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Introduction

Moore Industries' loop-powered, RTD transmitter, the RBX, is a device used to convert RTD (resistive) input to a proportional process current output. A wide range of factory-configured RTD input ranges and options is available.

This manual contains all of the information needed to calibrate, operate, and maintain the RBX. 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 RBX 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 aspects of installation or operation that require special attention, and that, if ignored could result in personal injury.

Description

The RBX transmitter is available in either the DIN-style, or Moore Industries' hockey-puck (HP) housing. It is factory-configured to accept input from either 2- or 3-wire RTD's, or slide-wire potentiometers, and to provide either 4-20 mA or 10-50 mA output.

The unit is loop-powered. Versions are available for any of three power ratings, 12-42 (standard), 12-24, or 12-28 Vdc (required for some IS applications. Consult your Moore Industries' Sales Representative for details).

The available housing styles for the RBX, HP or DIN-style, afford the user with a wide variety of mounting options. Consult with your Moore Industries' Sales Representative for more information on available RBX mounting hardware and options.

The HP RBX. Standard HP units are equipped with spring clips for installation inside multi-hub, glass- or solid-topped, high or low dome, explosionproof enclosures. The spring clips hold the unit in place inside the enclosure, eliminating the need for any drilling or tapping.

HP units can also be ordered with flanges, for example, which facilitate surface-mount, relay track, or even DIN-rail mounting schemes.

The DIN-style RBX. This type of unit 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 DIN-style front panel allow for basic unit testing without having to remove it from the process loop.

Table 1 lists the performance and operational specifications for Moore Industries' RBX.

Controls and Indicators

Labeled potentiometers (pots) to control unit zero and span are located on the front panel of both the DIN-style and HP RBX's. The Calibration Section of this manual describes how these pots can be adjusted.

Options

The following list provides an overview of some of the RBX 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 RBX data sheet, or consult the factory for information on current RBX IS certifications.

Table 1. RBX Operational and Performance Specifications

Characteristic	Specifications
Input	<p>Factory-configured according to customer specification at time of order. 2- or 3-wire, copper, nickel, or platinum RTD output; 100, 200, 500, or 1000Ω.</p> <p>Ranges (In Ω change): 5-10 10-20 20-40 40-80 80-160 160-320 320-640</p>
Output	<p>Factory-configured according to customer specification at time of order. 4-20 mA or 10-50 mA</p> <p>Limiting: 30 mA maximum for 4-20 mA units. 65 mA maximum for 10-50 mA units.</p>
Power	<p>Loop Powered. 12-42 Vdc, measured at +PS and –PS terminals. 12-24, and 12-28 Vdc also available with some units, and required for use with some IS certifications.</p> <p>Standard unit sustains 60 Vdc, maximum. Consult factory for details.</p>
Performance	<p>Accuracy (Repeatability & Linearity): $\pm 0.1\%$ of rated span.</p> <p>Line Voltage Effect: $\pm 0.002\%$ of rated span per volt change, measured at the input terminals.</p> <p>Sensor Excitation Current: 1 mA, maximum.</p> <p>Loop Load Capability: 600Ω @ 24 Vdc.</p> <p>Ambient Temperature Effect: $\pm 0.02\%$ of rated span per $^{\circ}\text{F}$ (5 - 10Ω change), in the rated operating temperature range. $\pm 0.01\%$ of rated span per $^{\circ}\text{F}$ for changes of 10Ω or greater.</p> <p>Linearizing Capability: 0.1% of full-scale for units with spans less than 200Ω. Options available. Consult factory for details.</p>
Controls	<p>Span: Over selected input range, output is fully adjustable to 100%.</p> <p>Zero: Adjusts output minimum (EZ) to $\pm 10\%$ of rated unit span.</p>
Environmental Ratings	<p>Recommended Ambient Operating Temperature: -29 to 82 $^{\circ}\text{C}$ (-20 to 180 $^{\circ}\text{F}$).</p>
Weight (mounting hardware not included)	<p>DIN-style units: Approximately 227 g (8 oz)</p> <p>HP units: Approximately 120 g (4.3 oz)</p>
<p>NOTE: Refer to Installation Section for RBX mounting dimensions.</p>	

DT Option – Differential Temperature Sensor Input. When used, configures RBX to transmit current proportional to the difference between two, separate sensor inputs.

EZ Option – Elevated Zero. This is **required** on all but DT-equipped RBX's (not available with DT Option). It is the value Moore Industries' Technicians set into the unit as the resistance for zero-percent input. Table 2 lists the available minimum EZ values.

LNP Option – Linearization. Provides linearization for 100 Ω platinum RTD. It is not available in some option combinations.

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

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

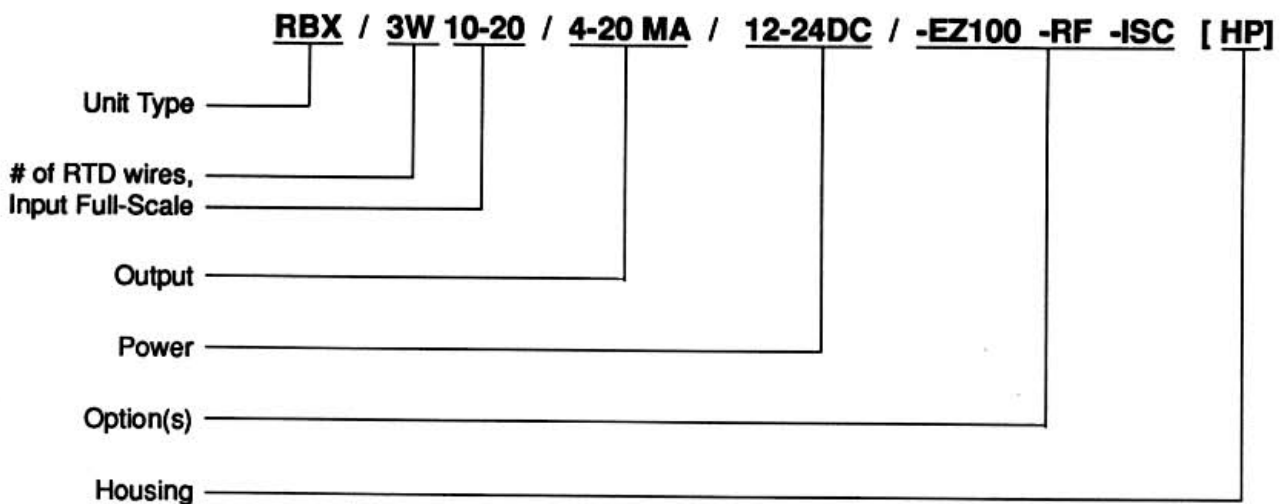
On DIN-style RBX's, look for the model and serial numbers on one of the housing side panels. The label on HP units is found either on the unit back or front panel.

Table 2. RBX Required Minimum EZ's

INPUT Range Selected	Available Minimum EZ
5-10	4
10-20	8
20-40	15
40-80	29
80-160	57
160-320	113
320-640	250

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

EXAMPLE



RBX

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

Calibration

Prior to shipment, every RBX 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.

Included at the end of this section are the procedures for calibrating units equipped with the LNP and DT options.

Calibration Setup

Table 3 lists the equipment you will need to calibrate the RBX. 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 units use a six-place, numbered terminal block (terminal 5 is inactive). DIN-style units also have a six-place terminal block. 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 RTD input.

Figure 1 illustrates the hookup for standard RBX calibration. The designator " R_L " refers to the appropriate precision resistor, used in combination with a voltmeter when a milliammeter is not available.

Table 3. RBX Calibration Equipment

Equipment	Specifications
Resistance Decade Box	Calibrated. Accurate to $\pm 0.05\%$, minimum. Use ESI Decabox model DB62, or equivalent.
DC Milliammeter -or- DC Voltmeter/Precision Resistor Combination	Calibrated. Accurate to $\pm 0.05\%$, minimum. Use Fluke model 8800, or equivalent. Voltmeter: Calibrated. Accurate to $\pm 0.005\%$, minimum. Use Keithley model 197, or equivalent. Resistor: Use a 250Ω , $\pm 0.01\%$, precision resistor for 4-20 mA units. Use a 100Ω , $\pm 0.01\%$ resistor for 10-50 mA units.
Power Source	Calibrated. Variable source capable of regulated output in the appropriate range, typically 12-42 Vdc. 12-24 or 12-28 Vdc sources may be required for units equipped with various IS certification options. Refer to unit model number.
Screwdriver	Blade width 2.54 mm (0.1 inch), maximum.

Use the appropriate materials listed in table 3 in the hookup, apply appropriate power, and allow approximately 5 minutes for unit warm-up and hookup stabilization.

Calibration Procedures

The following section consists of three procedures. The first is how to calibrate the RBX zero and span. This is followed by the procedure for calibrating the Midscale pot of LNP Option-equipped units. Finally, the instructions for setting the Balance pot of DT Option-equipped RBX's are presented.

Precedence. If the unit being calibrated is equipped with the LNP Option, calibrate zero and span first, but set the unit Mid-scale pot to its mid-point before completing the Zero/Span procedure. Figure 2 shows the location of the Mid-scale pot in the LNP-equipped RBX. Adjust it 25 turns clockwise, then 12 turns counterclockwise.

If the RBX being calibrated is equipped with the DT Option, refer to, and complete that procedure before addressing zero and span calibration.

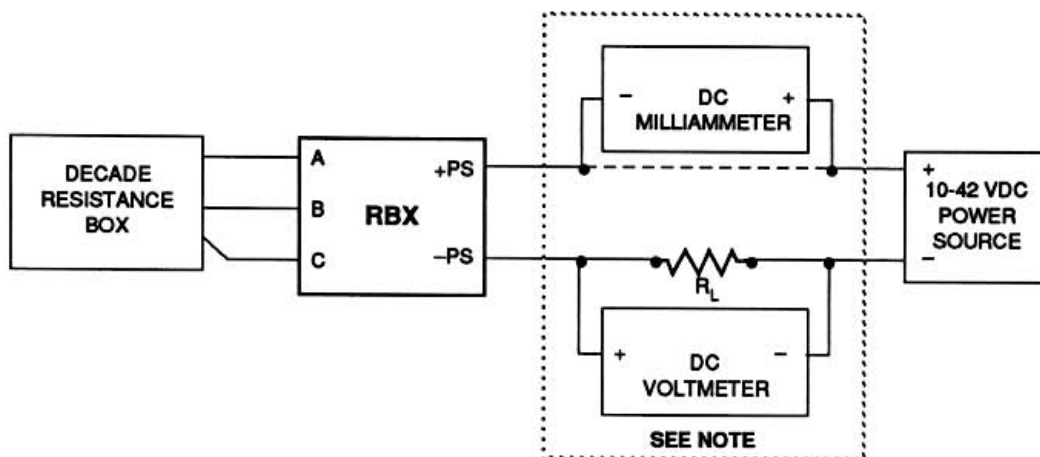
Calibrating Zero and Span. The calibration of the basic RBX consists of the procedure to adjust unit Zero and Span pots while receiving variable resistance input. The RBX Zero pot provides offset capability of unit minimum output, which is the EZ value for all but DT-equipped units, of $\pm 10\%$ of span. The unit's Span pot provides full-scale capability over the entire input range.

With the setup depicted in figure 1 complete, turn both external pots fully counterclockwise, and use the following procedure to calibrate the standard RBX.

The RBX Zero and Span pots, on both the HP and DIN-style units, are labeled and accessible on the front panel. Each is equipped with a slip clutch mechanism that prevents damage if turned past the wiper stop. If unable to sense the wiper stop when preparing the pot for calibration, simply turn it 15 times in either direction.

NOTE

If equipped with LNP Option, set Mid-scale pot to its mid-point before completing the following procedure.



NOTE: Use either a milliammeter or a resistor/voltmeter combination.

Figure 1. RBX Calibration Setup

RBX

1. Apply 0% of rated input span from application.
Refer to unit model number. The listed EZ value is equivalent to 0% resistance input.
2. Turn ZERO pot clockwise until reading of milliammeter is at 0% of rated output range; 4 mA for 4-20 mA units, or 10 mA for 10-50 mA units.

If using voltmeter/precision resistor combination, turn pot clockwise until meter reading is 1 V, ± 0.1 V.
3. Increase input to 100% (maximum) of rated span.

Refer to unit model number. Add highest number in input range field to listed EZ. The sum of these numbers is unit's rated full-scale.

NOTE

Calibrate the RBX using the highest possible full-scale value. This is the most efficient means of guaranteeing accurate output at both the minimum and maximum (full-scale) levels.

4. Turn SPAN pot clockwise until milliammeter reads 20 mA for 4-20 mA units, or 50 mA for 10-50 mA units.

If using a voltmeter/resistor combination, turn pot clockwise until meter reading is 5 V, ± 0.1 V.
5. Repeat steps 1 through 4 until settings are stable at both zero- and 100-percent of rated resistance range.
6. Confirm calibration by subtracting minimum from maximum resistance (EZ from full-scale), and multiplying remainder by 0.25, 0.5, and 0.75, to determine 25, 50, and 75% of rated range.
7. Add percentages of range to EZ value. Input these values as levels of resistance, and verify appropriate reading on connected milliammeter or voltmeter. This is confirmation that RBX outputs are linear with respect to resistance.

NOTE

Standard RBX output is linear with respect to resistance only. It is not linear with respect to temperature unless the unit is equipped with the LNP Option.

Calibrating LNP. RBX's equipped with the LNP Option provide linearized output with respect to temperature as taken from published ISA tables for 100 Ω , platinum RTD's. To calibrate this type of RBX, the setting of the internal, Mid-scale pot must be adjusted in conjunction with unit zero and span.

NOTE

Calibrate the RBX zero and span before calibrating LNP. Make sure to conduct the Zero/Span procedure with the Mid-scale pot set to its mid-point.

This procedure requires removal of one of the unit housing panels for access to the internal printed circuit (PC) boards.

Figure 2 shows the disassembly of both the DIN-style and HP RBX. The location of the LNP Mid-scale pot, as well as the location of the Balance pot, used in units with the DT Option, are also shown.

The calibration hookup for LNP-equipped RBX's is the same as for standard units (see figure 1).

The calibration of the LNP capability of the RBX is a repetitive process, wherein the Mid-scale pot is adjusted relative to the settings of unit zero and span. The Mid-scale pot is a 25-turn component, equipped, as with the Zero, Span, and DT Balance pots, with a slip clutch.

With the setup complete, appropriate power applied, and unit zero and span calibrated as described previously in this manual:

NOTE

The LNP Option makes RBX output linear with respect to temperature. All calculations must be performed using the temperature equivalents of the resistance values, as listed in the ISA tables for 100 Ω platinum RTD.

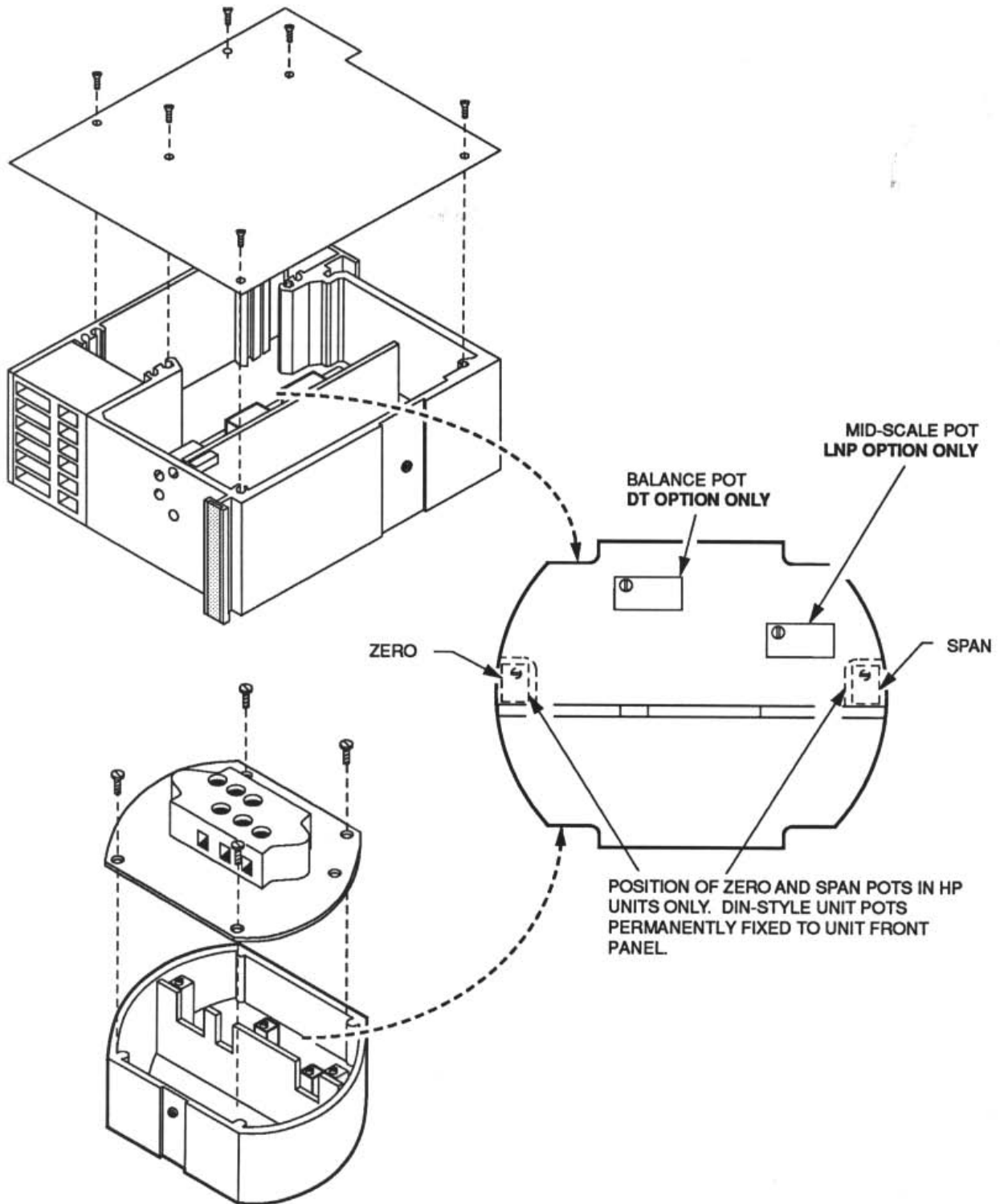


Figure 2. Disassembly of the RBX for Access to LNP or DT Option Pots

RBX

1. Determine mid-scale resistance for your application.

Refer to ISA tables to determine minimum and maximum resistance values of temperatures in intended RBX application. Subtract minimum temperature from maximum, and divide remainder by 2. From table, determine resistance equivalent of that value.

2. Set decade resistance box to value from step 1 (50%).
3. Note output meter reading. Desired output is 50% of appropriate output range; 12 mA for 4-20 mA units, 30 mA for 10-50 mA units, or 3 V when using a voltmeter/resistor combination.
4. Determine error.
 - If actual reading is greater than desired, subtract desired from actual, then go to step 5.
 - If actual reading is less than desired, subtract actual from desired, then go to step 5a.
5. Multiply error (from step 4) by 3, and add to meter reading from step 3. Go to step 6.
- 5a. Multiply error (from step 4) by 3, and subtract from meter reading from step 3. Go to step 6.
6. Adjust Mid-scale pot for meter reading of value derived in step 5 or 5a, as appropriate.

All three pots — zero, span, and mid-scale — are interactive. This means that it is usually necessary to "over-adjust" the midscale pot, seemingly adding to the error, until true zero and span (full-scale) settings are attained.
7. Increase resistance input to 100%.
8. Adjust SPAN pot until appropriate maximum output is produced; 20 mA, 50 mA, or 5 V.
9. Decrease resistance input to 0%.
10. Adjust ZERO pot until appropriate minimum output is produced; 4 mA, 10 mA, or 1 V.

11. Repeat steps 7 through 10 until zero and full-scale input produces minimum and 100% (respectively) of rated output, $\pm 0.1\%$.
12. Repeat steps 2 through 11 until zero, mid-scale, and full-scale input produces minimum, 50%, and 100% (respectively) of rated output, $\pm 0.1\%$.
13. Confirm correct linearity calibration by calculating 25% and 75% values for temperature span from intended application, and using ISA tables, determining resistance equivalents. Input the resistance for these values and check for linear response in setup meter, $\pm 0.1\%$.

Calibrating DT. RBX's with the DT Option accept input from two, separate RTD sensors, calculate the difference, and output a proportional process current. The accuracy of DT output is controlled with the internal Balance pot (a 20-turn component).

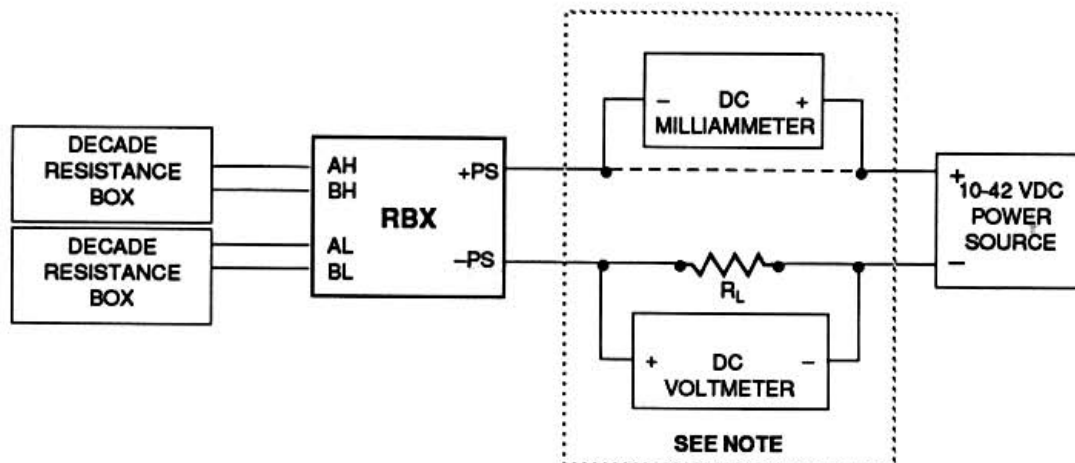
Calibration of this type of unit requires disassembly. See figure 2 for guidance in removing panels from the housing and accessing the Balance pot.

Additionally, the calibration of DT-equipped units requires the use of a second, calibrated decade resistance box. Figure 3 illustrates this hookup. Note that the front panel labelling for this type of RBX differs from the standard unit.

With the setup depicted in figure 3, apply appropriate power, allow 5-10 minutes for stabilization/warm-up, and complete the following:

1. Turn internal Balance pot 20 turns counterclockwise (wiper stop zero setting), then 10 turns clockwise. This approximates wiper mid-scale.

As with the other RBX pots, the Balance pot is equipped with a slip clutch mechanism to prevent damage if the wiper stop is passed during adjustment.
2. Set both decade boxes to 100 Ω .
3. Note milliammeter/voltmeter reading.
4. Input 1000 Ω resistance on both resistance boxes.



NOTE: Use either a milliammeter or a resistor/voltmeter combination.

Figure 3. Calibration Setup for DT-equipped RBX's

5. Adjust internal Balance pot until milliammeter/voltmeter reads the same as noted in step 3.
6. Return decade boxes to 100Ω.
7. Note meter reading. If necessary, repeat steps 4 through 6 until meter reading remains stable at both 100 and 1000Ω.
8. Use the channel that is to undergo the greatest change in resistance to calibrate unit zero and span as described in the earlier procedure for standard units.

Installation

Installation of the RBX 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 RBX 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

WARNING

If installing the RBX in a hazardous environment application, i.e., one that may require certified intrinsically safe systems hookup, make sure that the unit being installed is equipped with the proper IS certification option. Refer to the appendix of this manual for information regarding IS installations.

Several of the available housing and enclosure options in which the PIX 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.

RBX

Physical Mounting of the RBX

The housing styles available for the RBX present a number of mounting options. For example, the HP unit in the explosionproof enclosure or with the available flange mount hardware can be mounted on virtually any flat surface. With available pipe-mount hardware, any 2-inch piping can be used.

For more information on these options and pipe mounting hardware, or for information on options or enclosures not shown, contact your Moore Industries Sales Representative.

Figure 4 shows the mounting dimensions of the DIN-style RBX. Figure 5 shows the HP unit dimensions. The unit shown is in its flange-mount configuration. Dimensions for the housing of units equipped with spring clip mounting hardware do not differ.

Electrical Connections

Figure 6 shows the installation hookup for the standard RBX, both 2- and 3-wire configurations. If your unit is equipped with the DT Option, front panel labelling will differ from standard. Figure 7 shows the hookup for DT-equipped units.

As the RBX is a loop-powered device, no additional electrical connections are required. Check the Power field of the unit 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 RBX to the positive lead from the power source in the loop. Connect the -PS RBX terminal in series with the positive terminals of the other devices in the loop and the negative terminal of the loop power supply.

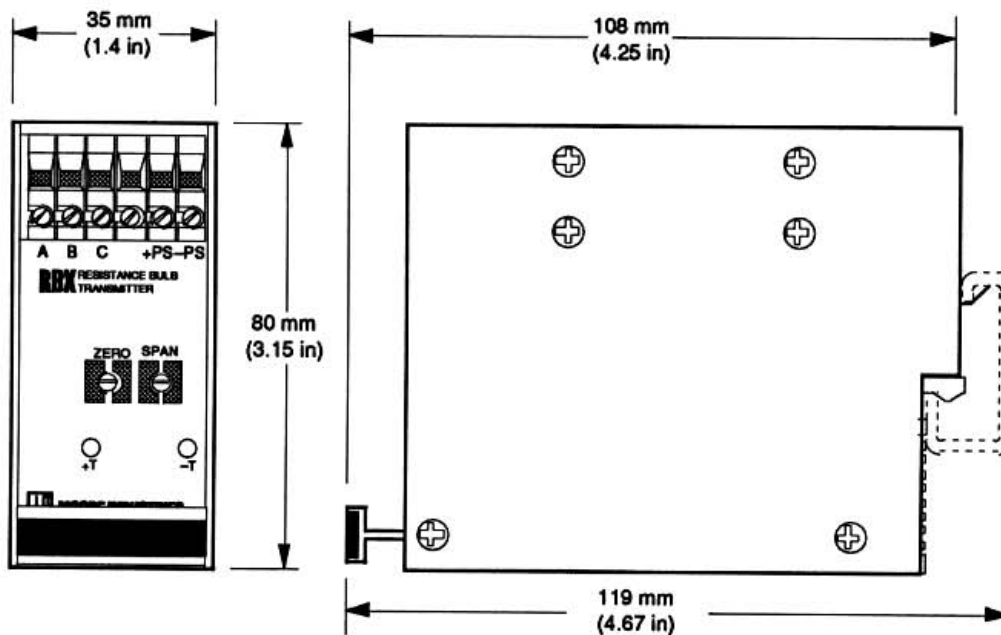
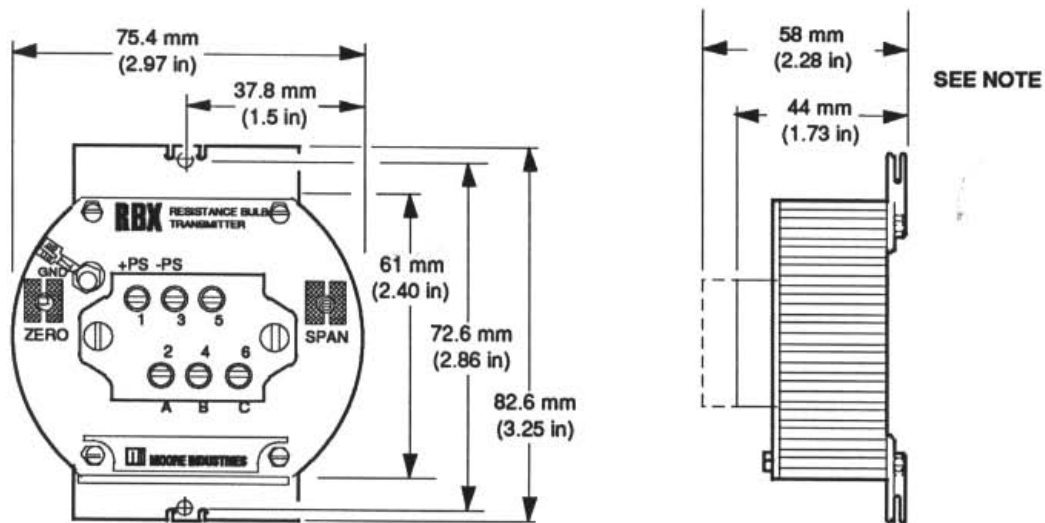
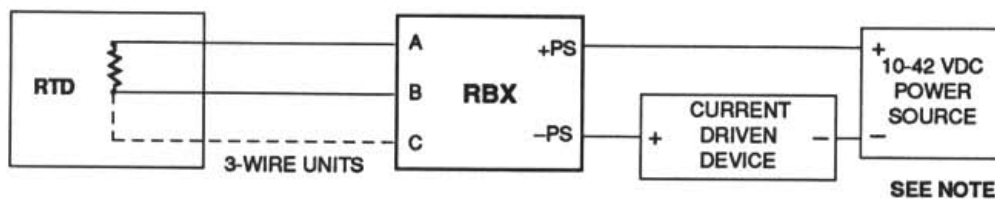


Figure 4. DIN-style RBX Outline Dimensions



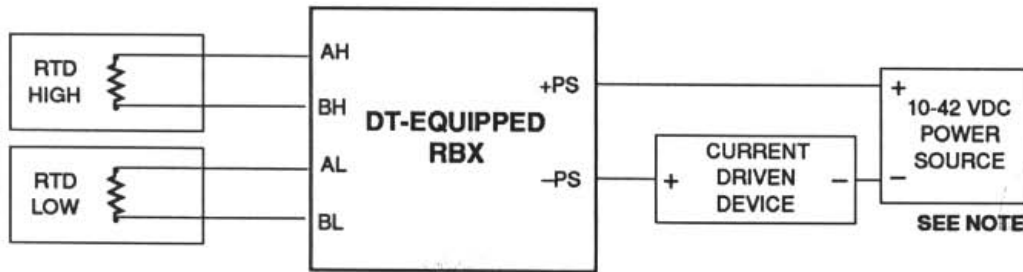
NOTE: Larger dimensions apply to units equipped with RF Option.

Figure 5. HP RBX Outline Dimensions



NOTE: Units equipped with I.S. Option require different power input. Refer to specifications table and appendix.

Figure 6. RBX Installation Hookup, Standard



NOTE: Units equipped with I.S. Option require different power input. Refer to specifications table and appendix.

Figure 7. RBX Installation Hookup, DT-equipped Units

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

In the case of DT-equipped units, connect one RTD to AH, BH, and the second to AL, and BL. The sensor that, in the application, is anticipated to undergo the greatest change in resistance should be connected to the AH and BH terminals.

Terminal 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 3 mm (0.12 inch).

Grounding. To ground the HP 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, in the case of HP units in explosionproof enclosures, the unit grounding screw is attached to the enclosure ground prior to shipment.

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

Maintenance & Troubleshooting

Once properly installed and connected, the RBX functions unattended. A simple, periodic check of connections is all that is required to maintain unit operation.

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

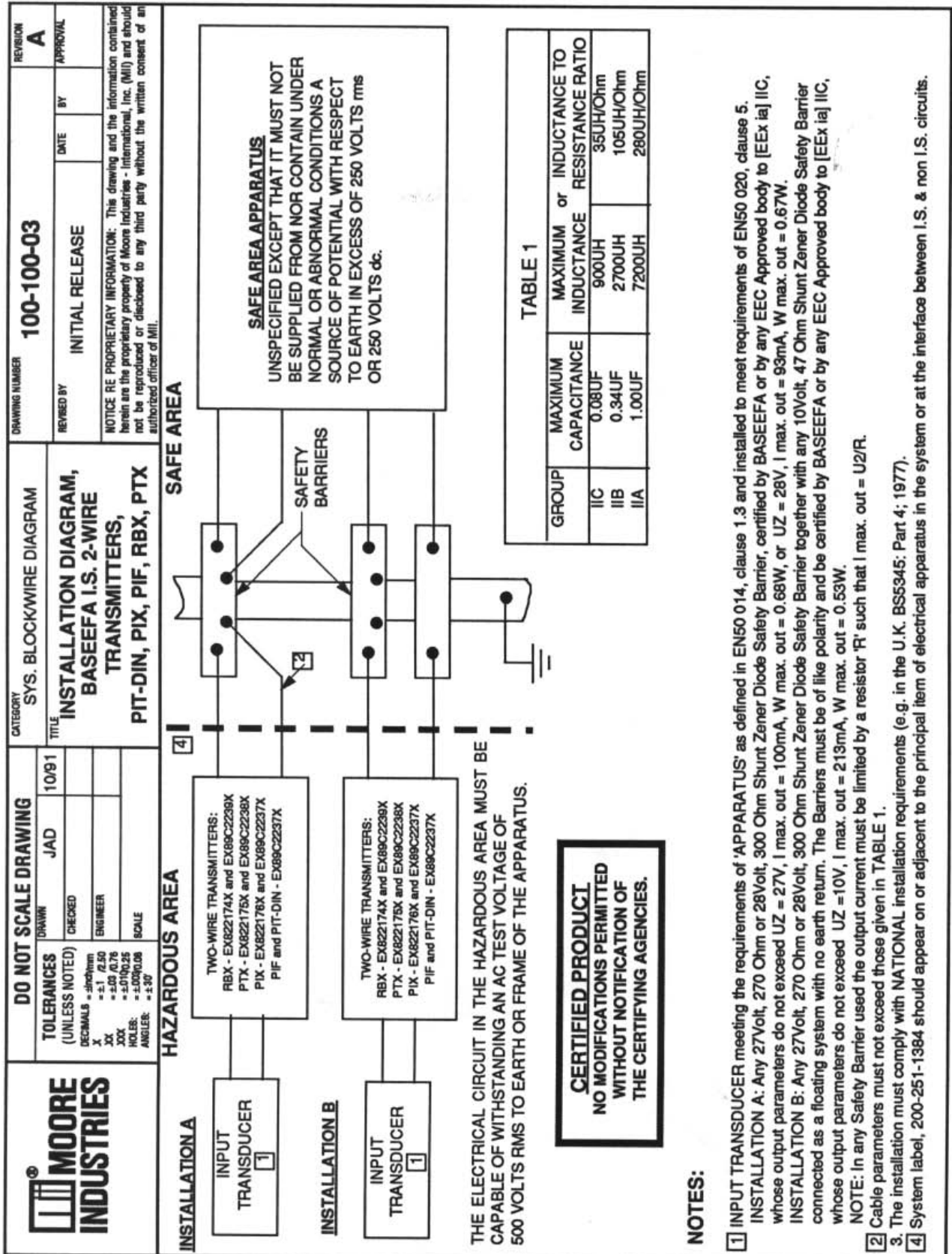
- Make sure that input and output connections are clean and tight.
- Remove the unit from service and recalibrate, making sure that bench instruments used are properly calibrated.
- Verify loop power levels.

If, after re-calibration, the RBX 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.

Test Jacks. The DIN-style RBX 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 10Ω , $\pm 0.05\%$ resistor connected to the jacks. The current in the loop should match that in the resistor, $\pm 0.01\%$.



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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