

# ANALOG INPUT MODULES

| F3-04ADS 4-Channel Isolated Analog Input |   |
|--|---|
| <b>Number of Channels</b>                | 4, (isolated)   |
| <b>Input Ranges</b>                      | 0-5V, 0-10V, 1-5V, ±5V, ±10V, 0-20mA, 4-20mA  |
| <b>Channels Individually Configured</b>  | Yes   |
| <b>Resolution</b>                        | 12 bit (1 in 4096)  |
| <b>Input Type</b>                        | Differential  |
| <b>Max. Common Mode Voltage</b>          | ±750V peak continuous transformer isolation   |
| <b>Noise Rejection Ratio</b>             | Common mode: -100dB at 60Hz   |
| <b>Active Low-pass Filtering</b>         | -3dB at 10Hz, -12dB per octave  |
| <b>Input Impedance</b>                   | 250ohm ± 0.1%, 1/2W current input, 200Kohm voltage input                                      |
| <b>Absolute Maximum Ratings</b>          | ±40 mA, current input ± 100V, voltage input   |
| <b>Conversion Time</b>                   | 1 channel per scan, successive approximation, AD574   |
| <b>Linearity Error</b>                   | ±1 counts max. (0.03% of full scale) unipolar<br>±2 counts max. (0.05% of full scale) bipolar |
| <b>Full Scale Calibration Error</b>      | ±8 counts maximum   |

|                                 |  |
|---------------------------------|--|
| <b>Offset Calibration Error</b> | ±8 counts maximum                              |
| <b>Accuracy vs. Temperature</b> | 57ppm/ °C maximum full scale                   |
| <b>Recommended Fuse</b>         | 0.032A, Series 217 fast-acting, current inputs |
| <b>Power Budget Requirement</b> | 183mA @ 9VDC, 50mA @ 24VDC                     |
| <b>External Power Supply</b>    | None required                                  |
| <b>Operating Temperature</b>    | 32° to 140°F (-20° to 60°C)                    |
| <b>Storage Temperature</b>      | -4° to 158° F (-20° to 70°C)                   |
| <b>Relative Humidity</b>        | 5 to 95% (non-condensing)                      |
| <b>Environmental Air</b>        | No corrosive gases permitted                   |
| <b>Vibration</b>                | MIL STD 810C 514.2                             |
| <b>Shock</b>                    | MIL STD 810C 516.2                             |
| <b>Noise Immunity</b>           | NEMA ICS3-304                                  |

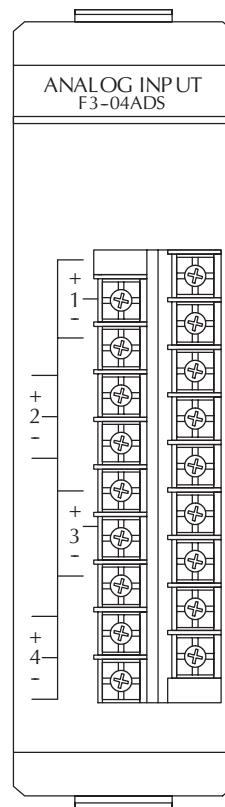
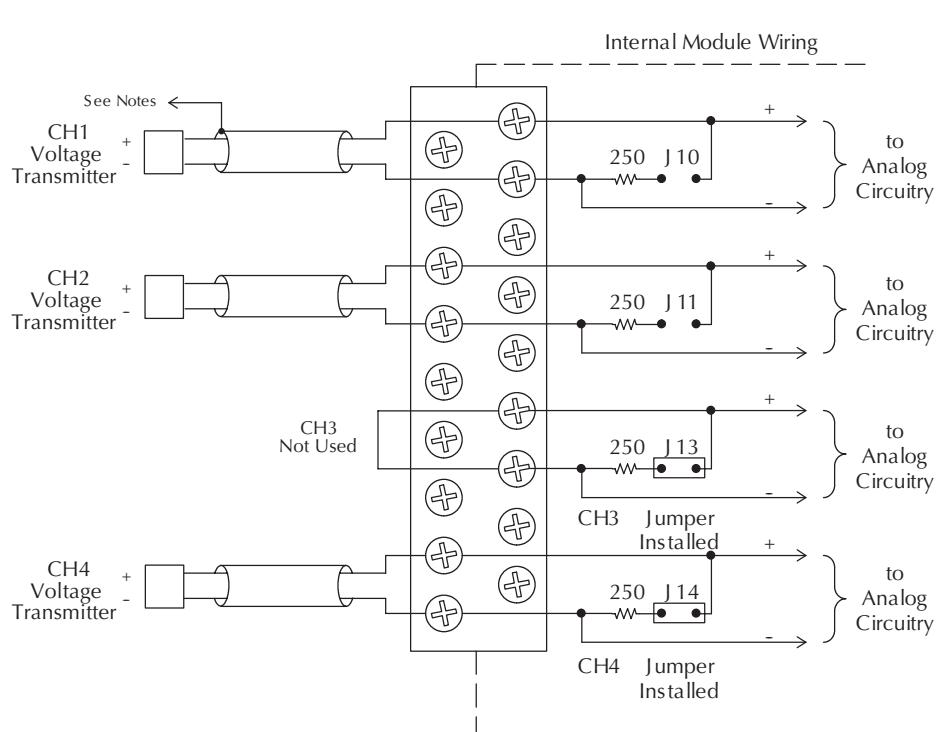
Note 1: Connect unused voltage or current inputs to OVDC at terminal block or leave current jumper installed (see Channel 3).

Note 2: A Series 217, 0.032A, fast-acting fuse is recommended for 4-20mA current loops.

Note 3: Transmitters may be 2, 3, or 4 wire type.

Note 4: Transmitters may be powered from separate power sources.

Note 5: Terminate all shields of the cable at their respective signal source.



# ANALOG INPUT MODULES

## F3-08AD-1 8-Channel Analog Input (Replaces F3-08AD)

|                                 |   |
|---------------------------------|---|
| <b>Number of Channels</b>       | 8, single ended (one common)  |
| <b>Input Ranges</b>             | 4-20mA  |
| <b>Resolution</b>               | 12 bit (1 in 4096)  |
| <b>Low Pass Filter</b>          | -3db @ 200Hz (-6db/octave)  |
| <b>Input Impedance</b>          | 250ohm ± 0.1%, 1/2W current input   |
| <b>Absolute Maximum Ratings</b> | ±40mA   |
| <b>Conversion Time</b>          | 1 channel per CPU scan  |
| <b>Converter Type</b>           | Successive approximation, MAX170  |
| <b>Linearity Error</b>          | ± 1 count (0.03% of full scale) maximum                                   |
| <b>Input Stability</b>          | ±0.05 count   |
| <b>Maximum Inaccuracy</b>       | 0.1% of full scale at 77°F (25°C)   |
| <b>Accuracy vs. Temperature</b> | 57ppm/°C maximum full scale (including maximum offset change of 2 counts) |

|                                 |                                |
|---------------------------------|--------------------------------|
| <b>Recommended Fuse</b>         | 0.032A, Series 217 fast-acting |
| <b>Power Budget Requirement</b> | 45mA @9 VDC, 55mA @ 24VDC      |
| <b>External Power Supply</b>    | None required                  |
| <b>Operating Temperature</b>    | 32° to 140°F (0° to 60°C)      |
| <b>Storage Temperature</b>      | -4° to 158°F (-20° to 70°C)    |
| <b>Relative Humidity</b>        | 5 to 95% (non-condensing)      |
| <b>Environmental air</b>        | No corrosive gases permitted   |
| <b>Vibration</b>                | MIL STD 810C 514.2             |
| <b>Shock</b>                    | MIL STD 810C 516.2             |
| <b>Noise Immunity</b>           | NEMA ICS3-304                  |

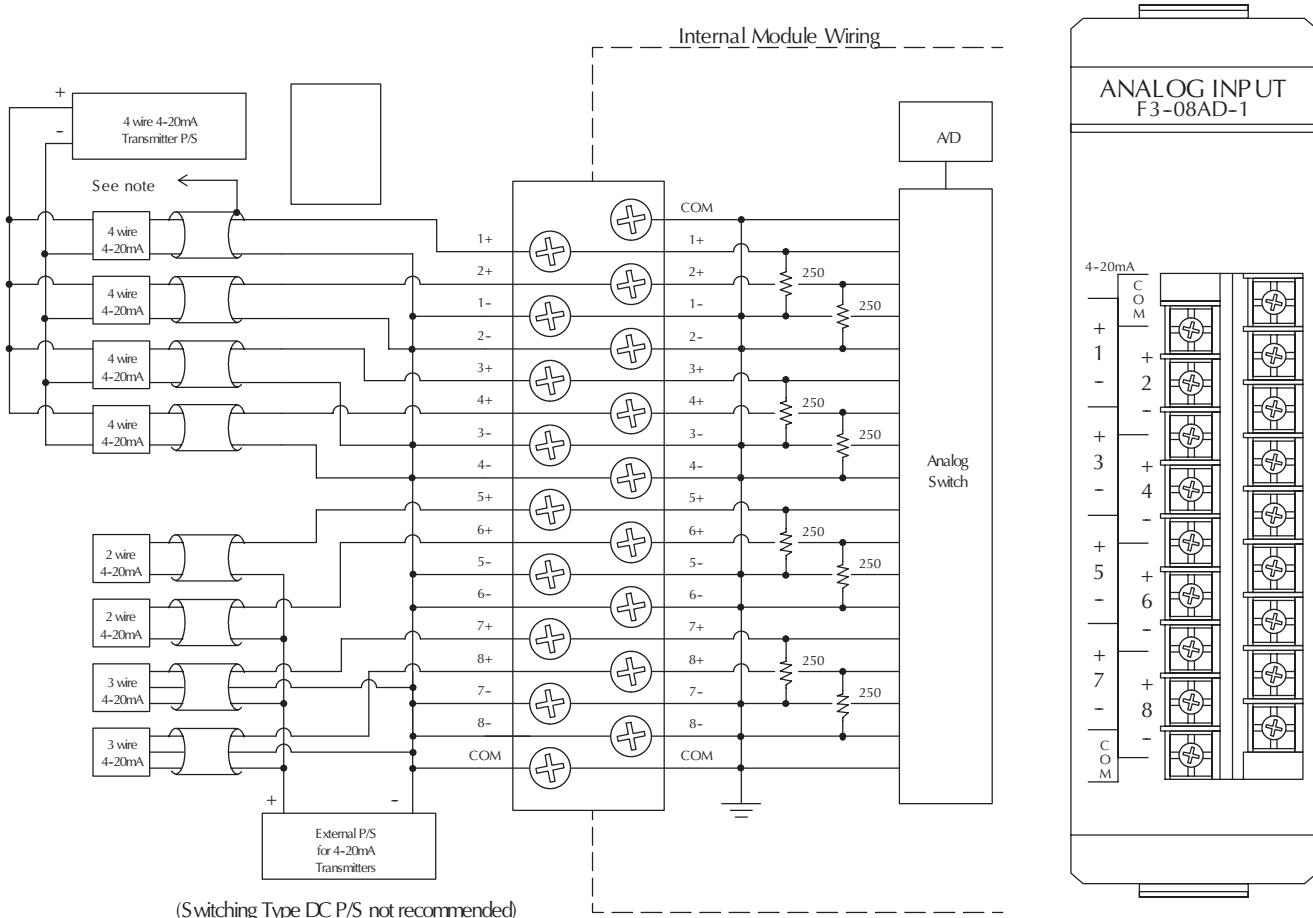
**Note 1:** Terminate all shields at their respective signal source.

**Note 2:** To avoid "ground loop" errors, the following transmitter types are recommended:

2 and 3 wire: Isolation between input signal and P/S

4 wire: Full isolation between input signal, P/S and output signal.

**Note 3:** A Series 217 0.032A fast-acting fuse is recommended for 4-20mA applications.



(Switching Type DC P/S not recommended)

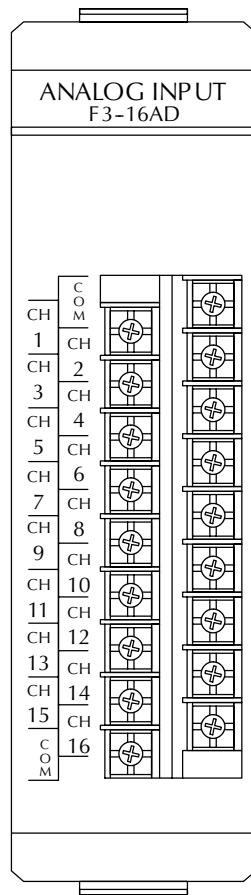
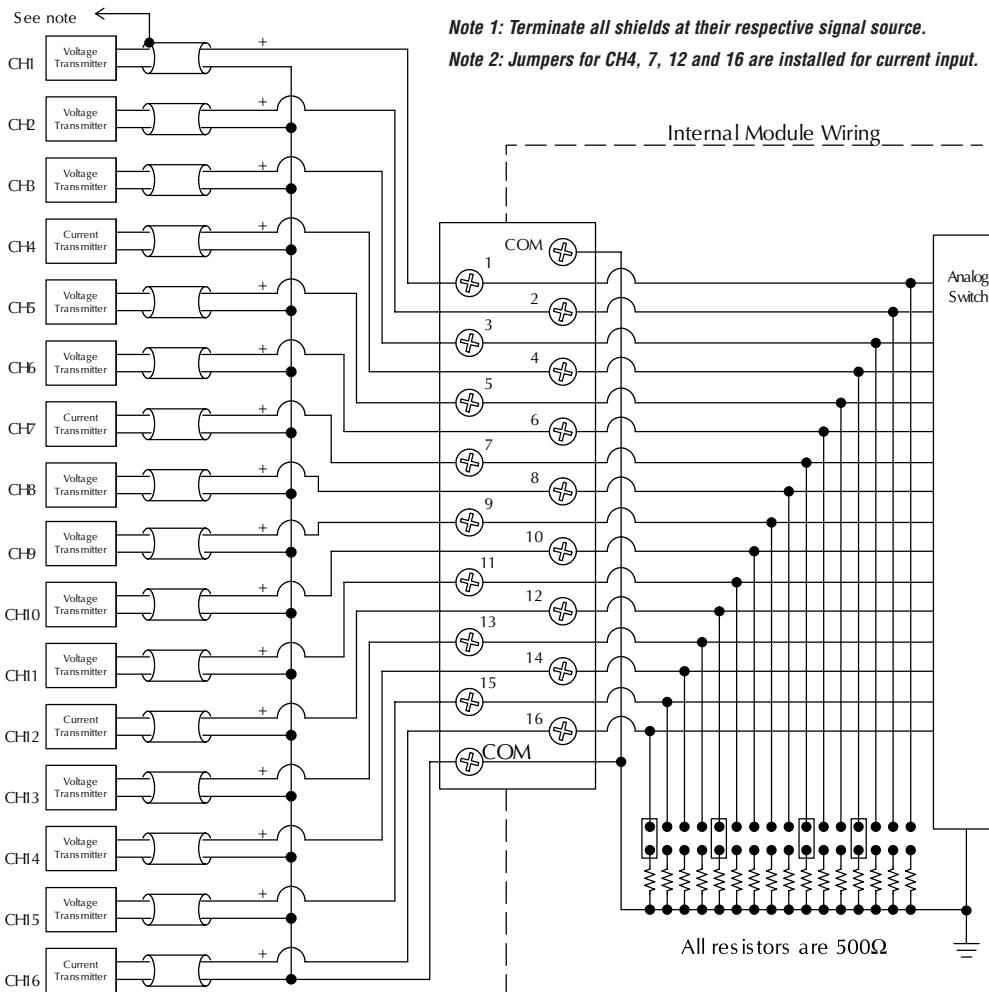
# ANALOG INPUT MODULES

## F3-16AD 16-Channel Analog Input

|  |   |
|--|---|
| <b>Number of Channels</b>                | 16, single ended (one common)   |
| <b>Input Ranges</b>                      | $\pm 5V$ , $\pm 10V$ , 0-5V, 0-10V, 0-20mA, 4-20mA <sup>2</sup>                       |
| <b>Channels Individually Configured</b>  | Range is selected for all channels. Each channel can be wired for voltage or current. |
| <b>Resolution</b>                        | 12 bit (1 in 4096)  |
| <b>Input Impedance</b>                   | 2Mohm, voltage input,<br>500ohm $\pm 1\%$ current input                               |
| <b>Absolute Maximum Ratings</b>          | $\pm 25mA$ , voltage input<br>$\pm 30mA$ , current input                              |
| <b>Conversion Time</b>                   | 35 $\mu$ s per channel,<br>1 channel per CPU scan                                     |
| <b>Converter Type</b>                    | Successive Approximation, AD574   |
| <b>Linearity Error</b>                   | $\pm 1$ count maximum   |
| <b>Maximum Inaccuracy at 77°F (25°C)</b> | 0.25% of full scale, voltage input<br>1.25% of full scale, current input              |
| <b>Accuracy vs. Temperature</b>          | 57ppm/ $^{\circ}$ C maximum full scale  |

|                                 |   |
|---------------------------------|---|
| <b>Recommended Fuse</b>         | 0.032 A, Series 217 fast-acting, current inputs |
| <b>Power Budget Requirement</b> | 55mA @ 9VDC, 65mA @ 24VDC                       |
| <b>External Power Supply</b>    | None required                                   |
| <b>Operating Temperature</b>    | 32° to 140°F (0° to 60°C)                       |
| <b>Storage Temperature</b>      | -4° to 158°F (-20° to 70°C)                     |
| <b>Relative Humidity</b>        | 5 to 95% (non-condensing)                       |
| <b>Environmental Air</b>        | No corrosive gases permitted                    |
| <b>Vibration</b>                | MIL STD 810C 514.2                              |
| <b>Shock</b>                    | MIL STD 810C 516.2                              |
| <b>Noise Immunity</b>           | NEMA ICS3-304                                   |

\* requires gain adjustment with potentiometer.  
\* resolution is 3275 counts (instead of 4096). Allows easier broken transmitter detection.

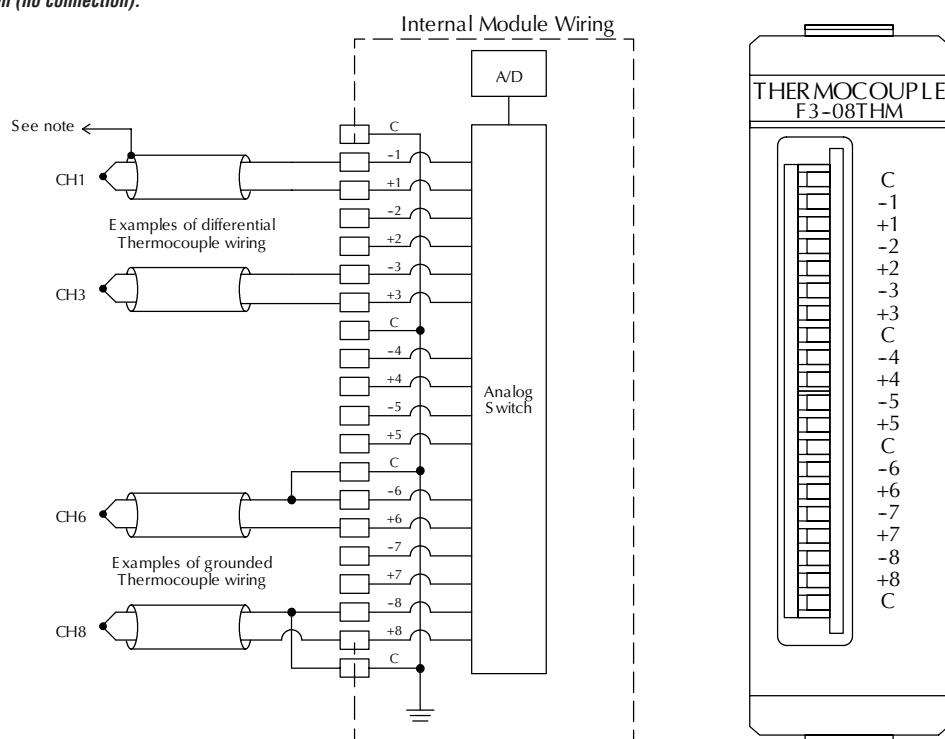


| <b>F3-08THM-n 8-Channel Thermocouple Input</b>   |  |
|--|--|
| <b>Note:</b> When you order the module, replace the "n" with the type of thermocouple needed. For example, to order a Type J thermocouple module, order part number F3-08THM-J or F3-08THM-K for type K. Types J and K are stock. All other are special order. |  |
| <b>Input Ranges</b>  | Type E: -270/1000°C, -450/1832°F (obsolete)<br>Type J: -210/760°C, -350/1390°F<br>Type K: -270/1370°C, -450/2500°F<br>Type R: 0/1768°C, 32/3214°F (obsolete)<br>Type S: 0/1768°C, 32/3214°F (obsolete)<br>Type T: -270/400°C, -450/752°F (obsolete)<br>-1: 0-50mV<br>-2: 0-100mV |
| <b>Resolution</b>  | 12 bit (1 in 4096)   |
| <b>Input Impedance</b>   | 27Kohm DC  |
| <b>Absolute Maximum Ratings</b>  | Fault protected input, 130 Vrms or 100 VDC   |
| <b>Cold Junction Compensation</b>  | Automatic  |
| <b>Conversion Time</b>   | 15ms per channel, minimum<br>1 channel per CPU scan  |

|  |  |
|--|--|
| <b>Converter Type</b>                    | Successive approximation, AD574        |
| <b>Linearity Error</b>                   | ±1 count (0.03% of full scale) maximum |
| <b>Maximum Inaccuracy at 77°F (25°C)</b> | 0.35% of full scale                    |
| <b>Accuracy vs. Temperature</b>          | 57ppm/°C maximum full scale            |
| <b>Power Budget Requirement</b>          | 50mA @ 9VDC, 34mA @ 24VDC              |
| <b>External Power Supply</b>             | None required                          |
| <b>Operating Temperature</b>             | 32° to 140°F (0° to 60°C)              |
| <b>Storage Temperature</b>               | -4° to 158°F (-20° to 70°C)            |
| <b>Relative Humidity</b>                 | 5 to 95% (non-condensing)              |
| <b>Environmental Air</b>                 | No corrosive gases permitted           |
| <b>Vibration</b>                         | MIL STD 810C 514.2                     |
| <b>Shock</b>                             | MIL STD 810C 516.2                     |
| <b>Noise Immunity</b>                    | NEMA ICS3-304                          |

**Note 1:** Terminate shields at the respective signal source.

**Note 2:** Leave unused channel open (no connection).



# ANALOG OUTPUT MODULES

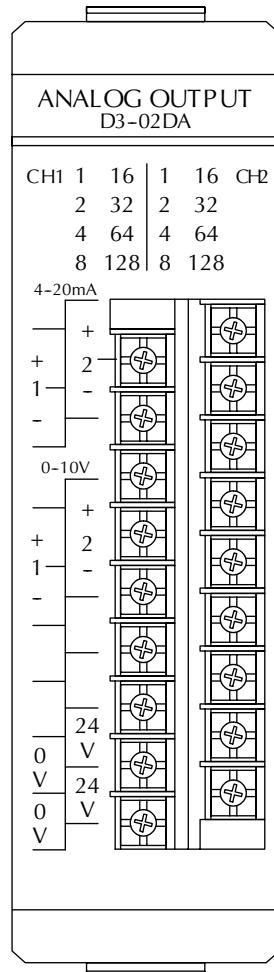
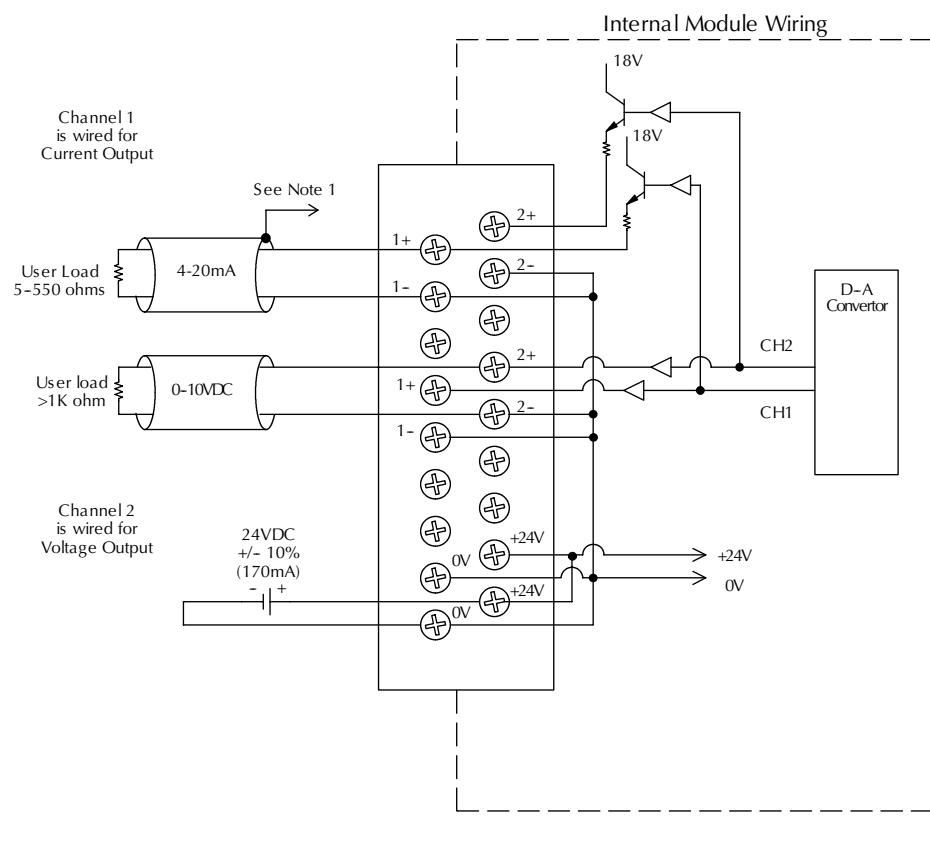
| D3-02DA 2-Channel Analog Output         |   |
|---|---|
| <b>Number of Channels</b>               | 2 (independent)                                       |
| <b>Output Ranges</b>                    | 0 - 10V, 4-20mA                                       |
| <b>Channels Individually Configured</b> | Yes. Use different terminals for voltage and current. |
| <b>Resolution</b>                       | 8-bit (1 in 256)                                      |
| <b>Output Type</b>                      | Single ended  |
| <b>Output Impedance</b>                 | 0.5ohm maximum, voltage output                        |
| <b>Output Current</b>                   | 10mA minimum, voltage output @ 10VDC                  |
| <b>Load Impedance</b>                   | 550ohm max. 50hm min., current output                 |
| <b>Total Inaccuracy</b>                 | ±0.4% maximum at 25°C                                 |
| <b>Accuracy vs. Temperature</b>         | ±50ppm/°C maximum                                     |

|                                 |                                |
|---------------------------------|--------------------------------|
| <b>Conversion Time</b>          | 100µs maximum(2 channels/scan) |
| <b>Power Budget Requirement</b> | 80mA @ 9V                      |
| <b>External Power Supply</b>    | 24VDC, ±10%, 170mA, class 2    |
| <b>Operating Temperature</b>    | 32° to 140°F (0° to 60°C)      |
| <b>Storage Temperature</b>      | -4° to 158°F (-20° to 70°C)    |
| <b>Relative Humidity</b>        | 5 to 95% (non-condensing)      |
| <b>Environmental Air</b>        | No corrosive gases permitted   |
| <b>Vibration</b>                | MIL STD 810C 514.2             |
| <b>Shock</b>                    | MIL STD 810C 516.2             |
| <b>Noise Immunity</b>           | NEMA ICS3-304                  |

Obsolete module

**Note 1:** Shields should be connected to the OV of the module or to the OV of the P/S.

**Note 2:** Unused voltage and current outputs should remain open (no connections).



# ANALOG OUTPUT MODULES

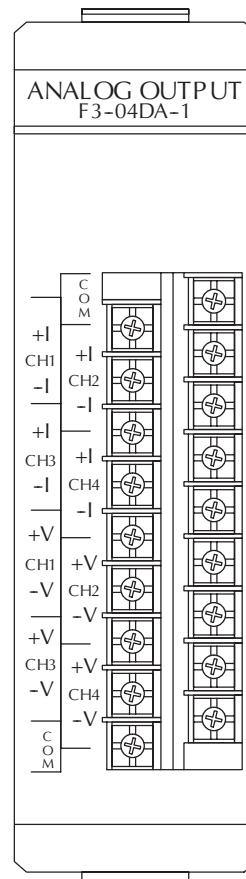
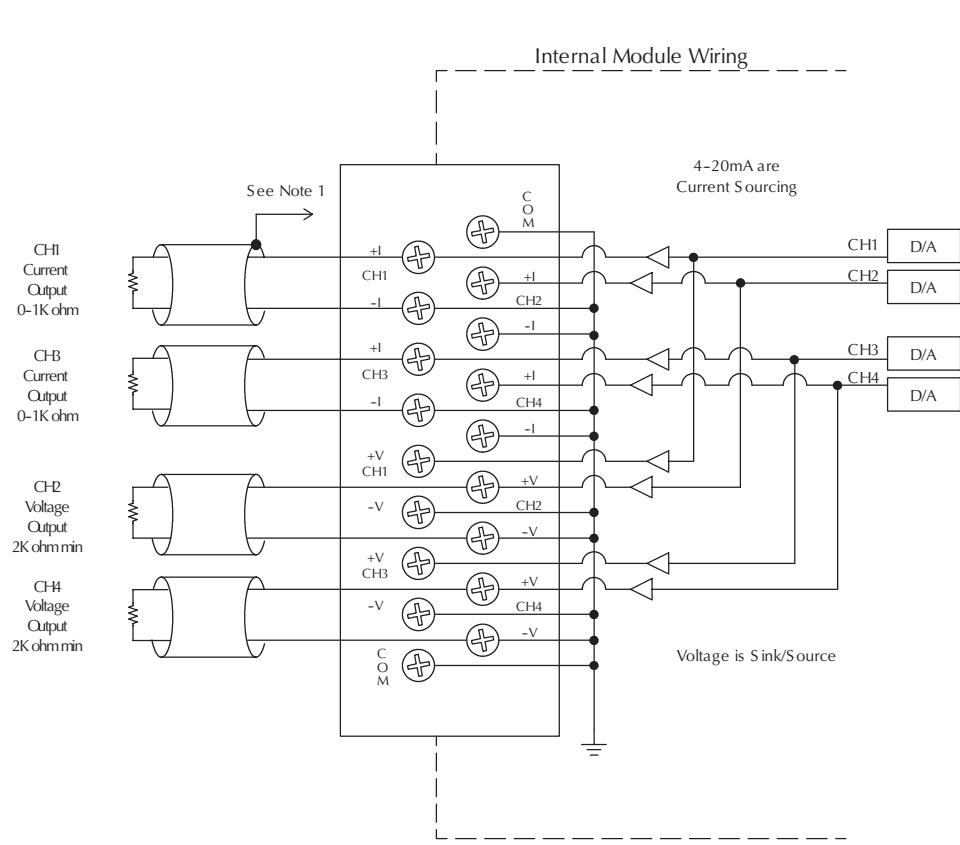
## F3-04DA-1 4-Channel Analog Output

|  |  |
|--|--|
| <b>Number of Channels</b>                  | 4  |
| <b>Output Range</b>                        | 0 - 5V, 0-10V 4-12 mA,<br>4-20 mA (source)                       |
| <b>Channels Individually Configured</b>    | Yes  |
| <b>Resolution</b>                          | 12-bit (1 in 4096)   |
| <b>Output Type</b>                         | Single ended (one common)  |
| <b>Output Impedance</b>                    | 0.5ohm typical, voltage output                                   |
| <b>Output Current</b>                      | 5mA source, 2.5mA sink (voltage)                                 |
| <b>Short-circuit Current</b>               | 40mA typical, voltage output                                     |
| <b>Load Impedance</b>                      | 1Kohm maximum, current output<br>2Kohm minimum, voltage output   |
| <b>Linearity Error</b>                     | ±1 count (±0.03% maximum)  |
| <b>Maximum Inaccuracy at 77° F (25° C)</b> | ± 0.6% of span, current output<br>± 0.2% of span, voltage output |

|                                 |                              |
|---------------------------------|------------------------------|
| <b>Accuracy vs. Temperature</b> | ±50ppm/°C maximum            |
| <b>Conversion Time</b>          | 30µS maximum                 |
| <b>Power Budget Requirement</b> | 144mA @ 9V, 108mA @24V       |
| <b>External Power Supply</b>    | None required                |
| <b>Operating Temperature</b>    | 32° to 140°F (0° to 60°C)    |
| <b>Storage Temperature</b>      | -4° to 158°F (-20° to 70°C)  |
| <b>Relative Humidity</b>        | 5 to 95% (non-condensing)    |
| <b>Environmental Air</b>        | No corrosive gases permitted |
| <b>Vibration</b>                | MIL STD 810C 514.2           |
| <b>Shock</b>                    | MIL STD 810C 516.2           |
| <b>Noise Immunity</b>           | NEMA ICS3-304                |

**Note 1:** Shields should be connected to the OV (COM) of the module.

**Note 2:** Unused voltage and current outputs should remain open (no connections).



# ANALOG OUTPUT MODULES

## F3-04DAS 4-Channel Isolated Analog Output

|   |  |
|---|--|
| <b>Number of Channels</b>                 | 4  |
| <b>Output Ranges</b>                      | $\pm 5V$ , $\pm 10V$ , $0 - 5V$ , $0 - 10V$ , $1 - 5V$<br>$0-20mA$ , $4-20mA$                                |
| <b>Channels Individually Configurable</b> | Yes  |
| <b>Resolution</b>                         | 12-bit (1 in 4096)   |
| <b>Output Type</b>                        | Isolated, 750 VDC channel-to-channel 750 VDC channel-to-logic  |
| <b>Output Current</b>                     | $\pm 5mA$ voltage output   |
| <b>Short-circuit Current</b>              | $\pm 20mA$ typical, voltage output   |
| <b>Capacitive Load Drive</b>              | $0.1\mu F$ typical, voltage output   |
| <b>Load Impedance</b>                     | 470ohm maximum, current output<br>2Kohm minimum, voltage output  |
| <b>Isolation Mode Rejection</b>           | 140dB at 60Hz  |
| <b>Linearity Error</b>                    | $\pm 1$ count ( $\pm 0.03\%$ maximum)  |
| <b>Calibration Error</b>                  | $\pm 0.15\%$ typical, $\pm 0.75\%$ max. of span $\pm 10 \text{ ppm}/^\circ\text{C}$<br>maximum of full scale |

|                                 |   |
|---------------------------------|---|
| <b>Calibrated Offset Error</b>  | $\pm 1$ count maximum, current output<br>$\pm 5 \text{ mV}$ typical, $\pm 50 \text{ mV}$ max.,<br>voltage out $\pm 0.2 \text{ mV}$ typical $^\circ\text{C}$ |
| <b>Conversion Time</b>          | 30 $\mu\text{s}$ maximum, 1 channel/scan  |
| <b>Power Budget Requirement</b> | 154mA @ 9V, 145mA @ 24V   |
| <b>External Power Supply</b>    | None required   |
| <b>Operating Temperature</b>    | 32° to 140°F (0° to 60°C)   |
| <b>Storage Temperature</b>      | -4° to 158°F (-20° to 70°C)   |
| <b>Relative Humidity</b>        | 5 to 95% (non-condensing)   |
| <b>Environmental Air</b>        | No corrosive gases permitted  |
| <b>Vibration</b>                | MIL STD 810C 514.2  |
| <b>Shock</b>                    | MIL STD 810C 516.2  |
| <b>Noise Immunity</b>           | NEMA ICS3-304   |

**Note 1:** Shields should be connected to the respective channel's –V terminal of the module.

**Note 2:** Each isolated output channel may have either a voltage or current load, but not both.

**Note 3:** An external 0.31 Amp fast-acting fuse in series with the isolated +I terminal (+15VDC) is recommended to protect against accidental shorts to the –V terminal (15VDC common).

**Note 4:** Do not attempt to source more than 20mA from any one of the four isolated 15VDC power supplies.

