Fast Analog Input Module

Cat. No. 1771-IFF Series A

Contents

Use this document as a guide when installing the 1771-IFF series A fast analog input module.

Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. *Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls* (Publication SGI-1.1 available from your local Rockwell Automation sales office or online at http://www.ab.com/manuals/gi) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

No patent liability is assumed by Rockwell Automation, Inc. with respect to use of information, circuits, equipment, or software described in this manual.

Publication 1771-IN046B-EN-P - December 2003

Throughout this manual we use notes to make you aware of safety considerations.

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.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION 	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you: • identify a hazard • avoid a hazard • recognize the consequence

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 enclosure. 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.

North American Hazardous Location Approval

This 1771-IFF series A module is hazardous location approved.

The following information applies when operating this equipment in hazardous locations:	Informations sur l'utilisation de cet équipement en environnements dangereux :
Products marked "CL I, DIV 2, GP A, B, C, D" are suitable for use in Class I Division 2 Groups A, B, C, 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.	Les produits marqués "CL I, DIV 2, GP A, B, C, D" ne conviennent qu'à 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.
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.	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 I, Division 2. •S'assurer que l'environnement est classé non dangereux avant de changer les piles.

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, store the equipment in appropriate static-safe packaging.

Understand Product Compatibilty

The 1771-IFF module can be used with any 1771 I/O chassis. Compatibility and data table usage is listed below.

Catalog Number	Use of Data Table				Compatibility			
	Image Input Bits	Output Image Bits	Read Block Words	Write Block Words	Addressing			Chassis Series
					1/2- Slot	1-Slot	2-Slot	
1771-IFF/A	8	8	24	41	Y	Y	Y	A, B

A = Compatible with 1771-A1, -A2, -A4
B = Compatible with 1771-A1B, -A2B, -A3B, -A3B1, -A4B
Y = Compatible without restriction

ATTENTION

Do not use this module with Cat. No. 1771-AL PLC-2/20 or 2/30 Local Adapter.

Calculate Power Requirements

The module receives its power through the 1771 I/O power supply and requires 500mA from the backplane.

Add this current to the requirements of all other modules in the I/O chassis to prevent overloading the chassis backplane and/or backplane power supply.

ATTENTION

Do not insert or remove modules from the I/O chassis while system power is ON. Failure to observe this rule could result in damage to the module circuitry.

Determine Module Placement in the I/O Chassis

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

Group your modules to minimize adverse affects from radiated electrical noise and heat. We recommend the following:

- Group analog input and low voltage dc modules away from ac modules or high voltage dc modules to minimize electrical noise interference.
- Do not place this module in the same I/O group with a digital high-density I/O module when using 2-slot addressing. This module uses a byte in both the input and output image tables for block transfer.

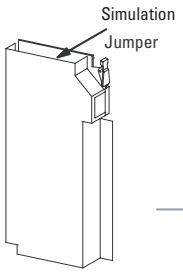
The 1771-IFF is a modular component of the 1771 I/O system requiring a properly installed system chassis. Refer to publication 1771-IN075 for detailed information on acceptable chassis, proper installation and grounding requirements. Limit the maximum adjacent slot power dissipation to 10W or less.

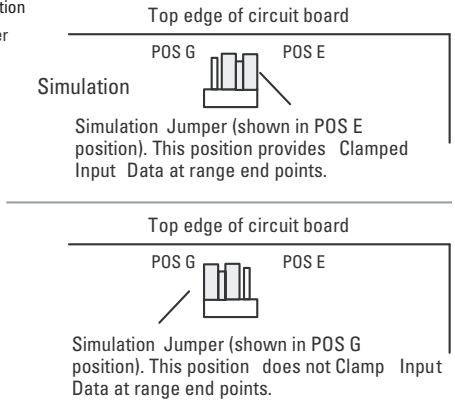
Set the Simulation Jumper

The module is shipped with the simulation jumper set in position **POS G**. This setting allows input data to go above and below the range points. If the simulation jumper is set to the **POS E** position, input data is clamped (does not exceed) at range end points.

Set the Simulation Jumper

1. Locate the simulation jumper at the top edge of the module circuit board.
2. Using your fingers, slide the jumper of f the 2 posts.
3. Carefully position the jumper on 2 of the 3 posts that correspond to your requirement.



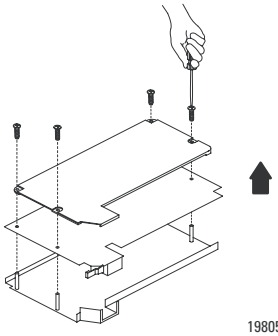


Set the Configuration Jumpers

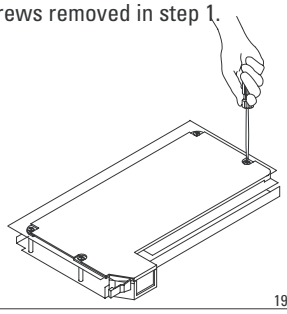
The module has configuration jumpers for determining the input type (voltage or current) desired for each input. **The module is shipped with the configuration jumpers positioned for voltage mode.**

Not that you can select either voltage or current for each input, but they must all be either single-ended or all differential. **Do not mix single-ended or differential inputs on the module.**

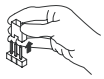
1 Remove the four screws securing the side cover to the module and remove the covers.



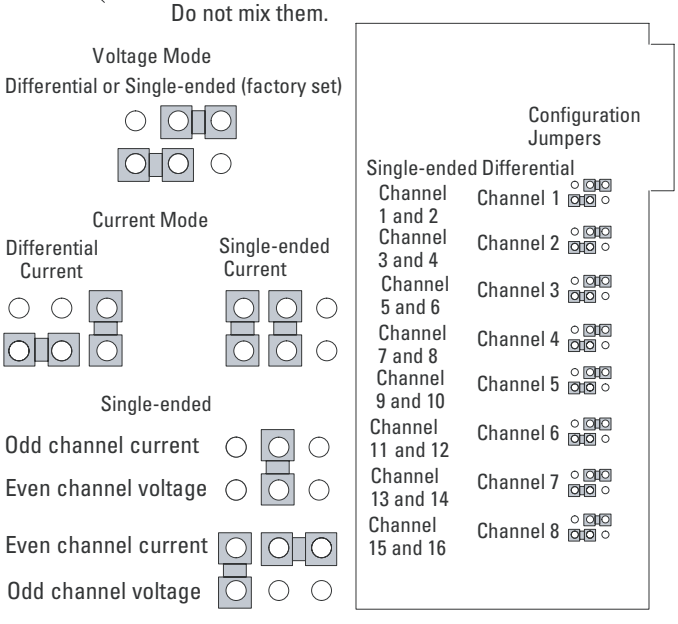
3 Reposition the cover and secure with the four screws removed in step 1.



2 Reposition the configuration jumpers associated with each input channel according to your requirements



You can mix voltage mode and current mode settings on the module. Make sure that the entire module is set for either single-ended or differential. Do not mix them.



Key the Backplane Connector

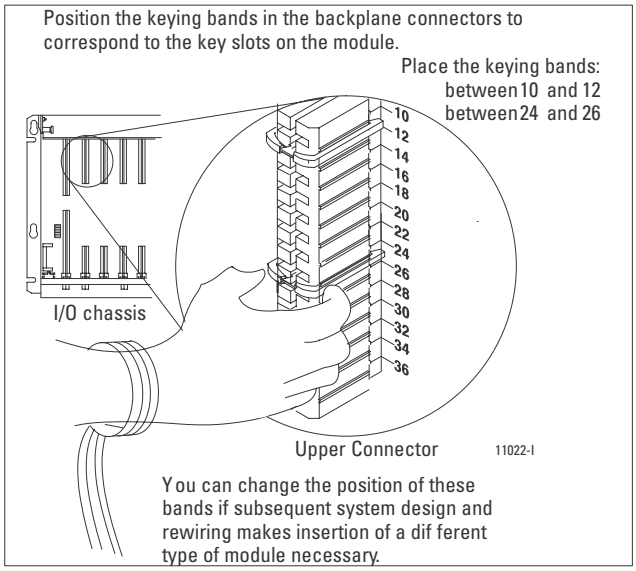
Place your module in any slot in the chassis except the leftmost slot which is reserved for processors or adapters.

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.



Install the Module and Field Wiring Arm

ATTENTION

Remove power from the 1771 I/O chassis backplane and field wiring arm before removing or installing the I/O module.

- Failure to remove power from the backplane or wiring arm could cause module damage, degradation of performance, or injury.
- Failure to remove power from the backplane could cause injury or equipment damage due to possible unexpected operation.

WARNING

If you insert or remove the module while backplane power is on, or connect or disconnect the wiring arm with field side power applied, an electrical arc can occur. This could cause an explosion in hazardous location installations.

Be sure that power is removed or the area is nonhazardous before proceeding.

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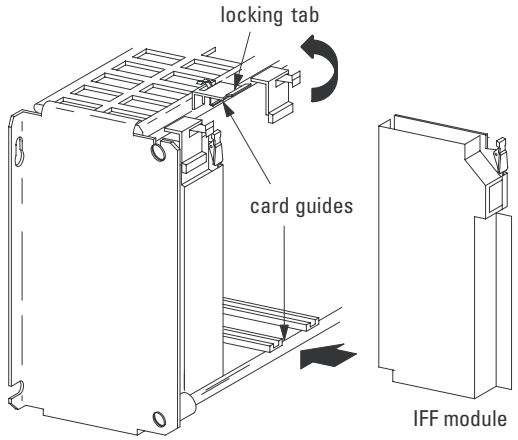
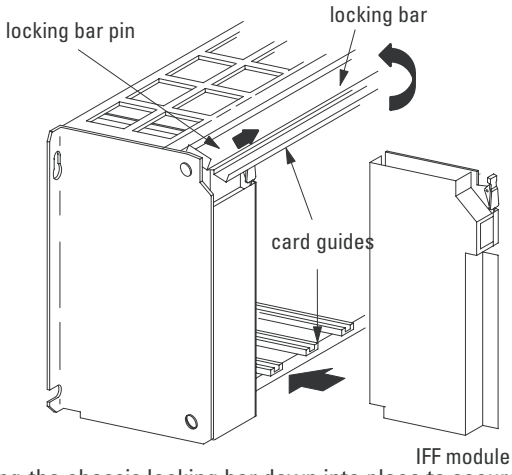
1771-A1B, -A2B, -A3B, -A3B1, -A4B I/O chassis



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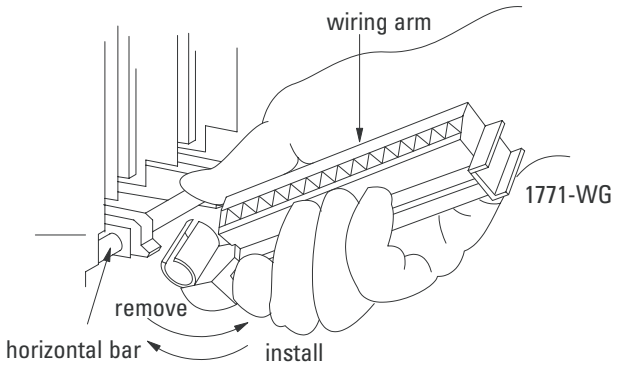
Attach the wiring arm (1771-WG) to the horizontal bar at the bottom of the I/O chassis.

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



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Connect Wiring to the Field Wiring Arm

Connect your I/O devices to the cat. no. 1771-WG wiring arm shipped with the module

ATTENTION

Remove power from the 1771 I/O chassis backplane and field wiring arm before removing or installing the I/O module.

- Failure to remove power from the backplane or wiring arm could cause module damage, degradation of performance, or injury.
- Failure to remove power from the backplane could cause injury or equipment damage due to possible unexpected operation.

WARNING

If you connect or disconnect the wiring with field-side power applied, an electrical arc can occur. This could cause an explosion in hazardous location installations.

Be sure that power is removed or the area is nonhazardous before proceeding.

Input connections for the 1771-IFF with:

- single-ended inputs are shown on page 11.
- differential inputs are shown on page 12.

Minimizing Ground Loops

To minimize ground loop current on input circuits:

- use single-ended mode whenever possible
- use 2-wire transmitters with a common power supply
- separate 2-wire and 4-wire transmitters between different modules
- tie 4-wire transmitter and/or separate power supply grounds together

IMPORTANT

Mixing 2-wire and 4-wire transmitter inputs on the same module is not recommended. Power supply placement can make it impossible to eliminate ground loops.

Cable Lengths

Recommended maximum cable length for voltage-mode input devices is 50 feet (15.24m), due to possible signal degradation and electrical noise immunity in typical industrial environments. Cable length for current-mode input devices need not be as restrictive because analog signals from these devices are less sensistive to electrical noise interference.

Connection Diagram for 16 Single-ended Inputs and Two-Wire Transmitters

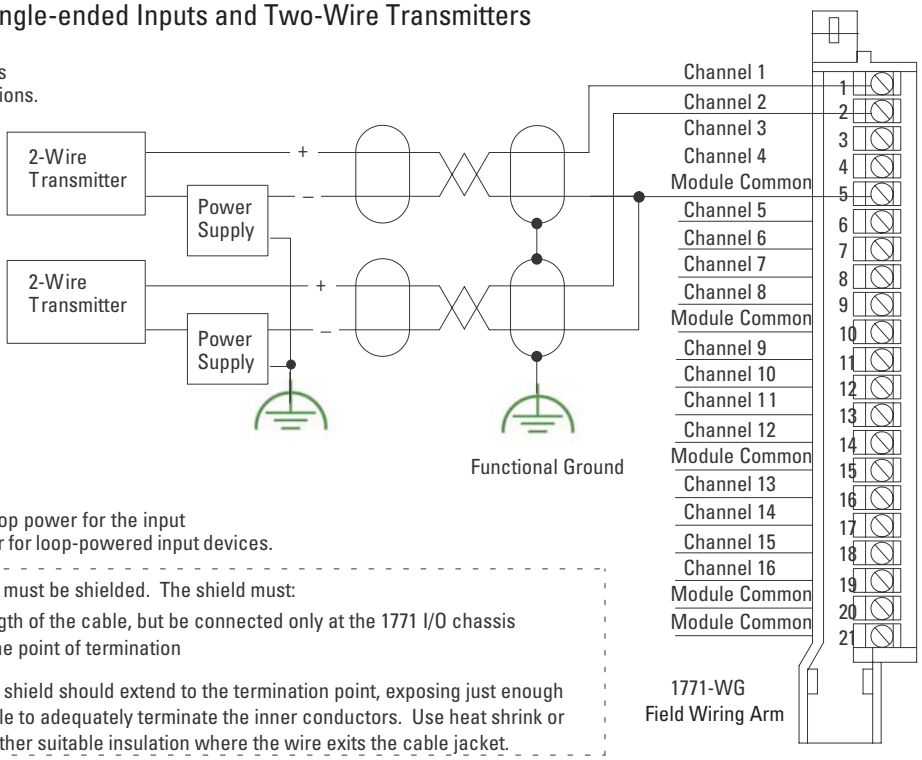
Note: Refer to transmitter manufacturers specifications for power supply connections.

Note:

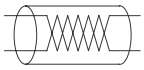
– All module commons are electrically tied together inside the module.

– Jumper all unused channels to module common to reduce noise.

– Tie power supply grounds together to minimize ground loops.



The 1771-IFF module does not supply loop power for the input device. The user must supply loop power for loop-powered input devices.



The sensor cable must be shielded. The shield must:

- extend the length of the cable, but be connected only at the 1771 I/O chassis
- extend up to the point of termination

Important: The shield should extend to the termination point, exposing just enough cable to adequately terminate the inner conductors. Use heat shrink or another suitable insulation where the wire exits the cable jacket.

Connection Diagram for 16 Single-ended Inputs and Four-Wire Transmitters

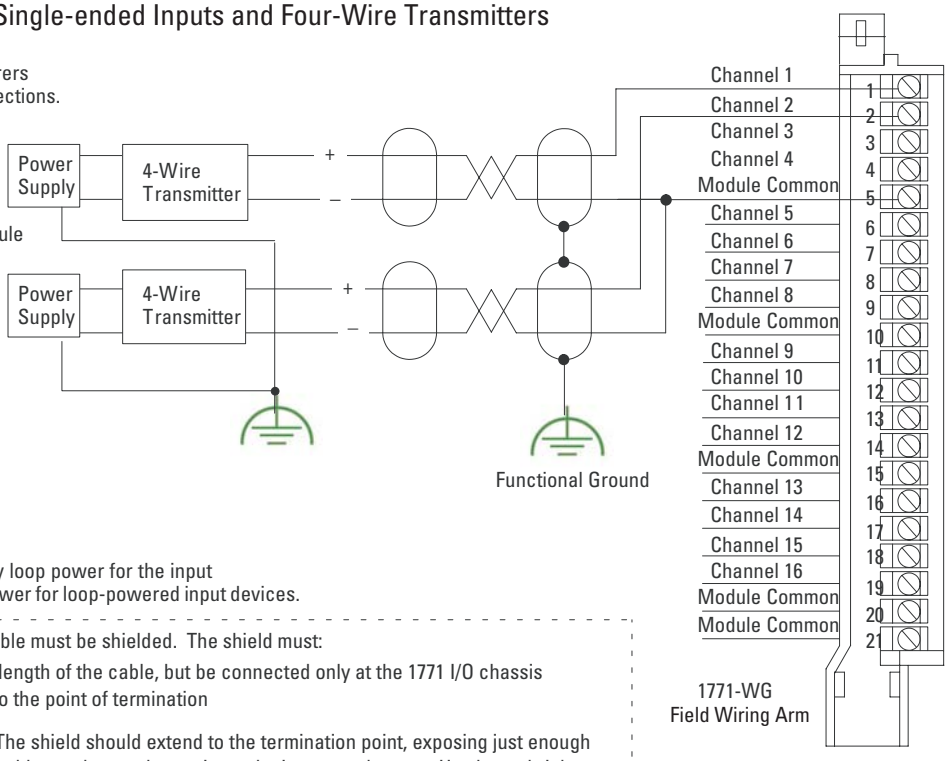
Note: Refer to transmitter manufacturers specifications for power supply connections.

Note:

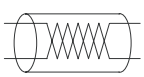
– All module commons are electrically tied together inside the module.

– Jumper all unused channels to module common to reduce noise.

– Tie power supply grounds together to minimize ground loops.



The 1771-IFF module does not supply loop power for the input device. The user must supply loop power for loop-powered input devices.



The sensor cable must be shielded. The shield must:

- extend the length of the cable, but be connected only at the 1771 I/O chassis
- extend up to the point of termination

Important: The shield should extend to the termination point, exposing just enough cable to adequately terminate the inner conductors. Use heat shrink or another suitable insulation where the wire exits the cable jacket.

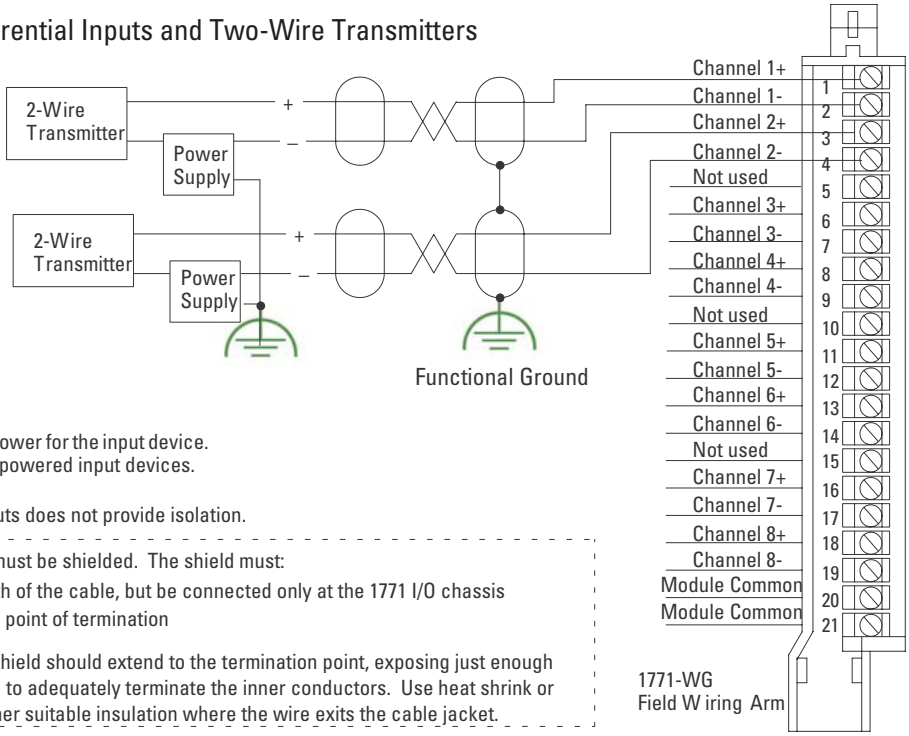
Connection Diagram for 8 Differential Inputs and Two-Wire Transmitters

Note: Refer to transmitter manufacturers specifications for power supply connections.

Note:

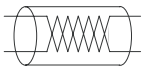
– Unused channels must have their + and - inputs jumpered together and tied to module common to reduce noise.

– Tie power supply grounds together to minimize ground loops.



The 1771-IFF module does not supply loop power for the input device.
The user must supply loop power for loop-powered input devices.

Configuring the module for differential inputs does not provide isolation.



The sensor cable must be shielded. The shield must:

- extend the length of the cable, but be connected only at the 1771 I/O chassis
- extend up to the point of termination

Important: The shield should extend to the termination point, exposing just enough cable to adequately terminate the inner conductors. Use heat shrink or another suitable insulation where the wire exits the cable jacket.

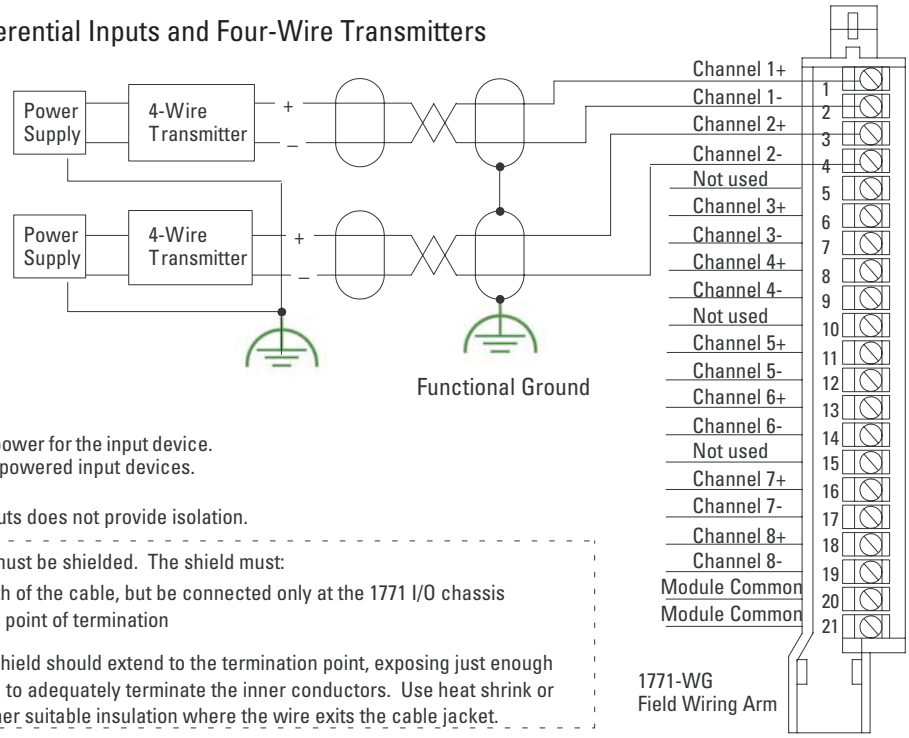
Connection Diagram for 8 Differential Inputs and Four-Wire Transmitters

Note: Refer to transmitter manufacturers specifications for power supply connections.

Note:

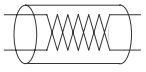
– Unused channels must havetheir + and - inputs jumpered together and tied to module common to reduce noise.

– Tie power supply grounds together to minimize ground loops.



The 1771-IFF module does not supply loop power for the input device.
The user must supply loop power for loop-powered input devices.

Configuring the module for differential inputs does not provide isolation.



The sensor cable must be shielded. The shield must:

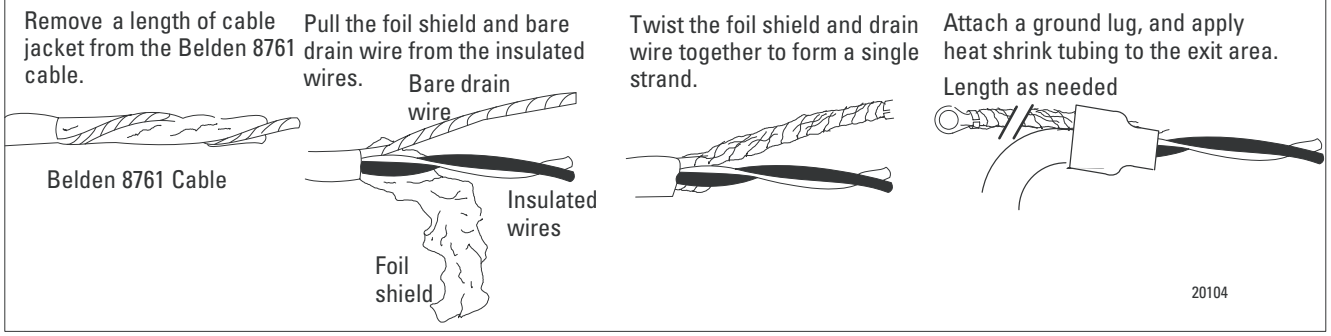
- extend the length of the cable, but be connected only at the 1771 I/O chassis
- extend up to the point of termination

Important: The shield should extend to the termination point, exposing just enough cable to adequately terminate the inner conductors. Use heat shrink or another suitable insulation where the wire exits the cable jacket.

Grounding

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 together, and connect them to a chassis mounting bolt, grounding stud or chassis single-point grounding point. Use heat-shrink tubing to seal the exit point of the wires. At the opposite end of the cable, tape exposed shield and drain wire with electrical tape to insulate it from electrical contact.

1 Cable Grounding



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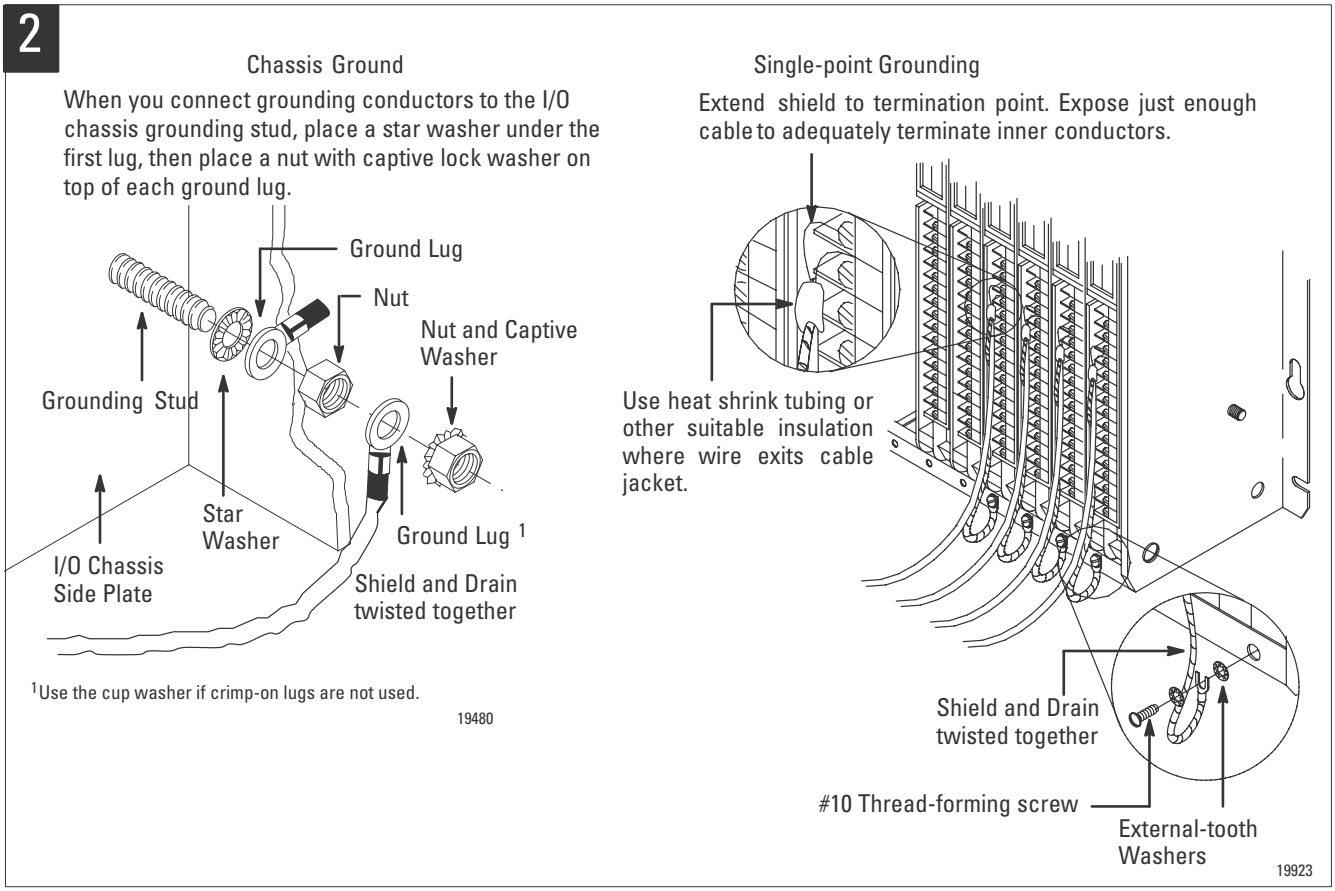


Configure the Module

You must configure the module to conform to the analog device and specific application that you have chosen. Use the configuration information below to configure your module to your specifications.

Dec. Bits	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00	Description
Octal Bits	17	16	15	14	13	12	11	10	07	06	05	04	03	02	01	00	
Word 1	8		7		6		5		4		3		2		1		Range Selection - Channels 1 - 8
2	16		15		14		13		12		11		10		9		Range Selection - Channels 9-16

Input range selections allow the user to configure the inputs for any of 7 input voltage or current ranges. Two bits are required for for each channel. Bits 00 and 01 for channel 1, bits 02 and 03 for channel 2, etc.

Bit 01	Bit 00	Voltage or Current Input
0	0	1 to 5V dc, 4 to 20mA (default)
0	1	0 to 5V dc, 0 to 20mA
1	0	-5 to +5V dc, -20 to +20mA
1	1	-10 to +10V dc, 0 to 10V dc

3	Real Time Sampling	Data Format	Input Type	Digital Filter	Real time sampling, data format, input type and digital filter

Real time sampling - Default is no RTS

Data format - set to match your processor .

Bit 10 (12)	Bit09 (11)	
0	0	BCD(default)
0	1	2's Complement, data first
1	0	Two's complement binary
1	1	Signed magnitude binary

Digital filter reduces effect of noise on input. (Default is no filter.)

Input type , set bit for differential mode on all channels.
Reset (0) = single-ended inputs (default)
Set (1) = differential inputs

4	Minimum sign bits , when set, designate negative minimum scaling values for the corresponding input channels. Bit 00 corresponds to channel 1, bit 01 corresponds to channel 2, etc.	Sign Bits, minimum scaling values
5	Maximum sign bits, when set, designate maximum scaling values that are negative. Maximum scaling value must be greater than minimum on any particular channel. Bit 00 corresponds to channel 1, bit 01 corresponds to channel 2, etc.	Sign Bits, maximum scaling values
6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36	Minimum scaling values for each channel. Enter in BCD format.	Channel 1 - minimum scaling
7, 9, 1 1, 13, 15, 17, 19, 21, 23, 25, 27, 29, 31, 33, 35, 37	Maximum scaling values for each channel. Enter in BCD format.	Channel 1 - maximum scaling
38	Offset calibration - Each bit represents a channel (bit 00 to channel 1, bit 02 to channel 2, etc.). When the bit is set, and a BTW has been sent, the module will read the channels and adjust the offset to analog ground potential. In differential mode, bits 08 thru 15 (10 thru 17 in octal) are ignored. In current mode, apply 0mA.	Of fset Calibration
39	Gain calibration - Each bit represents a channel (bit 00 to channel 1, bit 02 to channel 2, etc). When the bit is set, and a BTW has been sent, the module will read the channels and adjust the gain correction values. If used on +, 0 to 5, or 1 to 5V ranges, a value of 5V is expected. If used on +10V range, 10V is expected. In differential mode, bits 08 thru 15 (10 thru 17 in octal) are ignored. In current mode, apply 20mA.	Gain Calibration
40	15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0	Channel Sampling Disable
41	BCD or binary , 0-256 (2^X only), 0 = default (8X oversample)	Oversampling

Use the following table to read data from your input module.

Dec. Bits	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00	Description
Octal Bits	17	16	15	14	13	12	11	10	07	06	05	04	03	02	01	00	
Word 1										HF	EE	CS	RTS	IS	OR	PU	Diagnostics

Hardware fault - (HF) When this bit is set, the dc/dc converter fuse has blown. Digital logic will continue to operate.

EEPROM status bit - (EE) This bit is set if an error occurs saving calibration data to nonvolatile memory . If this bit is set at powerup, the data from the EEPROM did not pass the checksum and no calibration values are used.

Calibration status bit - (CS) When calibrating the module, this bit will be cleared if the calibration was successful. If the bit is set, an incorrect voltage/current was applied, or offset and gain calibrations were attempted simultaneously

Real time sample fault bit - (RTS) This bit is set if the module is configured for RTS and a block transfer read has not occurred within the user±programmed period.

Power up bit - (PU) Used by the module to tell the processor that it is alive but not yet configured. It is a key element in the application program.

Out of range bit - (OR) This bit is sent to tell the processor that one or more channels are either over or under range.

Invalid scaling bit - (IS) This bit reports that the scaling is somehow invalid. Usually , both values are equal or minimum is greater than maximum when this bit comes on. Can also be an invalid filter value.

2	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	Data underrange for channels 1-16
3	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	Data overrange for channels 1-16
	Underrange bits for each channel. Bit 00 for channel 1, bit 01 for channel 2, etc. These bits are set (1) at approximately the input range limits shown on the right.																1 to 5V dc, 4 to 20mA (default)
																	0 to 5V dc, 0 to 20mA
	Overrange bits for each channel. Bit 00 for channel 1, bit 01 for channel 2, etc. These bits are set (1) at approximately the input range limits shown on the right.																-5 to +5V dc, -20 to +20mA
																	-10 to +10V dc, 0 to 10V dc
4	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	Data polarity for channels 1-16
	Polarity bits - Set when input is less than zero. Bit 00 for channel 1, bit 01 for channel 2, etc.																
5	Channel 1 Input																Channel 1 Input
6	Channel 2 Input																Channel 2 Input
7	Channel 3 Input																Channel 3 Input
8	Channel 4 Input																Channel 4 Input
	⇓			⇓			⇓			⇓							
20	Channel 16 Input																Channel 16 Input
21	Offset calibration results bits - Each bit represents a channel. After a calibration BTW has been sent, the module confirms calibration by echoing back the channels that were calibrated during the ofset calibration BTW. In differential mode, channels 09 thru 16 are zero.																Offset Calibration Results
22	Gain calibration results bits - Each bit represents a channel. After a calibration BTW has been sent, the module confirms calibration by echoing back the channels that were calibrated during the gain calibration BTW. In differential mode, channels 09 thru 16 are zero.																Gain Calibration Results
23	binary, 1ms resolution																Time Stamp
24	10ms resolution																Scan time

When Data Format bits 9 and 10 in block transfer write word 3 are set for "2's complement - data first," the block transfer read will transmit channel data first in the transfer. For single-ended configuration, words 1 through 16 will have channel data. For differential configuration, words 1 through 8 will contain channel data.

Default Configuration

If a write block of five words with all zeroes is sent to the module, default selections will be:

- 1 to 5V dc or 4 to 20mA (dependent on configuration jumper setting)
- BCD data format
- no real time sampling (RTS)
- no filtering
- single-ended inputs
- 8X oversample
- oversample enabled on all channels

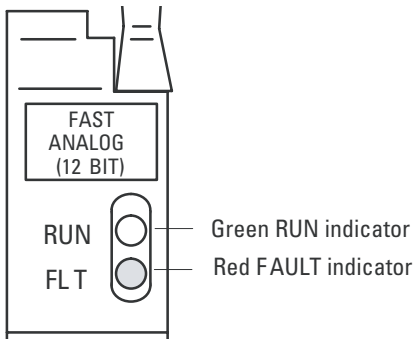
Interpret Status Indicators

The front panel of the analog input module contains a green RUN indicator and a red FAULT indicator. At power-up, the module momentarily turns on the red indicator as a lamp test, then checks for:

- correct RAM operation
- firmware errors

If there is no fault, the red indicator goes off.

The green indicator comes on when the module is powered. It will flash until the module is programmed. If a fault is found initially or occurs later, the red fault indicator lights. The module also reports status and specific faults (if they occur) in every transfer of data (BTR) to the PC processor. Monitor the green and red indicators and status bits in word 1 of the BTR file when troubleshooting your module.



Troubleshooting

Possible module fault causes and corrective action is described in the following table.

Indicators	Probable Cause	Recommended Action
RUN (green on) FLT (red off)	Normal operation	None
RUN (green blinking) FLT (red off)	Awaiting configuration block transfer write	Send configuration BTW
RUN (green off) FLT (red on)	Hardware failure in module	Return module for repair
RUN (green off) FLT (red off)	No power	Turn off power. Remove and reinsert module into chassis. Return power. If problem still exists, and chassis power supply is functioning properly, return the module for repair.

Specifications

Description	Value
Inputs per module	16 single-ended; 8 differential low level
Module Location	1771 I/O chassis - 1 slot
Input Voltage Ranges (nominal)	+1 to +5V dc 0 to +5V dc -5 to +5V dc -10 to +10V dc 0 to +10V dc
Input Current Ranges (nominal)	+4 to +20mA 0 to 20mA -20 to +20mA
Resolution	12-bit binary 12 bits plus sign on bipolar ranges
Accuracy	1.0% of full scale range at 25°C
Linearity	±1 LSB
Repeatability	±1 LSB
Isolation Voltage	Tested to 850V dc for 1s
Input overvoltage protection	35V maximum (voltage mode) 8V maximum (current mode)
Input overcurrent protection (current ranges)	30mA
Common mode voltage	±35V
Input impedance	>10 megohms (voltage ranges) 250 ohms (current ranges)
Common mode rejection	80db, dc - 120Hz
Current requirements	500mA at 5V dc from I/O chassis backplane
Power dissipation	Backplane: 2.5W maximum; Inputs: 2.5W maximum
Thermal dissipation	17 BTU/hr maximum
Unscaled BCD and binary output to processor	0000 to 4095 for polar ranges (0-5V, 1-5V 0-20mA, and 4-20mA) -4095_{10} to $+4095_{10}$ for bipolar ranges (±5V, ±10V,± 20mA)
Engineering units sent to processor	$\pm 9999_{10}$ with selectable scaling
Fastest internal scan rate	8 channels in less than 2ms (depending on number of oversamples, number of channels, and active features)
Environmental Conditions	
Operational 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): 0 to 60°C (32 to 140°F)
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 85°C (-40 to 185°F)
Relative Humidity	IEC 60068-2-30 (Test Db, Unpackaged Nonoperating Damp Heat): 5 to 95% noncondensing

Description	Value
Shock Operating Non-operating	IEC 60068-2-27 (Test Ea, Unpackaged Shock) 30g peak acceleration 50g peak acceleration
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
EFT/B Immunity	IEC 61000-4-4: ±1kV at 5kHz on signal ports
Surge Transient Immunity	IEC 61000-4-5: ±2kV line-earth(CM) on shielded ports
Conducted RF Immunity	IEC 61000-4-6: 10Vrms 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)
Field Wiring Arm	Cat. No. 1771-WG
Field Wiring Arm Screw Torque	9 pound-inches (1.0Nm)
Conductors Wire Size Category	14 AWG (2.5mm^2) - 22 AWG (0.25mm^2) solid or stranded copper wire rated at 75°C or greater 3/64 inch (1.2mm) insulation maximum 2[1]
Keying	between 10 and 12 between 24 and 26
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, Groups A, B, C and D Hazardous locations **CE**[2] - European Union 89/336/EEC EMC Directive, compliant with: EN 50082-2; Industrial Immunity EN 61000-6-2; Industrial Immunity EN 61000-6-4; Industrial Emissions EN 61326; Meas./Control/Lab., Industrial Requirements **C-Tick**[2] **-** Australian Radiocommunications Act compliant with AS/NZS CISPR 11, Industrial Emissions
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1 Use this conductor category information for planning conductor routing as described in publication 1770-4.1, "Industrial Automation Wiring and Grounding Guidelines."

2 See the Product Certification link at `www.ab.com` for Declaration of Conformity, Certificates, and other certification details.

Rockwell Automation Support

Rockwell Automation provides technical information on the web to assist you in using our products. At http://support.rockwellautomation.com, you can find technical manuals, a knowledge base of FAQs, technical and application notes, sample code and links to software service packs, and a MySupport feature that you can customize to make the best use of these tools.

For an additional level of technical phone support for installation, configuration and troubleshooting, we offer TechConnect Support programs. For more information, contact your local distributor or Rockwell Automation representative, or visit http://support.rockwellautomation.com.

Installation Assistance

If you experience a problem with a hardware module within the first 24 hours of installation, please review the information that's contained in this manual. You can also contact a special Customer Support number for initial help in getting your module up and running:

United States	1.440.646.3223 Monday – Friday, 8am – 5pm EST
Outside United States	Please contact your local Rockwell Automation representative for any technical support issues.

New Product Satisfaction Return

Rockwell tests all of our products to ensure that they are fully operational when shipped from the manufacturing facility. However, if your product is not functioning and needs to be returned:

United States	Contact your distributor. You must provide a Customer Support case number (see phone number above to obtain one) to your distributor in order to complete the return process.
Outside United States	Please contact your local Rockwell Automation representative for return procedure.

www.rockwellautomation.com

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