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Introduction

Moore Industries' Euro-style RBA with Display (RBA-ED) accepts all standard 2- or 3-wire RTD inputs and produces a signal that operates an alarm system. The RBA-ED may be configured as a single alarm with one relay, or a dual alarm with two relays operating from a single input or two independent inputs.

Each relay has a corresponding LED, which indicates when the relay is energized. The unit normally operates in fail-safe mode; where the relay is normally energized and is de-energized under alarm conditions or power loss.

This manual contains descriptive, calibration, and installation information for the RBA-ED.

Description

The RBA-ED is a 4-wire alarm unit in a euro-style package. The unit features an LCD in 0.25-inch high black numerals over a reflective background. There are 3-1/2 active digits and a decimal point to show values from 0 to +199.9. The display shows the trip point value and input value as a percent of span. These values are switch selectable by a rotary switch on the front panel of the unit.

The main board of the RBA-ED is divided into two identical halves (channels) with separate power supplies. A single alarm uses only one channel (single input, single output). A dual alarm uses both channels, with the inputs cross-linked (single input, dual output). For a dual input unit, both channels operate independently without crosslinking. This provides two single alarms on one board (dual input, dual output).

Two slide-switches on the printed circuit board allow each channel to be set to a high or a low alarm. Trip point controls allow the alarm to be set to trip at any point over the input range. Trip point potentiometers are provided to set the point at which each of the alarm relays change state. With a high alarm, the relay is de-energized when the input signal is above the trip point. The relay is de-energized when the input signal is below the trip point for a low alarm. See figure 1.

The dual input unit (DI Option) has two channels; A and B. Channel A is normally set to the higher trip point, but both channels are completely interchangeable.

Table 1 contains the equipment specifications for the RBA-ED.

Model Number. Moore Industries' model numbers identify the type of instrument, functional characteristics, operating parameters, any options ordered, and housing. If all accompanying documentation of a unit is missing, the model number can be used to obtain technical information. The model number for the RBA-ED is located on the plug-in connector.

Serial Number. A complete history is kept on every Moore Industries' unit. This information is keyed to the serial number. Whenever service data is required on a unit, it is necessary to provide the factory with the serial number. This information is engraved on the printed circuit board of the unit.

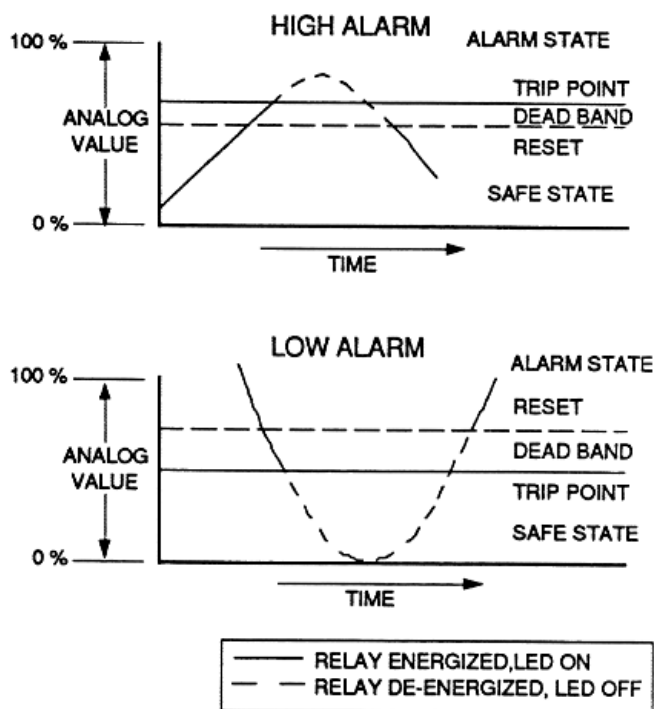


Figure 1. High and Low Alarm Configurations

Table 1. RBA-ED Equipment Specifications

Characteristic	Specification
Input	Input Resistance Greater than 10 M Ω Any standard 2- or 3-wire RTD Input Span: 10 Ω 25 Ω 100 Ω 400 Ω Zero Elevation: customer specified
Output	1 or 2 DPDT relay contacts rated for 5 A @ 117 Vac, non-inductive, or 28 Vdc
Input Power	24Vdc \pm 10%, 5 watts, nominal
Performance	Repeatability: Trip point repeats within \pm 0.1% of full span Deadband: 1% of span, standard Response: 150 milliseconds for a step change of 1% of span beyond trip points Line Voltage Effect: \pm 0.005% / 1% line change
Controls	Set Point: Multiturn potentiometer adjustable over 0-100% of span Dead Band: Externally adjustable dead band 1-20% of span, nominal Selection Switch: Enables user to display input or trip point value Zero Adjustment: \pm 10% of maximum range value
Operating Temperature	Range: -18 to +65 $^{\circ}$ C (0 to 150 $^{\circ}$ F) Effect on amplifier: Less than \pm 0.01% / $^{\circ}$ F over above range
Relay status	LEDs light up when relays are energized; switch selectable for high/low alarm status
Display	Shows trip point value and input value as a percent of span; switch selectable Type: LCD, 0.25" high black numerals over reflective background Format: 3-1/2 digits Range: 0 to +199.9 Decimal point: One Rate: 2 readings per second Resolution: 0.1% \pm 1LSD

Calibration

This section provides information necessary to adjust and calibrate the unit. Each unit is adjusted and checked at the factory for proper performance before shipping.

After the RBA-ED unit is unpacked, general operation level checks of the individual unit are recommended. Generally these checks, which are specified in Calibration Procedures, require little or no adjustments.

Controls

The RBA-ED has trip point and dead band adjustments located on the front panel of the unit. They are represented symbolically on the front panel by the following markings:

|  | represents Trip Point

|  | represents Dead Band

Each of these adjustments has a multiturn potentiometer that is adjustable with a slotted screwdriver. The type of potentiometer used with these adjustments usually requires twenty turns of the shaft to move the wiper from one end of its range to the other.

These potentiometers are equipped with a slip clutch at each end to prevent damage if the adjustment is turned beyond the wiper stop. Usually a slight change can be felt when the clutch is at the end of a range (i.e., slipping). However, if this change is not detected, either end can be reached by turning the shaft twenty turns in the desired direction.

LED's

LED's associated with each output relay are included on the front panel of the unit as a standard feature. These LEDs inform the user when an alarm condition or power failure has occurred. These LEDs are labeled "TRIP POINT A" and "TRIP POINT B" on dual alarm units, and "TRIP POINT" for single alarm units. See figure 2.

Liquid Crystal Display (LCD)

The LCD has 0.25-inch black numerals over a reflective background. There are 3-1/2 digits with a decimal point to show values from 0 to +199.9. The display shows the trip point value and input value as a percent of span. These values are switch selectable from the front panel. See figure 2.

RBA-ED

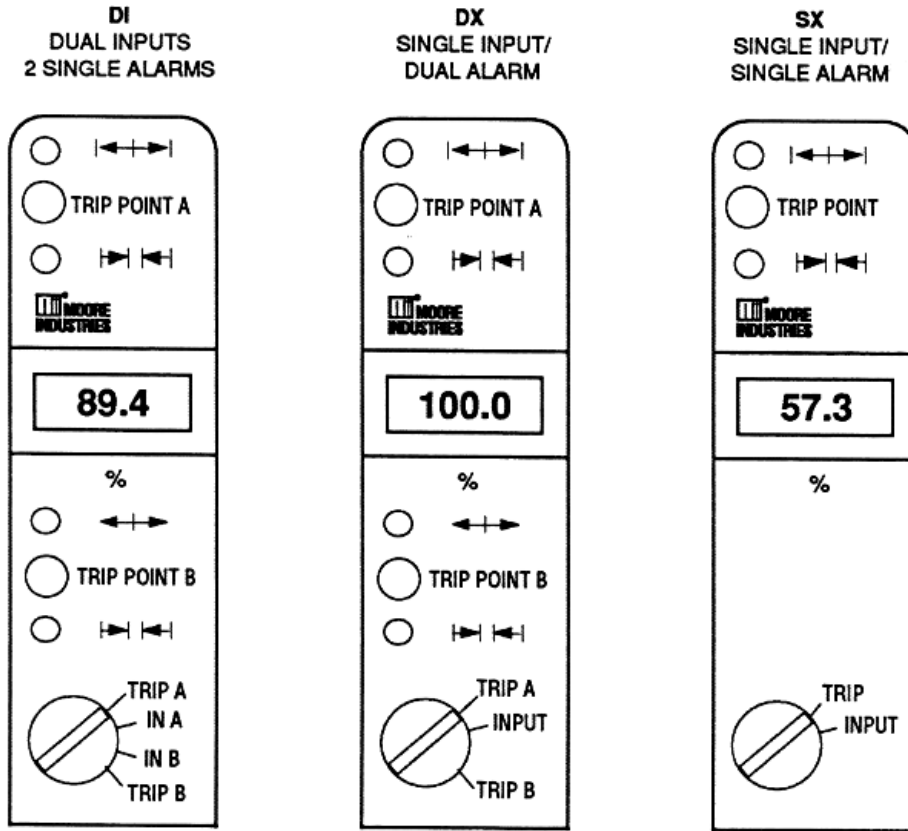


Figure 2. Front Panel Configurations

Calibration Equipment

Calibration equipment is listed in table 2. This equipment is not supplied with the unit and must be provided by the user.

Calibration Setup

Off-line calibration for all RBA-ED units generally requires the same test equipment setup. Three separate configurations are shown for clarity. The calibra-

tion setup for dual input/dual alarm units (DI Option) is shown in figure 3. The calibration setup for single input/dual alarm units is shown in figure 4. The calibration setup for single input/single alarm units is shown in figure 5.

At the factory, units are normally calibrated using a special test fixture to provide connection and a separate power supply. Calibration can be done on-site, using an extender card to bring the unit forward out of the rack, and using the normal power supply. An extender card is available from Moore Industries.

Table 2. Calibration Equipment

Equipment	Description
Precision Resistance Decade Box	Must be capable of producing resistance ranges defined by input level requirements
DC Voltmeter	Accurate to within $\pm 0.05\%$
Ohmmeter	Accurate to within 1%
Power Supply	24 Vdc, 1A
Female Connector	DIN 41612
Extender Board	Available from Moore Industries
Screwdriver (slotted)	Head width no greater than 2.54 mm (0.1 in)

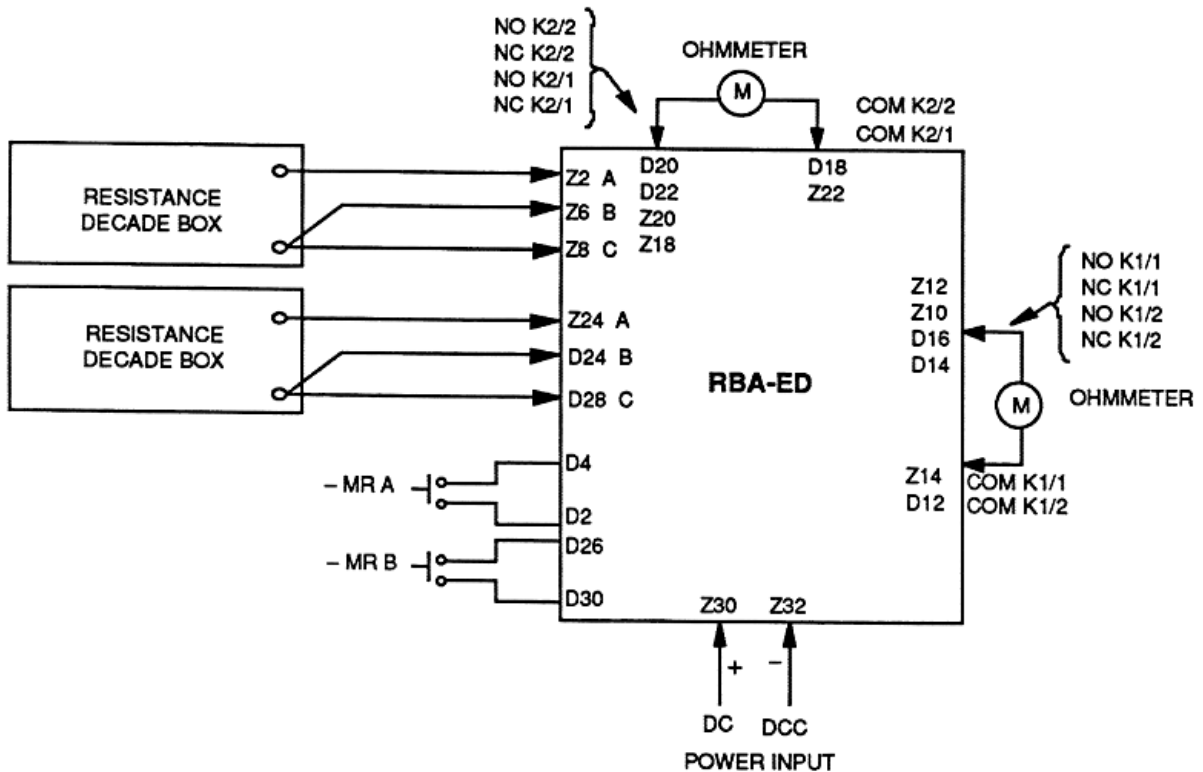


Figure 3. Calibration Setup for Dual Input/Dual Alarm Units

RBA-ED

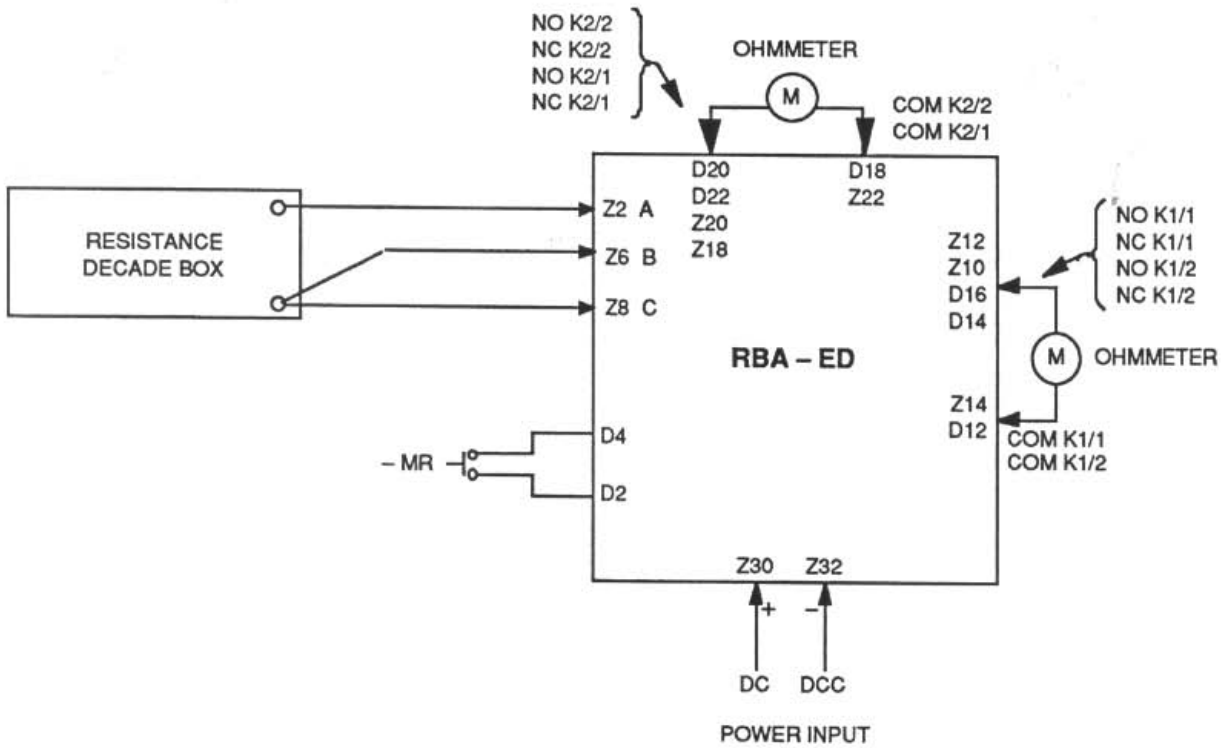


Figure 4. Calibration Setup for Single Input/Dual Alarm Units

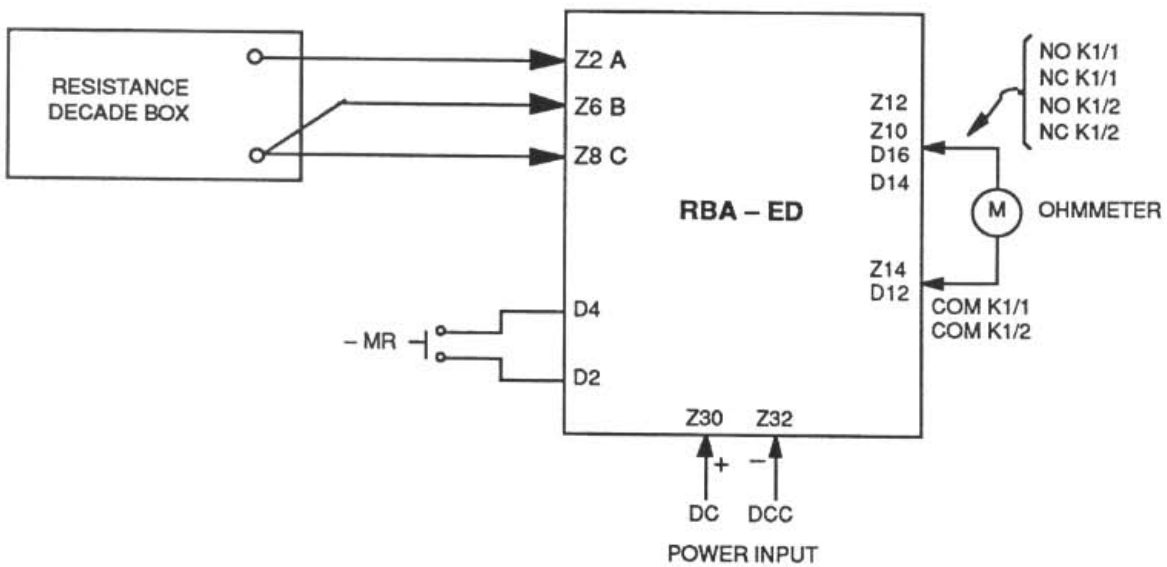


Figure 5. Calibration Setup for Single Input/Single Alarm Units

Calibration Procedure

Calibration consists of simulating an input signal to the RBA-ED, monitoring the input value on the LCD of the unit, and adjusting the controls to obtain the desired value. Trip point settings are also set and verified. The RBA-ED unit has an LCD, which shows the trip point value and input value as a percent of span.

1. Disconnect power from the euro-style rack.
2. Remove the RBA-ED to be calibrated from the rack.
3. Insert the extender card into the rack.
4. Insert the RBA-ED into the extender card.
5. Verify that switches SW1 and SW2 (dual alarm) are set for a high or low alarm, as specified. See figure 6.
 - UP = high alarm
 - DOWN = low alarm
6. Connect a precision resistance decade box to the input of the RBA-ED. Connect a 24 Vdc power source.
7. Turn the selector switch to the INPUT position. DI=IN B.
8. Connect a voltmeter from TP1 (U1-6) (+) to anode CR1 (-). DI=TP4(U4-6)(+) to anode of CR13.
9. Set R36 to midpoint of travel. DI=R93.
10. Apply power to the unit and set the decade box to an input voltage equal to zero percent of the input range.
11. Adjust input zero pot (R39) to obtain 0 V at TP1. DI=R96 to obtain 0V at TP4.
12. Connect the voltmeter from U1-3 (+) to U1-2 (-). DI=from U4-3(+) to U4-2(-).

13. Adjust R36 to obtain 0.000 V. DI=R93.
14. Repeat steps 8 & 11 to confirm 0 V at TP1. DI=TP4.
15. The display should read 000.0 percent.
16. Adjust the decade box to 100 percent of the input range.
17. If the display does not read 100.0 percent, adjust the display Span potentiometer, R6, for 100.0 percent.
18. For dual alarm units, set the input selector switch to the blank position between input and trip B. Adjust R51 for 100.0 percent on the display. DI=R51.
19. Repeat steps 10, 15 and 16 to verify a zero percent input reading.
20. Apply 0, 25, 50 and 75 percent input.
21. Observe the LCD at each setting in step 20 and verify that the input is linear for the operating range selected.
22. Turn the selector switch on the front of the unit to TRIP A.
23. Set the TRIP A potentiometer (R102), located on the front panel of the unit, to the desired trip point value in percent of span.
24. For dual alarm and DI units, repeat steps 22 and 23 for TRIP B potentiometer (R104).

Calibrating a Unit with the AR Option

The Alarm Response Delay (AR) option introduces a time delay in the unit. This makes calibration difficult because the user must wait for the delay time to see if the setpoints have been tripped. The delay may be defeated by short circuiting diodes CR4 and/or CR16. Take extreme care in shorting diodes, as damage may occur if diodes are accidentally shorted to other parts.

RBA-ED

Calibrating a Unit with the MR Option

If the Manual Reset (MR) option is present on your unit, the dead band circuit is not available. Verify that the unit latches upon alarm. Verify the unit resets only by shorting the MR terminals together with an external switch after changing the input signal from -25 to +125%.

The MR function resets both alarms in a single input, dual alarm units. For DI units, the MR function is separate for each channel.

Calibrating a Unit with the AD Option

The Adjustable Dead Band (AD) option provides an adjustable 1-20 percent dead band from the trip point (available to 100 percent). When the controlled variable is within this range, no control action takes place. The following is an example of a 20 percent dead band adjustment procedure:

1. Turn Dead Band A potentiometer (R103) fully clockwise.
2. Apply power to the unit.
3. Adjust TRIP (TRIP A) potentiometer to exactly 60 percent as indicated by the LCD when set to TRIP A.
4. Set SW1 alarm status to low. Check that the unit trips at 60 percent and resets at 80 percent or greater.
5. Turn the Dead Band potentiometer counterclockwise so the unit now resets at 80 percent, ± 0.1 percent.
6. Set SW1 alarm status to high. Check that the unit trips at 60 percent and resets at 40 percent, ± 2 percent.
7. For dual alarm or DI units, repeat steps 1 through 6 for TRIP B potentiometer and Dead Band B potentiometer (R105) using SW2.

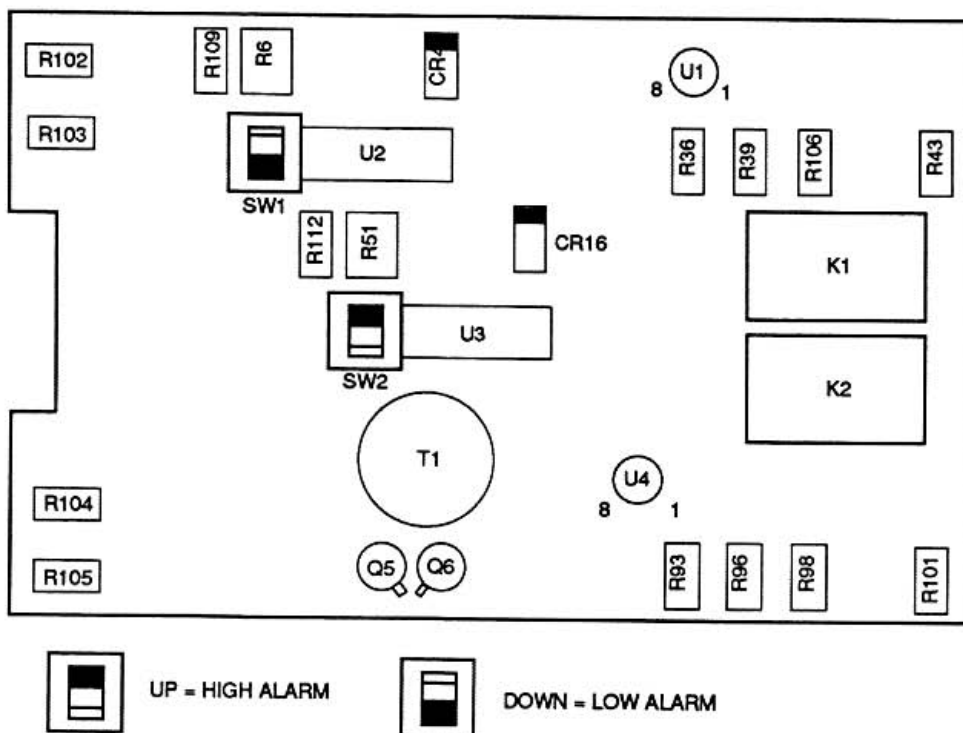


Figure 6. RBA-ED Component Locations

Any amount of dead band between 0.5 percent and greater than 20 percent may be set using this procedure.

Completion of Calibration

1. Remove power from the euro-style rack.
2. Disconnect the calibration equipment and reconnect the input leads.
3. Remove the extender card and the RBA-ED.
4. Replace the RBA-ED in the rack.
5. Re-connect power to the rack.

Installation

This section provides physical mounting dimensions, installation procedures, and electrical connections. Although the units are designed to operate in free air at a high ambient temperature, it is recommended

that if a large number of units are mounted together in a rack or cabinet, attention should be given to adequate ventilation. In addition, input and output values should be checked, on-site, before the unit is placed into service.

Mounting

The RBA-ED is a plug-in card that mounts in a rack. Moore Industries' Euro-style Rack is designed for high-density mounting of Moore Industries' euro-style devices. Up to 12 individual cards can be installed in this standard 19-inch rack.

The Euro-style Rack has 16-point screw connectors or 32-point screw connectors on the terminal block depending on the type of euro-style device selected. It is available without a terminal block for applications where terminal connectors (i.e., solder tags, wire wrap pins, etc.) are used.

Outline dimensions for Moore Industries Euro-style Rack and the RBA-ED are shown in figures 7 and 8, respectively.

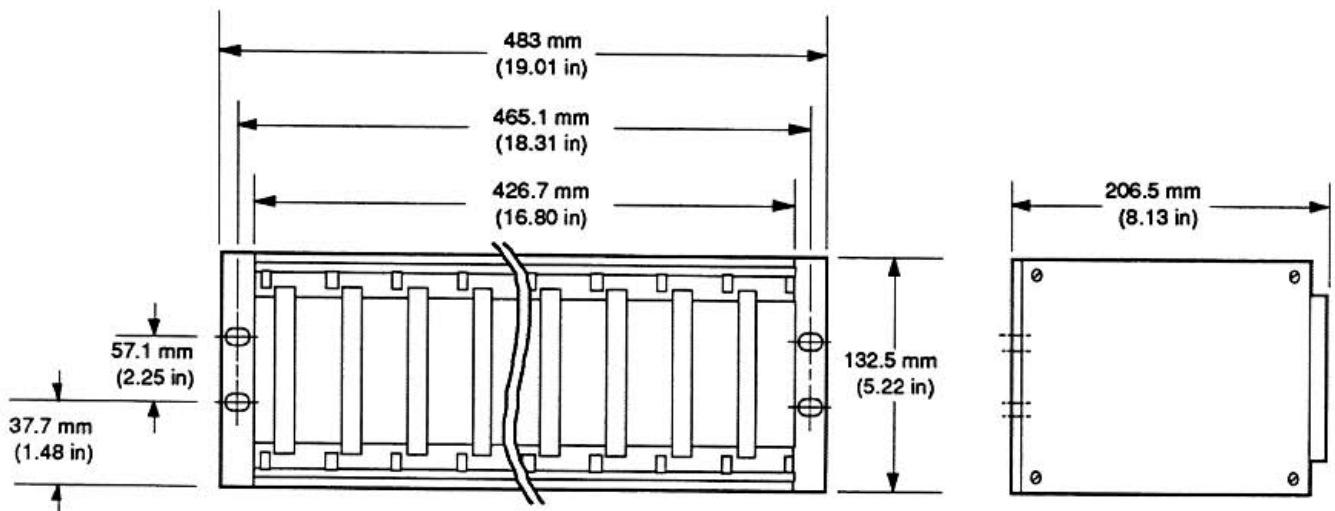


Figure 7. Euro-style Rack Outline Dimensions

RBA-ED

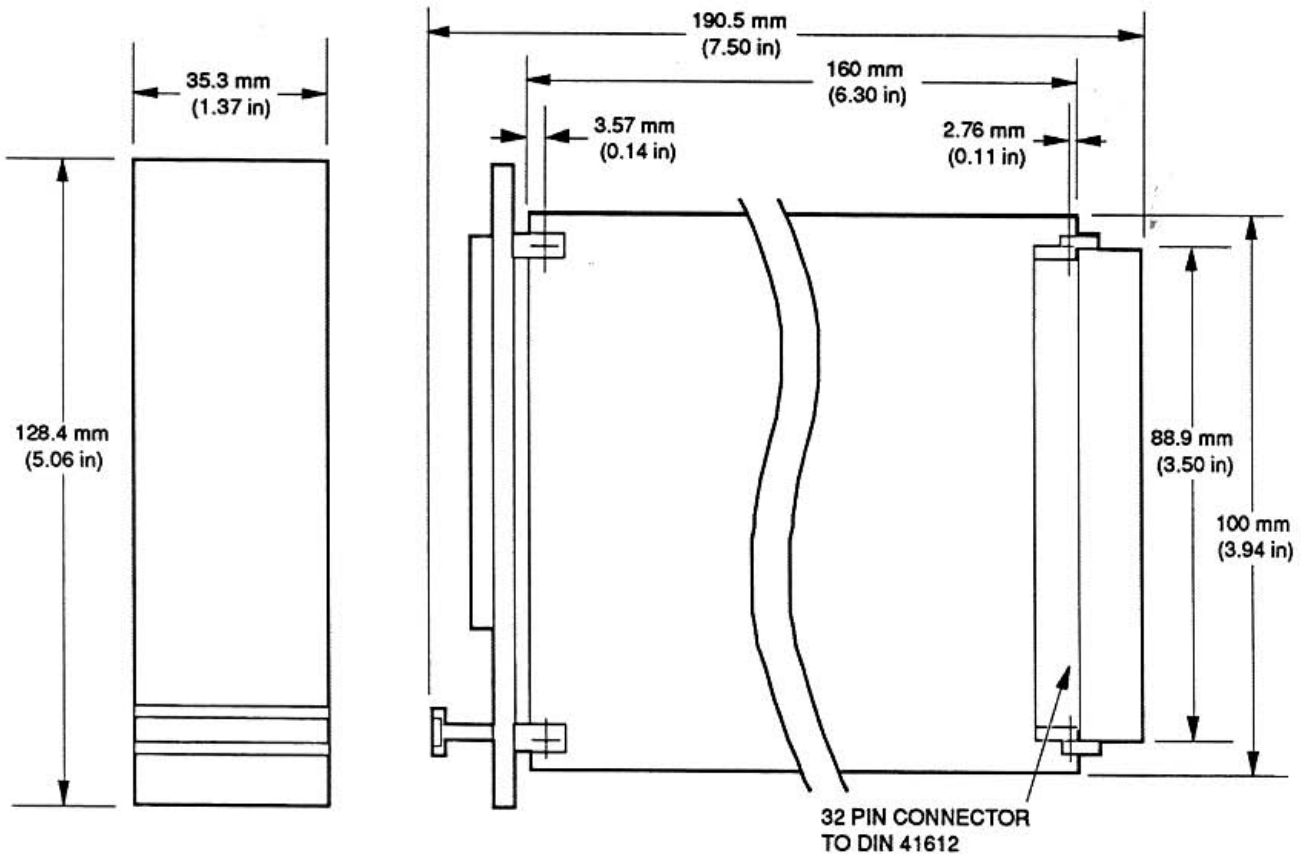


Figure 8. RBA-ED Outline Dimensions

Electrical Connections

All electrical connections to the RBA-ED are made to the terminals on the mating connector of the unit, located in the rack. See table 3, 4 or 5. (The terminals are designed for 16 AWG, maximum, wire size).

The RBA-ED operates directly from a 24-Vdc power source. The dc power source should be regulated to within $\pm 10\%$ of the nominal voltage and should be capable of delivering 5 watts.

Operation

Once the RBA-ED has been calibrated and installed, it may be left unattended. The only controls for the unit are the Trip Point and Dead Dand potentiometers,

which after initial adjustment require no further attention. The LEDs on the front of the unit indicate when an alarm is energized. Because the circuit uses highly reliable solid-state components with no moving parts, the RBA-ED operates maintenance free for extended periods of time.

The RBA-ED may become warm during operation, especially when a large number of cards are mounted together in a rack or cabinet, and the ambient temperature is above normal. This is perfectly acceptable and should not be a cause for alarm, unless a malfunction is also observed.

A periodic check of terminal connections is recommended every six months to ensure continued dependability of service.

Table 3. RBA-ED Connector Pins for Dual Input/Dual Alarm Units

Pin	Row d	Row z
2	MR, Channel A	A, Channel A
4	MR, Channel A	
6		B, Channel A
8		C, Channel A
10		NC K1/1
12	COM K1/2	NO K1/1
14	NC K1/2	COM K1/1
16	NO K1/2	
18	COM K2/2	NC K2/1
20	NO K2/2	NO K2/1
22	NC K2/2	COM K2/1
24	B, Channel B	A, Channel B
26	MR, Channel B	
28	C, Channel B	
30	MR, Channel B	DC (+24)
32		DCC (Common)

Table 4. RBA-ED Connector Pins for Single Input/Dual Alarms Units

Pin	Row d	Row z
2	MR	A
4	MR	
6		B
8		C
10		NC K1/1
12	COM K1/2	NO K1/1
14	NC K1/2	COM K1/1
16	NO K1/2	
18	COM K2/2	NC K2/1
20	NO K2/2	NO K2/1
22	NC K2/2	COM K2/1
24		
26		
28		
30		DC (+24)
32		DCC (Common)

Table 5. RBA-ED Connector Pins for Single Input/Single Alarm Units

Pin	Row d	Row z
2	MR	A
4	MR	
6		B
8		C
10		NC K1/1
12	COM K1/2	NO K1/1
14	NC K1/2	COM K1/1
16	NO K1/2	
18		
20		
22		
24		
26		
28		
30		DC (+24)
32		DCC (Common)

RBA-ED

Maintenance

Maintenance of the RBA-ED is limited to keeping the terminals clean and tight, and ensuring there is adequate ventilation or heat dissipation for the unit. It is recommended that the user check the terminals every six months.

Troubleshooting

Troubleshooting the RBA-ED involves determining whether the unit is functioning abnormally. The calibration equipment listed in table 2 can be used to verify that the RBA-ED outputs are within specified limits. See specifications, table 1. It is recommended that any unit found performing below specifications be returned to the factory for service, in accordance with the instructions on the back cover of this manual.

If a problem is suspected with the RBA-ED, it is suggested that the following check list be reviewed as a preliminary step:

1. Verify that all electrical connection are clean and tight.
2. Verify that the measuring instrument used for input voltage or current is of the proper range and accuracy.
3. Verify that the output circuit is electrically isolated from the input circuit.

If a unit is performing below specifications, and the unit cannot immediately be sent back to the factory without affecting operations, contact the Moore Industries' Customer Service Department toll-free at 1-800-999-2900.



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: RBA

	<u>MODEL</u>	<u>INPUT</u>	<u>OUTPUT</u>	<u>POWER</u>	<u>OPTIONS</u>	<u>HOUSING</u>
Model Number(s):	RBA	*W-50	**	*	*-CE ¹	***
	RBA	*W-100	**	*	*-CE ¹	***
	RBA	*W-400	**	*	*-CE ¹	***

*Indicates any number of wires, power and options as stated in the product data sheet.
 **Indicates any output excluding dual relays with DPDT option.
 ***Indicates any housing excluding plug-ins and panel mount.

Conforms to the following EMC specifications:

EN50081-2, 1993, Generic Emissions Standard; Industrial Environment.
 EN50082-2, 1995, Generic Immunity Standard; Industrial Environment.
 EN61010-1, 1995, Safety requirements for electrical equipment for measurement and control use.

Supplemental Information:

¹ RF filters are required for the CE option.

August 28, 1996

Date

Fred Adt

Quality Assurance Director

Robert Stockham

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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

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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