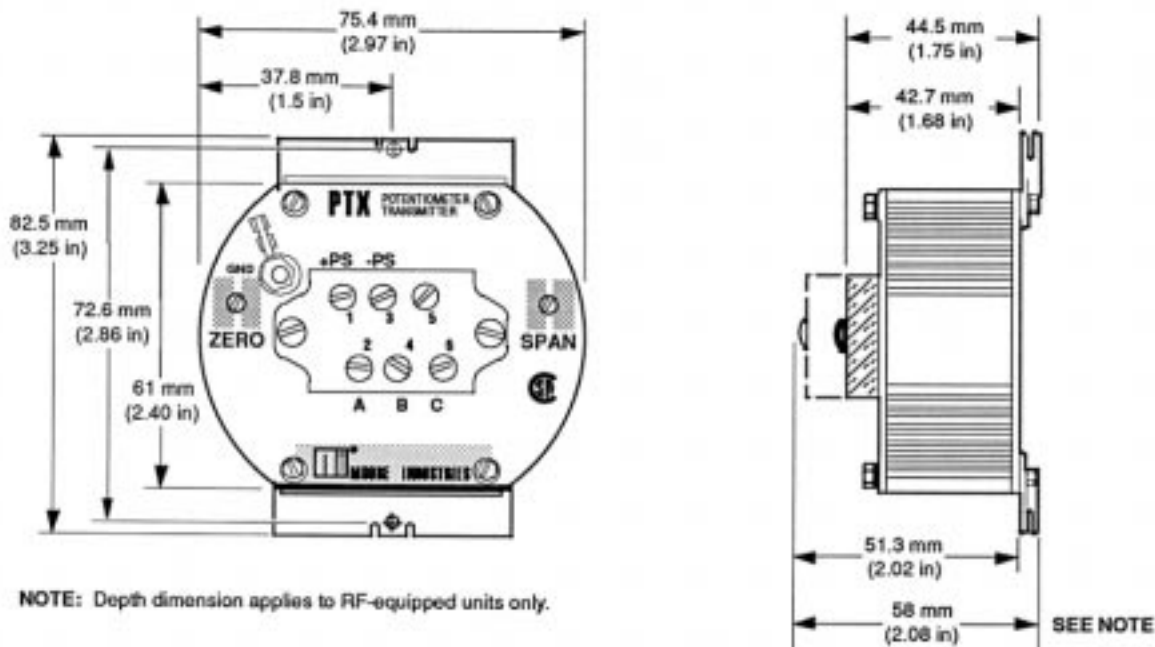


Figure 3. HP-style PTX Outline Dimensions

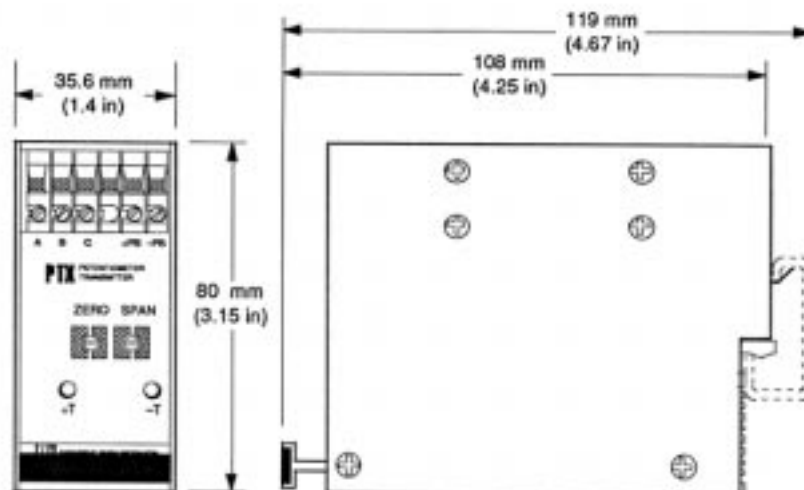
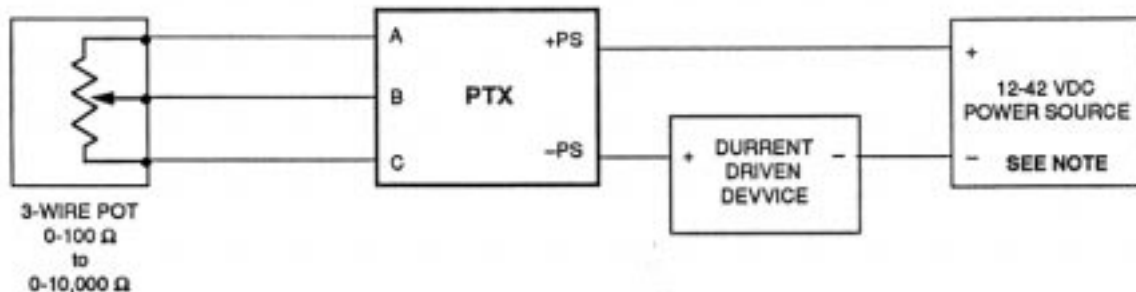


Figure 4. DIN-style PTX Outline Dimensions

PTX



NOTE: Some IS applications require different voltage ranges for power input. Refer to appendix, or consult factory for information.

Figure 5. PTX Installation Hookup

Maintenance & Troubleshooting

Once properly installed and connected, the PTX functions unattended. A simple, periodic check of connections is all that is required to maintain unit operation. Moore Industries suggests a 6-month schedule for maintenance checks.

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 PTX fails to perform up to specifications, contact your local Customer Service Department. Phone numbers of the STAR Centers 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.

When calling for assistance, always remember to provide the factory 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.

Test Jacks. The DIN-style PTX is equipped with two test jacks. Located on the front panel, these jacks provide a convenient means of verifying loop current when the unit is installed and operating.

Connecting a milliammeter to the jacks, labeled "+T" and "-T", when the unit is powered up, provides a reading, in milliamps, of the current in the loop, $\pm 0.1\%$. If desired, measure the voltage drop across a $10\ \Omega$ ($\pm 0.05\%$) resistor connected to the jacks. The current in the loop should match that observed in the resistor, $\pm 0.01\%$.



DO NOT SCALE DRAWING

TOLERANCES (UNLESS NOTED)
 DECIMALS = ±0.1 /mm
 .X = ±.1 /2.54
 .XX = ±.03 /0.76
 .XXX = ±.010/0.25
 HOLES = ±.005/0.13
 ANGLES = ±30'

DRAWN	K. Darbey	12/17
CHECKED		
ENGINEER		
SCALE	NONE	

CATEGORY
SYS.BLOACK/WIRE DIAGRAM

TITLE
**Installation Diagram:
 2-WIRE
 TRANSMITTER
 PTX-ISC**

DRAWING NUMBER
100-100-88

REVISION
A

REVISED BY
ECO 18280

DATE
 12/17

BY
 KD

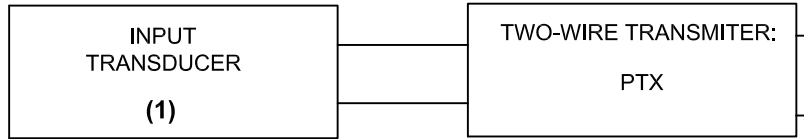
APPROVAL
CB

NOTICE RE PROPRIETARY INFORMATION: This drawing and the information contained herein are the proprietary property of Moore Industries International, Inc. (MII) and should not be reproduced or disclosed to any third party without the written consent of an authorized officer of MII.

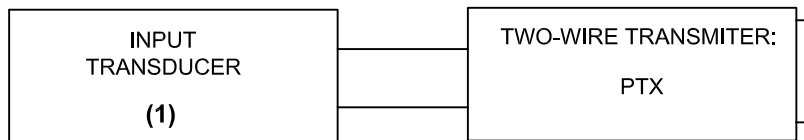
Hazardous Area

Non-Hazardous (Safe) Area

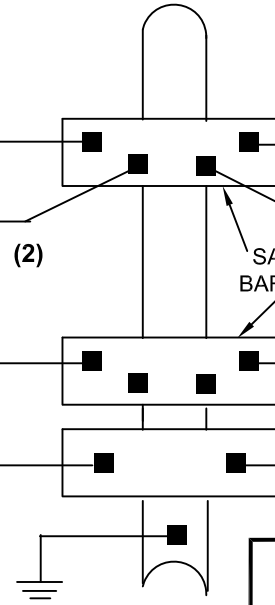
INSTALLATION A



INSTALLATION B



(4)



SAFE AREA APPARATUS
 UNSPECIFIED EXCEPT THAT IT MUST NOT BE SUPPLIED FROM NOR CONTAIN UNDER NORMAL OR ABNORMAL CONDITIONS A SOURCE OF POTENTIAL WITH RESPECT TO EARTH IN EXCESS OF 250 VOLTS rms OR 250 VOLTS dc.

THE ELECTRICAL CIRCUIT IN THE HAZARDOUS AREA MUST BE CAPABLE OF WITHSTANDING AN AC TEST VOLTAGE OF 500 VOLTS RMS TO EARTH OR FRAME OF THE APPARATUS.

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.)

TABLE 1

GROUP	MAXIMUM CAPACITANCE	MAXIMUM or INDUCTANCE	INDUCTANCE TO RESISTANCE RATIO
IIC	0.08uF	900uH	35uH/Ohm
IIB	0.34uF	2700uH	105uH/Ohm
IIA	1.00uF	7200uH	280uH/Ohm

Notes:

- (1) INPUT TRANSDUCER meeting the requirements of 'APPARATUS' as defined in CSA C22.2 No. 0 and installed to meet requirements of CSA C22.2 No.157.
 INSTALLATION A: Any 27 Volt, 270 Ohm or 28 Volt, 300 Ohm Shunt Zener Diode Safety Barrier, certified by CSA whose output parameters do not exceed Uz = 27V, I max. out = 100mA, W max. out = 0.68W, or Uz = 28V, I max. out = 93mA, W max. out = 0.67W.
 INSTALLATION B: Any 27 Volt, 270 Ohm or 28 Volt, 300 Ohm Shunt Zener Diode Safety Barrier together with any 10 Volt, 47 Ohm Shunt Zener Diode Safety Barrier connected as a floating system with no earth return. The Barriers must be of like polarity and be certified by CSA whose output parameters do not exceed Uz = 10V, I max. out = 213mA, W max. out = 0.53W.
 NOTE: In any Safety Barrier used the output current must be limited by a resistor "R" such that I max. out = U²/R.
- (2) Cable parameters must not exceed those given in TABLE 1.
- 3 The installation must comply with national installation requirements.
- (4) System label, 200-251-666 should appear on or adjacent to the principal item of electrical apparatus in the system or at the interface between I.S. & non I.S. circuits.

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

THE COMPANY MAKES NO EXPRESS, IMPLIED OR STATUTORY WARRANTIES (INCLUDING ANY WARRANTY OF MERCHANTABILITY OR OF FITNESS FOR A PARTICULAR PURPOSE) WITH RESPECT TO ANY GOODS OR SERVICES SOLD BY THE COMPANY. THE COMPANY DISCLAIMS ALL WARRANTIES ARISING FROM ANY COURSE OF DEALING OR TRADE USAGE, AND ANY BUYER OF GOODS OR SERVICES FROM THE COMPANY ACKNOWLEDGES THAT THERE ARE NO WARRANTIES IMPLIED BY CUSTOM OR USAGE IN THE TRADE OF THE BUYER AND OF THE COMPANY, AND THAT ANY PRIOR DEALINGS OF THE BUYER WITH THE COMPANY DO NOT IMPLY THAT THE COMPANY WARRANTS THE GOODS OR SERVICES IN ANY WAY.

ANY BUYER OF GOODS OR SERVICES FROM THE COMPANY AGREES WITH THE COMPANY THAT THE SOLE AND EXCLUSIVE REMEDIES FOR BREACH OF ANY WARRANTY CONCERNING THE GOODS OR SERVICES SHALL BE FOR THE COMPANY, AT ITS OPTION, TO REPAIR OR REPLACE THE GOODS OR SERVICES OR REFUND THE PURCHASE PRICE. THE COMPANY SHALL IN NO EVENT BE LIABLE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES EVEN IF THE COMPANY FAILS IN ANY ATTEMPT TO REMEDY DEFECTS IN THE GOODS OR SERVICES. BUT IN SUCH CASE THE BUYER SHALL BE ENTITLED TO NO MORE THAN A REFUND OF ALL MONIES PAID TO THE COMPANY BY THE BUYER FOR PURCHASE OF THE GOODS OR SERVICES.

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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