MOORE INDUSTRIES

DCA-ED

Direct Current Alarm,
Eurocard-style with Display

USER'S MANUAL

May1990

No. 192-762-00B

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DCA-ED

Introduction

This manual contains descriptive, calibration, and maintenance information on the Direct Current Alarm, Eurocard-style with Display (DCA-ED). The DCA-ED accepts all standard process inputs and produces a signal that operates an alarm system. The DCA-ED may be configured as a single alarm with one relay, a dual alarm with two relays operating from one input signal, or dual input (two isolated channels operating independently from two inputs).

Each relay has an LED indicator in series, which indicates when the relay is energized. The unit operates in fail-safe mode; the relay is energized in the normal condition and is de-energized under alarm conditions or power loss.

Description

The DCA-ED is a 4-wire alarm unit on a Eurocard. The unit features an LCD display in 0.25-inch high black numerals over a reflective background. There are 3-1/2 active digits with a decimal point and minus sign to show ranges from -199.9 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 DCA-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 (both fail-safe). 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 (DI option) unit has two channels: A and B. Channel A is normally set to the higher trip point, but both channels are totally interchangeable.

A complete set of specifications for the DCA-ED is shown in table 1. This specification contains complete information on input, output and performance.

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 DCA-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.

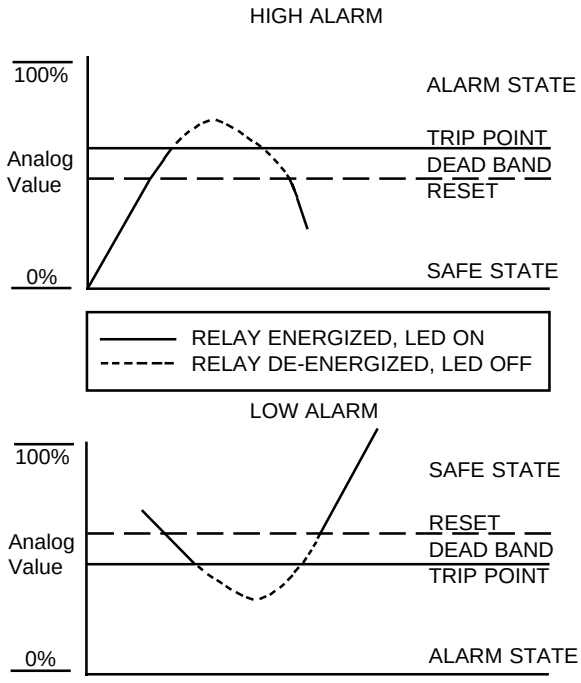

Figure 1. *High and Low Alarm Configurations*

Table 1. *DCA-ED Specifications*

Characteristic	Specification
Input	**Current:** 1-5 mA @ 200-ohm nominal input impedance 4-20 mA @ 50-ohm nominal input impedance 10-50 mA @ 20-ohm nominal input impedance 0-20 mA @ 50-ohm nominal input impedance **Voltage:** Input impedance 1 Mý, minimum; 200 Ký with DA or ATL option 0-5 V, 1-5 V, 0.25-1.25 V, 0-1 V
Output	1 or 2 DPDT relay contacts rated @ 5 A, 117 Vac non-inductive or 28 Vdc **TXA Output:** 25 mA @ 24 Vdc, ±5% **TXB Output:** 25 mA @ 24 Vdc ±5%
Input Power	24 Vdc ±10%, 5 watts, nominal
Performance	**Repeatability:** Trip point repeats within ±0.1% of full span **Dead band:** 1% of span, standard **Response:** 150 milliseconds for a step change of 1% of span beyond trip points **Line Voltage Effect:** ±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
Operating Temperature	**Range:** -18 to 65 °C (0 to 150 °F) **Effect:** Less than ±0.018% / °C (±0.01% / °F) over above range
Feature	**Relay status:** LEDs light when relays are energized; switch-selectable for high/low status
Display	Shows trip point value and input value as a percentage of span; switch-selectable **Type:** LCD, 0.25-inch high black numerals over reflective background **Format:** 3-1/2 digits **Range:** -199.9 to +199.9 **Decimal point:** One **Rate:** Two readings per second **Resolution:** 0.1% ±1 LSD

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

Adjustments

The DCA-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 using a slotted screwdriver. The type of potentiometer used with these adjustments usually require 20 turns of the shaft to move the wiper from one end of its range to the other.

The 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 felt, either end can be reached by turning the shaft twenty turns in the desired direction.

LEDs

LEDs 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. The LEDs are labeled TRIP POINT A and TRIP POINT B on dual input units, TRIP POINT A and TRIP POINT B on dual alarm units, and TRIP POINT for single alarm units.

See figure 2 for front panel controls and indicators.

LCD Display

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

See figure 2 for front panel controls and indicators.

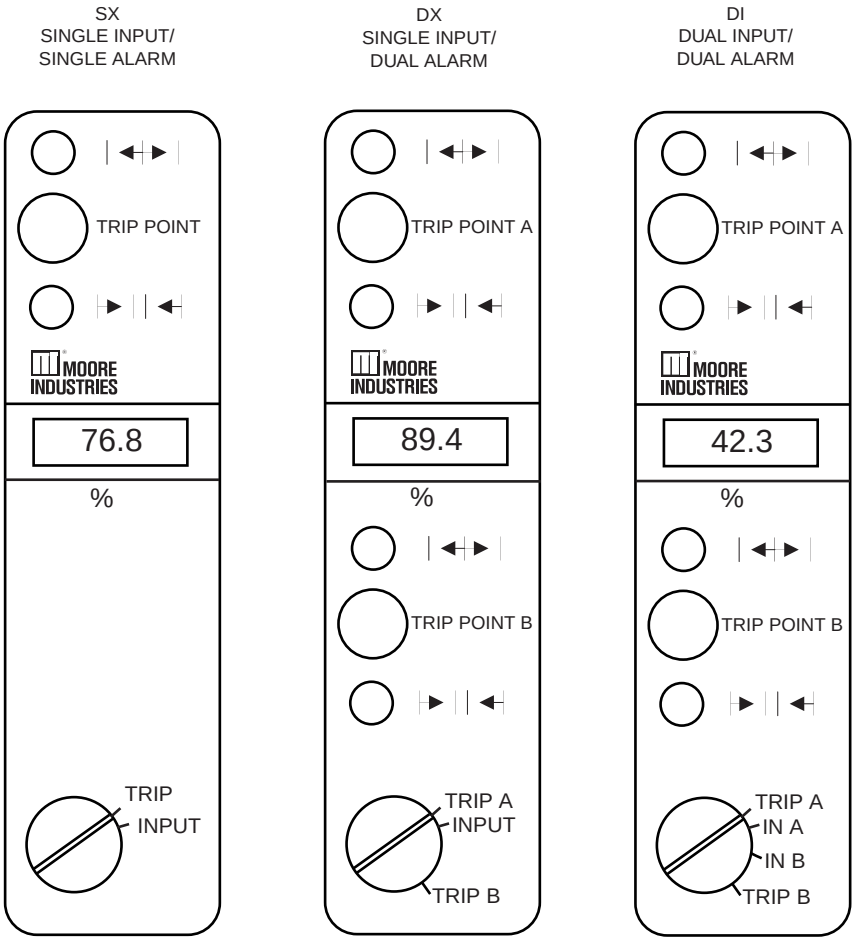

Figure 2. *Front Panel Controls and Indicators, All Models*

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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 DCA-ED units generally requires the same test equipment setup. Three separate configurations are shown for clarity. The calibration setup for single input/single alarm units is shown in figure 3. The calibration setup for single input/dual alarm units is shown in figure 4. The calibration setup for dual input dual alarms (DI option) 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 accomplished 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
Screwdriver (slotted)	Head width no greater than 2.54 mm (0.1 inch)
Adjustable dc signal source	Must be capable of producing signal ranges defined by input level requirements
Dc voltmeter	Must be accurate to within ±0.05%, or better
Dc milliammeter	Must be accurate to within ±0.05%, or better
Ohmmeter	Accurate to within 1%
Power supply	24 Vdc @ 1 A
Female connector	DIN 41612

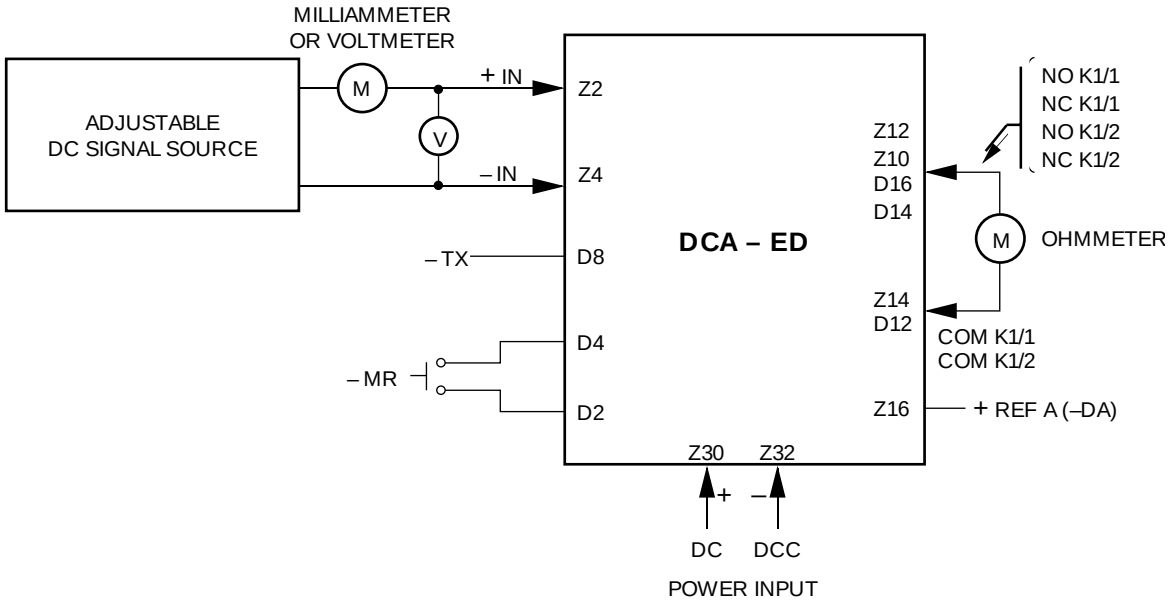

Figure 3. *Calibration Setup for Single Input/Single Alarm Units*

DCA-ED

FIG. 03 SI/DA

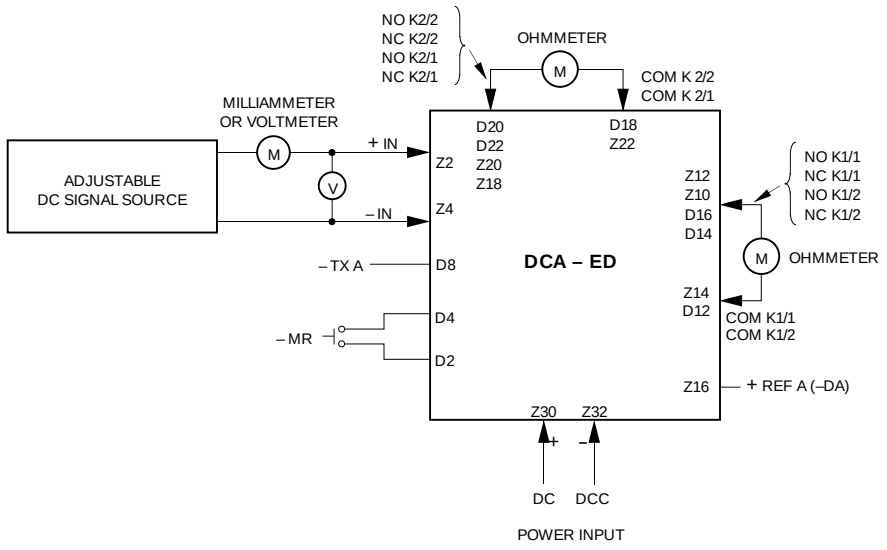

Figure 4. *Calibration Setup for Single Input/Dual Alarm Units*

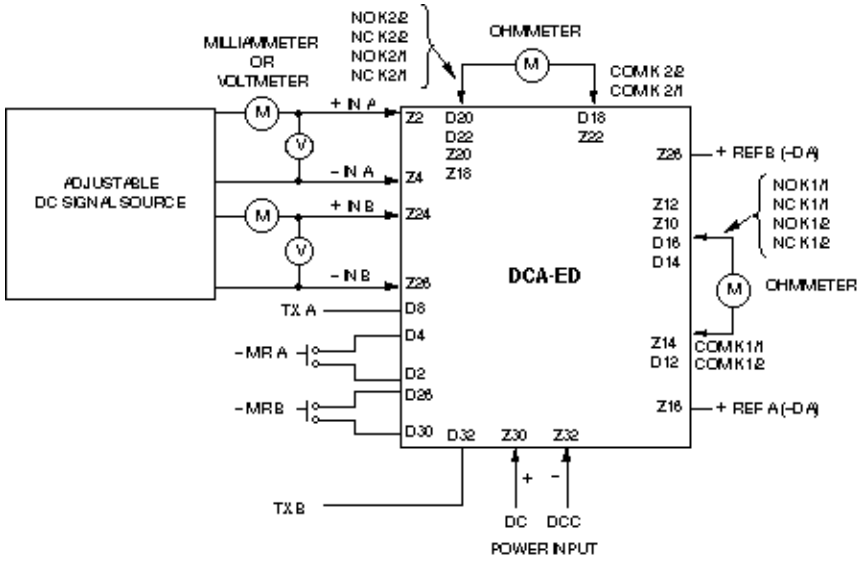

Figure 5. *Calibration Setup for Dual Input/Dual Alarm Units*

Display Calibration Procedure

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

NOTE

For units configured with the DI option, use the corresponding reference designation for DI, and repeat the test for the B channel.

1. Disconnect power from the EU-Rack.
2. Remove the DCA-ED to be calibrated from the EU-Rack.
3. Insert the extender card into the Eurorack.
4. Insert the DCA-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 signal source to the input of the DCA-ED. Connect a 24 Vdc power source. Refer to figures 3, 4 and 5.
7. Turn the selector switch to the INPUT position. (DI=IN B)
8. Apply power to the unit and set the signal source to an input equal to zero percent of the input range.
9. The display should read 000.0 percent.
10. If the display does not read 000.0 percent, adjust the display Zero potentiometer, R109, for 000.0 percent. (DI=R112)
11. Adjust the signal source to 100 percent of the input range.
12. If the display does not read 100.0 percent, adjust the display Span potentiometer, R6, for 100.0 percent.
13. 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)
14. Repeat steps 8, 9 and 10 to verify a zero percent input reading.
15. Apply 0, 25, 50 and 75 percent input.
16. Observe the LCD display at each setting in step 15 and verify that the input is linear for the operating range selected.
17. Turn the selector switch on the front of the unit to TRIP A.
18. Set the TRIP A potentiometer (R102), located on the front panel of the unit, to the desired trip point value in percent of span.
19. For dual alarm and DI units, repeat steps 17 and 18 for TRIP B potentiometer (R104).

Calibrating a Unit with 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.

Calibrating a Unit with the DA Option

The Deviation Alarm (DA) option requires two inputs: one reference signal and one input signal. The deviation alarm detects any variation of the control signal from the reference signal in either direction.

- Input signal = Reference signal (+REF)
  Alarm = 50%
- Input signal = 0%
  Reference signal = 100%, Alarm = 0%
- Input signal = 100%
  Reference signal = 0%, Alarm = 100%

Calibration is the same as shown, using the above conditions for zero percent, 50 percent and 100 percent input references.

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 exernal switch after changing the input signal from -25 to + 125%. Note: MR resets both alarms in a dual alarm. For DI units MR is separate.

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 untrips at 80 percent or greater.

5. Turn the Dead Band potentiometer counterclockwise so the unit now untrips at 80 percent, ±0.1 percent.

6. Set SW1 alarm status to high. Check that the unit trips at 60 percent and untrips 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.

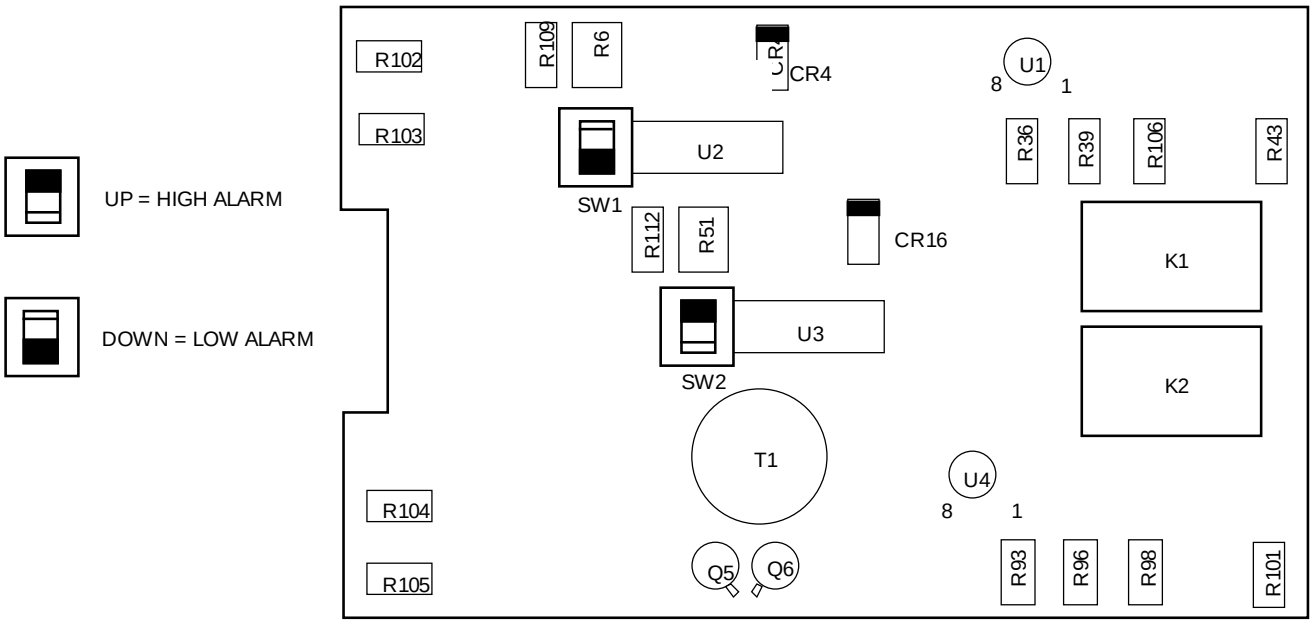

Figure 6. *Switch Positions*

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 EU-Rack.
2. Disconnect the calibration equipment and reconnect the input leads.
3. Remove the extender card and the DCA-ED.
4. Replace the DCA-ED in the EU-Rack.
5. Re-connect power to the EU-Rack.

Installation

This section contains physical mounting dimensions and electrical connections for the DCA-ED. 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 DCA-ED is a plug-in card that mounts in a rack. Moore Industries' EU-Rack is designed for high-density mounting of Moore Industries' Eurocards. Up to 12 individual cards can be installed in this standard 19-inch rack.

The EU-Rack has 16-point screw connectors or 32-point screw connectors on the terminal block, depending on the type of Eurocard 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 of the DCA-ED and the 19-inch EU-Rack are shown in figures 7 and 8.

Electrical Connections

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

The DCA-ED operates directly from a 24 Vdc power source. The dc power source should be regulated to within ±10 percent of the nominal voltage and should be capable of delivering 5 watts.

Operation

Once the DCA-ED has been calibrated and installed, it may be left unattended. The only controls for the unit are the Setpoint and Dead Band 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 DCA-ED operates maintenance-free for extended periods of time.

The DCA-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 cause for alarm, unless a malfunction is also observed.

FIG. 06 DCA-EU DIMENSION

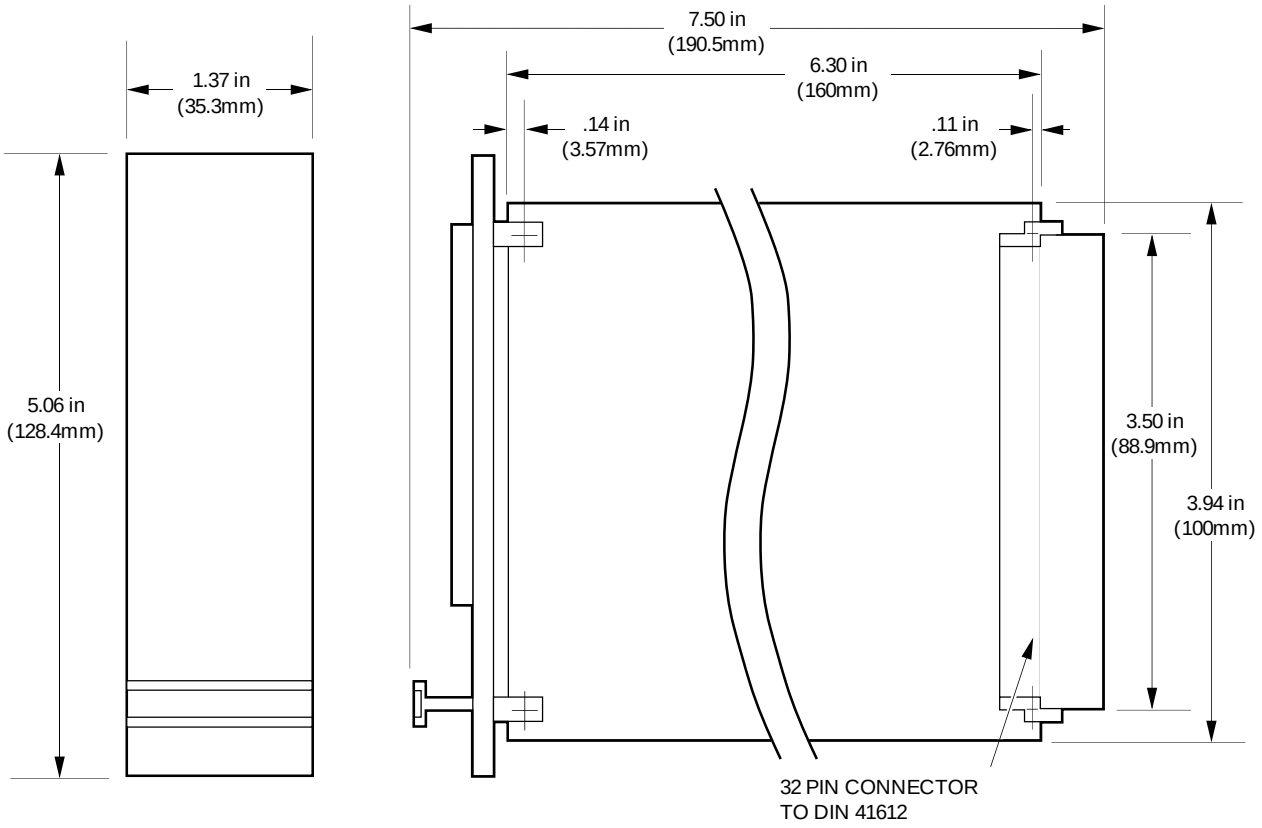

FIG. 07 EUROCARD RACK

Figure 7. *DCA-ED Outline Dimensions*

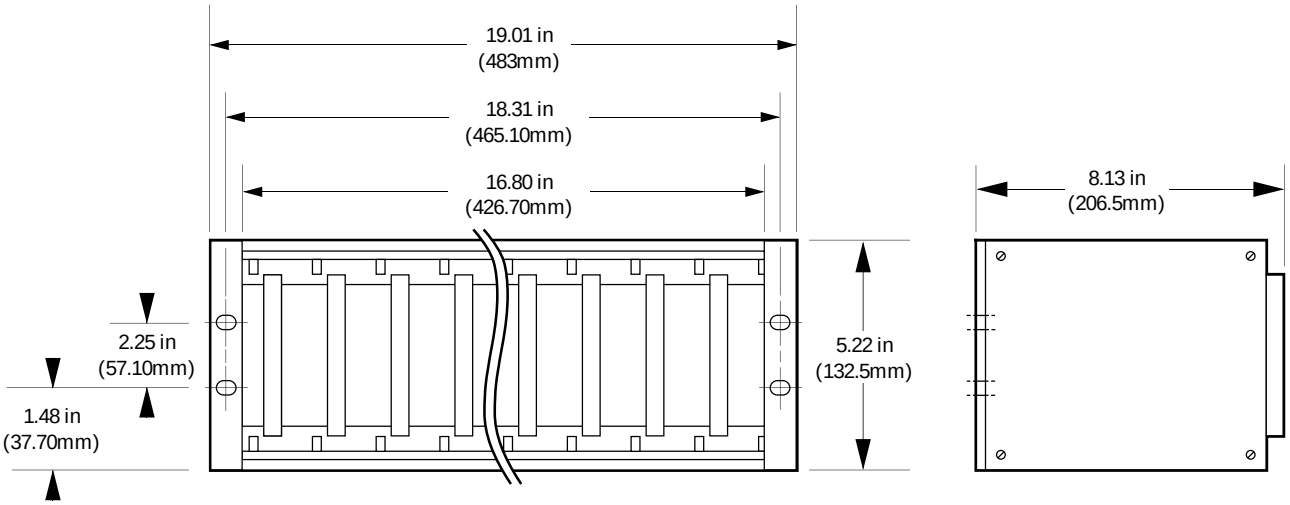

Figure 8. *EU-Rack Mounting Dimensions*

Table 3. *DCA-ED Connector Pins for Units with Single Alarm*

Pin	Row Z	Row D
2	+IN	MR
4	-IN	MR
6		
8		TXA
10	NC K1/1	
12	NO K1/1	COM K1/2
14	COM K1/1	NC K1/2
16	+REF	NO K1/2
18		
20		
22		
24		
26		
28		
30	DC +24	
32	DCC COMMON	

Table 4. *DCA-ED Connector Pins for Units with Single Input/Dual Alarms*

Pin	Row Z	Row D
2	+IN	MR
4	-IN	MR
6		
8		TX
10	NC K1/1	
12	NO K1/1	COM K1/2
14	COM K1/1	NC K1/2
16	+REF	NO K1/2
18	NC K2/1	COM K2/2
20	NO K2/1	NO K2/2
22	COM K2/1	NC K2/2
24		
26		
28		
30	DC +24	
32	DCC COMMON	

Table 5. *DCA-ED Connector Pins for Units with Dual Input/Dual Alarms*

Pin	Row Z	Row D
2	+IN, CHANNEL A	MR , CHANNEL A
4	-IN, CHANNEL A	MR, CHANNEL A
6		
8		TX, CHANNEL A
10	NC K1/1	
12	NO K1/1	COM K1/2
14	COM K1/1	NC K1/2
16	+REF, CHANNEL A	NO K1/2
18	NC K2/1	COM K2/2
20	NO K2/1	NO K2/2
22	COM K2/1	NC K2/2
24	+IN, CHANNEL B	
26	+REF, CHANNEL B	MR , CHANNEL B
28	-IN, CHANNEL B	
30	DC +24	MR, CHANNEL B
32	DCC COMMON	TX, CHANNEL B

Theory of Operation

This section describes the unit operation. The functional description is based on the block diagram in figure 9.

Power Supply Circuit

Units are supplied for use with a dc power input that is applied directly to the power inverter, with diode protection to prevent damage to the power inverter if the dc power input is accidentally connected with reverse polarity.

Manual Reset

The manual reset option configures U2 and U3 such that they latch in an alarm condition. An additional input is provided (external contact closure) to overcome the latched condition of U2 and U3 when the input returns to normal.

Adjustable Dead Band

The adjustable dead band circuit adjusts the hysteresis between the trip point and reset points. The adjustment is available for both single and dual alarm units. The dead band is adjusted by the potentiometer(s) on the front of the unit. After the trip point has occurred, the affect of the inverting input (pin 9) on amplifier output (pin 8) occurs only after the non-inverting amplifier input (pin 10) is overcome. The Dead Band potentiometer varies this non-inverting amplifier input level by adjusting the amount of feedback to pin 10. The Dead Band potentiometer varies the difference between the trip point and reset point within the signal span. The greater amount of feedback to pin 10, the greater the dead band.

Maintenance

Maintenance of the DCA-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 DCA-ED involves determining whether the unit is functioning abnormally. The calibration equipment listed in table 2 can be used to verify that the DCA-ED outputs are within specified limits (refer to 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 DCA-ED, it is suggested that the following check list be reviewed as a preliminary step:

1. Verify that all electrical connections 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 Moore Industries' Customer Service Department toll free at 1-800-999-2900.

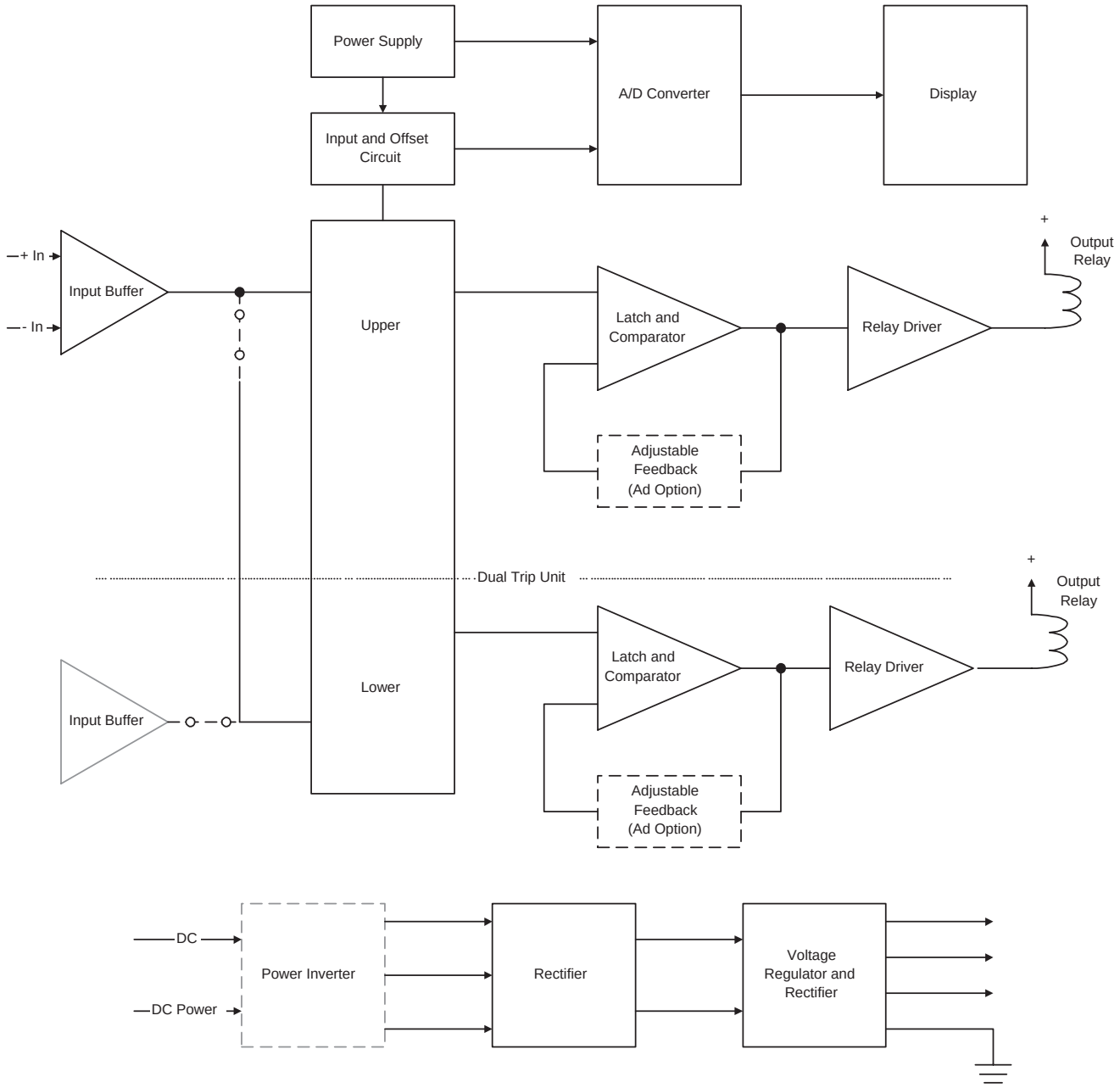

Figure 9. *DCA-ED Simplified Block Diagram*

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.

MOORE INDUSTRIES

WORLDWIDE • www.miinet.com

United States • info@miinet.com
Tel: (818) 894-7111 • FAX: (818) 891-2816

Belgium • info@mooreind.be
Tel: 03/448.10.18 • FAX: 03/440.17.97

China • sales@mooreind.sh.cn
Tel: 86-21-62491499 • FAX: 86-21-62490635

Australia • sales@mooreind.com.au
Tel: (02) 8536-7200 • FAX: (02) 9525-7296

The Netherlands • sales@mooreind.nl
Tel: (0)344-617971 • FAX: (0)344-615920

United Kingdom • sales@mooreind.com
Tel: 01293 514488 • FAX: 01293 536852