



## Configurable Flowmeter Module (Catalog Number 1771-CFM)

### Contents



This icon is used when additional information is available in the *Configurable Flowmeter Module User Manual*, publication 1771-6.5.99.

Use this document as a guide when installing a Configurable Flowmeter module.

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### Important User Information

Because of the variety of uses for the products described in this publication, those responsible for the application and use of these products must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes and standards. In no event will Rockwell Automation be responsible or liable for indirect or consequential damage resulting from the use or application of these products.

Any illustrations, charts, sample programs, and layout examples shown in this publication are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Rockwell Automation does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Allen–Bradley publication SGI–1.1, Safety Guidelines for Application, Installation, and Maintenance of Solid–State Control (available from your local Rockwell Automation office), describes some important differences between solid–state equipment and electromechanical devices that should be taken into consideration when applying products such as those described in this publication.

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Throughout this publication, notes may be used to make you aware of safety considerations. The following annotations and their accompanying statements help you to identify a potential hazard, avoid a potential hazard, and recognize the consequences of a potential hazard.

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**WARNING**

Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

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**ATTENTION**

Identifies information about practices or circumstances that may lead to personal injury or death, property damage, or economic loss.

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**IMPORTANT**

Identifies information that is critical for successful application and understanding of the product.

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**ATTENTION****Environment and Enclosure**

This equipment is intended for use in a Pollution Degree 2 industrial environment, in overvoltage Category II applications (as defined in IEC publication 60664-1), at altitudes up to 2000 meters without derating.

This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR Publication 11. Without appropriate precautions, there may be potential difficulties ensuring electromagnetic compatibility in other environments due to conducted as well as radiated disturbance.

This equipment is supplied as “open type” equipment. It must be mounted within an enclosure that is suitably designed for those specific environmental conditions that will be present, and appropriately designed to prevent personal injury resulting from accessibility to live parts. The interior of the enclosure must be accessible only by the use of a tool. Subsequent sections of this publication may contain additional information regarding specific enclosure type ratings that are required to comply with certain product safety certifications.

See NEMA Standards publication 250 and IEC publication 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosures. Also, see the appropriate sections in this publication, as well as the Allen-Bradley publication 1770-4.1, (“Industrial Automation Wiring and Grounding Guidelines”), for additional installation requirements pertaining to this equipment.

**ATTENTION****Preventing Electrostatic Discharge**

This equipment is sensitive to electrostatic discharge, which can cause internal damage and affect normal operation. Follow these guidelines when you handle this equipment:

- Touch a grounded object to discharge potential static.
- Wear an approved grounding wriststrap.
- Do not touch connectors or pins on component boards.
- Do not touch circuit components inside the equipment.
- If available, use a static-safe workstation.
- When not in use, keep modules in appropriate static-safe packaging.




## Calculate Power Requirements

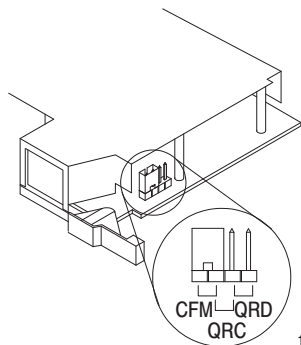
Your CFM module receives its power through the 1771 I/O chassis backplane from the chassis power supply. The maximum current drawn by the CFM module is **0.8A**. Add this value to the requirements of all other modules in the I/O chassis to prevent overloading the chassis backplane and/or backplane power supply.

## Setting the Module Operational Jumper

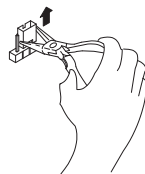
**ATTENTION**

When using a 1771-P7 or 1771-PS7 power supply to power an I/O chassis, you cannot place more than four CFM modules in this chassis. The interaction between the four CFM modules and the 1771-P7 or 1771-PS7 power supply (not 16A limit) prevents the power supply from powering up.

If you are using the 1771-CFM as a	Set the jumper to
replacement for a 1771-QRC module (no BTW / 3 word BTR)	QRC 
replacement for a 1771-QRD module (1 word BTW / 9 word BTR)	QRD 
CFM module (software configurable)	CFM 



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## Set the Input Channel Jumpers

These jumpers	Are used to set
flowmeter jumpers (F0-F3)	flowmeter for low-pass filter (70Hz) or high-speed operation
gate jumpers (G0-G3)	gates for +5-12V or +12-30V operation

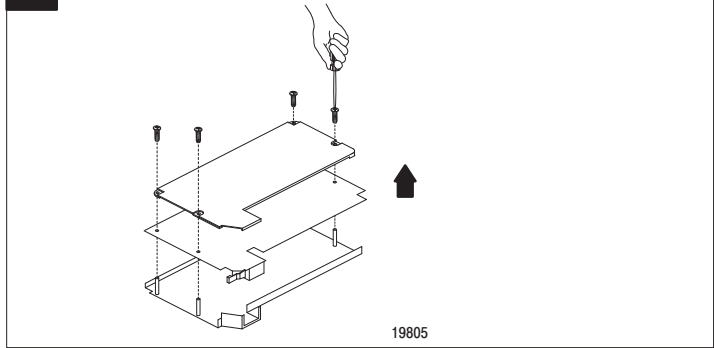
The CFM module is configured for high-speed operation. If any input channel will be accepting input from a mechanical switch, you need to set the flowmeter jumper for that input channel to filter operation. The filter provides debouncing for the mechanical switch.

**ATTENTION**



The frequency of counting must be less than 70Hz when the filter mode is selected. If the frequency exceeds 70Hz, the CFM module will not read the incoming pulse.

**1** Remove the four screws securing the side cover to the module and remove the covers.

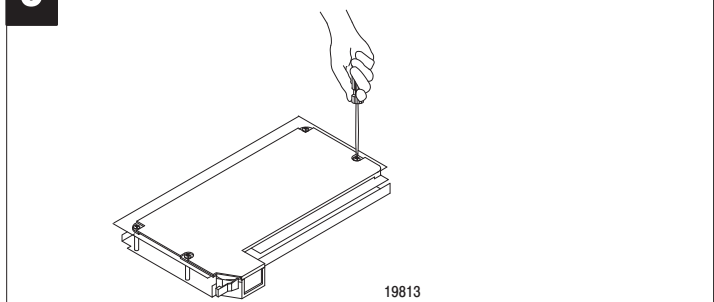


**2** Reposition the flowmeter and gate jumpers associated with each input channel according to your requirements

The flowmeter and gate jumpers<sup>2</sup> can be set independent of each other (you can select the filter action for each flowmeter input and a voltage for each and gate input independently).

<sup>1</sup> In the filter position, the module will not read frequencies above 70Hz.  
<sup>2</sup> Jumpers are shown in default settings.

**3** Reposition the cover and secure with the four screws removed in step 1.



## Determine CFM Module Placement

Place your module in any slot of the I/O chassis except for the extreme left slot. This slot is reserved for processors or adapter modules.

Use of data table		2-slot addressing	1-slot addressing	1/2-slot addressing
Input Image Bits	8	Place the CFM module in any module group with any 8-bit or block transfer module.	Place the CFM module in any module group with any 8-bit, 16-bit or block transfer module.	no restrictions
Output Image Bits	8			
Read Block Words	41 max			
Write Block Words	60 max			

## Key the Backplane Connector

### ATTENTION

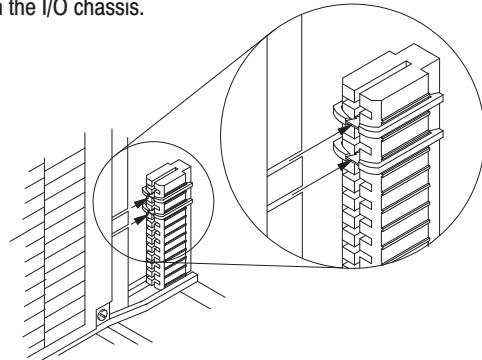
Observe the following precautions when inserting or removing keys:



- insert or remove keys with your fingers
- make sure that key placement is correct

Incorrect keying or the use of a tool can result in damage to the backplane connector and possible system faults.

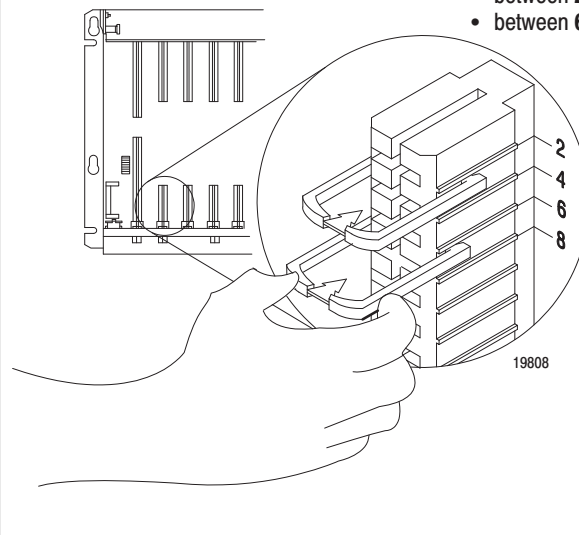
The CFM module's printed circuit board is slotted in two places on the rear edge. These slots are intended to mate with the plastic keying bands supplied with the I/O chassis.



Position the keying bands in the backplane connectors to correspond to the key slots on the CFM module.

Place the keying bands:

- between 2 and 4
- between 6 and 8



## Install the Module

### WARNING



When you insert or remove the module while backplane power is on, or you connect or disconnect the wiring arm with field power applied, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure power is removed or the area is nonhazardous before proceeding.

### ATTENTION



Remove power from the 1771 I/O chassis backplane before you install the CFM module. Failure to remove power from the backplane could cause:

- injury
- equipment damage due to unexpected operation
- degradation of performance

At power-up, the active and fault indicators are on. An initial module self-check occurs. If there is no fault, the fault indicator turns off. See page 16 for information on interpreting the status indicators.

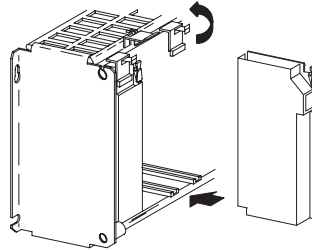
The 1771-CFM module is a modular component of the 1771 I/O system requiring a properly installed system chassis. Refer to publication 1771-IN075 for detailed information on acceptable chassis, proper installation and grounding requirements. Limit the maximum adjacent slot power dissipation to 11W maximum.

# 1

Place the module in the card guides on the top and bottom of the chassis that guide the CFM module into position.

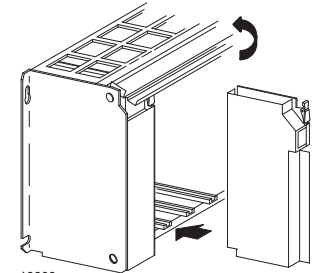
**Important:** Apply firm even pressure on the module to seat it into its backplane connector.

1771-A1B, -A2B, -A3B, -A3B1, -A4B I/O chassis



Snap the chassis latch over the top of the module to secure it.

1771-A1B, -A2B, -A3B1, -A4B Series B I/O chassis

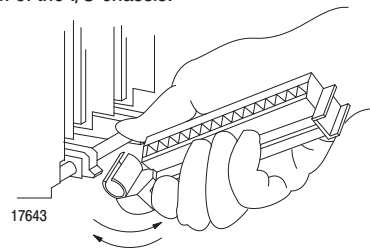


Swing the chassis locking bar down into place to secure the modules. Make sure the locking pins engage.

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# 2

Attach the wiring arm (1771-WN) to the horizontal bar at the bottom of the I/O chassis.



The wiring arm pivots upward and connects with the module so you can install or remove the module without disconnecting the wires.

## Make Connections to the Field Wiring Arm

Connect your I/O devices to the 40-terminal field wiring arm (cat. no. 1771-WN) shipped with the CFM module.

### ATTENTION

Remove power to all I/O devices before you connect them to the wiring arm. Failure to remove power from your I/O devices could cause:

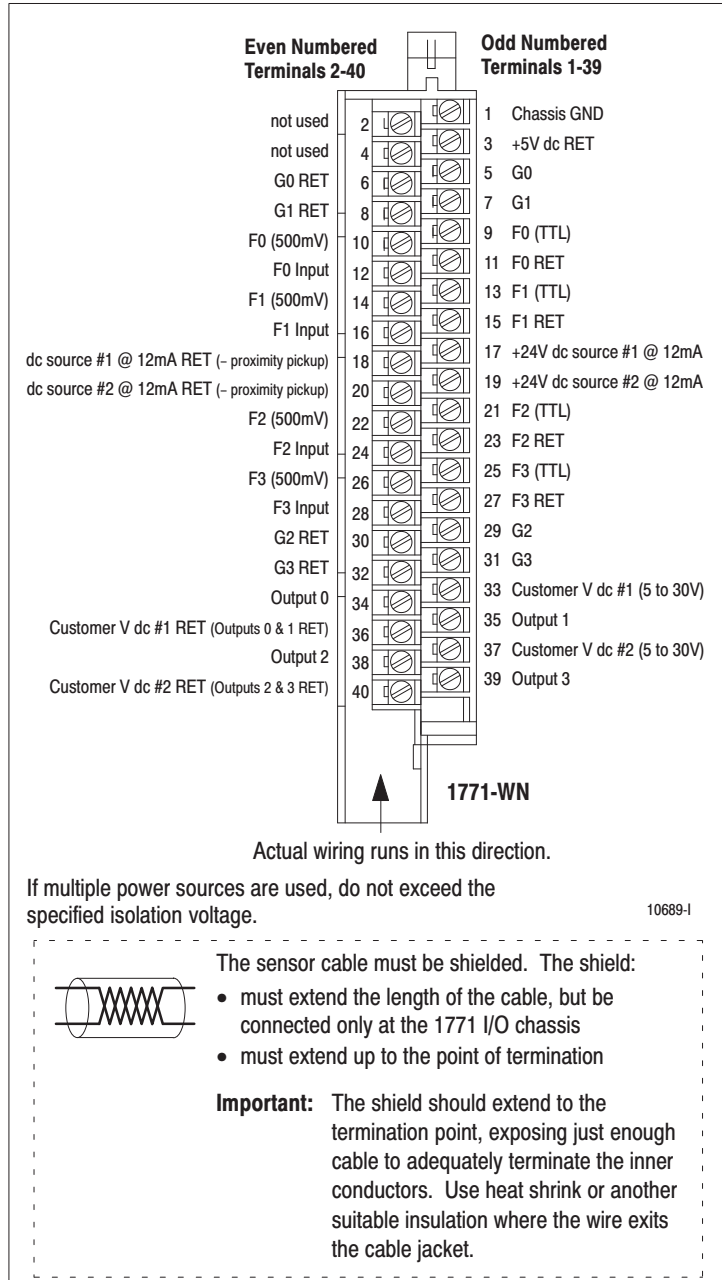


- injury
- damage to module circuitry
- equipment damage due to unexpected operation

The following tables and wiring diagrams represent wiring for a flowmeter input (F0), a gate input (G0), and an output (O0). See the wiring-arm diagram for the terminals used in wiring F1-F3, G1-G3, and O1-O3.

F0 wiring	Terminal
signal input	12
signal common	11

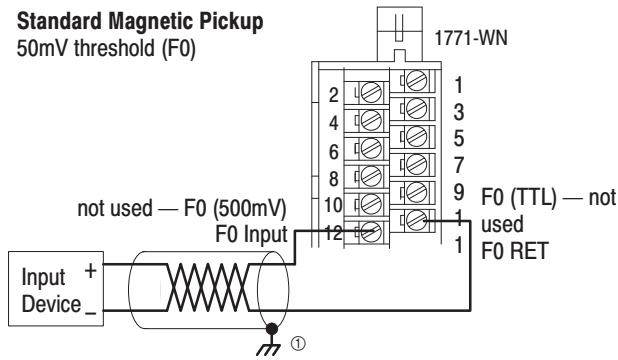
For this threshold (ON/OFF) voltage	Jumper
50 mV	no jumper
500 mV	11 - 10
1.3 V	11 - 9



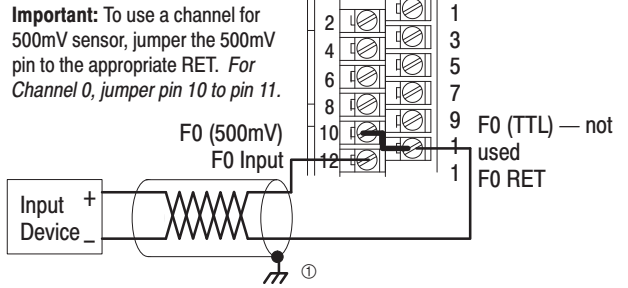


### Wiring Examples

#### Standard Magnetic Pickup 50mV threshold (F0)

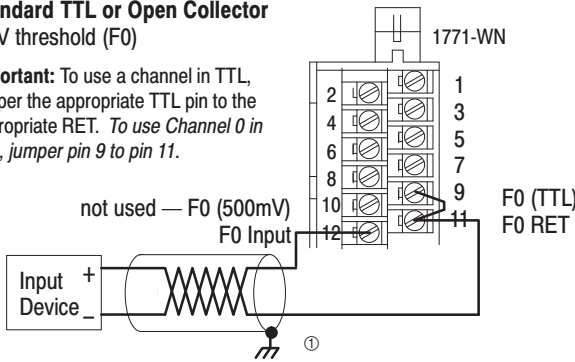


#### Standard Magnetic Pickup 500mV threshold (F0)

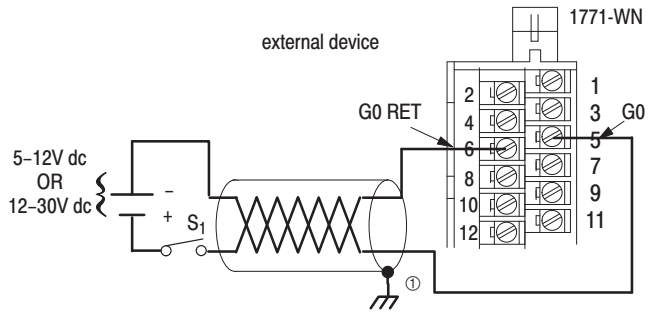


#### Standard TTL or Open Collector 1.3V threshold (F0)

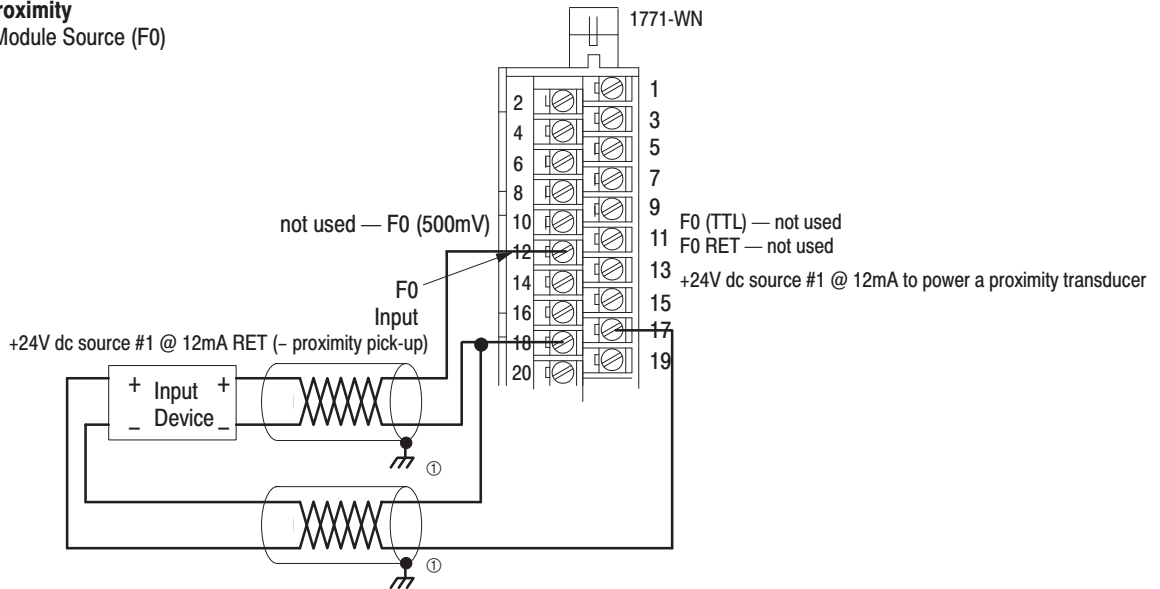
**Important:** To use a channel in TTL, jumper the appropriate TTL pin to the appropriate RET. To use Channel 0 in TTL, jumper pin 9 to pin 11.



#### Standard Prover/Store Count (G0)

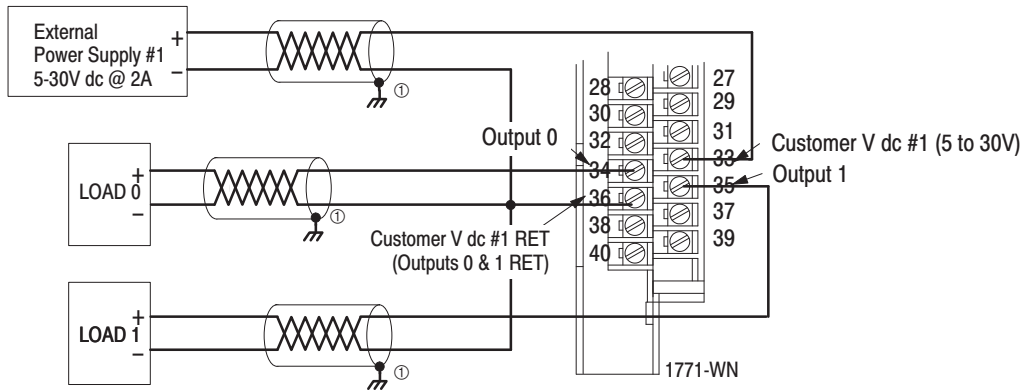


#### Standard Proximity using CFM Module Source (F0)



**Wiring Examples (continued)**

**Standard Output (O0)**

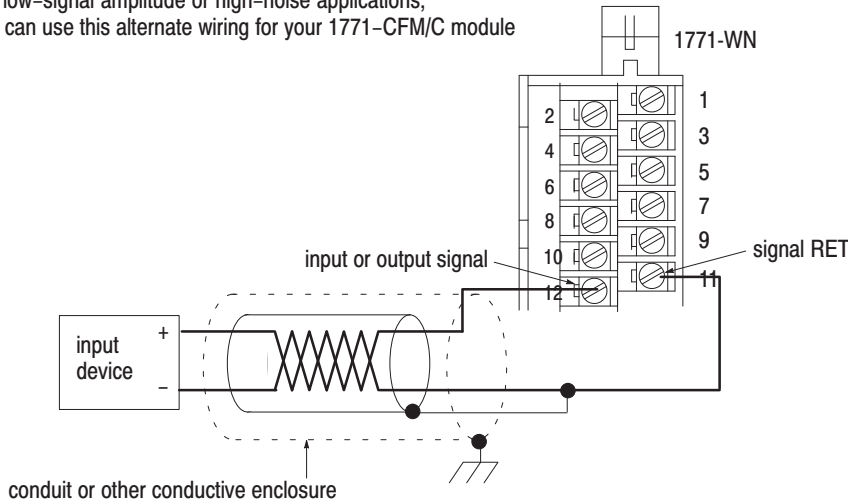


- ① For new installations, terminate the shields at the chassis. While not recommended, existing installations can continue to terminate the shields at the return (RET) terminal.
- If multiple power sources are used, do not exceed the specified isolation voltage.

**Alternate Wiring Method – Low-signal amplitude or High-noise applications**

**low-signal amplitude or high-noise applications**


For low-signal amplitude or high-noise applications, you can use this alternate wiring for your 1771-CFM/C module



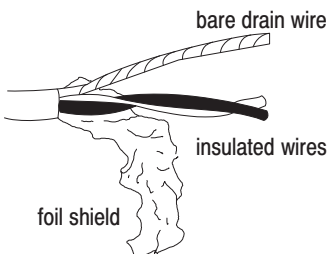
## Ground the Module

Use the following diagrams to ground your I/O chassis and CFM module.


**1** Remove a length of cable jacket from the Belden 8761 cable.




**2** Pull the foil shield and bare drain wire from the insulated wires.



**3** Twist the foil shield and drain wire together to form a single strand.



**4** Attach a ground lug.



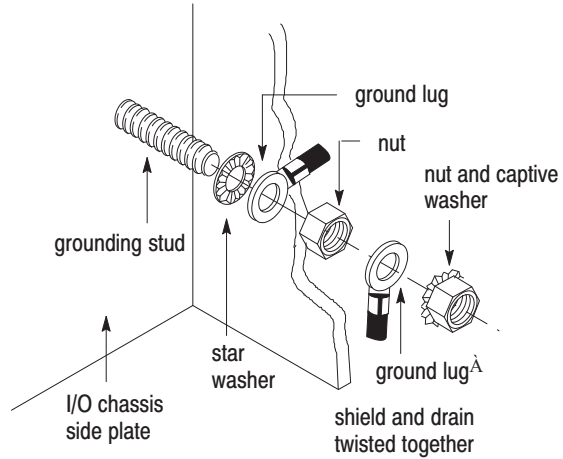
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When using shielded cable wire, ground the foil shield and drain wire only at one end of the cable. We recommend that you wrap the foil shield and drain wire together and connect them to a chassis mounting bolt. At the opposite end of the cable, tape exposed shield and drain wire with electrical tape to insulate it from electrical contact.

For additional grounding information, see the *Industrial Automation Wiring and Grounding Guidelines*, publication 1770-4.1.

### Chassis Ground

When you connect grounding conductors to the I/O chassis grounding stud, place a star washer under the first lug, then place a nut with captive lock washer on top of each ground lug. Torque the nut with captive washer to 18(±3) pound-inches.

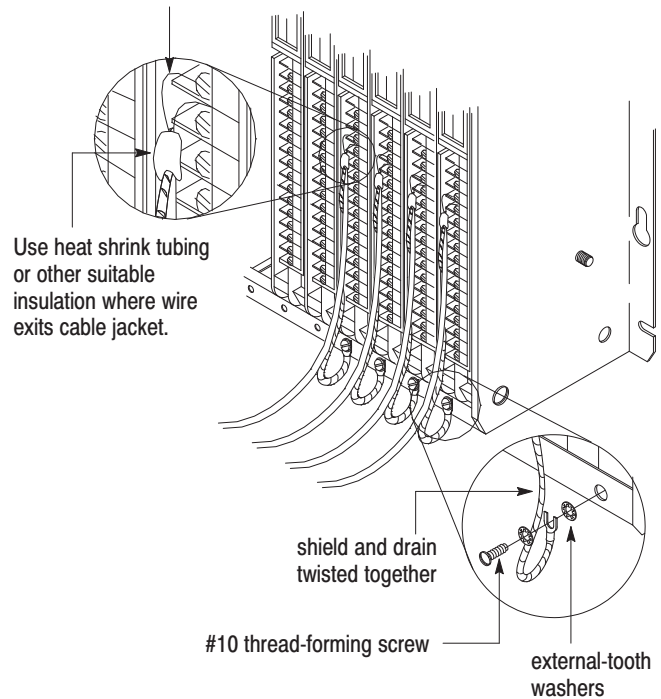


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^ Use the cup washer if crimp-on lugs are not used.

### Single-point Grounding

Extend shield to termination point. Expose just enough cable to adequately terminate inner conductors.



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## Configure the Module

To configure the CFM module, you enter BTW and BTR instructions into your ladder logic, then you enter data into the BTW instruction. This data should conform to the input device and specific application that you have chosen.

You can configure the module using I/O configuration software or by editing bits in the BTW instruction.

During normal operation, the processor transfers 1 to 60 words to the CFM module when you program a BTW instruction to the CFM module's address.

**IMPORTANT** You must program at least one BTW, with a word length of 4, to get useful data back from the CFM module.

Your PLC processor gets data from the CFM module using BTR instructions in your ladder logic program. The CFM module transfers up to 41 words to the PLC processor's data table file. The words contain module status and input data from each channel.

You should program a block transfer read length of zero (0). When a BTR of 0 is programmed, the CFM module will determine the correct number of words (41) to return.

## Input Capabilities

The CFM module accepts input for up to four channels (mode dependent). Each of the four input channels may accept these input signals:

- magnetic pickup — 50mV to 30V ac
- 3-30V dc pulses with open collector (TTL compatible)
- proximity probe inputs
  - compatible with Bently Nevada 3300 (5mm and 8mm) proximity transducer systems
  - provides two isolated 24V dc power supplies (rated at 12mA) to power external devices

## Output Capabilities

The CFM module has four assignable outputs. These outputs are designed for applications that require fast response. The outputs:

- are electronically current limited to 2A
- can be assigned to any input channel with user-selectable turn-on and turn-off values
- are current sourcing at 5-30V dc (1A maximum per output)
- must be connected to an external power supply
- are in groups of two — this lets you use two separate external power supplies if desired (one for outputs 0&1 and one for outputs 2&3)

Outputs may be forced on or off independent of count or frequency value. They may be forced on and off by setting bits in the BTW configuration block.

**IMPORTANT** You can assign as many as four outputs to a given channel; however, you can not use the same output with two different channels.

## Modes of Operation

You configure the CFM module for these modes of operation:

Use this mode	To	Indicators/ Alarms	Prover	Total reset	Scaler values	Rollover value
Totalizer	<ul style="list-style-type: none"> <li>accurately measure counts using a flowmeter or positive displacement meter</li> <li>trigger outputs directly from the CFM module — trigger on total, frequency, acceleration</li> <li>monitor flow total, rate, and rate of change independent of your PLC processor scan times</li> <li>store counts based on external input</li> <li>scale the frequency and count to engineering units</li> <li>interface to a prover</li> </ul>	overrange overflow overspeed acceleration	√	√	√	√
Nonresettable Totalizer	operate in the Totalizer mode with the count reset function disabled to prevent loss of accumulated value	overrange overflow overspeed acceleration	√		√	√
High-resolution Frequency <sup>1</sup> (channels 0&1 or channels 2&3)	<ul style="list-style-type: none"> <li>monitor the frequency of an input with high accuracy (e.g. shaft)</li> <li>monitor the rate of speed change</li> <li>operate outputs based on speed or rate of change</li> <li>scale the frequency to engineering units</li> </ul>	overspeed overrange acceleration			√	
Direction Sensor <sup>1</sup> (channels 0&1 or channels 2&3)	<ul style="list-style-type: none"> <li>monitor the direction of shaft rotation</li> <li>monitor rate of change and frequency</li> <li>trigger outputs based on direction, frequency, rate of change</li> <li>scale the frequency and count to engineering units</li> </ul>	overspeed acceleration overrange			√	

<sup>1</sup> This mode uses two channels for one input (your input device is connected to F0 or F2, while F1 or F3 is unused).

In this mode of operation	You can assign outputs that are programmable to trigger
Totalizer	on total, rate, rate change (acceleration), total overflow or prover status
Nonresettable Totalizer	on total, rate, rate change (acceleration), total overflow or prover status
High-resolution Frequency	on frequency or frequency rate of change (acceleration)
Direction Sensor	on either CLOCKWISE or COUNTER-CLOCKWISE direction, acceleration or frequency (outputs are triggered ON only)

If you want to configure the module	You
through I/O Configuration software (if you are using a PLC-5 family processor <sup>1</sup> )	enter the appropriate information on the CFM module edit screens.
by editing bits at the address of the BTW instruction	edit the data file addresses in the BTW instruction to match your particular application. Use the word assignments on page 14 to edit the bits that apply to your application(s).

<sup>1</sup> See *PLC-5 Programming Software I/O Configuration Manual*, publication 6200-6.4.12, for supported processors.

## BTW Word Assignments

Word(s) <sup>①</sup>	Bit <sup>②</sup>															
	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
<b>Block ID &amp; Resets</b>																
1	Header				Prover Run Initialize				Overflow Reset				Total Reset			
<b>Output 1 and Output 0 Trigger &amp; Select</b>																
2	Output 1 Trigger				Tie Output 1 to Channel				Output 0 Trigger				Tie Output 0 to Channel			
<b>Output 3 and Output 2 Trigger &amp; Select</b>																
3	Output 3 Trigger				Tie Output 3 to Channel				Output 2 Trigger				Tie Output 2 to Channel			
<b>Input Channel Operating Mode</b>																
4	Channel 3				Channel 2				Channel 1				Channel 0			
<b>Input Channel Configuration</b>																
<b>Channel 0 (words 5-14)</b>				<b>Channel 1 (words 15-24)</b>				<b>Channel 2 (words 25-34)</b>				<b>Channel 3 (words 35-44)</b>				
5, 15, 25, 35	Frequency in 10ths	Bandwidth Limit	Sampling Termination	4 x High Hz	Prover Type	Debounce Filtering	Acceleration Calculation Time									
6, 16, 26, 36	Minimum Frequency Sampling Time															
7, 17, 27, 37	Number of Pulses to Terminate Sampling															
8, 18, 28, 38	Highest Allowable Frequency															
9, 19, 29, 39	Acceleration Alarm Value (what rate to trigger on)															
10, 20, 30, 40	Frequency Scaler Multiplier <sup>③</sup>								Frequency Scaler Divisor <sup>③</sup>							
11, 21, 31, 41	Total Scaler Multiplier <sup>③</sup>															
12, 22, 32, 42	Total Scaler Divisor <sup>③</sup>															
13, 23, 33, 43	Rollover Value — Most Significant Digit (0-999 x 10,000)															
14, 24, 34, 44	Rollover Value — Least Significant Digit (0-9,999)															
<b>Output Configuration</b>																
<b>Output 0 (words 45-48)</b>				<b>Output 1 (words 49-52)</b>				<b>Output 2 (words 53-56)</b>				<b>Output 3 (words 57-60)</b>				
45, 49, 53, 57	Output ON value — Most Significant Digit (0-999 x 10,000)															
46, 50, 54, 58	Output ON value — Least Significant Digit (0-9,999)															
47, 51, 55, 59	Output OFF value — Most Significant Digit (0-999 x 10,000)															
48, 52, 56, 60	Output OFF value — Least Significant Digit (0-9,999)															

① Valid BTW lengths are: 0, 1, 2, 3, 4, 14, 24, 34, 44, 48, 52, 56, 60.

② ALL numeric values are in binary.

③ When scaling is used, all outputs are still controlled by the actual value not the scaled value.



For detailed BTW descriptions, see chapter 4, (publication 1771-6.5.99).

## Interpret Module Status and Input Data

Your PLC processor gets data from the CFM module using BTR instructions in your ladder logic program. The CFM module transfers up to 41 words to the PLC processor's data table file. The words contain module status and input data from each channel.

You should program a block transfer read length of zero (0). When a BTR of 0 is programmed, the CFM module will determine the correct number of words (41) to return.

### BTR Word Assignments

Word(s)	Bit															
	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00
<b>Block ID &amp; Resets</b>																
1	Header															Power-up bit
<b>Output Status &amp; Diagnostics</b>																
2	Output Status								Error Words & Diagnostics							
<b>Mode Indication</b>																
3	Channel 3				Channel 2				Channel 1				Channel 0			
<b>Channel 1 Status</b>								<b>Channel 0 Status</b>								
4		Prover Status	Overrange Alarm	Overflow Status	Overspeed Alarm	Acceleration Alarm		Prover Status	Overrange Alarm	Overflow Status	Overspeed Alarm	Acceleration Alarm				
<b>Channel 3 Status</b>								<b>Channel 2 Status</b>								
5		Prover Status	Overrange Alarm	Overflow Status	Overspeed Alarm	Acceleration Alarm		Prover Status	Overrange Alarm	Overflow Status	Overspeed Alarm	Acceleration Alarm				
<b>Input Channel Data</b>																
<b>Channel 0 (words 6-14)</b>				<b>Channel 1 (words 15-23)</b>				<b>Channel 2 (words 24-32)</b>				<b>Channel 3 (words 33-41)</b>				
6, 15, 24, 33	Percent of Full Scale (Rate % of High RPM value)															
7, 16, 25, 34	Frequency (0-120 ) MSD															
8, 17, 26, 35	Frequency (0-999) LSD															
9, 18, 27, 36	Total MSD (0-999)															
10, 19, 28, 37	Total LSD (0-9,999)															
11, 20, 29, 38	Acceleration (rate of change of frequency)															
12, 21, 30, 39												Direction				
13, 22, 31, 40	Prover Total Count Value or Store Count Value — MSD (0-999)															
14, 23, 32, 41	Prover Total Count Value or Store Count Value — LSD (0-9,999)															
	not used				* Numeric values are in binary except for <i>Diagnostics</i> (word 2, bits 00-07)*											



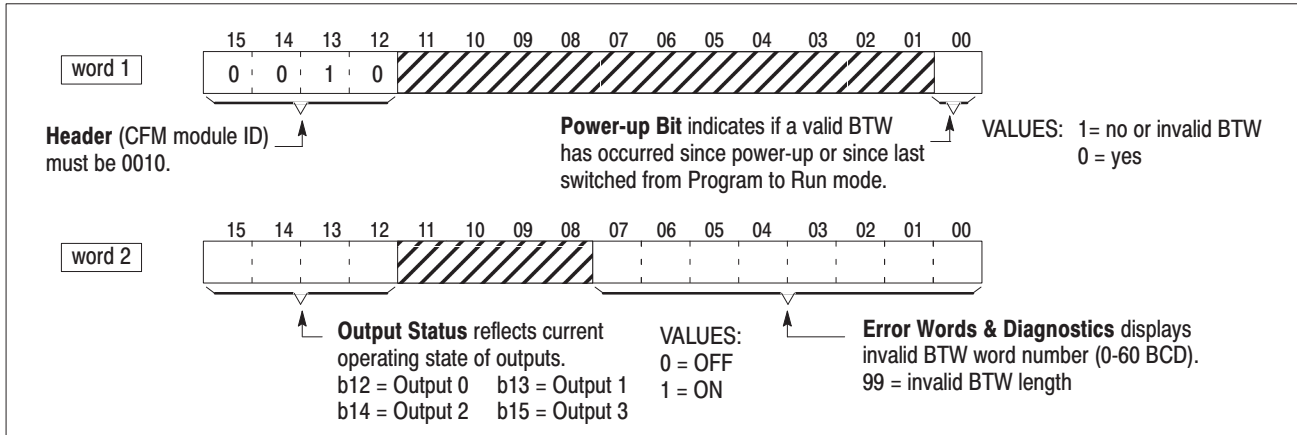
For detailed BTR descriptions, see chapter 5, (publication 1771-6.5.99).

## Diagnostics and Troubleshooting

The CFM module returns diagnostics to the PLC processor in words one and two of the BTR file. These diagnostics give you the word in the BTW configuration block that has caused an error to occur.

**IMPORTANT**

In the event that there are multiple incorrect BTW words, the CFM module only returns **the first incorrect word**.



## Status Indicators

The CFM module provides these status indicators:

Indicators	If indicator	Is ON	Is OFF
	ACTIVE	the CFM module is successfully receiving power and operational	<p>a. Check FAULT LED — if on, follow the steps listed under if FAULT is ON.</p> <p>b. Check the power supply.</p>
	INPUTS (F0-F3 & G0-G3)	a signal is present at the designated input terminal	a signal is not present at the designated input terminal
	OUTPUTS (O0-O3)	the module has commanded an output on	the output is off
STATUS	S1	<i>Power-up Bit</i> (BTR word 1, bit 00) is ON (=1) — BTW hasn't occurred since power-up, or invalid BTW, or PLC processor in Program mode	<i>Power-up Bit</i> (BTR word 1, bit 00) is OFF (=0) — valid BTW has occurred since power-up or since last switched from Program to Run mode
	S2	BTW is occurring	BTW is not occurring
	S3	BTR is occurring	BTR is not occurring
FAULT		<ol style="list-style-type: none"> <li>Turn off power to the I/O chassis backplane and wiring arm.</li> <li>Reseat the CFM module in the I/O chassis.</li> <li>Restore power to the I/O chassis backplane and wiring arm.</li> </ol>	normal operation

**Important** If the fault LED remains on, there may be an internal problem. Contact your local Allen-Bradley representative for additional assistance.



## Hazardous Locations

### The following information applies when operating this equipment in hazardous locations:

Products marked “CL I, DIV 2, GP A, B, C, D” are suitable for use in Class I Division 2 Groups A, B, C, and D Hazardous Locations and nonhazardous locations only. Each product is supplied with markings on the rating nameplate indicating the hazardous location temperature code. When combining products within a system, the most adverse temperature code (lowest “T” number) may be used to help determine the overall temperature code of the system. Combinations of equipment in your system are subject to investigation by the local Authority Having Jurisdiction at the time of installation.

#### WARNING



#### EXPLOSION HAZARD -

- Do not disconnect equipment unless power has been removed or the area is known to be nonhazardous.
- Do not disconnect connections to this equipment unless power has been removed or the area is known to be nonhazardous. Secure any external connections that mate to this equipment by using screws, sliding latches, threaded connectors, or other means provided with this product.
- Substitution of components may impair suitability for Class I, Division 2.
- If this product contains batteries, they must only be changed in an area known to be nonhazardous.

### Informations sur l'utilisation de cet équipement en environnements dangereux:

Les produits marqués CL I, DIV 2, GP A, B, C, D ne conviennent que une utilisation en environnements de Classe I Division 2 Groupes A, B, C, D dangereux et non dangereux. Chaque produit est livré avec des marquages sur sa plaque d'identification qui indiquent le code de température pour les environnements dangereux. Lorsque plusieurs produits sont combinés dans un système, le code de température le plus défavorable (code de température le plus faible) peut être utilisé pour déterminer le code de température global du système. Les combinaisons d'équipements dans le système sont sujettes à inspection par les autorités locales qualifiées au moment de l'installation.

#### AVERTISSEMENT



#### RISQUE D'EXPLOSION -

- Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher l'équipement.
- Couper le courant ou s'assurer que l'environnement est classé non dangereux avant de débrancher les connecteurs. Fixer tous les connecteurs externes reliés à cet équipement à l'aide de vis, loquets coulissants, connecteurs filetés ou autres moyens fournis avec ce produit.
- La substitution de composants peut rendre cet équipement inadapté à une utilisation en environnement de Classe 1, Division 2.
- S'assurer que l'environnement est classé non dangereux avant de changer les piles.

## Specifications

Number of Input Channels	4
Module Location	1771-A1B, -A2B, A3B, -A3B1, -A4B (series A and B) I/O chassis 1771-AM1, -AM2 I/O chassis with integral power supply, adapter
Maximum Count Value	0-9,999,999 (programmable)
BTW Processing Time (worst case)	5.5ms — on a configuration change
Module Scan Time	1.3-5ms (depending on configuration and frequency)
Maximum Input Frequency	100kHz @ flowmeter Input (maximum frequency is 120kHz - 100kHz @ gate input overrange occurs at 100kHz)
Inputs per Channel	2 - flowmeter input — used for all modes gate input — used in Totalizer and Nonresettable Totalizer modes
Flowmeter (F0-F3) Input Voltage	50mV-30V ac — Magnetic Pickup 5-30V dc (TTL compatible) Bently 3300 5 & 8 mm — Proximity Pickups
Flowmeter (F0-F3) Input Impedance	5K $\Omega$ $\pm$ 30% resistive
Gate (G0-G3) Voltage	5-12 and 12-30V dc
Gate (G0-G3) Current	22mA maximum
Number of Outputs	4
Maximum Output Off-state Leakage Current	less than 300 $\mu$ A @ 30V dc
Maximum On-state Voltage Drop	0.6 $\Omega$ x current
Output Control	Any number of outputs are assignable to any of 4 channels. One "turn-on" value and one "turn-off" value per output.
Output Voltage	5 to 30V dc, customer supplied
Output Current	1A per channel sourced out of module All outputs can be on simultaneously without derating.
Output Switching Time	outputs triggered by <i>Total</i> : turn ON < 100 $\mu$ s; turn OFF < 100 $\mu$ s all other turn ON and OFF times < 1ms
Filtering (F0-F3 inputs) — jumper selectable	high-speed or low-pass filter jumper (filter = below 70Hz)
Debouncing (G0-G3 inputs) — software selectable	1s (approximate) between transitions with no minimum pulse width — Totalizer and Nonresettable Totalizer modes only
Module dc Source Output	24V dc; 12mA; ripple: $\pm$ 5%; noise: 240mV peak-to-peak
Backplane Current	0.8A maximum, 5V dc
Customer Supply	5 to 30V dc
Isolation Voltage	Tested to withstand - for 60s 500V between input and backplane, 1500V between output and backplane, 500V between isolated channels, 1500V between isolated outputs and gates
Module Power Dissipation	13W (maximum); 2W (minimum)
Module Thermal Dissipation	54.2 BTU/hr (maximum); 6.8 BTU/hr (minimum)
Maximum Adjacent Slot Power Dissipation	11W
Input Conductors	Wire Type Category Length
	Belden 8761 Category 2 <sup>1</sup> 304.8m (1000ft)
Output Conductors	Wire Size Category
	14AWG (2.5mm <sup>2</sup> ) solid or stranded copper wire rated @ 60°C or greater Category 2 <sup>1</sup>

Environmental Conditions	
Operating Temperature	IEC 60068-2-1 (Test Ad, Operating Cold) IEC 60068-2-2 (Test Bd, Operating Dry Heat) IEC 60068-2-14 (Test Nb, Operating Thermal Shock) 32 to 131°F (0° to 60°C)
Storage Temperature	IEC 60068-2-1 (Test Ab, Unpackaged, Nonoperating Cold) IEC 60068-2-2 (Test Bb, Unpackaged, Nonoperating Dry Heat) IEC 60068-2-14 (Test Na, Unpackaged, Nonoperating Thermal Shock) -40 to 185°F (-40 to 85°C)
Relative Humidity	IEC 60068-2-30 (Test Db, Unpackaged, Nonoperating Damp Heat) 5 to 95%, noncondensing
Shock Operating Nonoperating	IEC 60068-2-27 (Test Ea, Unpackaged Shock) 30g 50g
Vibration	IEC 60068-2-6 (Test Fc, Operating) 2g @ 10-500Hz
ESD Immunity	IEC 61000-4-2 4kV contact discharges
Radiated RF Immunity	IEC 61000-4-3 10V/m, with 1kHz sine-wave 80% AM from 30MHz to 1000MHz 10V/m, with 200Hz 50% Pulse 100%AM from at 900MHz
EFT/B Immunity	IEC 61000-4-4 ±1kV @ 5kHz on signal ports
Surge Transient Immunity	IEC 61000-4-5 ±2kV line-earth (CM) on signal ports
Conducted RF Immunity	IEC 61000-4-6 10V rms with 1kHz sine wave 80% AM from 150kHz to 30MHz
Emissions	CISPR 11 Group 1, Class A (with appropriate enclosure)
Enclosure Type Rating	None (open-style)
Keying (lower backplane connector)	Between 2 and 4 Between 6 and 8
Field Wiring Arm	Catalog Number 1771-WN
Wiring Arm Screw Torque	9 pound-inches (1.0Nm)
User Manual	Publication 1771-6.5.99 (See User Manuals on page 20.)
Certifications (when product is marked)	UL UL Listed Industrial Control Equipment CSA CSA Certified Process Control Equipment CSA CSA Certified Process Control Equipment for Class I, Division 2 Group A, B, C, D Hazardous Locations EEx <sup>2</sup> European Union 94/9/EEC ATEX Directive, compliant with: EN 50021; Potentially Explosive Atmospheres, Protection "n" CE <sup>2</sup> European Union 89/336/EEC EMC Directive, compliant with: EN 50082-2, Industrial Immunity EN 61236, Meas./Control/Lab., Industrial Requirements EN 61000-6-2, Industrial Immunity EN 61000-6-4, Industrial Emissions C-Tick <sup>2</sup> Australian Radiocommunications Act, compliant with: AS/NZS 2064, Industrial Emissions

<sup>1</sup> You use this conductor category information for planning conductor routing as described in publication 1770-4.1, Industrial Automation Wiring and Grounding Guidelines.

<sup>2</sup> See the Product Certification link at [www.ab.com](http://www.ab.com) for Declarations of Conformity, Certificates and other certification details

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## European Zone 2 Certification

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This equipment is intended for use in potentially explosive atmospheres as defined by European Union Directive 94/9/CE.

The LCIE (Laboratoire Central des Industries Electriques) certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of Category 3 equipment intended for use in potentially explosive atmospheres, given in Annex II to this Directive. The examination and test results are recorded in confidential report No. 28 682 010.

Compliance with the Essential Health and Safety Requirements has been assured by compliance with EN 50021 (1999).

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### IMPORTANT

Observe the following additional Zone 2 certification requirements:

- This equipment is not resistant to sunlight or other sources of UV radiation.
  - The secondary of a current transformer shall not be open-circuited when applied in Class I, Zone 2 environments.
  - Equipment of lesser Enclosure Type Rating must be installed in an enclosure providing at least IP54 protection when applied in Class I, Zone 2 environments.
  - This equipment shall be used within its specified ratings defined by Allen-Bradley.
  - Provision shall be made to prevent the rated voltage from being exceeded by transient disturbances of more than 40% when applied in Class I, Zone 2 environments.
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## User Manuals

Thank you for purchasing this product. This product has a user manual associated with it. If you would like a manual, you can:

- download a free electronic version from the internet:  
[www.ab.com/manuals](http://www.ab.com/manuals) or  
[www.theautomationbookstore.com](http://www.theautomationbookstore.com)
- purchase a printed manual by:
  - contacting your local distributor or Rockwell Automation representative,
  - visiting [www.theautomationbookstore.com](http://www.theautomationbookstore.com) and placing your order
  - calling 1.800.963.9548 (USA/Canada) or 001.330.725.1574 (Outside USA/Canada)

The publication number of the user manual for your product is listed under “Specifications.”

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**[www.rockwellautomation.com](http://www.rockwellautomation.com)**

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