



## INSTALLATION

### READ THESE INSTRUCTIONS BEFORE YOU BEGIN INSTALLATION.

Ground yourself before touching board. Some components are static sensitive.

### MOUNTING:

Circuit board may be mounted in any position. If circuit board slides out of snap track, a nonconductive "stop" may be required.

Use only fingers to remove board from snap track. Slide out of snap track or push against side of snap track and lift that side of the circuit board to remove. Do not flex board or use tools.

### POWER CONNECTIONS:

1) **24 VDC** - with power off, connect 24 volt DC power supply to "24" (+) and (-) terminals on the board.

**24 VAC** - with power off, connect one transformer secondary leg to "24" (+) and the other to the common (-) on the board, along with signal input and signal output common (-). Check the wiring configuration of any other loads that may be connected to this transformer. Any field device connected to this transformer must use the same common. If you are not sure of other field device configuration, use separate transformers.

2) **If the 24 volt AC power is shared** with devices that have coils such as relays, solenoids, or other inductors, each coil must have an MOV, AC Transorb, or other spike snubbing device across each of the shared coils. Without these snubbers, coils produce very large voltage spikes when de-energizing that can cause malfunction or destruction of electronic circuits.

- 3) **If the 24 volt DC power is shared** with devices that have coils such as relays, solenoids, or other inductors, each coil must have an MOV, DC Transorb, or diode placed across the coil or inductor. The cathode, or banded side of the DC Transorb or diode, connects to the positive side of the power supply.
- 4) The secondary voltage should be isolated from earth ground, chassis ground, and neutral leg of the primary winding. Grounding should be to the system common only. Failure to follow these procedures can result in improper operation.
- 5) You should measure the actual voltage output of the secondary. If the output is not fully loaded you may read a higher voltage than the circuit board can handle.

The ARM does NOT isolate the input signals from the output. Use the Analog Isolation Module (AIM1, AIM2, or AIM3) if you need to isolate the signal from the device being controlled.

## FACTORY CALIBRATION

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The ARM is set as follows:

No Attenuation to the Input Signal

Voltage Input Signal

Voltage Output Signal

Normal Acting Output Signal

No Offset to the Output Signal

Gain of 1 to the Output Signal (1:1)

The ARM can be ordered calibrated to your specifications or you may follow the procedure below to set your own calibration.

Be sure to check the input, output, GAIN and OFFSET specifications of the ARM. It is possible that the ARM cannot re-scale to your requirements.

## CHECKOUT AND CALIBRATION

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Complete the following steps to change the calibration of the ARM. You will need a digital volt/ current meter, a 24 VDC power supply and a voltage input signal simulator. (A 5K ohm or greater trim pot can be used as a voltage input signal simulator by connecting one end of the trim pot resistance winding to the (+) 24 of the power supply, the other end of the trim pot resistance winding to the (-) 24 of the power supply and the wiper end of the trim pot to the "IN" terminal of the ARM.)

### EQUIVALENT CALIBRATION VOLTAGE

**Use a voltage signal for your input signal during calibration:** this makes both the procedure and the explanation easier. If you will require a current input when you are finished, use the equation below to find the equivalent calibration voltage to use during the calibration procedure:

Equivalent Calibration Voltage = Required Input Signal Amps x 250

For example, 1 VDC is the equivalent calibration voltage for a 4 milliamp input signal ( $1 = .004 \times 250$ ) or 5 VDC is the equivalent calibration voltage for a 20 milliamp input signal ( $5 = .020 \times 250$ ).

### Step 1) Trim Pot Presets

Set all pots as follows to start (These are 25 turn trim pots with no hard stops; they may make a slight clicking sound at either end of their range):

Turn the following pots Full Clockwise:

GAIN = gain of 1

FINE

OFFSET = 0 volts offset

REV = 0 volts reverse

Turn the following pot Full Counterclockwise:

ATTN = no input signal attenuation)

## Step 2) Jumper Shunt Presets

**J1- NORMAL OR REVERSE ACTING:** Set in “N” position for direct acting output signal. (If you require a reverse acting output signal, you will set this shunt in the “R” position in Step 7.)

**J2 - OFFSET:** Set in the “O” position for no offset to the output. (If you will require a “+” or “-” offset, you will set this shunt in the appropriate position in Step 6.)

**J3 IN - INCOMING SIGNAL VOLTAGE OR CURRENT:** Set in “E” position for voltage **input**. (If you require a current input, you will set this shunt in the “I” position AFTER you are finished with the calibration procedure.)

**J3 OUT - OUTGOING SIGNAL VOLTAGE OR CURRENT:** Set in “E” position for voltage **output**. (If you require a current output, you will set this shunt in the “I” position AFTER you are finished with the calibration procedure - Step 8.)

**Step 3) Wiring Connections.** Make the following connections with the power OFF:

Connect a 24 volt AC or DC power supply to the ARM terminals “+24” and “-24”.

Connect the input signal common (-) and the (-) meter lead to the “-24” terminal. Connect (+) input signal lead to the “IN” terminal.

Connect (+) meter lead to the “OUT” terminal.

## Step 4) Power Up

Turn on the 24 volt power supply: the POWER indicator will light.

## Step 5) Input/Output Signal Adjustments

In this step you will figure the desired voltage input signal span and the desired voltage output signal span (see the section on Equivalent Calibration Voltage) and calibrate the ARM to these input and output signal spans.

To calculate the voltage input signal span, subtract the minimum voltage input signal from the maximum input signal (i.e. a 0 to 5 volt input signal will give you a 5 volt input signal span:  $5-0=5$ ).

To calculate the voltage output signal span, subtract the minimum voltage output signal from the maximum voltage output signal (i.e. a 3 to 15 volt output signal will give you a 12 volt output signal span:  $15-3=12$ ).

Take the number for the voltage input signal span and apply this voltage to “IN” terminal.

Compare the output voltage reading on your meter with the voltage output signal span you calculated above. If the meter reading is higher, adjust the “ATTN” trim pot until the meter reading drops to the calculated output span. If the meter reading is lower, adjust the “GAIN” and “FINE” trim pots until the meter reading increases to the calculated output signal span.

## Step 6) Offset Adjustments

The offset adjustments simply shift the output signal range up or down from a “no offset” condition. For example, an output signal range in a “no offset” condition is 3 to 15 volts. Adding an offset of 2 volts will now make the output signal range 5 to 17 volts. Subtracting an offset of 2 volts will now make the output signal range 1 to 13 volts.

Apply the minimum voltage input signal and read the minimum output signal on the meter. With the “OFFSET” jumper shunt “J2” in the “NO” position (from Step 6) no offset voltage will be added or subtracted from the output signal range.

If you need to shift the output signal range up, set the “OFFSET” jumper shunt “J2” in the “+” position and adjust the “OFFSET” trim pot until you increase the voltage reading on the meter to match the desired minimum output voltage. (Remember, this also increases the maximum output signal by the same amount.)

If you need to shift the output signal range down, set the “OFFSET” jumper shunt “J2” in the “-” position and adjust the “OFFSET” trim pot until you decrease the voltage reading on the meter to match the desired minimum output voltage. (Remember, this also decreases the maximum output by the same amount.)

### Step 7) Reverse Action Adjustments

If you will require your output signal to reverse act, set jumper shunt "J1" in the "R" position. Apply the minimum voltage input signal and adjust the "REV" trim pot for the highest desired output signal. Check the low, mid-scale and high signal points to insure proper calibration.

### Step 8) Final Adjustments

If you require a current input, set the "J3" IN jumper shunt in the "I" position. If you require a current output, set the "J3" OUT jumper shunt in the "I" position. Check operation of the ARM for desired signal rescaling and operation.

**Use this handy ARM calibration worksheet: Fill in and circle answers.**

1. Input: min.\_\_\_\_max.\_\_\_\_ mA or VDC,    Output: min.\_\_\_\_max.\_\_\_\_ mA or VDC
2. Is the input (VDC)? Yes/No                      Is the output (VDC)? Yes/No
  - a) If yes to both, set jumper J3 (IN/OUT) to E and skip to step #5.
  - b) If no to both, set jumper J3 (IN/OUT) to I and skip to step #5.
  - c) If yes to only one, continue to next step.
3. Is current the input signal. If no, skip to step 4. If yes,
  - a) Set J3 (IN) to I and (OUT) to E.
  - b) Multiply input min. by 250 and enter value in "Input min." in step #5a.
  - c) Multiply input max. by 250 and enter value in "Input max." in step #5a.

Example: min.=4mA = .004 x 250 = 1 vdc and max.=20mA = .020 x 250 = 5 vdc.
4. Is voltage the input signal. If no, skip to step 5. If yes,
  - a) Set J3 (IN/OUT) to E. Output jumper will be changed to I in later steps.
  - b) Multiply output min. by 250 and enter value in "Output min." in step #5b,
  - c) Multiply max. by 250 enter value in "Output max." in step #5b.

Example: min. 4mA = .004 x 250 = 1 vdc and max. 20mA = .020 x 250 = 5 vdc.
5. Enter mA, VDC or equivalent values below. **Note:** Do not mix voltage and current.
  - a) Input min.\_\_\_\_                      Input max.\_\_\_\_ max.-min. = Input span\_\_\_\_
  - b) Output min.\_\_\_\_                      Output max.\_\_\_\_ max.-min. = Output span\_\_\_\_
6. Preset trimpots: Turn 20 times or until it clicks.

Clockwise - Gain, Fine, Offset and Reverse  
Counter clockwise – Attenuation
7. Make all connections including signal generator and multimeter. Apply power 24 VAC or VDC.
8. Set jumpers J2 to 0 and J1 to N
9. First test: input a 50% signal. Is the input equal to or close to the output?

If yes, go on to next step.  
If not, return to step #7.

Note: Min, max and span values are found in step #5.
10. Supply the "input span" signal or equivalent to the input. Refer to step 5.
  - a) If the "input span" is less than "output span". Turn the gain or fine trim pot until the output is equal to the "output span" signal.
  - b) If the "input span" is greater than "output span". Turn the attenuation trim pot until the output is equal to the "output span" signal.

11. Setting the offset jumper:
  - a) If the "input min." is greater than "output min." Set J2 to (-). Skip to #12.
  - b) If the "input min" is less than "output min." Set J2 to (+). Skip to # 12.
  - c) If the "input min" is equal to "output min" Leave J2 alone and skip to step #12.
12. Supply the "input min." signal or equivalent to the input. Adjust the offset trim pot until the output reads the same as "output min."
13. If the signal is reverse acting. If not skip to step 14.
  - a) Set J1 to R.
  - b) Supply "input min" or equivalent and adjust the Rev trim pot until reading is equal to "output max."
14. If the output is current. Set J3 (out) to I and reset meter to current.  $V.out / 250 = mA$ .
15. Check the low, mid scale and high signal Points to check output for proper calibration. Fine calibration adjustments may be made now.

ARM Power Consumption:

Supply Current - 200 mA maximum  
 20 VDC Power Output - 30 mA maximum  
 Input Impedance: Voltage - 1,000,000 ohms  
 Current - 250 ohms

Output Impedance: Voltage - 5000 ohms  
 Current - 750 ohms  
 Output Current: 44 mA maximum