

# FC Series Signal Conditioners



## FC-33

### DC Selectable Signal Conditioner with 3-way isolation

Field configurable input and output ranges of 0-5V, 0-10 V, 0-20 mA and 4-20 mA with 1500 VDC isolation between input and output, and 1500 VDC isolation from 24 volt power and input/output. LED indicates normal operation and is used in conjunction with the calibration pushbutton for the internal calibration process.

- 3-way 1500 V isolation
- Push button calibration



## FC-T1

### Thermocouple/mV Isolated Signal Conditioner

Field configurable input for type J, K, E, T, R, S, B, N and C thermocouples or  $\pm 156.25$  mV inputs with 1500 VDC isolation between input and the 4-20 mA output. Cold junction compensation and burnout detection. Alarm/run LED.

- 1500 V isolation
- Cold junction compensation (CJC)
- Internal diagnostics (burnout detection or calibration errors)



## FC-35B

### Unipolar Voltage or Current to Bipolar Voltage Signal Conditioner

Field configurable input and output, unipolar input ranges of 0-5V, 0-10 V, 0-20 mA or 4-20 mA, and bipolar output ranges of  $\pm 100$  mV,  $\pm 50$  mV,  $\pm 5$ V,  $\pm 10$ V,  $\pm 15$ V. Field calibrated with offset and span adjustments.



## FC-3RLY2

### Analog Input, 2-Relay, Limit Alarm

Field configurable analog to relay limit alarm powered by 24VAC/VDC and Input signal ranges of 0-15V, 0-30V or 0-20mA. Trip/Release Point programmed via DIP switches. LED's indicate operating status.



## FC-ISO-D

### Encoder Signal Conditioner and Optical Isolator - Differential Line Driver Output

Ideal for use with single-ended (open collector, NPN, pull-up, push-pull, totem pole) or differential line driver encoders. Three complementary inputs (A, B, Z, A-not, B-not, Z-not) are rated for 4.5-7.5 and 12-26 VDC and frequency response up to 1 MHz.

Optical isolation separates the input signals from three differential line driver outputs (A, B, Z, A-not, B-not, Z-not) rated for 5VDC.



## FC-11

### 4-20 mA Isolated Signal Conditioner

Loop powered 4-20 mA input/output signal with 1500 VDC isolation between input and output.

- 1500 V isolation
- Loop powered



## FC-R1

### RTD Input Signal Conditioner

Loop powered, non-isolated, 3-wire unit converts an RTD input to a linear 4-20 mA signal. User selectable CU10, PT100 or PT1000 input.



## FC-P3

### Potentiometer Input, Analog Output Signal Conditioner

Field configurable input and output, input ranges of 3-wire potentiometer 0 to 100 ohms through 0 to 100 kilohms, and output ranges of 0-5V, 0-10 V, 0-20 mA or 4-20 mA. Field calibrated to 10% of potentiometer full range.



## FC-B34

### Bipolar Voltage to Unipolar Voltage or Current Signal Conditioner

Field configurable input and output, bipolar input ranges of  $\pm 100$  mV,  $\pm 50$  mV,  $\pm 5$ V,  $\pm 10$ V,  $\pm 15$ V, and unipolar output ranges of 0-5V, 0-10 V, 0-20 mA or 4-20 mA. Field calibrated with offset and span adjustments.



## FC-3RLY4

### Analog Input, 4-Relay, Limit Alarm

Field configurable analog to relay limit alarm powered by 24VAC/VDC and Input signal ranges of 0-15V, 0-30V or 0-20mA. Trip/Release Point programmed via DIP switches. LED's indicate operating status.



## FC-ISO-C

### Encoder Signal Conditioner and Optical Isolator - Open Collector Output

Ideal for use with single-ended (open collector, NPN, pull-up, push-pull, totem pole) or differential line driver encoders. Three complementary inputs (A, B, Z, A-not, B-not, Z-not) are rated for 4.5-7.5 and 12-26 VDC and frequency response up to 1 MHz.

Optical isolation separates the input signals from three complementary open collector outputs (A, B, Z, A-not, B-not, Z-not) rated for 5-36 VDC that can be used in single-ended configurations.

# FC-ISO-C Encoder Signal Conditioner and Optical Isolator - Open Collector Output



## Overview

The FC-ISO-C high speed optical isolator module has the versatility to solve various interface problems between an incremental encoder signal and a PLC, servo drive, or other input device. Ideal for use with single-ended (open collector, NPN, pull-up, push-pull, totem pole) or differential line driver encoder signals, the three complementary inputs (A, B, Z, A-not, B-not, Z-not) are rated for 4.5-7.5 VDC and 12-26 VDC and frequency response up to 1 MHz. Input terminals A, B, and Z can be internally connected together and complementary input terminals A-not, B-not, and Z-not can be internally connected to common through DIP switches for simplified wiring.

The FC-ISO-C has three complementary open collector outputs (A, B, Z, A-not, B-not, Z-not) rated for 5-36 VDC that can be used in single ended configurations. The open collector output terminals can be connected to internal pull-up resistors through DIP switches for quick troubleshooting. Optical isolation rated at 1800V separates the input signals from the outputs. The slim-line plastic housing includes an integral 35mm DIN rail mounting adapter, LED indication, and removable screw terminal blocks for easy installation and wiring. The FC-ISO-C module is UL508 listed and CE marked.

## Applications:

- Provide optical isolation between an encoder signal and PLC, servo drive, or other input device
- Solve electrically noisy signal problems
- Use as a repeater to allow longer cable runs
- Convert a differential line driver encoder signal to an open collector single-ended signal
- Change encoder signal voltage to match receiving electronics input
- Ideal for use with encoders, servo drive encoder signal inputs and outputs, or as a multi-channel, high speed optically isolated interface for sensors like photoelectric and proximity switches

Specifications		
<b>Input Specifications</b>		
<b>Input Voltage (DIP selectable)</b>	4.5-7.5 VDC	12-26 VDC
<b>Input Current</b>	9mA typical, 18mA maximum	
<b>Protection Type, Component</b>	Surge, Suppressor Diode; Over current/temperature, Microprocessor	
<b>Switching Threshold "0" Signal</b>	< 2.2 VDC	< 3.9 VDC
<b>Switching Threshold "1" Signal</b>	> 2.6 VDC	> 4.8 VDC
<b>Output Specifications</b>		
<b>Output Circuit</b>	Open collector: 2-wire - floating or pull-up (DIP switch selectable); Sinking	
<b>Output Rating</b>	5-36 VDC	
<b>Continuous Output Current</b>	65mA maximum	
<b>Overcurrent Trip Level</b>	76mA minimum	
<b>Quiescent Current</b>	25µA maximum	
<b>Output Voltage Protection</b>	Polarity reversal, surge voltage protection	
<b>Output Current Protection</b>	Short circuit/Over Current/Over Current Limiting/Thermal Shutdown	
<b>Timing Specifications</b>		
<b>Input to Output Response Time</b>	1.3µs (max w/ 4.7k ohm internal pull-up resistor)	
<b>Output Timing Difference (Ch. to Ch. Lag)</b>	<20ns channel to channel (max)	
<b>Rise Time (t<sub>on</sub> w/ 1k ohm Load)</b>	250ns	
<b>Fall Time (t<sub>off</sub> w/ 1k ohm Load)</b>	38ns	
<b>Max Frequency Response w/ 1k ohm Load</b>	1 MHz	
<b>Rise Time (t<sub>on</sub> w/ 2.2k ohm Load)</b>	512ns	
<b>Fall Time (t<sub>off</sub> w/ 2.2k ohm Load)</b>	56ns	
<b>Max Frequency Response w/ 2.2k ohm Load</b>	750 kHz	
<b>Rise Time (t<sub>on</sub> w/ 4.7k Internal Pull-Up)</b>	1.2µs	
<b>Fall Time (t<sub>off</sub> w/ 4.7k Internal Pull-Up)</b>	25ns	
<b>Max Frequency Response w/ 4.7k Internal Pull-Up</b>	200 kHz	
<b>Terminal Block Specifications</b>		
<b>Number of Positions</b>	2 pole (Dinkle: EC350V-02P), 8 pole (Dinkle: EC350V-08P)	
<b>Wire Range</b>	28-16AWG Solid or Stranded Conductor; Wire strip length 9/32" (6-7mm)	
<b>Screw Size (Slotted)</b>	M 2.5 size, 0.4 T x 2.5 W mm (Screwdriver part number DN-SS1)	
<b>Screw Torque</b>	1.7 inch-pounds (0.19 Nm)	

# FC-ISO-C Specifications Continued

Specifications (continued)	
General Specifications	
External DC Power Required	7.8-24VDC $\pm$ 10% @ 125mA, 3.5W*
Power Dissipation Within Module	10W (maximum power with all outputs at max current and max voltage)
Thermal Dissipation	34.13 BTU/hr (1W = 3.413 BTU/hr)
Isolation	1800VAC input-output applied for 1 second
Mounting	35mm DIN Rail or panel mount (with no restrictions)
Operating Temperature	0 to 60°C (32 to 140°F) IEC 60068-2-14 (Test Nb, Thermal Shock)
Storage Temperature	-20 to 70°C (-4 to 158°F) IEC 60068-2-1 (Test Ab, Cold) IEC 60068-2-2 (Test Bb, Dry Heat) IEC 60068-2-14 (Test Na, Thermal Shock)
Humidity	5 to 95% (non-condensing) IEC 60068-2-30 (Test Db, Damp Heat)
Environmental Air	No corrosive gases permitted (EN61131-2 pollution degree 1)
Vibration	MIL STD 810C 514.2 IEC 60068-2-6 (Test Fc)
Shock	MIL STD 810C 516.2 IEC 60068-2-27 (Test Ea)
Insulation Resistance	>10M $\Omega$ @ 500 VDC
Noise Immunity	NEMA ICS3-304 IEC 61000-4-2 (ESD) Impulse 1000V @ 1 $\mu$ S pulse IEC 61000-4-4 (FTB) RFI, (145MHz, 440MHz 5W @ 15cm) IEC 61000-4-3 (RFI)
Weight	0.3 lbs
Agency Approvals	UL*, cUL (File # E157382), CE

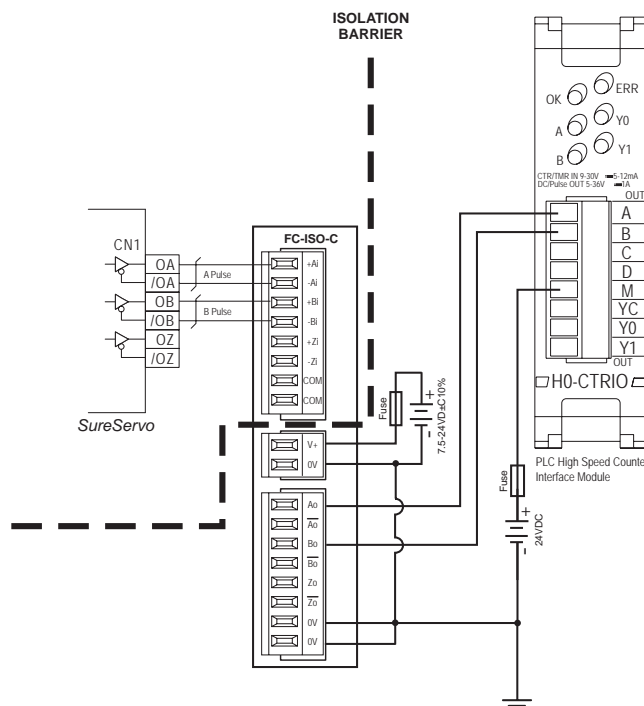
\* in order to comply with UL508 the supplied power must be less than 26VDC and fused at a maximum of 3 amps.



Unit Front Face

## Applications

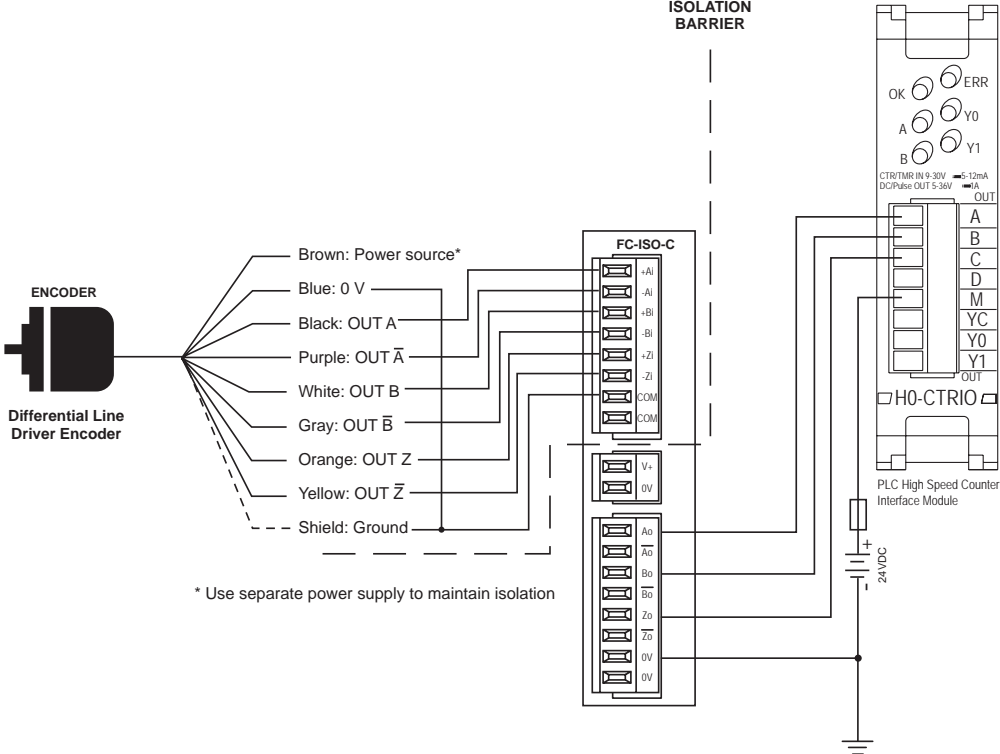
Convert SureServo line driver Input/Output Terminals (CN1) to a 24VDC open collector single ended signal that is compatible with a PLC high speed counter interface module.



# FC-ISO-C Applications and Dimensions

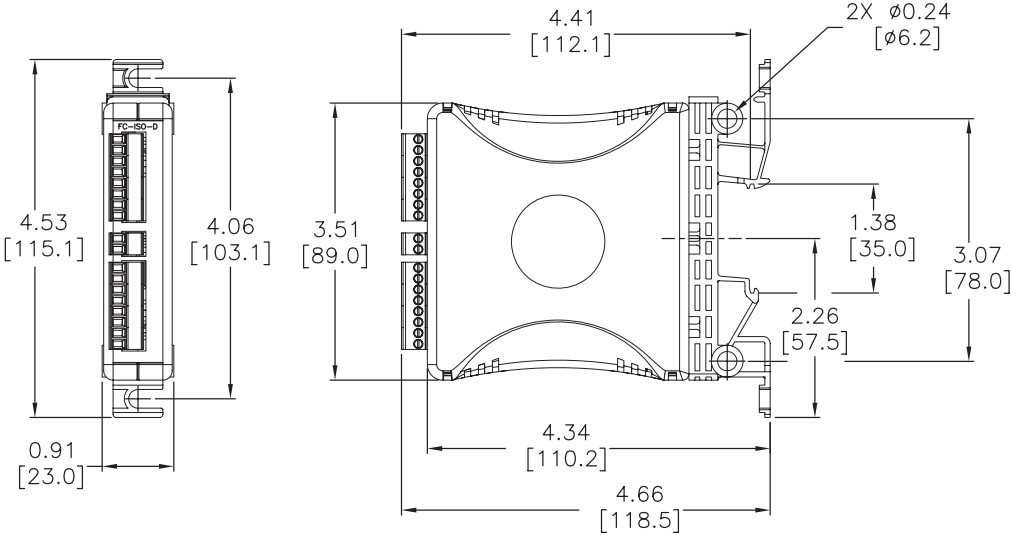
## Applications Continued

Convert a 5VDC differential line driver encoder signal to a 24VDC open collector single-ended signal that is compatible with a PLC high speed counter interface module.



## Dimensions

inches [mm]



# FC-ISO-D Encoder Signal Conditioner and Optical Isolator - Differential Line Driver Output



## Overview

The FC-ISO-D high speed optical isolator module has the versatility to solve various interface problems between an incremental encoder signal and a PLC, servo drive, or other input device. Ideal for use with single-ended (open collector, NPN, pull-up, push-pull, totem pole) or differential line driver encoder signals, the three complementary inputs (A, B, Z, A-not, B-not, Z-not) are rated for 4.5-7.5 VDC and 12-26 VDC and frequency response up to 1 MHz. Input terminals A, B, and Z can be internally connected together and complementary input terminals A-not, B-not, and Z-not can be internally connected to common through DIP switches for simplified wiring.

The FC-ISO-D has three differential line driver outputs (A, B, Z, A-not, B-not, Z-not) rated for 5 VDC. Optical isolation rated at 1800V separates the input signals from the outputs. The slim-line plastic housing includes an integral 35mm DIN rail mounting adapter, LED indication, and removable screw terminal blocks for easy installation and wiring. The FC-ISO-D module is UL508 listed and CE marked.

## Applications:

- Provide optical isolation between an encoder signal and PLC, servo drive, or other input device
- Solve electrically noisy signal problems
- Use as a repeater to allow longer cable runs
- Convert a single ended encoder signal to a differential line driver signal
- Convert a differential line driver encoder signal to a single-ended signal
- Change encoder signal voltage to match receiving electronics input
- Ideal for use with encoders and servo drive encoder signal inputs and outputs

Specifications		
<b>Input Specifications</b>		
<b>Input Voltage (DIP selectable)</b>	4.5-7.5 VDC	12-26 VDC
<b>Input Current</b>	7.5mA typical, 14mA maximum	
<b>Protection Type, Component</b>	Output Short Circuit Protection, Output Current Limiting, Output Thermal Shutdown, 15kV ESD protection; Differential Driver Chip	
<b>Switching Threshold "0" Signal</b>	< 2.2 VDC	< 3.9 VDC
<b>Switching Threshold "1" Signal</b>	> 2.6 VDC	> 4.8 VDC
<b>Output Specifications</b>		
<b>Output Circuit</b>	Differential line drive; Sourcing	
<b>Output</b>	5 VDC	
<b>Continuous Output Current</b>	70mA maximum	
<b>Overcurrent Level</b>	Limited to 70mA	
<b>Quiescent Current</b>	1.0mA maximum	
<b>Output Voltage Protection</b>	None (not reverse polarity protected); Voltage less than -9 V or greater than 14V will damage chip	
<b>Voltage Drop at Max Continuous Current</b>	1.75VDC	
<b>Output Current Protection</b>	Short Circuit, Current Limiting, Thermal Shutdown, 15kV ESD Protection	
<b>Timing Specifications</b>		
<b>Input to Frequency Response Time</b>	1.3µs	
<b>Output Timing Difference (Ch. to Ch. Lag)</b>	<20ns	
<b>Output Rise Time (<math>t_{on}</math>)</b>	<15ns	
<b>Output Fall Time (<math>t_{off}</math>)</b>	<15ns	
<b>Max Frequency Response</b>	1 MHz	
<b>Terminal Block Specifications</b>		
<b>Number of Positions</b>	2 pole (Dinkle: EC350V-02P), 8 pole (Dinkle: EC350V-08P)	
<b>Wire Range</b>	28-16 AWG Solid or Stranded Conductor; Wire strip length 5/16" (7.8mm)	
<b>Screw Size (Slotted)</b>	M 2.5 size, 0.4 T x 2.5 W mm (Screwdriver part number DN-SS1)	
<b>Screw Torque</b>	1.7 inch-pounds (0.19 Nm)	

# FC-ISO-D Specifications Continued

Specifications (continued)	
General Specifications	
External DC Power Required	24VDC ±10% @ 105mA*
Power Dissipation Within Module	9W (all outputs at max current at max voltage)
Thermal Dissipation	30.72 BTU/hr (1W = 3.413 BTU/hr)
Isolation	1800VAC input-output applied for 1 second
Mounting	35mm DIN Rail or panel mount (with no restrictions)
Operating Temperature	0 to 60°C (32 to 140°F) IEC 60068-2-14 (Test Nb, Thermal Shock)
Storage Temperature	-20 to 70°C (-4 to 158°F) IEC 60068-2-1 (Test Ab, Cold) IEC 60068-2-2 (Test Bb, Dry Heat) IEC 60068-2-14 (Test Na, Thermal Shock)
Humidity	5 to 95% (non-condensing) IEC 60068-2-30 (Test Db, Damp Heat)
Environmental Air	No corrosive gases permitted (EN61131-2 pollution degree 1)
Vibration	MIL STD 810C 514.2 IEC 60068-2-6 (Test Fc)
Shock	MIL STD 810C 516.2 IEC 60068-2-27 (Test Ea)
Insulation Resistance	>10M Ω @ 500 VDC
Noise Immunity	NEMA ICS3-304 IEC 61000-4-2 (ESD) Impulse 1000V @ 1μS pulse IEC 61000-4-4 (FTB) RFI, (145MHz, 440MHz 5W @ 15cm) IEC 61000-4-3 (RFI)
Agency Approvals	UL*, cUL (File # E157382), CE

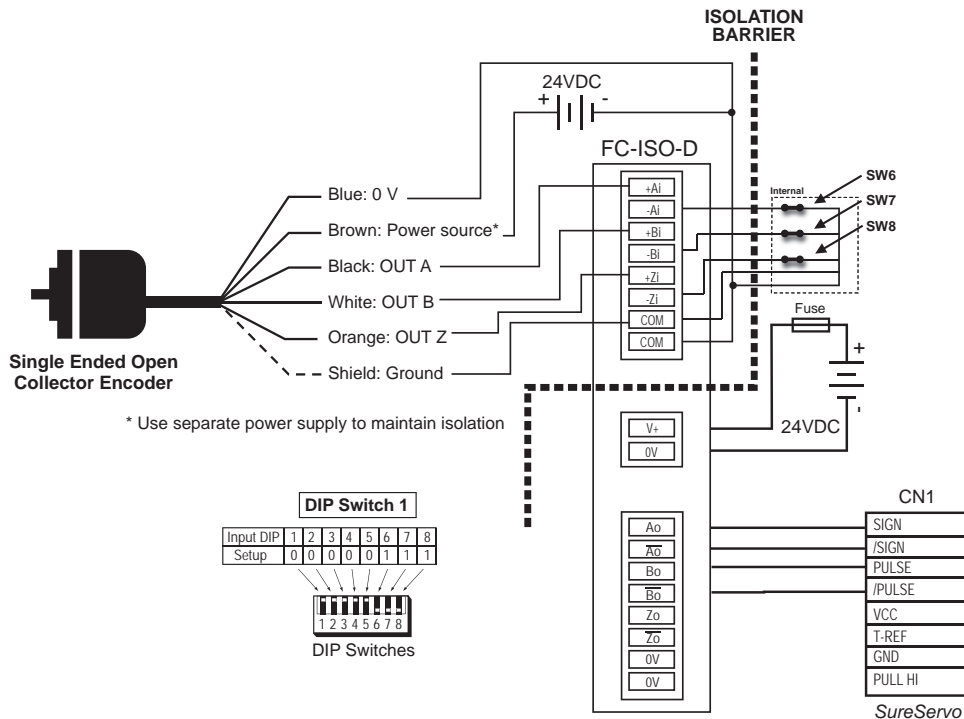


Unit Front Face

\*in order to comply with UL508 the supplied power must be less than 26VDC and fused at a maximum of 3 amps.

## Applications

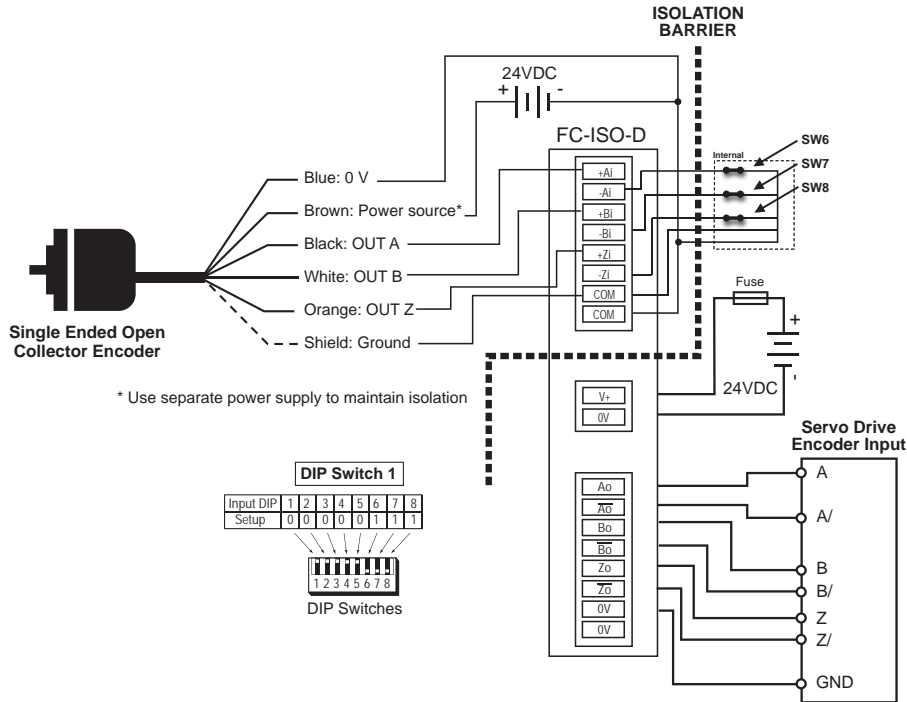
Convert a 24VDC single ended open collector encoder signal to a 5VDC differential line driver signal compatible with SureServo Input/Output Terminals (CN1).



# FC-ISO-D Applications and Dimensions

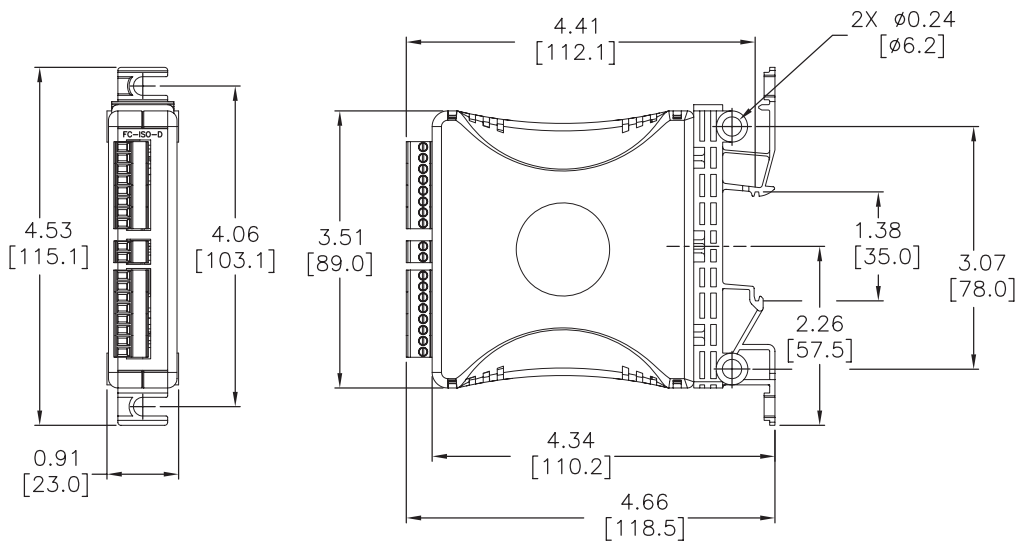
## Applications Continued

Convert a 24VDC single-ended open-collector encoder signal to a 5VDC differential line driver signal compatible with the encoder input on a servo drive.



## Dimensions

inches [mm]



# FC Series Accessories



FC-5MM



FC-35MM

## Description

Universal terminal block replacements for the FC Series signal conditioners. Each package includes enough terminal blocks to replace all the terminal blocks on any FC Series signal conditioner according to the following table:

FC Series Terminal Blocks		
FC Series Model	Terminal Block Replacement Part Number	Package Includes
FC-11	FC-5MM	(2) 2-pole blocks (2) 3-pole blocks (1) 4-pole blocks
FC-33		
FC-R1		
FC-T1		
FC-ISO-C	FC-35MM	(6) 2-pole blocks (2) 3-pole blocks (2) 4-pole blocks (1) 5-pole blocks (1) 6-pole blocks (2) 8-pole blocks
FC-ISO-D		
FC-B34		
FC-35B		
FC-P3		
FC-3RLY2		
FC-3RLY4		

*Note: Depending on the model, some terminal blocks in the package may be unused.*

Universal Signal Conditioners				
Part No.	Description	Rated Torque (N·m)	Weight (Lbs)	Price
FC-5MM	Terminal block, replacement, 5mm. Package of 5. For use with FC Series signal conditioners.	0.5	0.1	
FC-35MM	Terminal block, replacement, 3.5mm. Package of 14. For use with FC Series signal conditioners.	0.2	0.1	