

DIX

Low Cost, Field-Mount,
Digital Indicator

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DIX

Description

The DIX is Moore Industries' low-cost, field-mount, Digital Indicator. It is a two-wire device providing economical, accurate, on-site display of a process variable in harsh environments.

The unit is designed to accept 4-20mA input from any temperature, pressure, level, or flow transmitter. Cost-effective temperature assemblies can be created by installing a Moore Industries head-mount RTD or thermocouple transmitter such as the RLX, TLX, or TNX inside the housing. DIX output is a digital readout proportional to input.

Features

- **IP67 (NEMA 4) A.B.S. Housing.** The DIX consists of a compact, two-part, O-ring sealed, thermoplastic housing. The housing provides superior impact resistance and water-tight protection from the harsh environments called for in many industrial applications. Additional protective enclosures are not necessary.
- **Easy-to-Read Display.** The top of the DIX consists of a large, 3-1/2 digit LCD with black numerals displayed over a reflective silver background. Readouts are in user-modifiable engineering units. A sheet of application-specific labels are provided by the factory for convenient identification of readout type, e.g. °C, %, bbl/hr, etc.
- **On-Site Programmability.** Zero (offset) and span are controlled by potentiometers (pots) and jumpers on the internal printed circuit (PC) board. Users can quickly re-configure the unit using the step-by-step instructions in the Calibration section of this manual.

Certifications

- **Intrinsic Safety.** With its -ISE option, the DIX is certified intrinsically safe. Please refer to the section of this manual that describes DIX options for more information.

Specifications

Table 1 summarizes the performance specifications for Moore Industries' DIX.

Unit Data Tracking & Orders for Additional DIX's — Moore Industries' Model & Serial Numbers

Table 2 lists the ordering specifications for the DIX. Use the table as a guide when ordering additional units. Always check with a Moore Industries Sales Representative for information on the latest options and certifications.

If service assistance is ever required for your unit, make a note of the model number before contacting the factory. If possible, and for fastest assistance, also note the unit serial number, job number, and the purchase order number under which it was shipped. This information helps our skilled staff to provide you with the answers you need as efficiently as possible.

On the DIX, look for the model and serial numbers on the side of the top half of the DIX housing. Figure 1 shows a typical DIX model number.

- **DIX Model Number Notes.** Both the high and low input display selections must fall within the range of -1000 to +1999. The minimum span available with the DIX is 200 counts, which means that the difference between the high input display and the low input display must be at least +200.

NOTES

The low input display selection must be lower than the high input display selection. Negative spans are not available.

If the low input display is to be negative, the desired value will be shown in parenthesis in the model number.

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Table 1. DIX Specifications

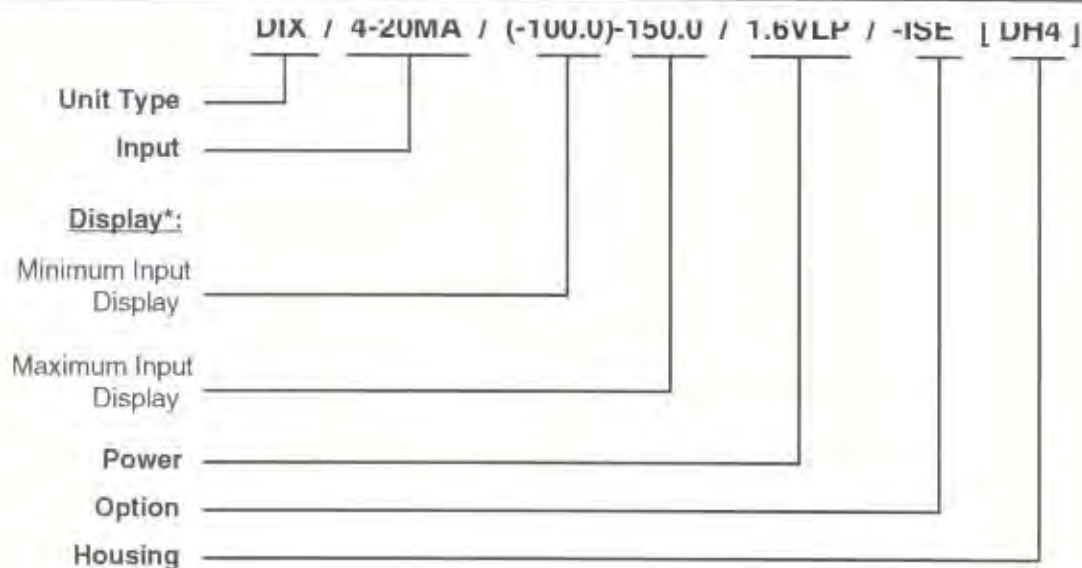
<p>Display Type: Liquid Crystal (LCD), 12.5 mm (0.49 in) high, black digits over reflective background</p> <p>Format: 3 1/2 digits, -1000 to 1999</p> <p>Decimal Point: User-set: X.XXX, XX.XX, XXX.X, and no decimal (XXXX)</p> <p>Update Rate: 3 times per second</p> <p>Span Range: 200 to 2000 counts for a 16mA change</p> <p>Zero (offset): ±1000 counts at 4mA input</p> <p>Performance Accuracy: 0.1% of reading, ±1 count</p>	<p>Performance (continued)</p> <p>Stability: 0.02% per °C, maximum; 0.005% per °C, typical</p> <p>Voltage Drop: 1.0V @ 20mA (1.6V @ 20mA when equipped with -ISE option)</p> <p>Maximum Input Current: ±100mA</p> <p>Maximum Operating Voltage: 36Vdc (28Vdc when equipped with -ISE option)</p> <p>Fuse Rating: 125mA (fuse not available with -ISE option)</p> <p>Minimum Current Required: 3.8mA</p>	<p>Ambient Temperature Range: 0 to 50 °C (32 to 122 °F)</p> <p>Ambient Humidity: 95% relative, maximum, non-condensing</p> <p>Adjustments Type: Internal potentiometers and inter-active, solderless jumpers control Span and Zero</p> <p>Housing Material/Protection: Impact resistant A.B.S. IP67 (NEMA 4), O-ring sealed, four types of hub configuration available</p> <p>Weight: 170 g (approximately 6 oz)</p>
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Table 2. DIX Ordering Specifications

Unit	Input	Display	Power	Option	Housing
DIX	4-20MA	(-1000) - 1999 Specify range for factory calibration. Default is 000.0-100.0. Minimum count span is 200. Range is field-configurable using internal jumpers and pots. Available decimal positions are X.XXX, XX.XX, XXX.X, and no decimal. If low input display is to be negative, enclose low display value in parenthesis when ordering.	1.0VLP 1 Volt loop powered 1.6VLP 1.6 Volts loop powered, (required for units with -ISE option)	-ISE BASEEFA approved intrinsically safe (requires 1.6VLP selection in Power field)	DH1 Two side ports with M20 x 1.5 threading DH2 One side and one base port; side port w/M20 x 1.5 threading, base port w/1/2-inch BSP threading DH3 Two side ports (1/2-inch NPT threading) DH4 One side and one base port, both with 1/2-inch NPT threading

To order, specify: Unit / Input / Display / Option / [Housing]

Example: DIX / 4-20MA / (-90.0)-200.0 / 1.6VLP / -ISE [DH4]

DIX**Figure 1.** Typical DIX Model Number

Calibration

Prior to shipment, every DIX is fully tested at the factory to ensure compliance with Moore Industries' strict quality control guidelines. This section provides the means to perform the DIX bench check and the instructions for setting the unit's zero and span. The procedures provide a safe means of uncovering any unit damage that may have occurred during shipping, and offer a simple familiarization with DIX operation in the safety of a testing environment, separate from the intended process or application.

CAUTION

Never perform the DIX Calibration in a Hazardous Area.

These procedures should be carried out in an environment considered appropriate for general testing of electronic equipment, rather than in the field. Use a technician's bench or a similar, lab-type environment.

Internal Jumpers (Links)

The setting of the DIX's internal jumpers, or "links" as they are sometimes called, controls unit display characteristics and the available range of the zero offset pot.

The jumpers are located on the unit's internal PC board. To access them, unscrew the molded retaining ring around the housing midsection. Figure 2 shows the ring and the relative locations of the DIX jumpers and pots.

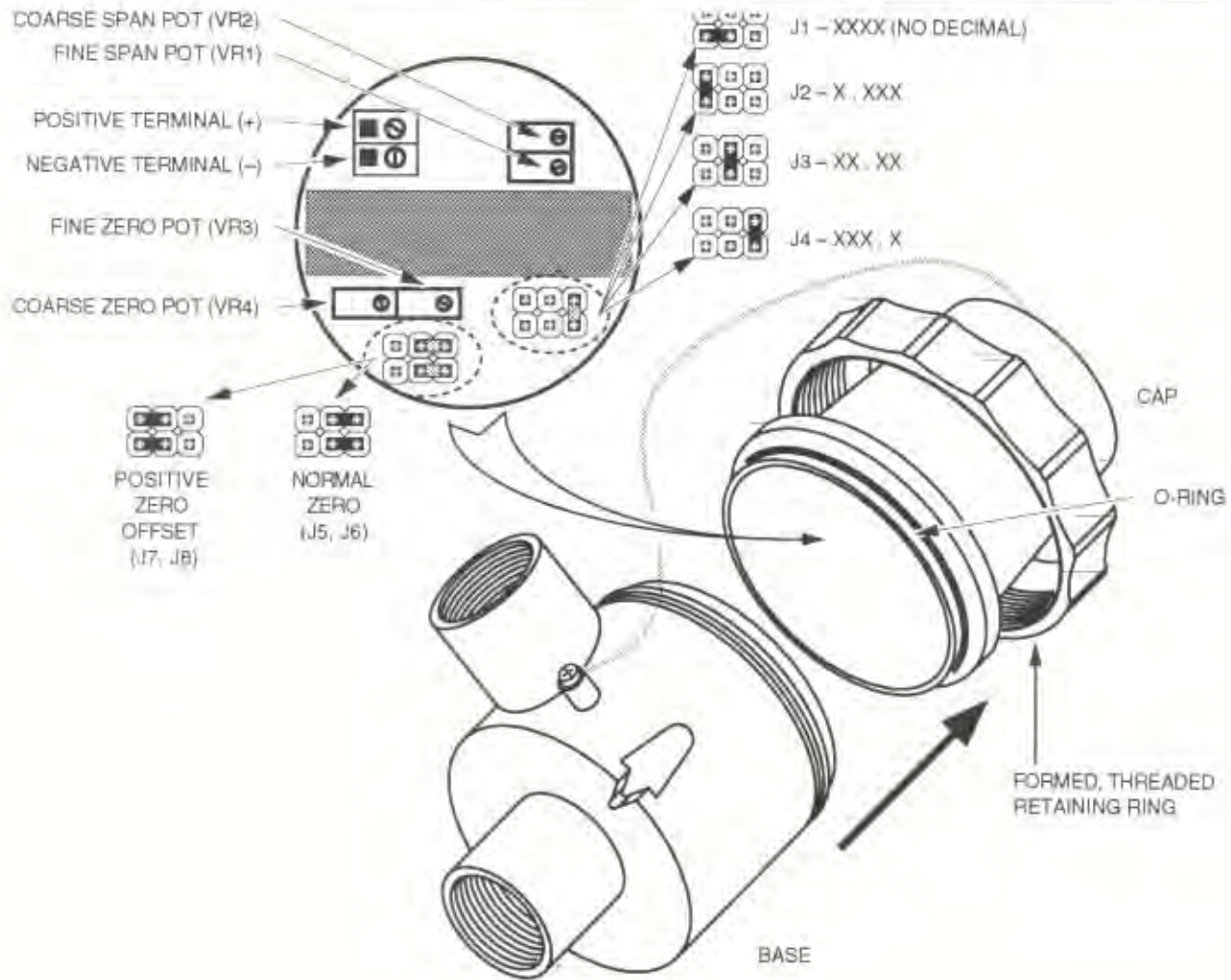
NOTE

All DIX jumpers must be installed for the unit to function properly. There is one jumper for display range selection and two for zero selection (normal or positive offset).

Use a pair of technician's tweezers or fine, needle-nosed pliers to move the jumpers as required for the desired output. Refer to the Procedures section of this manual for instruction in setting the pots.

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Figure 2. DIX Jumper and Pot Locations



NOTES:

1. Drawing not to scale
2. Component designators for reference only
No markings on PCB board
3. Base shows typical DH2 or DH4 configuration
DH1- and DH3-style base features 2 side ports and no base port.

Setup

The equipment listed in Table 3 is needed when calibrating the DIX. These items are not supplied by Moore Industries, but should be available in most testing labs.

Be sure to use calibrated test equipment when performing the bench check and zero/span adjustment of the DIX. The use of inaccurate test equipment will result in unreliable settings and may precipitate costly process down-time.

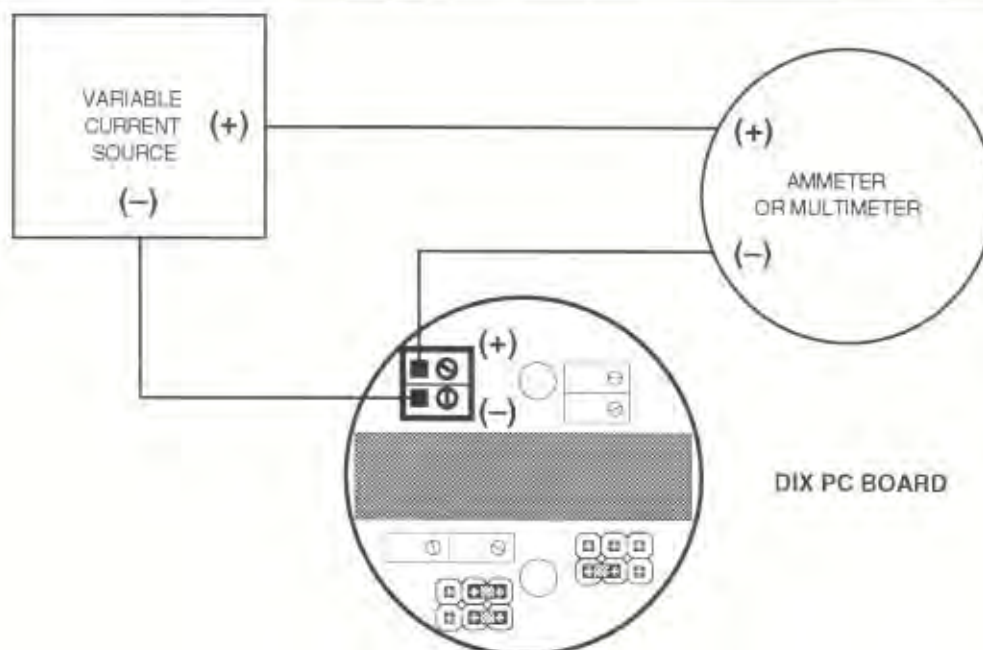
Figure 3 shows the basic hookup used in the calibration procedures. The polarity of the connection terminals are not shown on the unit. Make sure to orient the DIX being calibrated as is shown in the figure. Use a screwdriver to loosen terminal screws and connect appropriate leads to the labeled terminals.

With connections completed as shown, apply the appropriate power to the setup and allow a few minutes for stabilization/warm-up.

Table 3. DIX Calibration Equipment

Equipment	Specifications
Current Source	Calibrated, adjustable source unit, capable of discrete output levels, $\pm 0.025\%$ in a 4-20mA range
Multimeter, or Ammeter	Calibrated meter capable of verifying desired input current. Accuracy of $\pm 0.025\%$, minimum
Screwdriver	Blade tip. Head width no greater than 2.54 mm (0.01 in)

Figure 3. DIX Calibration Setup



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Controls

The four, internal DIX pots are equipped with slip clutch mechanisms to prevent damage in the event of overadjustment. A change in the torque of the pot will be felt, and a soft "clicking" can usually be heard as the pot is turned past a wiper stop.

When calibrating the DIX zero and span, turn the appropriate pot clockwise (CW) to increase the setting, and counterclockwise (CCW) to decrease.

See Figure 2 for the correct jumper (link) positioning.

Procedures

Before beginning this procedure, check the model number of the unit to be calibrated for the appropriate input/output type and range (loop power). See Figure 1 for an example and breakout of a typical DIX model number.

Start with all pots turned to about mid-scale, which is fully CW (25 turns), then 10 turns CCW. Make sure jumpers J5 and J6 (normal zero) are installed.

1. Set the input to the DIX to the desired full scale level, typically 20mA (DIX maximum full scale).
2. Adjust the DIX coarse span pot to obtain the desired full scale readout, ± 5 counts, on the unit LCD.
3. Adjust the fine span pot to obtain the desired readout, ± 1 count.
4. Set the input to the desired zero, typically 4mA (DIX minimum zero).
5. Adjust the coarse zero pot to obtain the desired zero, ± 5 counts, on the LCD.

NOTES

Minimum DIX span is 200 counts. That is, the difference between the DIX readout at full scale and zero must be at least 200.

If the desired zero reading cannot be obtained, return the coarse zero pot to approximate mid-scale, and move jumpers J5 and J6 to J7 and J8 (Positive Zero Offset). Then repeat steps 1 through 5.

6. Return input to the desired full scale and note the DIX readout. Correct errors of up to 2 counts by adjusting the fine span pot.
7. Repeat steps 1 through 6 until the readout is within acceptable tolerances at both zero and full scale input.
8. Confirm correct calibration by varying the input between 0 and 20 mA. The DIX is capable of readouts from -1000 to 1999 (minimum span is 200 counts). When the unit is correctly calibrated, the readout is a stable, accurate display proportional to input between 4 and 20 mA.

Installation

Figure 4 gives the outline dimensions for the DH1 and DH3 housing style DIX. Figure 5 shows the DH2 and DH4 housing. Refer to the housing field of the model number for your unit to determine which dimensions apply for you.

Figure 6 illustrates the installation hookup for the DIX. Figure 7 shows how a DIX can be used with one of Moore Industries' line of RTD or Thermocouple transmitters. Complete temperature assemblies, including indicator, transmitter, thermowell, and fittings are available. Contact your Moore Industries Sales Representative for more information.

Figure 4. DIX Outline Dimensions, DH1 & DH3 Housing Styles

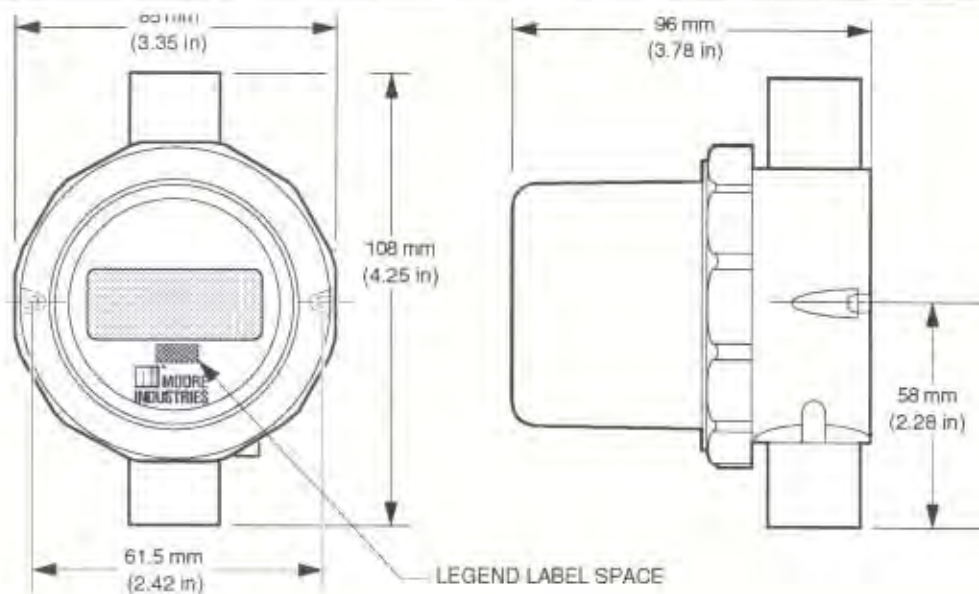
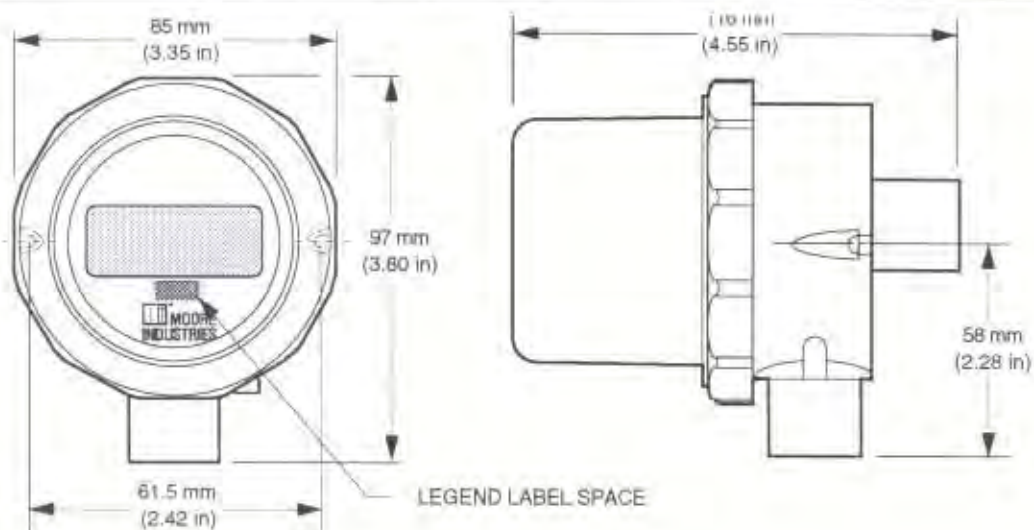
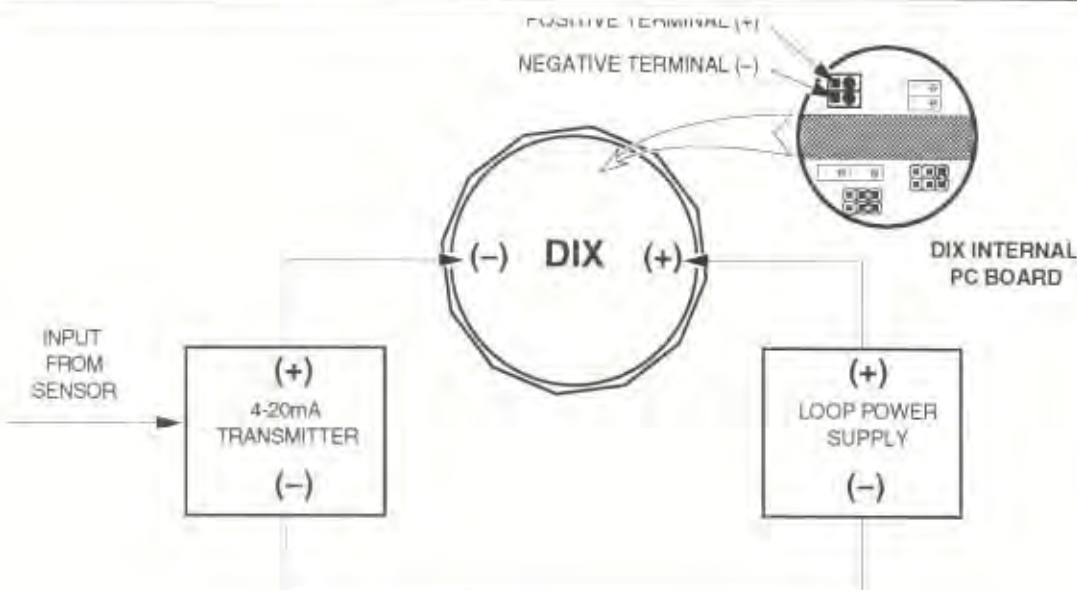


Figure 5. DIX Outline Dimensions, DH2 & DH4 Housing Styles



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Figure 6. Typical DIX Installation



All electrical connections are made to the removable terminal block on the unit's internal PC board. To make a connection, loosen the screw that corresponds to the correct terminal, insert the stripped end of the connection lead, hold the lead in place and tighten the screw until snug. Moore Industries suggests making connections with the terminal block seated in the unit. Apply a gentle "tug" to the connected lead to confirm a good connection.

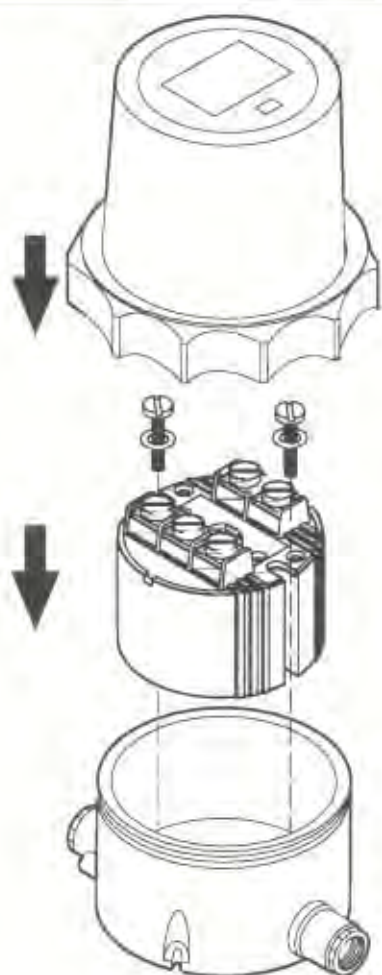
CAUTION

Do not use a screwdriver with a head width greater than 2.54mm (0.1 in) to loosen or tighten the terminal block screws.

- Shielding.** The use of shielded, twisted-pair wiring, connected as near as possible to the DIX case, is recommended for all low level signals.
- A Special Note Concerning the DIX -ISE Option.** When installing the intrinsically safe version of the DIX in a hazardous environment, use the specifications shown in Figure 8 as a guide.

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Figure 7. Using the DIX with Moore Industries' TLX/TNX or RLX



- ❑ Verify that all electrical connections are clean and tight.
- ❑ Check the integrity of the O-ring seals under the formed retaining ring around the housing mid-section, and around the openings of the conduit ports inside the housing base. The DIX housing IP67 (NEMA 4) integrity will be adversely affected by damage to these seals. Replace damaged or missing O-rings.
- ❑ Verify that the loop power to the offending unit is at levels rated safe and appropriate according to product specifications.
- ❑ Check the calibration of the instruments used in calibrating the DIX.
- ❑ Verify, if possible, that other devices in the process loop are not the cause of the problem.

If continued difficulties are experienced, remove the unit from service and recalibrate. The DIX's removable terminal block make it easy to replace a DIX without having to rewire.

If problems persist, or if additional technical assistance is required, contact your local Sales Representative, or Moore Industries' Customer Service Department. When calling the STAR* Center, have the unit model number, and if possible the serial number, job number, and purchase order number of the problem unit. This information assists our staff of skilled technicians and engineers in providing you with the answers you need as efficiently as possible.

Maintenance & Troubleshooting

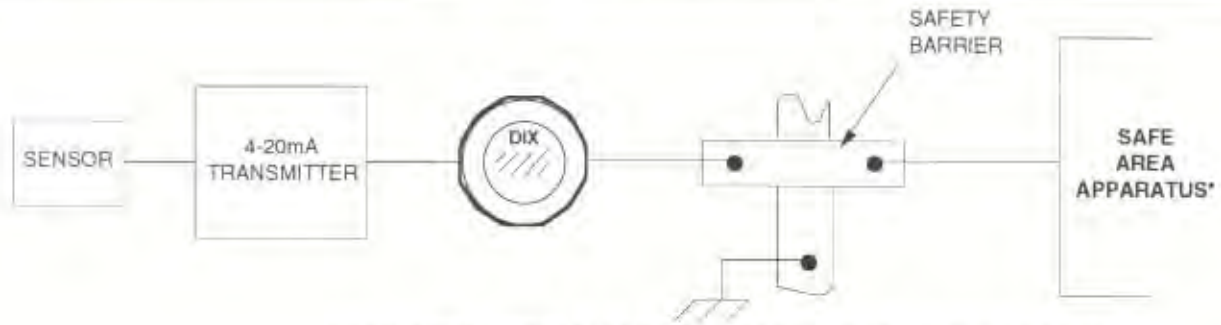
Once properly calibrated, connected, and powered, the DIX will operate reliably for an extended period of time. It is a "hands off" unit. Unit maintenance is a simple check of terminal connections. Initially, we recommend a check of units once every six months.

If a DIX begins to malfunction or to function below rated specifications, complete the following checklist before calling the factory for assistance.

* STAR Center is Service, Technical Assistance, and Repair. Refer to inside the back cover of this manual for more information.

DIX

Figure 8. Typical Intrinsically Safe Installation of the DIX equipped with the IS Option



*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 VRMS OR 250 VDC.

SAFETY BARRIER			
GROUP	MAXIMUM CAPACITANCE	MAXIMUM INDUCTANCE	or INDUCTANCE TO RESISTANCE RATIO
IIC	0.08UF	900UH	35UH/Ohm
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STAR Center is Service, Technical Assistance and Repair.

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.

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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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