



Table of Contents

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Introduction

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

Each relay has an LED indicator in series, which lights when the relay is energized and turns off when the relay is de-energized. The unit normally 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 main board of the DCA-EU 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. Set-point controls allow the alarm to be set to trip at any point over the input range. Setpoints 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 setpoint. The relay is de-energized when the input signal is below the setpoint for a low alarm. See figure 1. Each relay is double-pole, double-throw and may be wired to make, break or changeover on alarm.

The dual input unit (DI option) has two channels: A and B. Channel A is normally set to the higher set-point, but both channels are completely interchangeable. With the Burnout Alarm (BA) option, if the input goes open circuit, the lower relay trips, the upper relay does not.

A complete set of specifications for the DCA-EU 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-EU is located on the rear 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.

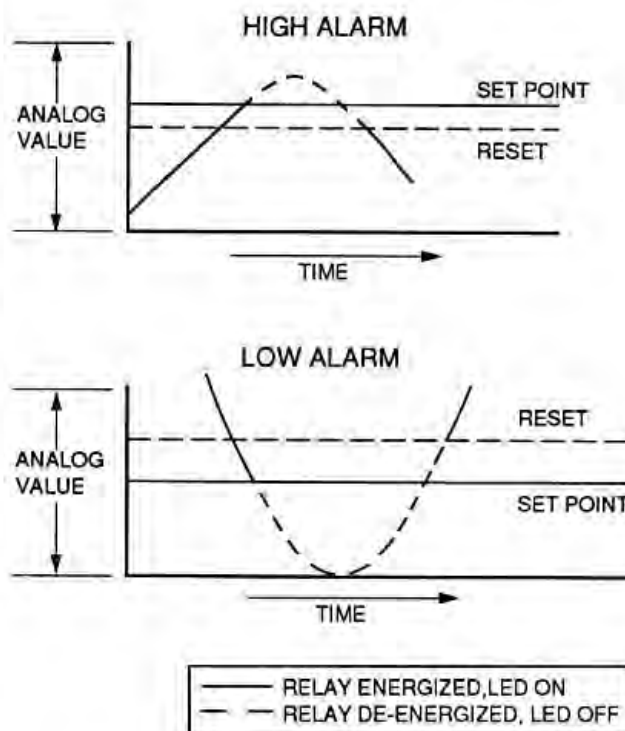


Figure 1. High and Low Alarm Configurations

Table 1. DCA-EU Specifications

Characteristic	Specification
Input	Current: 1-5mA @ 200 Ω nominal input impedance 4-20mA @ 50 Ω nominal input impedance 10-50mA @ 20 Ω nominal input impedance 0-20mA @ 50 Ω nominal input impedance Voltage: Input impedance 1M Ω , minimum; 200K Ω with DA or ATL option 0-5V, 1-5V, 0.25-1.25V, 0-1V
Output	1 or 2 DPDT relay contacts rated @ 5A, 117Vac non-inductive or 28Vdc Analog outputs (representing variable and trip settings): 0-5V on zero-based input signals; 1-5V on live zero input signals
Input Power	24Vdc \pm 10%, 5 watts, nominal
Performance	Repeatability: Setpoint repeats within \pm 0.1% of full span Deadband: 1% of span, standard Response: 50 milliseconds for a step change of 1% of span beyond setpoints Line Voltage Effect: \pm 0.005% / 1% line change
Controls	Set Point: Multiturn potentiometer adjustable over 0-100% of span Deadband: Externally adjustable deadband 1-20% of span, nominal
Operating Temperature	Range: 0 to 150°F (-18 to 65°C) Effect: Less than \pm 0.01% / °F over above range
Feature	Relay status: LEDs light up when relays are energized; switch selectable for high/low status

Calibration


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

After the DCA-EU unit is unpacked, general operation level checks of the individual unit are recommended. Generally these checks, which are specified in the Calibration Procedure portion of this section, require little or no adjustments.

Adjustments

The DCA-EU has setpoint and deadband adjustments located on the front panel of the unit. They are represented symbolically on the front panel by the following markings:

|  | represents Setpoint

|  | represents Deadband

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

They 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. These LEDs are labeled CHANNEL A and CHANNEL B on dual input units and dual alarm units, and CHANNEL A for single alarm units.

Calibration Equipment

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

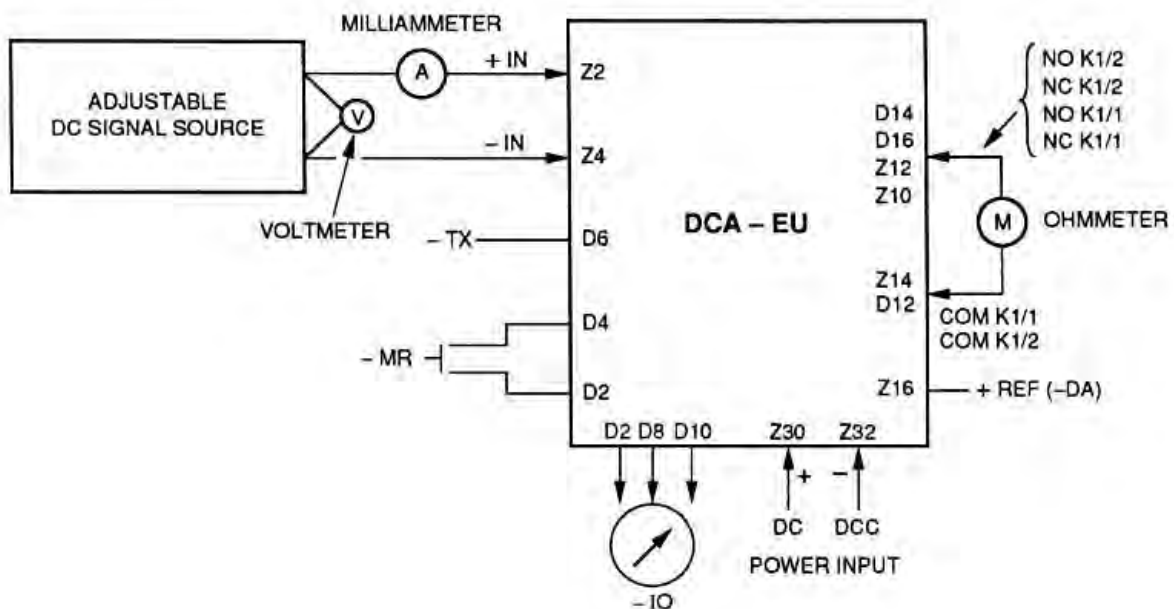
Calibration Setup

Off-line calibration for all DCA-EU units generally require 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 2. The calibration setup for single input/dual alarm units is shown in figure 3. The calibration setup for dual input (-DI option)/dual output (alarm) units is shown in figure 4.

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
Screwdriver (slotted)	Head width no greater than 0.1 inch (2.54mm)
Adjustable dc signal source	Must be capable of producing signal ranges defined by input level requirements
Dc voltmeter	Must be accurate to within $\pm 0.05\%$ or better
Dc milliammeter	Must be accurate to within $\pm 0.05\%$ or better
Ohmmeter	Accurate to within 1%
Power supply	24Vdc @ 1A
Female connector	DIN 41612, "F" body
Extender card	P/N MSD-069-003

**Figure 2. Calibration Setup for Single Input/Single Alarm Units**

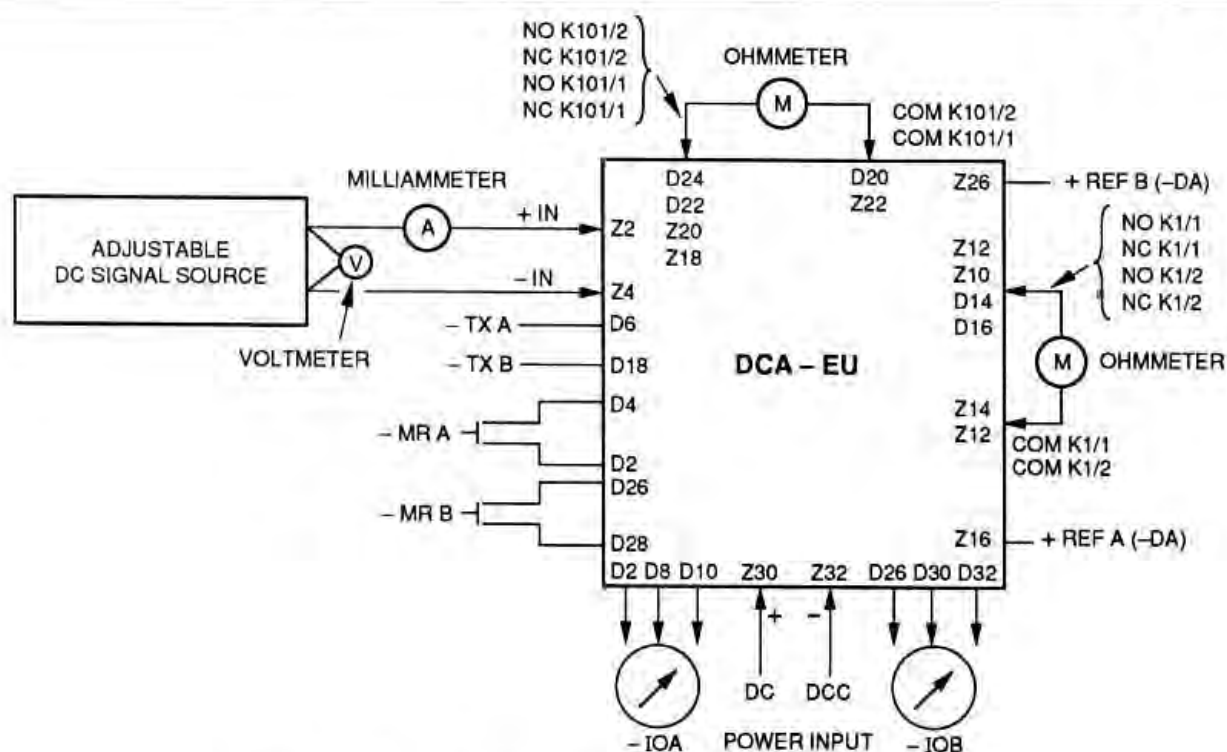


Figure 3. Calibration Setup for Single Input/Dual Alarm Units

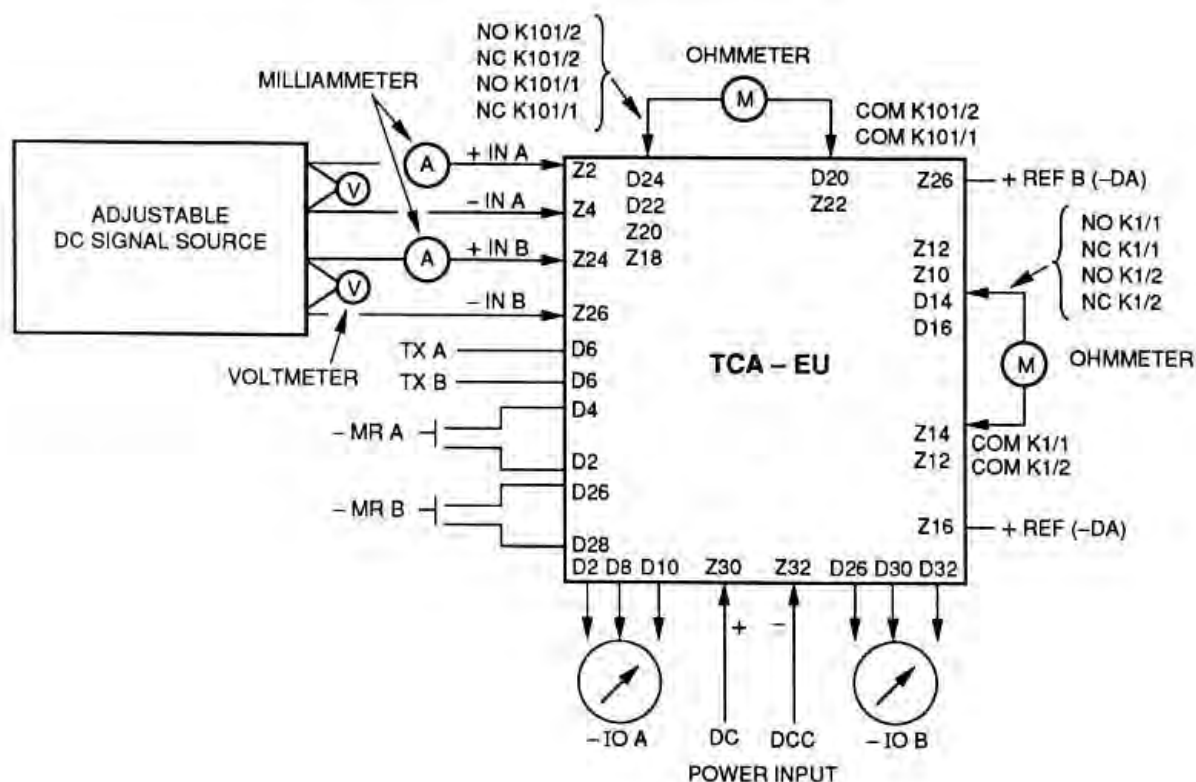


Figure 4. Calibration Setup for Dual Input/Dual Output and Dual Alarm Units

Calibration Procedure

Calibration consists of simulating an input signal to the DCA-EU, monitoring the output, and adjusting the controls to obtain the desired value. An adjustable dc current or voltage input signal source, input monitoring device and ohmmeter are required for calibration. The input monitoring device must have an accuracy to within $\pm 0.05\%$.

The following procedure assumes that the unit being calibrated has two setpoints (both upper and lower setpoints) with both upper and lower deadband adjustment options included. If your unit does not have these features, perform only those steps that apply to your unit.

Preliminary Procedure

1. Turn all front panel control potentiometers fully counterclockwise.
2. Verify that switches SW1 and SW101 (dual alarm) are set for a high or low alarm, as specified. See figure 5.

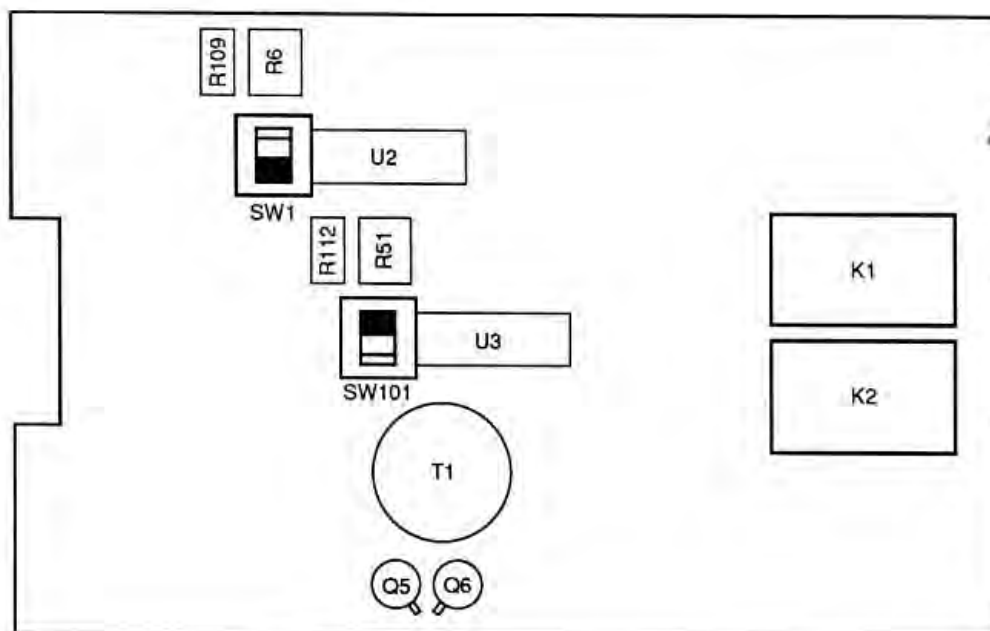
UP = low alarm
DOWN = high alarm

Calibrating a Unit with the Adjustable Deadband Option

If the unit is equipped with the Adjustable Deadband (AD) option, turn both Deadband potentiometers fully counterclockwise before calibrating the unit.

Note: Single alarm units use only the Upper Deadband potentiometer and Upper Setpoint potentiometer; dual alarm units use both upper and lower Deadband and Setpoint potentiometers.

1. Turn the upper setpoint potentiometer fully clockwise. Turn the lower setpoint potentiometer fully counterclockwise.
2. Apply power to the unit.
3. Apply an input signal equal to the value of the lower setpoint. Both the upper and lower alarms should be in the reset (out of alarm) condition.
4. Slowly turn the lower setpoint potentiometer clockwise until the lower alarm just trips. Turn the potentiometer clockwise and counterclockwise several times to achieve a precise setting.
5. Increase the input current or voltage level by an amount equal to the percent of desired deadband. Slowly turn the lower deadband potentiometer clockwise until the lower alarm returns to the reset condition.
6. Re-check the setpoint and reset action of the lower alarm.
7. Increase the input current or voltage to the value of the upper setpoint.
8. Slowly turn the upper setpoint potentiometer counterclockwise until the upper alarm just trips. Turn the potentiometer clockwise and counterclockwise several times around the setpoint to achieve a precise setting.
9. Turn the upper deadband potentiometer fully counterclockwise. Decrease the input current or voltage level by an amount equal to the percent of deadband desired. Slowly turn the upper deadband potentiometer clockwise until the upper alarm returns to the reset condition.
10. Re-check the setpoint and reset action of the upper alarm.
11. Remove the input signal and turn off the power to the unit.



UP = LOW ALARM



DOWN = HIGH ALARM

Figure 5. Switch Positions

Calibrating a Unit with the Deviation Alarm Option

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

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

Calibration is the same as shown on page 6, using the above conditions for zero percent, 50 percent and 100 percent input references.

Calibrating a Unit with Alarm Response Delay 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 CR9 and/or CR109. Take extreme care in shorting diodes, as damage may occur if diodes are accidentally shorted to other parts.

Calibrating a Unit with the Manual Reset Option

If the Manual Reset (MR) option is present on your unit, the deadband circuit is not available. The Indicator Output (IO) option is also not available with the MR option. Verify that the unit latches upon alarm. Verify the unit resets only by shorting the MR terminals together with an external switch and by changing the input signal to a non-alarm level.

Calibrating a Unit with the Two-wire Excitation Option

If the Two-wire Excitation (TX) option is installed, check with a voltmeter and suitable load that the proper voltage is present at the output terminals.

Calibrating a Unit with the Indicator Output Option

The Indicator Output (IO) option provides analog outputs proportional to one or both input signals and one or both setpoint levels. This output is 0-5 volts, except on non-zero based inputs, when it is 1-5 volts. It is not isolated from the input.

The indicator output at pin D10 varies with the setting of the front panel setpoint potentiometer. The 0-5 volt signal represents 0-100 percent of the range of the setpoint.

There is no calibration procedure for the indicator output.

Installation

This section contains physical mounting dimensions, installation procedures and electrical connections. The units are designed to operate in free air at a high ambient temperature. However, 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-EU is a plug-in card that mounts in a rack. Moore Industries' Eurorack 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 Eurorack 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. The Eurorack carries 24Vdc power input independently to each of the connectors.

Outline dimensions of the DCA-EU and the 19-inch rack are shown in figures 6 and 7.

Electrical Connections

All electrical connections to the DCA-EU are made to the terminals on the mating connector of the unit, located in the rack. See tables 3 and 4. Special wire or cable is not required for signal connections to the unit. (The terminals are designed for 16 AWG, maximum).

Connections for TX Option

For units with the TX option, connect the positive output lead from the external equipment to the TX terminal on this unit. Connect the minus output lead from the external equipment to the +IN input on this unit.

To avoid transients and stray pickups, it is recommended that twisted conductors be used where the signal wires run close to other services (i.e., power wiring).

The DCA-EU operates directly from a 24Vdc 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 DCA-EU has been calibrated and installed, it may be left unattended. The only controls for the unit are the Setpoint and Deadband 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-EU operates maintenance free for extended periods of time.

The DCA-EU 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.

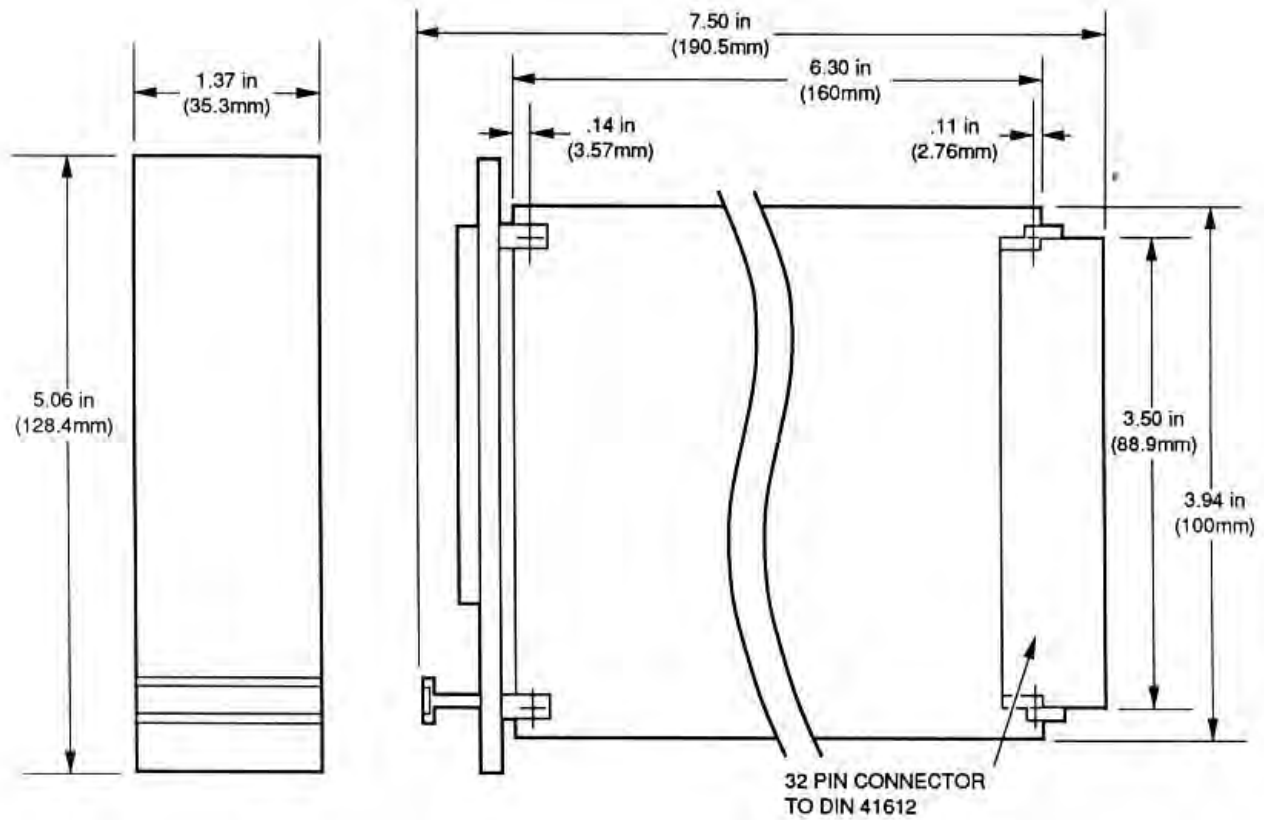


Figure 6. DCA-EU Outline Dimensions

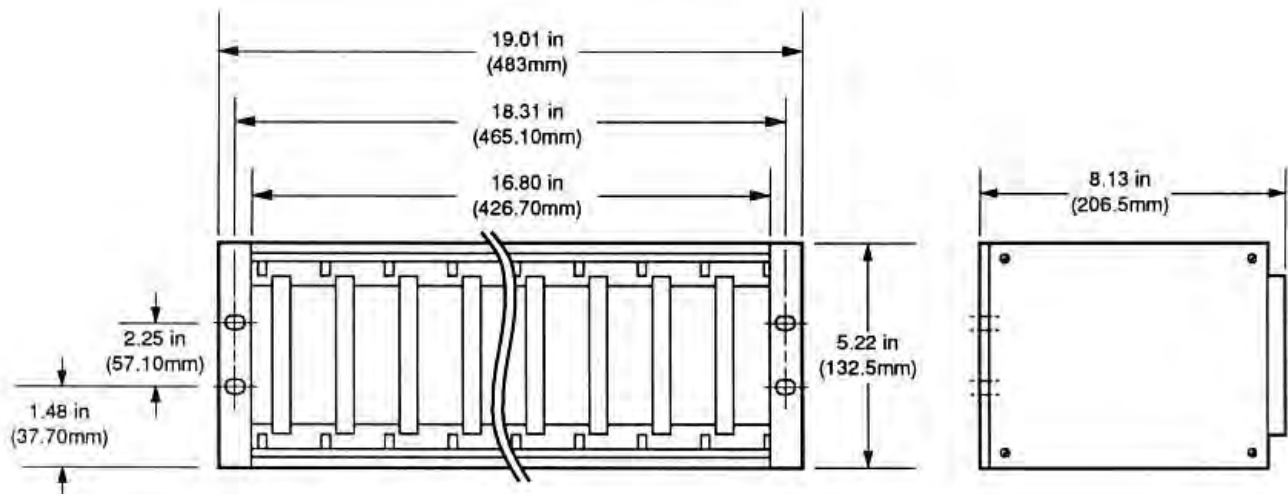


Figure 7. Eurorack Mounting Dimensions

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

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

Table 4. DCA-EU Connector Pins for Units with Dual Alarms

Pin	Row Z	Row D
2	+IN, CHANNEL A	MR or IO COM, CHANNEL A
4	-IN, CHANNEL A	MR, CHANNEL A
6		TX, CHANNEL A
8		IO SIG, CHANNEL A
10	NC K1/1	IO SET, CHANNEL A
12	NO K1/1	COM K1/2
14	COM K1/1	NO K1/2
16	+REF, CHANNEL A	NC K1/2
18	NC K101/1	TX, CHANNEL B
20	NO K101/1	COM K101/2
22	COM K101/1	NC K101/2
24	+IN, CHANNEL B	NO K101/2
26	+REF, CHANNEL B	MR or IO COM, CHANNEL B
28	-IN, CHANNEL B	MR, CHANNEL B
30	DC	IO SIG, CHANNEL B
32	DCC	IO SET, CHANNEL B

NOTES:

1. Pins 2D and 26D are either MR switching connection or common I/O reference.
2. Pin 26D is only used as I/O common if the DCA-EU has Dual Input option (-DI).

Theory of Operation

This section briefly describes how the DCA-EU operates. A simplified block diagram is shown in figure 8, to help in understanding the circuit description. In addition, a detailed schematic diagram is located in the Drawings Section of this manual.

The dc input is applied directly to the power inverter, which is converted to a square-wave output of approximately 3KHz.

An input buffer circuit isolates the input signal source, so that adjustments in the setpoint(s) do not affect the input signal.

Deviation Alarm Circuit. Refer to the schematic diagram. The deviation alarm circuit (optional) uses a reference input (+REF) and compares the +IN signal with the +REF input. Input currents are such that, when +REF and +IN are equal in value, the output of IC1 (pin 1) is at 50% of the input span.

Manual Reset Circuit. Refer to the schematic diagram. The manual reset option configures IC1 and IC101 such that they latch in an alarm condition. An additional input is provided (external contact closure) to overcome the latched condition of IC1 and IC101 when the input returns to normal.

Adjustable Deadband Circuit. Refer to the schematic diagram. The adjustable deadband circuit adjusts the hysteresis between the setpoint and reset points. The adjustment is available for both single and dual alarm units. The deadband is adjusted by the potentiometer(s) on the front of the unit. After the setpoint has been passed, the effect of the inverting input (pin 9) on amplifier output (pin 8) occurs only after the non-inverting amplifier input (pin 10) is overcome. The deadband potentiometer varies this non-inverting amplifier input level by adjusting the amount of feedback to pin 10. The deadband potentiometer varies the span between the setpoint and reset point within the input signal span. The greater amount of feedback to pin 10, the greater the deadband.

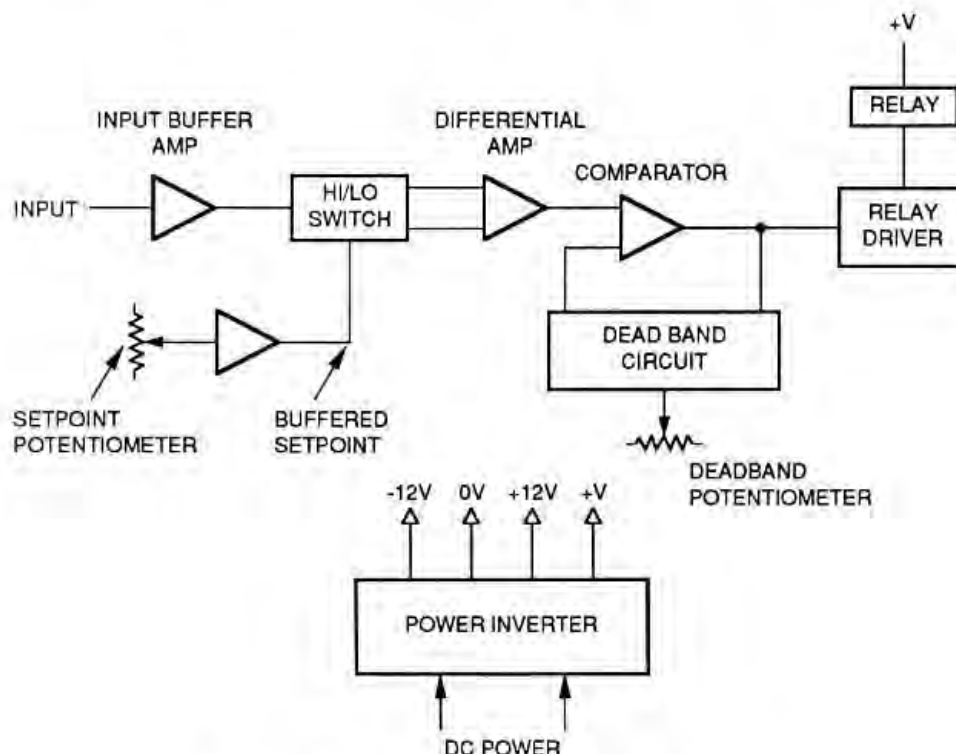


Figure 8. DCA-EU Simplified Block Diagram

DCA-EU

Maintenance

Maintenance of the DCA-EU 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-EU involves determining whether the unit is functioning abnormally. The calibration equipment listed in table 2 can be used to verify that the DCA-EU 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.

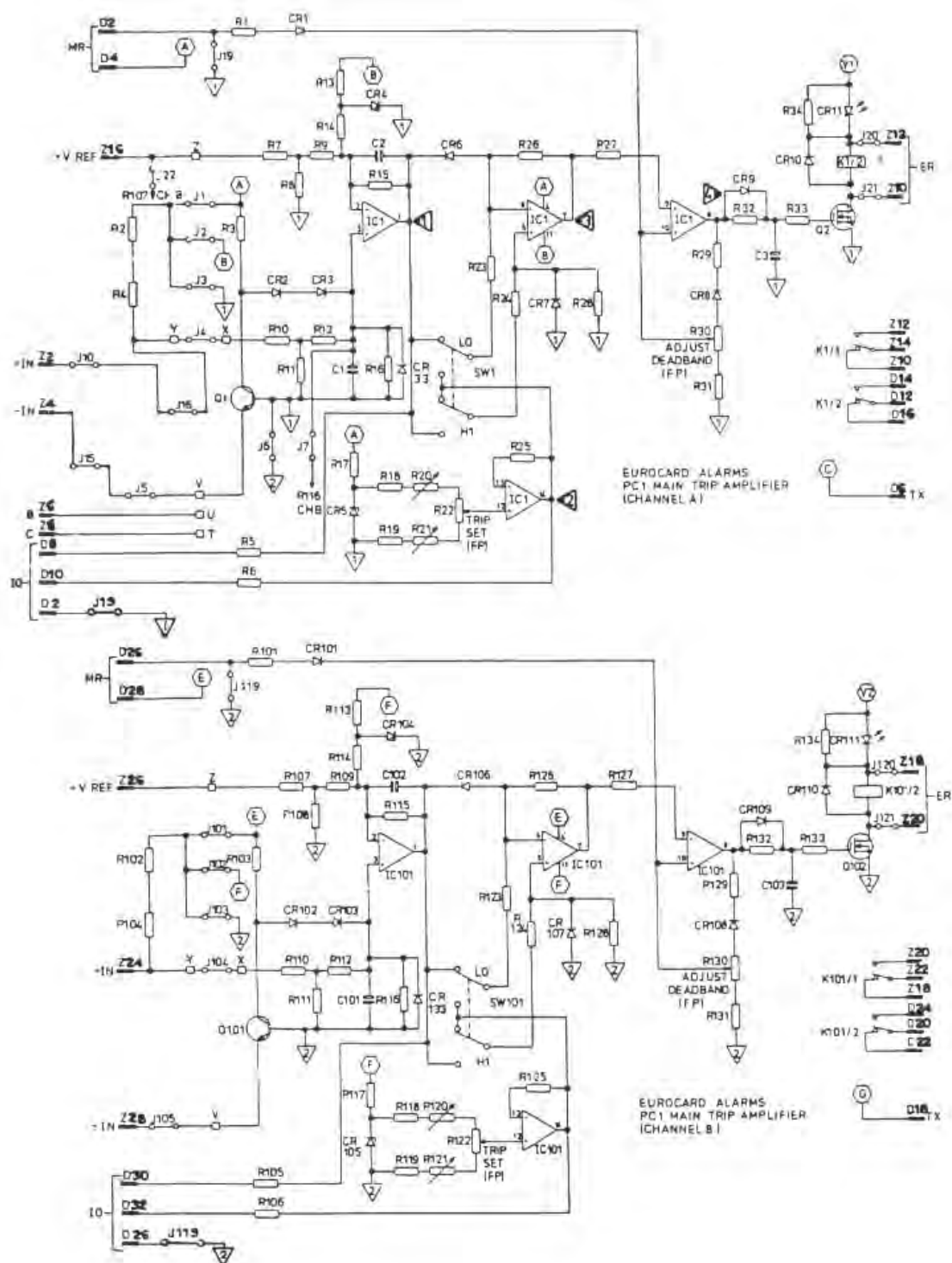
If a problem is suspected with the DCA-EU, it is suggested that the following check list be reviewed as a preliminary step:

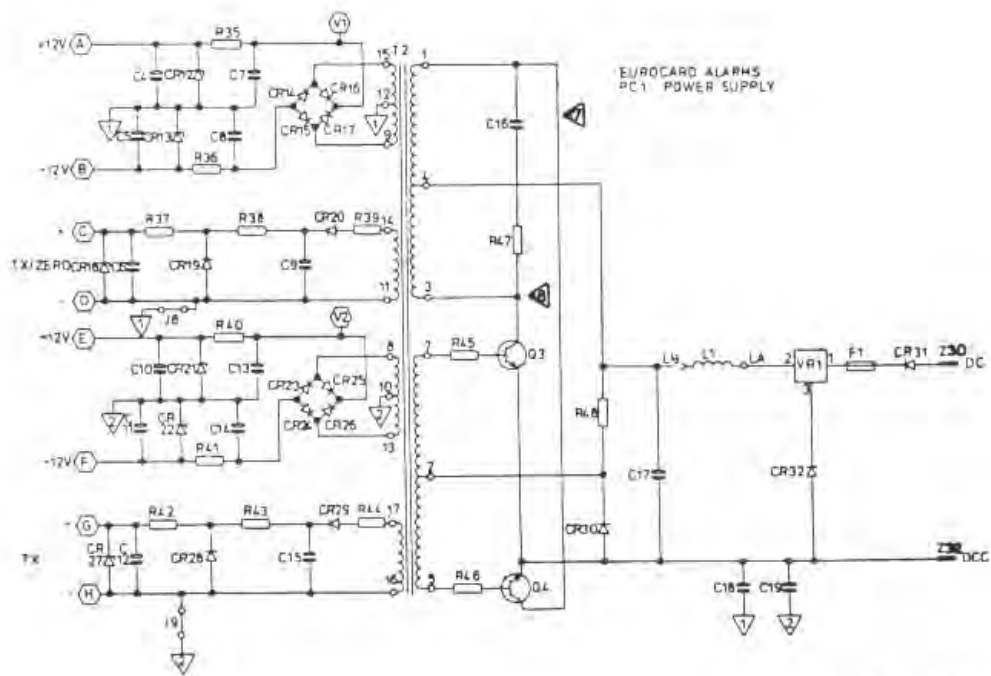
1. Verify that all electrical connection are clean and tight.
2. Verify that the measuring instrument used for input voltage or current is of the proper range and accuracy.
3. Verify that the output circuit is electrically isolated from the input circuit.

If a unit is performing below specifications, and the unit cannot immediately be sent back to the factory without affecting operations, contact the Customer Service Department by telephone.

Drawings

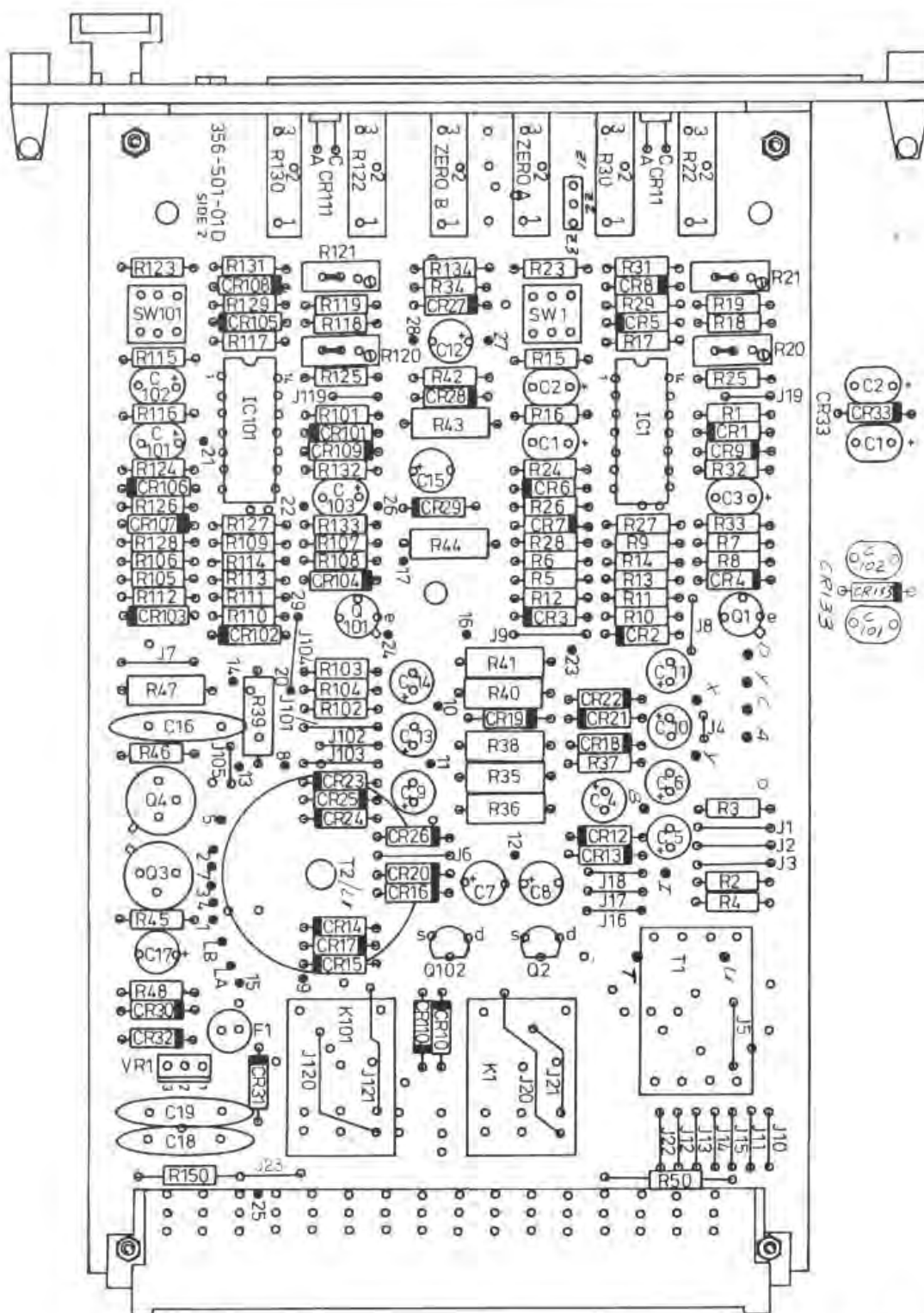
Figures 9 and 10 are the schematic and assembly drawings for the DCA-EU.





192-461-00 A

Figure 9. DCA-EU Schematic Diagram



192-561-00 E

Figure 10. DCA-EU Component Location 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.

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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