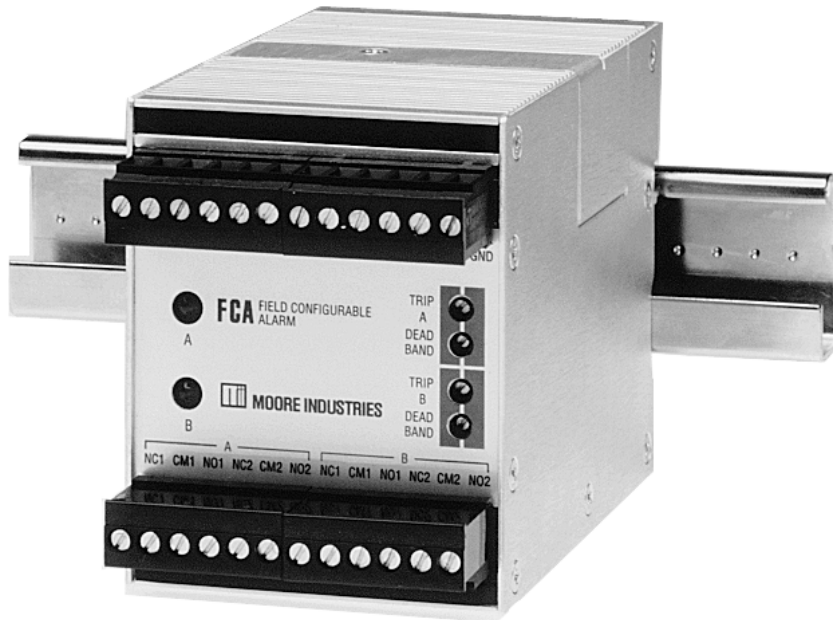


FCA *Field-Configurable
Current or Voltage Alarm*



Description

This is the Users' Manual for Moore Industries' 4-wire, Field-Configurable Alarm (FCA). The FCA accepts a current or voltage input signal from an analog device such as a temperature, pressure, level, or flow transmitter, and when that signal value exceeds a preset limit, outputs two, separately configurable, contact closure signals. These alarm outputs are ideal for indicating high and/or low process conditions via a bell, buzzer, light or other device. Front panel LED's indicate when the unit is in an alarm condition.

Two Alarm Trips per module reduce space requirements and equipment costs. Every FCA delivers two, independent, contact closure output signals from a single signal input. The alarms can be configured to respond to any combination of High/Low, High/High, or Low/Low process conditions. Precise trip point and deadband settings can be made quickly using potentiometers (pots) located on the unit front panel. The choice of failsafe or non-failsafe alarms is also field-configurable.

NOTE

Explanations of the terms used in describing Moore Industries' Alarms, i.e., High, Low, Failsafe, Non-failsafe, Deadband, and Response Delay, can be found in the Calibration section of this manual. A companion publication, Alarm Trips: The Ups and Downs, is also available from Moore Industries' Marketing Communications Department.

Alarm LED's are wired in series with each FCA relay. When a relay is energized, the corresponding LED is lit; when de-energized the LED is out. In units configured for failsafe operation, the LED goes OFF when an alarm is tripped (ON in non-alarm). In units configured for non-failsafe operation, the LED goes ON when an alarm is tripped (OFF in non-alarm).

The DIN-style, universal mounting clip of the FCA allows quick installation on a 32mm G-type (EN50035) or 35mm Top Hat (EN50022) rail, either in a control room or in a field-mounted cabinet. Refer to the Installation section of this manual for unit outline dimensions.

Options

The following list provides an overview of the FCA options. Complete information on mounting hardware options, changes to this list, or currently available certifications and approvals is available from your Moore Industries Sales Representative, or by contacting the factory.

AR Option — Alarm Response Delay. Two internal pots allow the user to program a delay into each alarm. Settings from 150 milliseconds (msec) to 30 seconds are possible. When an FCA is equipped with this option, the input must exceed the trip point for at least as long as the specified delay in order for the alarm to trip. Refer to the section of this manual describing the calibration of the AR Option for more information.

NOTE

Units equipped with the AR Option require a 45 second warm-up period after initial power-on.

DA Option — Deviation Alarm. The alarm trips when the difference between two inputs exceeds a user-set limit. User-determined input and transmitter excitation are not available on FCA's equipped with the DA Option. Customers must specify "2X1-5V", "2X4-20MA", or "2X10-50MA" input at time of order.

MR Option — Manual Reset. Unit is equipped with reset contact terminals on the front panel. Tripped alarms (latched relays) are cleared only when input returns to non-alarm levels **and** MR terminals are shorted, usually with a simple toggle or push button (user-supplied). The MR Option is not available in FCA's equipped with the SPDT Option. The adjustable deadband feature of the standard FCA is not available with the MR Option.

SPDT Option — Single Pole/Double Throw Relays. Two, SPDT, Form C relays, rated 5A @220/240Vac or 24Vdc, non-inductive. Includes front panel connections for both normally open and normally closed relay contacts.



Table 1. FCA Performance Specifications

<p>Performance Characteristics</p> <p>Repeatability: Trip points repeat within $\pm 0.1\%$ of input span.</p> <p>Deadband: Adjusts from 1 to 20% of span using front panel potentiometers (one pot per relay). Larger ranges also available. Consult the factory for details.</p> <p>Response Time: 50msec, average, input-to-output (for a step input with trip point at midpoint of step). Refer to procedure for calibration of AR Option for more information.</p> <p>Contact Rating: Two, DPDT, Form 2C relays per unit, each rated 5A @ 220/240Vac or 24Vdc, non-inductive. SPDT relays available as an option.</p> <p>Isolation: 1000Vrms between input, output, and power.</p> <p>Dielectric Withstand Capability: 1500Vrms between case, power, inputs, and outputs.</p>	<p>Performance Characteristics (continued)</p> <p>Common Mode Rejection: Greater than 100dB between input and case.</p> <p>Power-up/Power-down Filtering: All units equipped with filtering to prevent chatter or bounce upon unit power-up and power-down. If configured input-to-alarm relationship provides de-energized relay output on power-up, unit is electronically prevented from changing state during either power-up or power-down. If configured to provide energized output, relay is limited to a single state change in the event of a power-up or a power-down.</p> <p>Transmitter Excitation: Front panel terminals available for powering one, 2-wire, 4-20mA transmitter, 24Vdc @ 25mA (Not available on FCAs equipped with DA Option).</p>	<p>Performance Characteristics (continued)</p> <p>Power Consumption: 2 Watts, nominal, 3.5 Watts, maximum. Non-energized unit draws less than 1 Watt.</p> <p>Environmental Effects</p> <p>RFI/EMI: Immune to field strengths of 30V/m - ABC = 0.1% of full scale, when tested according to SAMA standard PMC 33.1</p> <p>Power Supply Effect: Less than 0.002% of span per volt, maximum</p> <p>Ambient Temperature: $\pm 0.02\%$ of span per C change, maximum, over the rated unit range.</p> <p>Ambient Temperature Operating Range: -18 to 70 C (0 to 158 F).</p>
<p>Adjustments</p> <p>Two, multiturn pots per relay on the unit front panel; one for Trip Point, one for Deadband.</p> <p>Trip point: -10 to 110 % of input span (20-turn pot).</p> <p>Deadband: 1 to 20 % of input span (15-turn pot). Consult factory for availability of larger deadband.</p>	<p>Adjustments (continued)</p> <p>Jumpers: Internal, user-positioned PC board jumpers select any combination of High, Low, Failsafe, or Non-failsafe. Refer to Calibration section for information on location and setting of the jumpers.</p>	<p>Indicators</p> <p>Two, front panel LEDs. Each indicates when its associated trip point has been reached.</p> <p>Failsafe Alarms: LED is ON in non-alarm; goes OUT in alarm (& power loss).</p> <p>Non-failsafe Alarms: LED is OUT in non-alarm (& power loss); ON in alarm.</p>
<p>Physical Characteristics</p> <p>Weight: 450g (15.9 oz)</p>	<p>Physical Characteristics (continued)</p> <p>Dimensions: Refer to Installation section of this manual.</p>	

Unit Data Tracking & Orders for Additional FCA's – The Model & Serial Numbers

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

On the FCA, look for the model and serial numbers on one of the housing side panels. Figure 1 shows a typical FCA model number.

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

Figure 1. FCA Model Number Example

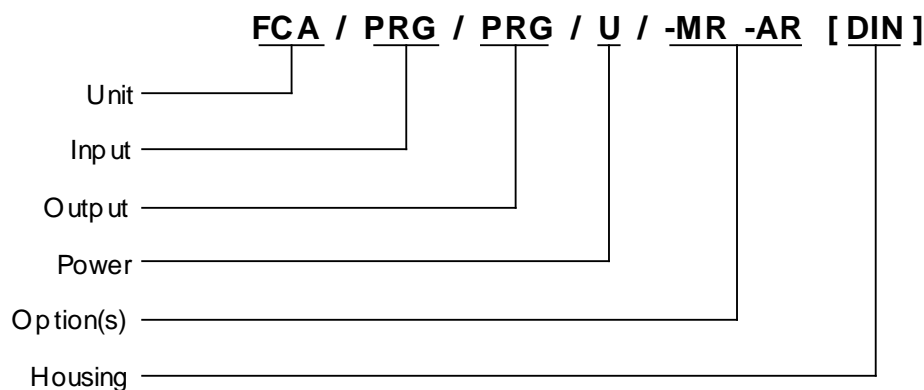


Table 2. FCA Ordering Specifications

Unit	Input	Output	Power	Option(s)	Housing
FCA	<p>PRG - Universal unit is field-configured via connection terminals on front panel to accept: 4-20mA into 50Ω 10-50mA into 20Ω 1-5V @ 1MΩ</p> <p>w/ -DA option (specify one): 2X4-20MA 2X10-50MA 2X1-5V</p>	<p>PRG - Universal unit is field-configured via internal, solderless jumpers, for any of the output types listed under Factory Calibration. Initial configuration of PRG output units is DH1L1.</p> <p>Factory Calibration - Specify one: DH1L1 - High/Failsafe, Low/Failsafe DH1L2 - High/Failsafe, Low/Non-failsafe DH2L1 - High/Non-failsafe, Low/Failsafe DH2L2 - High/Non-failsafe, Low/Non-failsafe DH1H1 - High/Failsafe, High/Failsafe DH2H2 - High/Non-failsafe, High/Non-failsafe DL1L1 - Low/Failsafe, Low/Failsafe DL2L2 - Low/Non-failsafe, Low/Non-failsafe</p>	<p>U - Universal. Accepts 22-300Vdc and 90-260Vac.</p>	<p>-AR -DA -MR -SPDT</p> <p>Refer to explanation of unit options in Description section of this manual.</p>	<p>DIN - Aluminum DIN-style housing mounts on both G-type (EN50035, 32mm) and Top Hat (EN50022, 35mm) rail</p>

FCA

Remember that the “D” in the FCA model number does not refer to the type of relays used. All FCA’s have two of the selected type of relays. Standard FCA’s are equipped with Double Pole/Double Throw relays. Single Pole/Double Throw relays are available as an option. All FCA model numbers should show a “D” in the Input field of the model number unless the unit being ordered is PRG.

Calibration

The Calibration of the FCA, as it is presented in this manual, is a three-phase process. First, the internal PC board jumpers that configure FCA alarms as High, Low, Failsafe, and Non-failsafe are set. Next, the trip point and deadband for each alarm is set. Finally, an alarm response delay, in those units equipped with the AR Option, is programmed.

Even if a unit has been configured to your specifications by the factory, it is a good idea to perform the FCA calibration as a bench check. The procedures provide a safe means of uncovering any unit damage that may have occurred during shipping, and a simple familiarization with FCA operation in the safety of a testing environment.

Prior to shipment, every FCA is fully tested at the factory to ensure compliance with Moore Industries’ strict quality control guidelines. This section provides the means to perform the FCA bench check, and the instructions for setting unit trip points, deadbands, and alarm response delays on AR-equipped units. These procedures should be conducted in an environment considered appropriate for general testing of electronic equipment, rather than in the field. Use a technician’s bench or a similar lab-type environment, so that any unit damage that may have occurred during shipment can be discovered safely, i.e., separated from the intended process or application.

Alarm Terminology

Before calibrating or installing the FCA, and before using it in an application, it is a good idea to become familiar with some of the terms associated with the use of process instrumentation alarms. Brief definitions of some of the key terms are presented here. Figure 2 illustrates alarm operation.

For more in depth information, ask your Moore Industries Sales Representative for the publication [Alarm Trips: The Ups and Downs](#), from our Marketing Communications Department.

A Trip Point is the process input level at which an alarm relay goes into alarm, or trips.

A Reset Point is the process input level at which an alarm relay returns to a non-alarm condition. Non-alarm is sometimes referred to as “safe”.

A High Alarm trips when the process input goes above the trip point.

A Low Alarm trips when the process input goes below the trip point.

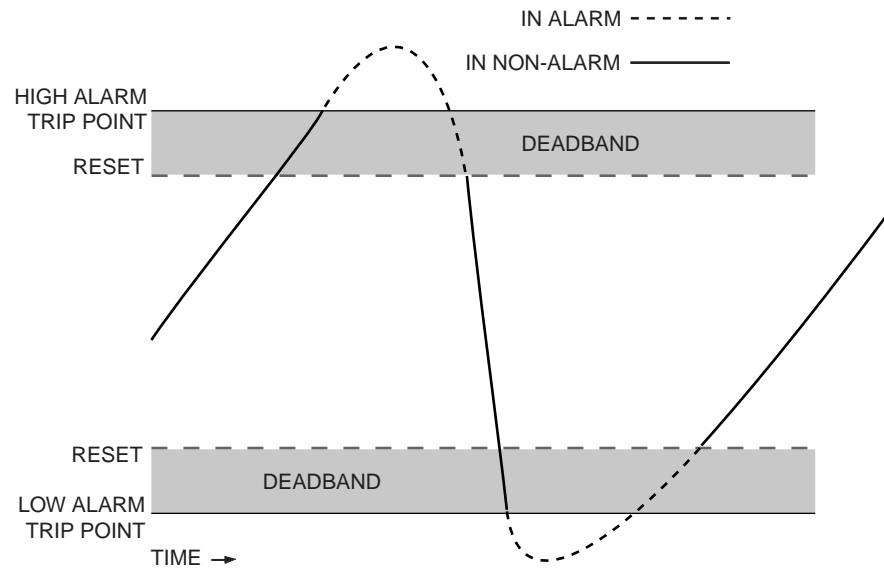
A Failsafe Alarm is de-energized when tripped, energized when in non-alarm.

A Non-failsafe Alarm is energized when tripped, de-energized when in non-alarm.

Deadband is the range in which an alarm remains tripped or “in alarm” even after the process input has returned to a non-alarm level.

Normal is the term used to describe the “shelf-state” of relay contacts. **Normally Open** contacts are open when a relay is not energized. **Normally Closed** contacts are closed when a relay is not energized.

Figure 2. Alarms Illustrated: High/Low, Trip/Reset Points, and Deadbands



NOTE

Sometimes a non-alarm input level is referred to as a “normal” condition. This practice is intentionally avoided in this manual. Do not confuse the term “normal”, as in Normally Open or Normally Closed, with a non-alarm input condition. In this manual, “normal” is a reference to the shelf, or quiescent state of the relay contacts.

The application of these terms can be confusing in the case of the FCA, because of the unit’s inherent functional flexibility. For example, with process input in a non-alarm condition, the normally open contacts of a failsafe alarm would actually be *closed*, and the front panel LED would be lit. Conversely, in a non-failsafe alarm, normally open relay contacts would be open in non-alarm, and its front panel LED would be off.

Becoming familiar with general alarm terminology is a good way to stave off the tide of configuration confusion.

Setting FCA Internal Jumpers

The settings of the unit’s internal jumpers control the high, low, failsafe, and non-failsafe operation of the FCA alarms.

The jumpers are located on one of the unit’s internal PC boards. To access them, remove the small, Phillips-head screw from the access panel on the top of the unit case.

Figure 3 shows the location of the various jumpers, and the jumper configurations necessary to effect the desired settings in both the standard and SPDT-equipped versions of the FCA. Although the figure shows the standard (DPDT) unit only, the jumper positions and access are the same in the SPDT version.

Use a pair of technician’s tweezers or fine, needle-nosed pliers to remove/install jumpers as required. Refer to table 3 for the settings associated with the various types of alarm.

FCA

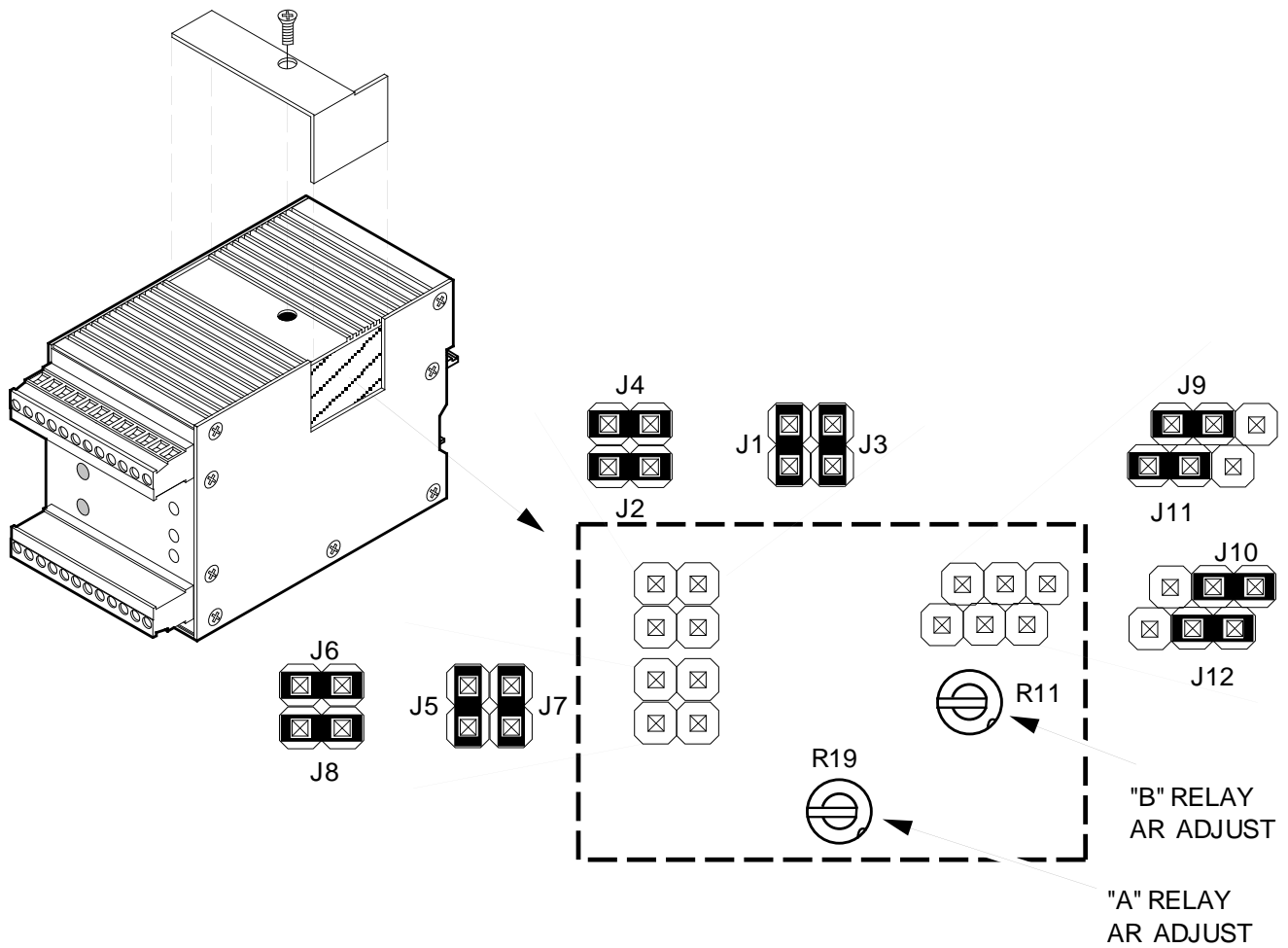


Figure 3. FCA Internal Jumpers and Pots

Table 3. FCA Internal Jumper Positions and AR Pot Designations

	High Alarm	Low Alarm	Failsafe	Non-Fail - Safe	R11	R19
A Trip	J6 & J8	J5 & J7	J10	J9	•	AR Option Pot
B Trip	J2 & J4	J1 & J3	J11	J12	AR Option Pot	•

NOTE

If the unit is equipped with the AR Option, leave the access panel open after setting jumpers to allow for adjustment of the AR pots during the Response Delay calibration procedure.

Setup

The equipment listed in table 4 is needed for calibrating the FCA. These items are not supplied by Moore Industries, but should be available in most testing labs.

Be sure to use calibrated test equipment when performing the bench check and calibration of trip points and deadbands. The use of inaccurate test equipment may result in unreliable settings and precipitate costly process down-time.

Figure 4 shows the basic setup used in the calibration procedures.

Controls and Indicators — External

The front panel of the standard FCA has 4 pots and 2 LED's. Each pair of pots controls one of the available relays. The state of the relay is indicated by its LED.

Trip point pots provide adjustability of -10% to 110% of input span. The deadband pots provide a deadband of 1-20% of span. Larger deadbands are available. Consult the factory for details.

Turning a pot clockwise (CW) raises the trip point or deadband setting. Turning counterclockwise (CCW) lowers the setting.

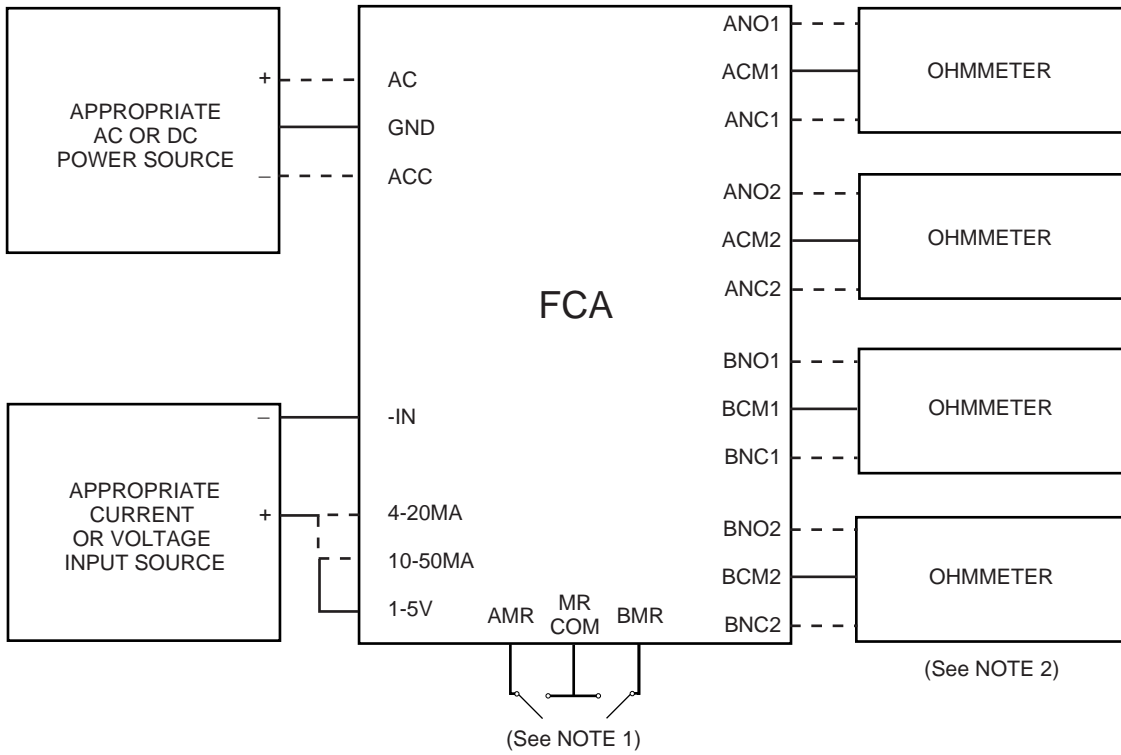
NOTE

Both the FCA trip point and deadband pots are equipped with slip clutch mechanisms to prevent damage in the event of over-turning. To reach either wiper stop, adjust the pot 20 turns (trip point), or 15 turns (deadband) in the desired direction.

Table 4. FCA Calibration Equipment

Equipment	Specifications
Voltage or Current Source	Calibrated, adjustable source unit, capable of discrete output levels, $\pm 0.05\%$, in the appropriate range, and with the appropriate impedance required for the process input level selected with the front panel terminals used.
Power Source	AC or DC, from 22-300 Vdc or 90-260 Vac.
Ohmmeter	Accuracy of $\pm 1\%$.
Screwdriver	Slotted-tip. Head width no greater than 2.54 mm (0.01 in).
Timing Device	Required for setting response delays in units equipped with AR Option only.
Multimeter	Optional, calibrated meter capable of verifying input levels.

FCA



1. Units equipped with the MR option do not have adjustable deadband.
2. Units equipped with the SPDT option have only one set of contacts per relay.

Figure 4. FCA Calibration Hookup, Standard Units

The unit's front panel LED's light whenever the associated relay is energized. Depending upon the High/Low and Failsafe/Non-failsafe configuration selected by the user with the internal jumpers, a lit LED can be used to indicate either an alarm or a non-alarm input condition.

Setting Alarm Trip Points

The procedure for setting trip points consists of monitoring the resistance across the FCA terminals as the input is varied above and below the user-set trip points. Resistance across open relay contacts is infinite. Resistance across closed contacts is nearly negligible.

It is suggested that a trip point be calibrated, then its associated deadband, then the next trip point, and then its deadband.

With unit setup complete as shown in figure 4, and with the jumpers set according to requirements of intended application (figure 3), make sure that the ohmmeter is connected to the desired process output terminals, NO for normally open, or NC for normally closed.

Low Alarm Trip Points. If unit is equipped with the AR Option, set internal adjustment pots (R11 and R19, as shown in figure 3) fully counterclockwise.

CAUTION

Do not turn the AR pots too far. They are 270° pots, not equipped with any mechanism to protect against over-turning.

Start with the deadband pot of the alarm trip to be calibrated fully CCW. This sets it to minimum, which for the FCA is 1% of span. These pots will not be present in units equipped with the MR option.

1. Apply 100% of the intended input span. This is a non-alarm input condition for a low alarm. Disregard the LED and ohmmeter at this point.
2. Turn the selected low alarm trip pot fully CCW.
3. If the unit is equipped with the MR option, momentarily short the manual reset terminals on the unit front panel. This will place the relay contacts in a non-alarm condition. If the unit is not equipped with MR, it will reset automatically.

NOTE

An MR-equipped FCA will never trip when its front panel manual reset terminals are shorted. Do not leave the terminals in a shorted state. To reset an MR-equipped FCA, short the front panel MR terminals momentarily, removing the short when the alarm trip returns to a non-alarm state.

4. Note the state of the LED and the ohmmeter (if used). Remember, failsafe low alarms will be energized when input is above the trip point (non-alarm condition), and the associated front panel LED will be lit. Non-failsafe low alarms will be de-energized, and the associated front panel LED will be out when input is above the trip point. Normally open (NO) contacts will be closed when energized; normally closed (NC) contacts will be open.
See FIGURE 3 for information on setting the FCA internal jumpers to configure the alarm trips.
5. Apply an input equal to the desired trip point level.
6. While monitoring the state of the relay, as indicated by the LED and the ohmmeter (if used), turn the selected low alarm trip point slowly CW until the alarm trips.
7. The LED and the ohmmeter will show a change of state.
8. To “zero in” on the exact setting ($\pm 0.1\%$), vary the trip point pot setting slightly CCW until the alarm resets, and then slightly CW, noting the alarm trip state. Use the setting closest to the point at which the alarm first trips.

In FCA's equipped with MR, a manual reset must be performed to take the unit out of alarm. In such cases, this zeroing-in procedure consists of turning the pot slightly CCW, manually resetting, then turning it slowly CW again until the alarm trips.

9. To confirm the setting, vary the input above and below the trip point level. A low alarm will trip whenever the input goes below the trip point level. Standard units will reset whenever the input is above the trip point level by at least 1% (minimum deadband).

NOTE

MR-equipped units require the input to be above the trip point level, and a manual reset. Do not execute step 9 unless the deadband pot is set to minimum (fully CCW).

Low Alarm Deadbands. To set the deadband for a low alarm, first set the trip point as described in the earlier procedure. Start with the input at a level somewhere below the trip point (unit in alarm).

1. Turn the deadband pot fully CW. This is the maximum deadband, 20% of span.
2. Raise the input level to the reset point. This is above the trip point in the case of low alarms.
3. Turn the deadband pot slowly CCW until the alarm resets.
4. Confirm the setting by lowering the input so that the alarm trips. OBSERVE the multimeter and raise the input slowly past the trip point. With the low alarm deadband properly set, it will not reset (remaining in alarm) until the input is raised above the deadband level (reset point).

High Alarm Trip Points. If unit is equipped with the AR Option, set internal adjustment pots (R11 and R19, as shown in figure 3) fully CCW.

CAUTION

Do not turn the AR pots too far. They are 270° pots, not equipped with any mechanism to protect against over-turning.

FCA

Start with the deadband pot of the alarm trip to be calibrated fully CCW. This sets it to minimum. Minimum FCA deadband on standard units is 1% of span. These pots will not be present in units equipped with the MR option.

1. Apply 0% of appropriate input span. This is a non-alarm input condition for a high alarm. Disregard the LED and ohmmeter at this point.
2. Turn the selected high alarm trip pot fully CW.
3. If the unit is equipped with the MR option, momentarily short the manual reset terminals on the unit front panel. This will place the relay contacts in a non-alarm condition. If the unit is not equipped with MR, it will reset automatically.

NOTE

An MR-equipped FCA will never trip when its front panel manual reset terminals are shorted. Do not leave the terminals in a shorted state. To reset an MR-equipped FCA, short the front panel MR terminals momentarily, removing the short when the alarm trip returns to a non-alarm state.

4. Note the state of the LED and the ohmmeter (if used).
Remember, failsafe high alarms will be energized when input is below the trip point (non-alarm condition), and the associated front panel LED will be lit.
Non-failsafe high alarms will be de-energized, and the associated front panel LED will be out when input is below the trip point. Normally open (NO) contacts will be closed when energized; normally closed (NC) contacts will be open.
See FIGURE 3 for information on setting the FCA internal jumpers to configure the alarms trips.
5. Apply an input equal to the desired trip point level.
6. While monitoring the state of the relay, as indicated by LED and ohmmeter (if used), turn the selected low alarm trip point CCW until alarm trips.

7. The LED and the ohmmeter will show a change of state.
8. To “zero in” on the exact setting ($\pm 0.1\%$), vary the trip point pot setting slightly CW until the alarm resets, and then CCW, noting the alarm trip state. Use the setting closest to the point at which the alarm first trips.
In FCA's equipped with MR, a manual reset must be performed to take the unit out of alarm. In such cases, the zeroing-in procedure consists of turning the pot slightly CW, manually resetting, then turning slowly CCW again until the alarm trips.
9. To confirm the setting, vary the input above and below the trip point level. A high alarm will trip whenever the input goes above the trip point level. Standard units will reset whenever the input is below the trip point by at least 1% (minimum FCA deadband).

NOTE

MR-equipped units require the input to be below the trip point level, and a manual reset. Do not execute step 9 unless the deadband pot is set to minimum (fully CCW).

High Alarm Deadbands. To set the deadband for a high alarm, first set the trip point as described in the earlier procedure. Start with the input at a level somewhere above the trip point (unit in alarm).

1. Turn the deadband pot fully CCW. This is the maximum deadband, 20% of span.
2. Lower the input level to the reset point. This is below the trip point in the case of high alarms.
3. Turn the deadband pot slowly CW until alarm resets.
4. Confirm the setting by raising input so that the alarm trips. Observe the multimeter and lower the input slowly past the trip point. With the high alarm deadband properly set, it will not reset (remaining in alarm) until the input is lowered below the deadband level (reset point).

Calibrating DA-equipped FCA's

Units equipped with the Deviation Alarm Option, DA, provide relay output when the difference between its two inputs varies more than or less than a user-set limit, or tolerance. Refer to the Operation section of this manual for important information about using the correct kind of deviation alarm configuration with your application.

The following procedure describes how to set the trip point for an FCA deviation alarm. It is also a good idea to refer to the example, at the end of the procedure, for extra help in using the FCA deviation alarm (DA option) in your application.

Calibration of this type of FCA requires the use of two input sources. Figure 5 shows the setup. Refer to the section on setting FCA internal jumpers, earlier in this manual, for instructions on configuring the alarm trips.

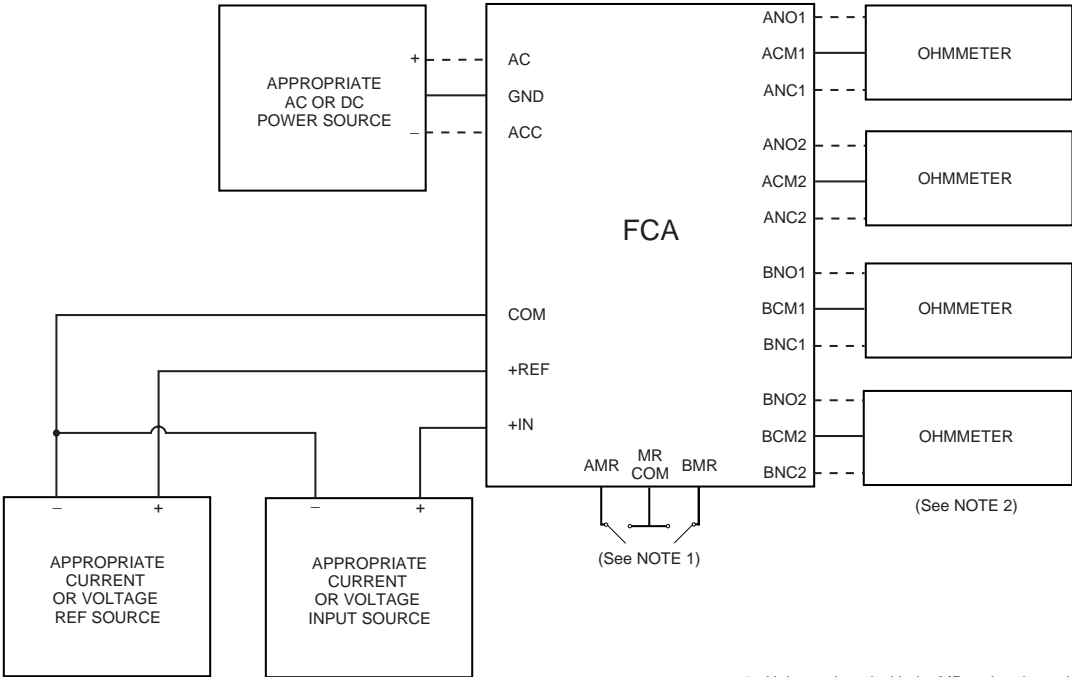
NOTE

DA-equipped units must show "2X..." in the input field of the model number. Refer to the explanation of Moore Industries' unit data tracking system, earlier in this manual, for information on interpreting the FCA model number.

To calibrate the deviation alarm, apply appropriate power, reference and process input to the setup shown in figure 5. **If the unit is equipped with adjustable deadband (no MR option), start with the deadband pots turned fully CCW (minimum deadband, 1%).** If unit is equipped with the AR Option, set internal adjustment pots (R11 and R19, as shown in figure 3) fully counterclockwise.

CAUTION

Do not turn the AR pots too far. They are 270° pots, not equipped with any mechanism to protect against over-turning.



- 1. Units equipped with the MR option do not have adjustable deadband.
- 2. Units equipped with the SPDT option have only one set of contacts per relay.

Figure 5. FCA Calibration Hookup, DA-equipped Units

FCA

1. Set +REF and +IN inputs to the same level.
2. Turn the trip point pot of the alarm being calibrated fully CCW (low alarm) or fully CW (high alarm).
3. If the unit is equipped with the MR option, momentarily short the manual reset terminals on the unit front panel.
4. Make sure the alarm trip being calibrated is in a non-alarm state before proceeding. Check the appropriate front panel LED and the ohmmeter (if used) to confirm non-alarm.
5. Increase and/or decrease one of the inputs until the difference between +IN and +REF is equal to the limit (trip point tolerance) desired, keeping both inputs within the rated input range (input field of the unit model number).
6. If calibrating a high alarm, skip to step 9.
7. **Low alarm:** turn trip point pot CW until alarm trips. Check the LED and the ohmmeter (if used) to confirm the state change.
8. Skip to step 10.
9. **High alarm:** turn trip point pot CCW until alarm trips. Check the LED and ohmmeter (if used) to confirm the state change.
10. Confirm correct trip point setting by varying inputs as follows:

High alarms: Decrease +IN until alarm resets (perform a manual reset if MR-equipped), then slowly increase it again until the alarm trips. At the trip point, note the relationship between +IN and +REF.

Low alarms: Decrease +REF until alarm resets (perform a manual reset if MR-equipped), then slowly increase it again until alarm trips. At the trip point, note the relationship between +IN and +REF.

Mathematically, the internal alarm comparators of the FCA “see” the following signal in an application (values expressed as a percent of span):

$$\text{SIGNAL} = 50\% + \frac{(\text{Sin} - \text{Sref})}{2}$$

Where Sin and Sref are the inputs to +IN and +REF (in % of span), respectively. The example that follows this procedure explains how this technique is used in an FCA deviation alarm application.

11. Refer to the procedures, earlier in this manual, for setting the deadband (available only in units not equipped with MR).

Example — Typical Application of an FCA DA:

An FCA with both DA and MR is to be used to monitor the temperature of a fluid at either end of a length of pipe. An alarm is required when the temperature at the start of the pipe goes too high relative to the temperature at the end, and when the temperature at the end of the pipe goes too high relative to the temperature at the start.

The input to the FCA is 2X4-20MA (model number). A 4-20mA temperature transmitter is employed at both ends of the pipe, and each is connected to one of the alarm trips of the FCA. Note that a dual alarm is required in most deviation alarm applications.

Using figure 3 in this manual, the internal jumpers are set so that trip A is a high alarm, trip B a low alarm. Trip A is connected to the transmitter at the start of the pipe, and trip B is wired to the transmitter at the pipe’s end.

The high alarm trip point is 4mA (arbitrary). This means that whenever the current (temperature) at the start of the pipe is 4mA higher than the current (temperature) at the end of the pipe, trip A will show an alarm.

The low alarm trip point is to be 1mA (arbitrary). This means that whenever the current (temperature) at the start of the pipe is 1mA lower than the current (temperature) at the end of the pipe, trip B will show an alarm.

To calibrate the setup shown in figure 5 of this manual is used. Both inputs are brought to 10mA (arbitrary), and alarm trips are reset — both trips start out in non-alarm. The high alarm trip point pot is turned fully CW, and the low alarm pot is turned fully CCW.

+IN is raised to 14mA, and the high alarm trip point pot is turned slowly CCW until the alarm trips. Then +REF is raised to 14mA and a manual reset is performed. The high alarm resets.

Then +IN is lowered to 13mA, and the low alarm trip point pot is turned slowly CW until the alarm trips.

The trip points of the FCA in this example are now calibrated. In the application, whenever the current (temperature) at the start of the pipe is 4mA higher than the current (temperature) at the end, the high alarm will trip. Whenever the current (temperature) at the end of the pipe is 1mA higher than the current at the pipe's start, the low alarm will trip.

Calibrating AR-equipped FCA Delays

To calibrate units with the AR Option, you will need a timing device or an oscilloscope. Make sure that the trip point and deadband settings have been calibrated before setting the AR delay.

The available delay period for the AR option is user-set for between 150 milliseconds (msec) and 30 seconds (sec). The pots that control the settings are located on the same PC board as the jumpers used to set high/low and failsafe/non-failsafe (figure 3).

To set the delay, use the same calibration setup used in the procedures for setting standard trip points and deadbands. Start with the AR pots (on the PC board) turned fully CCW.

CAUTION

Do not turn the AR pots too far. They are 270° pots, not equipped with any mechanism to protect against over-turning.

A fully CCW setting provides a delay of approximately 150 ms. Set input at an arbitrary point within the trip-point-defined non-alarm range.

Step the input to a level beyond the trip point, and use the stopwatch or scope to measure the delay. Turn the AR pot clockwise to increase the delay period.

NOTE

Units equipped with MR Option (manual reset) will remain "latched" in an alarm state until reset. This is accomplished when a user-supplied push button or toggle switch momentarily shorts the MR and MR COM terminals.

Installation

This manual defines installation as a two-step process in which the FCA is first physically mounted, and then electrical connections are made.

Mounting

Figure 6 gives the outline dimensions of the standard FCA. Figure 7 shows the SPDT-equipped unit. Each figure also illustrates the method in which the unit is mounted on G-type or Top-hat DIN rails.

When mounting FCA's in a multiple unit scenario, remember to allow adequate vertical spacing to move the units up and down when installing or removing.

Electrical Connections

Figure 8 illustrates the installation hookup for the standard FCA. Figure 9 shows the connections for transmitter excitation. These hookups are similar for units equipped with the SPDT option; the difference being that fewer outputs are available.

The input terminals for units equipped with the DA option consist of terminals for connection of the reference, process variable, and common inputs. Range and current or voltage must be specified (2X4-20MA, 2X10-50MA, or 2X1-5V) for these units when ordering.

All connections are made in the removable terminal blocks along the top and bottom edges of the FCA front panel. Each terminal is labeled.

To make a connection, loosen the screw that corresponds to the terminal, insert the stripped end of the connection lead, and tighten the screw until snug. Moore Industries suggests making connections with the terminal block seated in the unit.

FCA

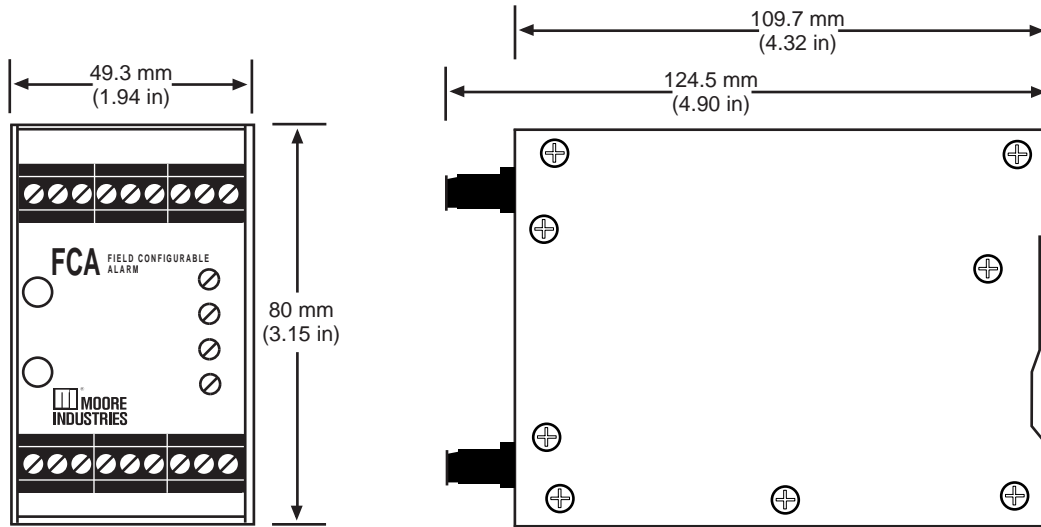


Figure 6. FCA Mounting Dimensions, Standard Units

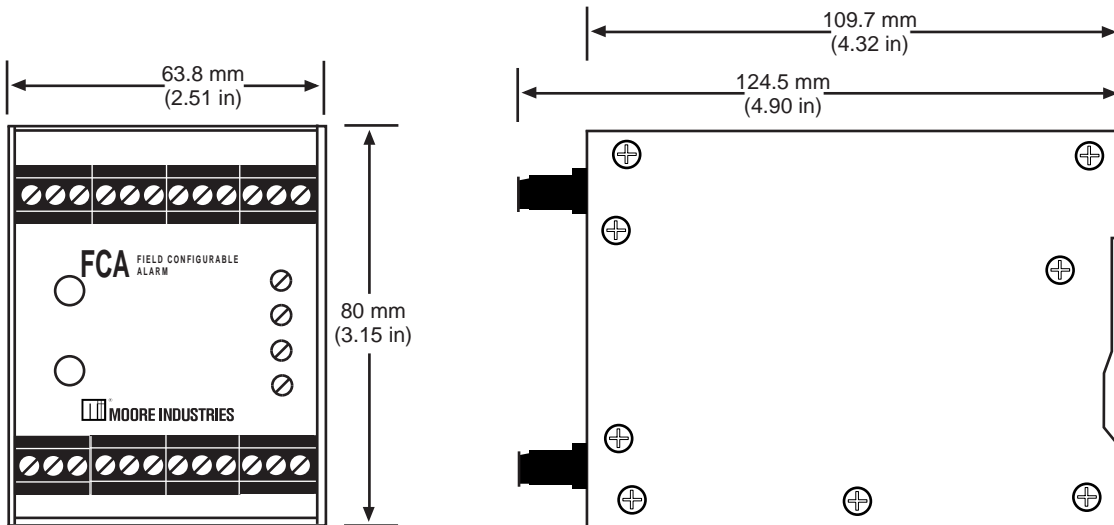
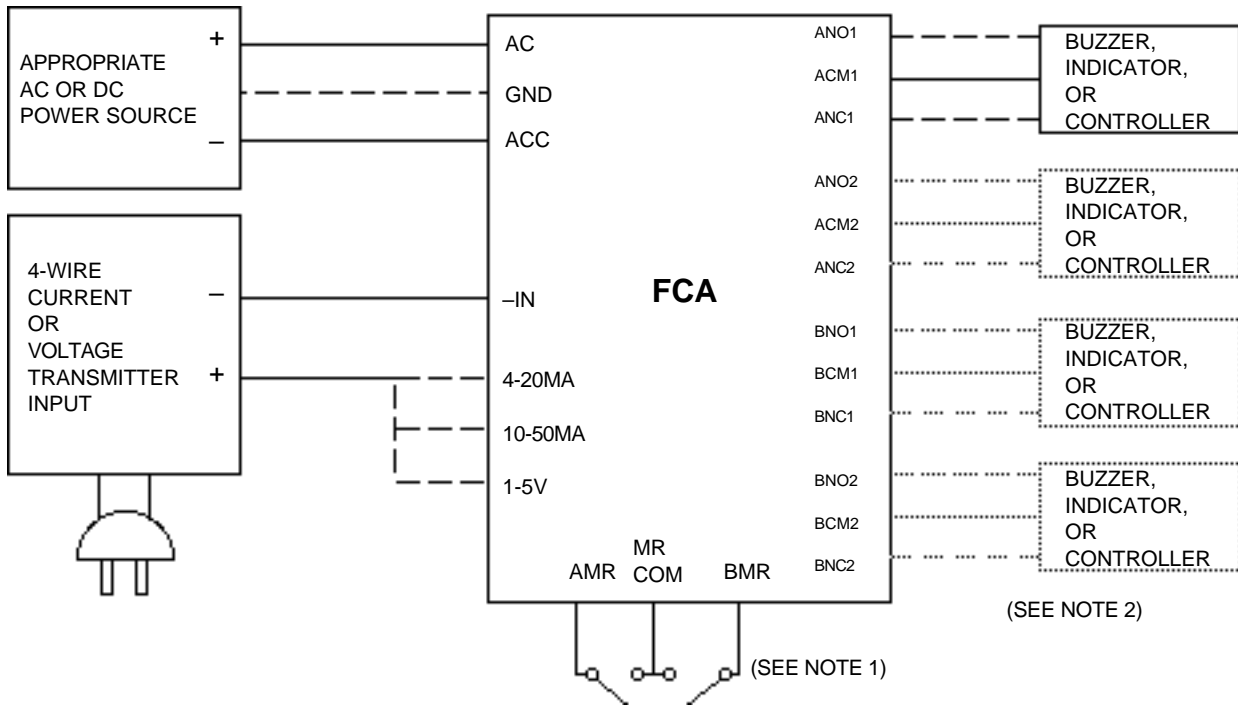


Figure 7. FCA Mounting Dimensions, SPDT-equipped Units



1. Units equipped with MR option do not have adjustable deadband.
2. Units equipped with SPDT option have only one set of contacts per relay.

Figure 8. Typical FCA Installation Hookup

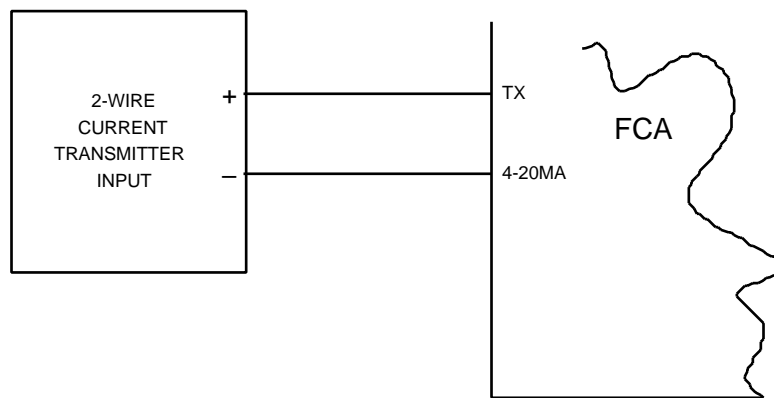


Figure 9. Connections for FCA Transmitter Excitation

FCA

CAUTION

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

The following list breaks out the abbreviations used in FCA labeling:

4-20MA	=	Positive Process Input	BMR	=	Relay B, Manual Reset Connection (MR-equipped units only)
10-50MA	=	Positive Process Input	BNC1	=	Relay B, Normally Closed Connection #1
1-5V	=	Positive Process Input	BNC2	=	Relay B, Normally Closed Connection #2
+IN	=	Input Connection, DA-equipped Units	BNO1	=	Relay B, Normally Open Connection #1
+REF	=	Input Connection, DA-equipped Units	BNO2	=	Relay B, Normally Open Connection #2
-IN	=	Negative Polarity Process Input Connection	COM	=	Common Input Connection (DA-equipped units)
AC, ACC	=	AC Power Input Connections. When using DC Power, connect +PS To AC and -PS to ACC.	COM MR	=	Manual Reset Common (MR-equipped units only)
ACM1	=	Relay A, Common Connection #1	GND	=	Input Power Ground Connection (connected to unit case)
ACM2	=	Relay A, Common Connection #2	TX	=	Transmitter Excitation Connection. Use with appropriate Positive Process Input.
AMR	=	Relay A, Manual Reset Connection (MR-equipped units only)			
ANC1	=	Relay A, Normally Closed Connection #1			
ANC2	=	Relay A, Normally Closed Connection #2			
ANO1	=	Relay A, Normally Open Connection #1			
ANO2	=	Relay A, Normally Open Connection #2			
BCM1	=	Relay B, Common Connection #1			
BCM2	=	Relay B, Common Connection #2			

Grounding. To ground the FCA, make sure a shielded grounding lead is connected to the GND screw on the bottom panel of the unit. The use of shielded, twisted-pair wiring, connected to the FCA case, is recommended for all low level signals.

Operation

The FCA is equipped with anti-chatter circuitry. If configured input/alarm relationship provides de-energized relay output on power-up, unit is electronically prevented from changing state during either power-up or power-down. If configuration provides energized relay output on power -up, relay is limited to a single state change in the event of power-up and power-down.

Applications with the DA Option

A common misconception about deviation alarms is that a single alarm unit can be used to show when the difference between +IN and +REF is *either* too great or too small. Keep in mind the formula in the calibration procedure. Note in particular that the relationship between the inputs is sign-dependent.

That is, in a high alarm, for example, the alarm will trip if +IN rises above the user-set tolerance. It will also trip if +REF drops below the tolerance. **It will not trip**, however, if +REF rises above +IN. A second, low alarm must be used to generate an alarm for that.

Refer to the DA calibration procedure and the accompanying example, earlier in this manual, for more information.

Maintenance & Troubleshooting

Unit maintenance involves simple attention to the cleanliness and tightness of terminal connections. Moore Industries recommends a six month, periodic check of terminals and LED operation to ensure continuing, reliable product performance.

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

- Verify that all electrical connections are clean and tight.
- Verify that the power source for the offending unit is supplying power at levels rated safe according to product specifications.
- Check calibration of instruments used in calibrating the FCA.
- Verify, if possible, that other devices in the process loop are not the cause of the problem.

If continued difficulties are experienced, remove the unit from service and recalibrate. The front panel terminal blocks make it easy to replace an FCA without having to rewire.

If problems persist, or if additional technical assistance is required, contact your local Sales Representative, or Moore Industries' Customer Service Department.



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: FCA

	MODEL	INPUT	OUTPUT	POWER	OPTIONS	HOUSING
Model Number(s):	FCA	*	*	117 Vac	* -CE	DIN
	FCA	*	*	240 Vac	* -CE	DIN

*Indicates any input, output, power, option and housing as stated on the product data sheet.

Conforms to the following EMC specifications:

EN 61326 Electromagnetic Compatibility and Safety requirements for electrical equipment for control use.

Supplemental Information:

None.

October 2, 2001
Date

Fred Adt
Quality Assurance Director

Robert Stockham
Moore Industries-International, Inc.

European Contact: Your Local Moore Industries Sales and Service Office

The Interface Solution Experts • www.miinet.com



United States • info@miinet.com
 Tel: (818) 894-7111 • FAX: (818) 891-2816
 Australia • sales@mooreind.com.au
 Tel: (02) 8536-7200 • FAX: (02) 9525-7296

Belgium • info@mooreind.be
 Tel: 03/448.10.18 • FAX: 03/440.17.97
 The Netherlands • sales@mooreind.nl
 Tel: (0)344-617971 • FAX: (0)344-615920

China • sales@mooreind.sh.cn
 Tel: 86-21-62481120 • FAX: 86-21-62490635
 United Kingdom • sales@mooreind.com
 Tel: 01293 514488 • FAX: 01293 536852

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.



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