Thermocouple/Millivolt Input Module

Cat. No. 1771-IXE Series C

Contents

This icon is used when additional information is available in the *Thermocouple/mV Input Module User Manual*, publication 1771-6.5.77.

If you need a copy of this manual, fax the enclosed User Manual Request Card to 1.800.576.6340. Outside the USA, fax the card to 1.330.723.4036.

Use this document as a guide when installing the 1771-IXE series C thermocouple/mV input module.

Prevent Electrostatic Discharge

The thermocouple/mV input module is sensitive to electrostatic discharge.

ATTENTION: Electrostatic discharge can damage integrated circuits or semiconductors if you touch backplane connector pins. Follow these guidelines when you handle the module:

- Touch a grounded object to discharge static potential
- Wear an approved wrist-strap grounding device
- Do not touch the backplane connector or connector pins
- Do not touch circuit components inside the module
- If available, use a static-safe work station
- When not in use, keep the module in its static-shield bag

Publication 1771-5.49 – October 1996

Understand Compliance to European Union Directives

If this product has the CE mark it is approved for installation within the European Union and EEA regions. It has been designed and tested to meet the following directives.

EMC Directive

This product is tested to meet Council Directive 89/336/EEC Electromagnetic Compatibility (EMC) and the following standards, in whole or in part, documented in a technical construction file:

- EN 50081-2EMC – Generic Emission Standard, Part 2 – Industrial Environment
- EN 50082-2EMC – Generic Immunity Standard, Part 2 – Industrial Environment

This product is intended for use in an industrial environment.

Low Voltage Directive

This product is tested to meet Council Directive 73/23/EEC Low Voltage, by applying the safety requirements of EN 61131–2 Programmable Controllers, Part 2 – Equipment Requirements and Tests.

For specific information required by EN 61131-2, see the appropriate sections in this publication, as well as these Allen-Bradley publications:

- Industrial Automation Wiring and Grounding Guidelines For Noise Immunity, publication 1770-4.1
- Guidelines for Handling Lithium Batteries, publication AG-5.4
- Automation Systems Catalog, publication B111

Understand Product Compatibility

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

Catalog Number	Use of Data Table				Compatibility			
	Input Image Bits	Output Image Bits	Read Block Words	Write Block Words	Addressing			Chassis Series
					1/2-Slot	1-Slot	2-Slot	
1771-IXE/C	8	8	12/13	27/28	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.

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 850mA 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 module circuitry.

Determine Module Placement in the I/O Chassis

Place your module in any I/O module slot of the I/O 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 discrete 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.

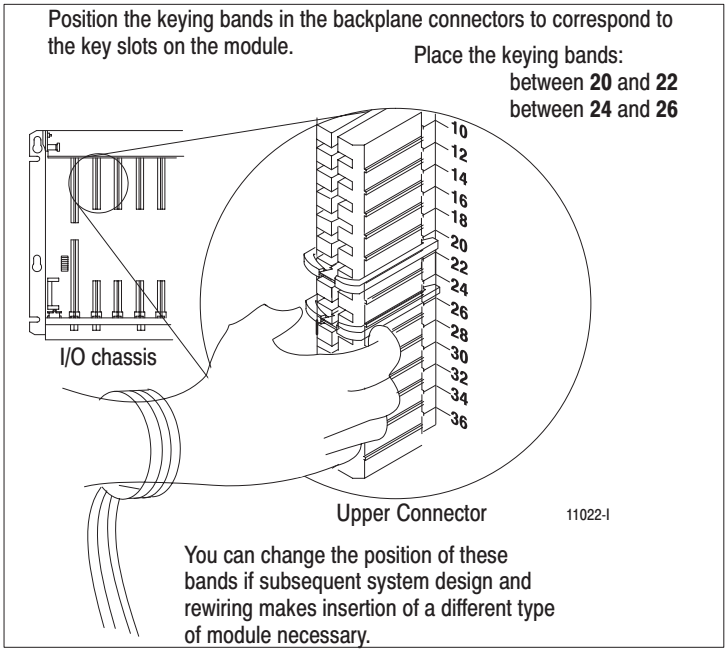
Key the Backplane Connector

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 an 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.

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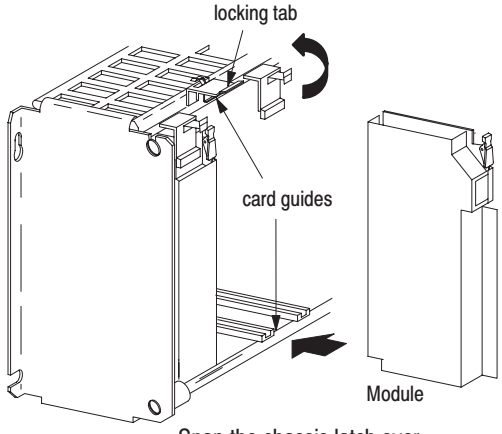
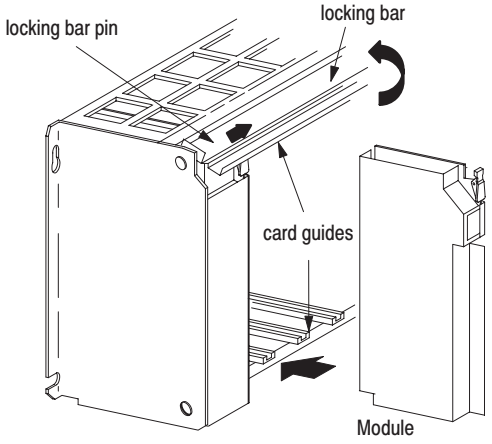
1771-A1B, -A2B, -A3B, -A3B1, -A4B I/O chassis



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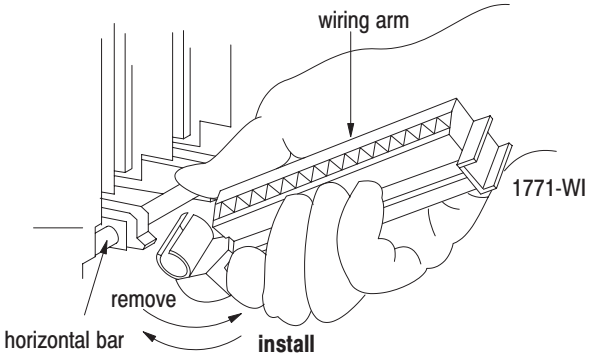
Attach the wiring arm (1771-WI) to the horizontal bar at the bottom of the I/O chassis.

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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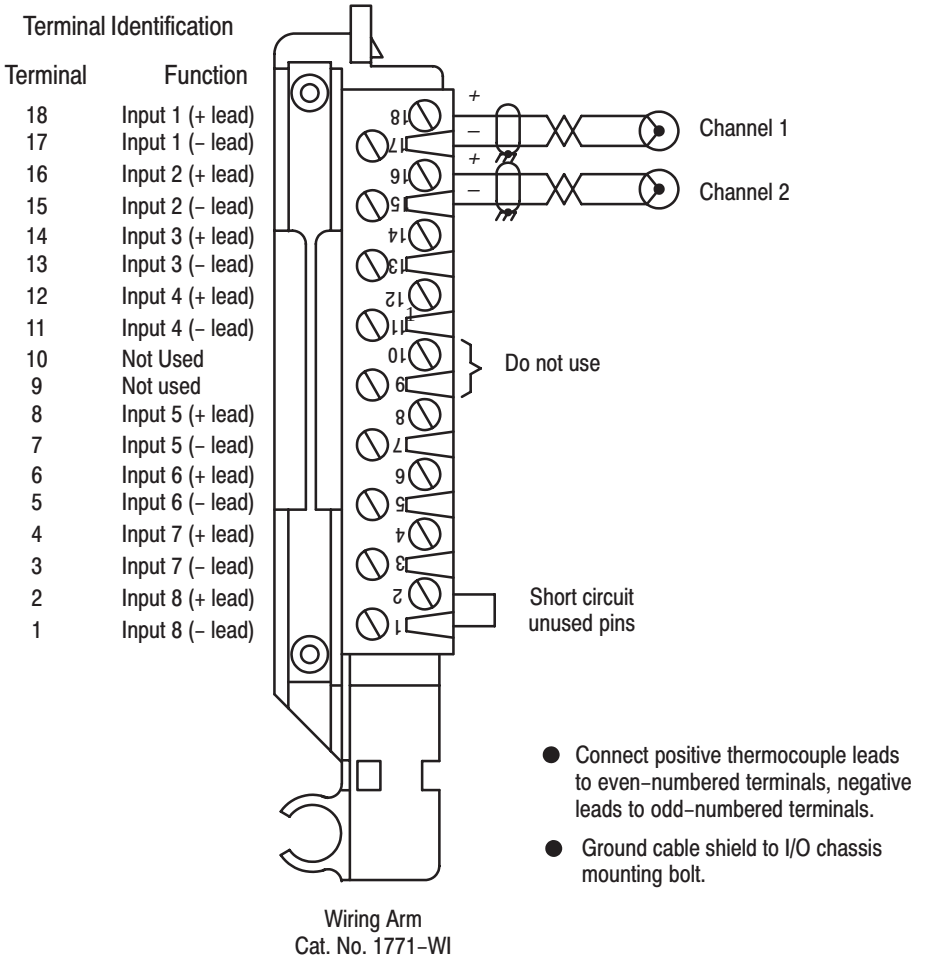
Connect Wiring to the Field Wiring Arm

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

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

Input connections for the 1771-IXE are shown below.



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.

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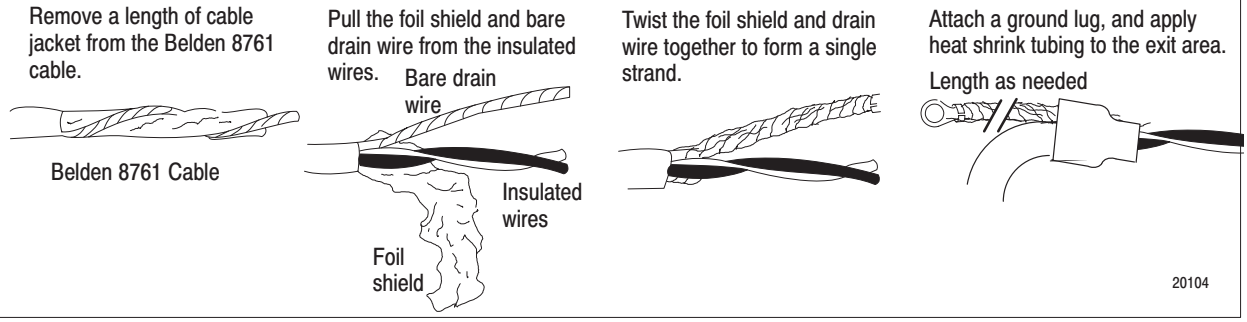
Cable Lengths

Recommended maximum cable length for voltage-mode input devices is 50 feet, due to possible signal degradation and electrical noise immunity in typical industrial environments.

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 wire 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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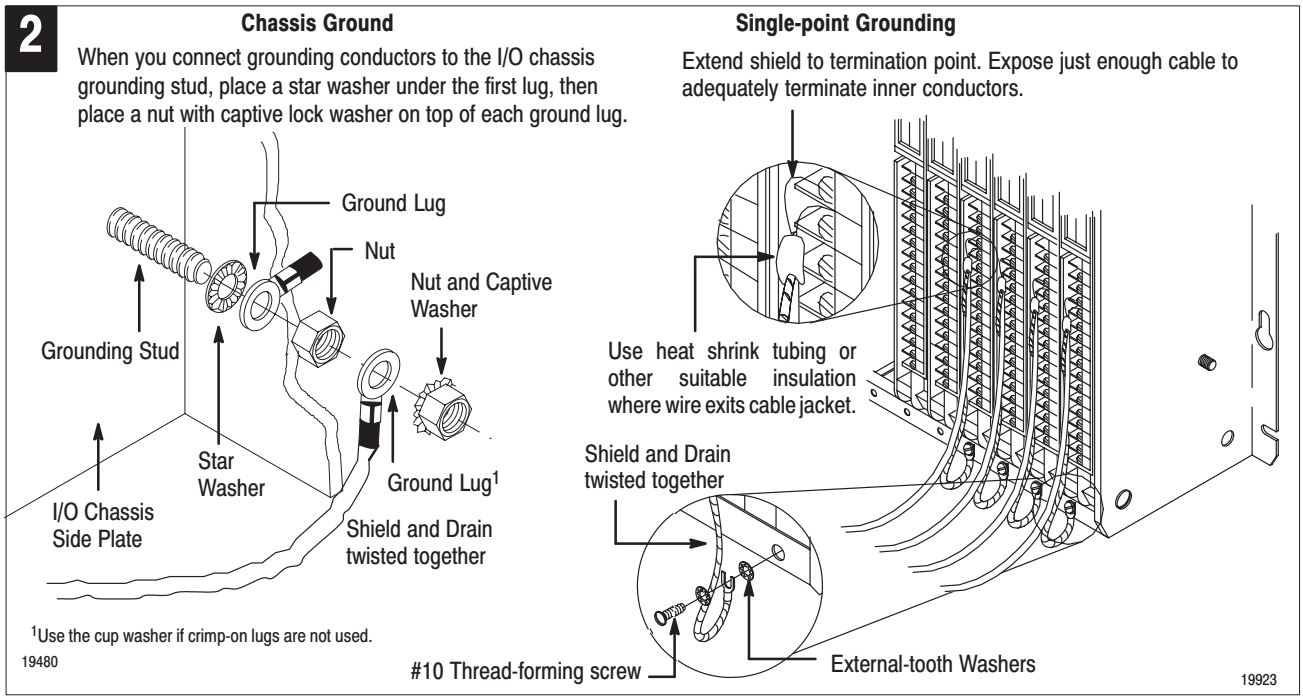


Refer to Industrial Automation Wiring and Grounding Guidelines for Noise Immunity, publication 1770-4.1 for additional information.

Configure the Module

For detailed configuration information, see "Module Configuration" in your *Thermocouple/mV Input Module User Manual* (publication 1771-6.5.77).

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.

Word Dec. Bit	17	16	15	14	13	12	11	10	07	06	05	04	03	02	01	00
Word Octal Bit	17	16	15	14	13	12	11	10	07	06	05	04	03	02	01	00
1	Sample Time					Format		T	0	E	Input Type			Input Type		

Real time sampling – Default is no RTS.

Data format – set to match your processor.

Bit 10 (12)	Bit 09 (11)	
0	0	BCD (default)
0	1	Two's complement binary
1	0	Signed magnitude binary
1	1	

Temperature scale bit, when set, reports temperature in °F; when reset, in °C. The module ignores this bit for millivolt inputs.

Input Type Enable – When set to 0 bits 00–02 define input type for all channels.
When set to 1 bits 00–02 defines input type for channels 1–4, and bits 03–05 defines input type for channels 5–8.

Input Type	Bits 05	04	03	02	01	00
Millivolt	0	0	0	0	0	0
E	0	0	1	0	0	1
J	0	1	0	0	1	0
K	0	1	1	0	1	1
T	1	0	0	1	0	0
R	1	0	1	1	0	1
S	1	1	0	1	1	0
	1	1	1	1	1	1

2	Not Used	Channel alarm enable bits tell the module which channel alarm values are activated. Set bit 00 for alarm(s) in channel 1, and set alarm(s) in words 4 (low alarm) and 5 (high alarm). Repeat the procedure for setting alarms in channels 2 thru 8 (bits 01–07 and words 6–19 respectively).
3	**High Alarms Polarity** (one bit per input channel) – tell the module the sign of the values that you enter in high alarm words: set for negative, reset for positive. Bits 10–17 represent words 5, 7, 9, 11, 13, 15, 17 and 19 for channels 1 thru 8, respectively.	**Low Alarms Polarity** (one bit per input channel) – tell the module the sign of the values that you enter in low alarm words: set for negative, reset for positive. Bits 00–07 represent words 4, 6, 8, 10, 12, 14, 16, and 18 for channels 1 thru 8, respectively.
4, 6, 8, 10, 12, 14, 16, 18 5, 7, 9, 11, 13, 15, 17, 19	**Low and high channel alarm values** that you enter via the terminal in BCD are converted automatically by the module to its own format. Store low and high channel alarms in pairs, low alarm values in even–numbered words, high alarm values in odd–numbered words. For example, store channel 1 low and high alarm values in words 4 and 5, respectively.	
20, 21, 22, 23, 24, 25, 26, 27	**Calibration words** are a composite of two independent bytes for each channel. Enter calibration data in signed magnitude binary only. The most significant bit in each byte is the sign bit; set for negative, reset for positive. Use the high byte (bits 10–17) for offset correction, the low byte (bits 00–07) for gain correction for each channel. Use word 20 for channel 1 thru word 27 for channel 8.	
28	**Auto–calibration request word** – used to automatically calibrate selected channels and save the calibration constants in EEPROM.	

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

For detailed configuration information, see your *Thermocouple/mV Input Module User Manual* (publication 1771-6.5.77).

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	Polarity Bits								EE	0	CJ TH	CJ TL	0	RTS	OR	PU	Diagnostics

Polarity bits set to indicate negative polarity: bit 10 for channel 1 thru bit 17 for channel 8. These bits are used in BCD and signed magnitude data formats.

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.

High cold junction temperature bit is set when the cold junction temperature exceeds 60ºC.

Low cold junction temperature bit is set when the cold junction temperature is less than 0ºC.

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.

Real time sample time–out bit is set when the module updates an input buffer with new data before the processor has read the previous data. Monitor this bit only if you select real time sampling.

2	**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.	**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.	Data underrange and overrange bits
3	High alarm bit for each channel is set to indicate the input has exceeded the high limit value you entered in the corresponding high alarm word (word 5, 7, 9, 11, 13, 15, 17, or 19): bit 10 for channel 1 thru bit 17 for channel 8.	Low alarm bit for each channel is set to indicate the input is less than the low limit value you entered in the corresponding low alarm word (word 4, 6, 8, 10, 12, 14, 16, or 18): bit 00 for channel 1 thru bit 07 for channel 8.	Low and high alarm bits
4, 5, 6, 7, 8, 9, 10, 11	Input for channel 1 through 8 respectively.		
12	Cold Junction Temperature in ºC		

13	15	14	13	12	11	10	09	08	07	06	05	04	03	02	01	00	Auto-Calibration Word

Uncalibrated channel bits – channel not calibrated if bit is set. Bit 10 corresponds to channel 1, bit 11 corresponds to channel 2, etc.

Calibration fault when bit is set.

EEPROM fault is bit is set.

Offset calaibration complete when bit is set

Gain calibration complete when bit is set.

Calibration saved to EEPROM if bit is set

Default Configuration

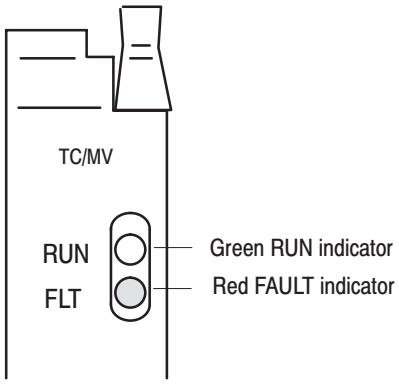
If a write block of five words with all zeroes is sent to the module, default selections will be:

- Millivolt input
- one input type
- temperature in °C
- BCD data format
- no real time sampling (RTS) (50ms)
- no alarming

Interpret Status Indicators

The front panel of the thermocouple/mV 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
- EPROM operation
- EEPROM operation
- a valid write block transfer with configuration data



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

Thereafter, the module lights the green RUN indicator when operating without fault, or lights the red FAULT indicator when it detects fault conditions. If the red FAULT indicator is on, block transfers will be inhibited.

Troubleshooting

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

For detailed troubleshooting information, see "Troubleshooting" in your *Thermocouple/mV Input Module User Manual* (publication 1771-6.5.77).

Indicators	Probable Cause	Recommended Action
Both indicators are OFF	No power to module Possible short on the module LED driver failure	Check power to I/O chassis. Recycle as necessary. Replace module.
Red FLT ON and Green RUN is ON	Microprocessor, oscillator or EPROM failure	Replace module.
Red FLT ON	If immediately after power–up, indicates RAM or EPROM failure.[1]	Replace module.
	If during operation, indicates possible microprocessor or backplane interface failure.[1]	Replace module.
Green RUN is flashing	Power–up diagnostics successfully completed.	Normal operation.
	If LED continues to flash, and write block transfers (BTW) cannot be accomplished, you have a possible interface failure.	Replace module.

[1] When red LED is on, the watchdog timer has timed out and backplane communications are terminated. Your user program should monitor communication.

Status Reported in Word 1

Design your program to monitor status bits in the lower byte of word 1, and to take appropriate action depending on your application requirements. You may also want to monitor these bits while troubleshooting with your industrial terminal. The module sets a bit (1) to indicate it has detected one or more of the following conditions:

Word	Bit	Explanation
1	00	Module is powered but has not received its first (configuration) block transfer. The green LED is flashing.
	01	One or more inputs are out of the range for which you configured the module.
	02	Module updated its inputs before the processor read them. The RTS interval timed out before the processor read the data.
	03	Not used
	04	The module's ambient temperature is below 0ºC. Temperature readings will be inaccurate.
	05	The module's ambient temperature is above 60ºC. Temperature readings will be inaccurate.
	06	Not used
	07	EEPROM calibration constants could not be read. The module will continue to operate but readings may be inaccurate.
	10–17	Sign bits for each channel

Status Reported in Words 2 and 3

Design your program to monitor over/under range bits, and to take appropriate action depending on your application requirements. You may also want to monitor these bits while troubleshooting with your industrial terminal.

Bits 00–07 and 10–17 each represent an input for channels 1–8, respectively. For example, bit 04 represents input channel 5. The module sets a bit (1) to indicate it has detected an out of range condition.

Word	Bit	Condition
2	00–07	Inputs underrange. Bit 00 is channel 1, bit 07 is channel 8. If input connections and voltages are correct, this status may indicate failed channel communications with the microprocessor. If all channels are underrange, this indicates a possible dc/dc converter failure or a blown fuse.
	10–17	Inputs overrange. Bit 10 is channel 1, bit 17 is channel 8. If input connections and voltages are correct, this status may indicate a failed thermocouple functional analog block (TC FAB).
3	00–07	Corresponding channel input value is below the alarm value that you entered for that channel.
	10–17	Corresponding channel input value has exceeded the alarm value that you entered for that channel.

Status Reported in Word 13

Design your program to monitor status bits in word 13 during auto–calibration, and to take appropriate action depending on your requirements. You may also want to monitor these bits while troubleshooting with your industrial terminal. The module sets a bit (1) to indicate it has detected one or more of the following conditions as shown below.

Word	Bit	Condition
13	6	The EEPROM could not be written.
	7	Channel(s) could not be calibrated as indicated by bits 10 through 17 respectively.
	10–17	Bit 10 (channel 1) through bit 17 (channel 8) could not be calibrated. Check field wiring arm connections and source for proper voltage.

Specifications

Number of Inputs	8, all of the same type or 4 each of 2 different types
I/O Chassis Location	Any single I/O module slot
Type of Input (Selectable)	Type E, chromel/constantan (–270 to 1000ºC) Type J, iron/constantan (–210 to 1200ºC) Type K, chromel/alumel (–270 to 1380ºC) Type R, Pt/Pt–13% Rh (–50 to 1770ºC) Type T, copper/constantan (–270 to 400ºC) Type S, Pt/Pt–10% Rh (–50 to 1770ºC) Millivolt (–100 to +100mV dc)
Thermocouple Linearization	IPTS–68 standard, NBS MN–125
Cold Junction Compensation	Range: 0 to 60ºC Accuracy: ±0.5ºC
Temperature Scale (Selectable)	ºC or ºF
Input Resolution	1ºC, 1ºF, or 10uV
Input Isolation	1000V peak between inputs, between input and common, and between input and backplane connections
Common Mode Rejection	120dB at 60Hz, up to 1000V peak
Common Mode Impedance	Greater than 10 megohms
Normal Mode Rejection	60dB at 60Hz
Input Overvoltage Protection	120V rms, continuous
Open Input Detection	Open input produces a maximum value reading in less than 10 seconds
Input Connections	18–terminal wiring arm (Cat. No. 1771–WI)
Data Format (Selectable)	4–digit BCD 2's complement binary signed magnitude binary
Calibration	Auto–calibration (offset and gain) Zero offset and gain adjustment for each channel via programming terminal Verify every six months for maintaining absolute accuracy
Processor Compatibility	Any A–B processor using the 1771 I/O structure and block transfer

Specifications continued on next page

Backplane Power	850mA @ 5V;
Power Dissipation	4.25 Watts maximum
Thermal Dissipation	14.5 BTU/hr
Environmental Conditions Operating Temperature: Rate of Change: Storage Temperature: Relative Humidity:	 0 to 60°C (32 to 140°F) Ambient changes greater than 0.5°C per minute may temporarily degrade performance during periods of change –40 to 85°C (–40 to 185°F) 5 to 95% (without condensation)
Field Wiring Arm	Cat. No. 1771–WI
Keying	Between 20 and 22 Between 24 and 26
Agency Certification (when product or packaging is marked)	• CSA certified • CSA Class I, Division 2, Groups A, B, C, D certified • UL listed • CE marked for all applicable directives
User Manual	Publication 1771-6.5.77

Thermocouple/Millivolt Input Module Accuracy

Use the calibration procedure in Chapter 7, "Module Calibration," in your *Thermocouple/mV Input Module User Manual* (publication 1771-6.5.77) to adust your module to compensate for your specific environment.

The accuracy of your thermocouple readings depends on:

- module accuracy
- lead resistance effect
- accuracy of the thermocouple

Use the calibration procedure in Chapter 7 to adjust your module to compensate for your specific environment.

Thermocouple Range Accuracy Based on Temperatures Above 0°C

Thermocouple Type	Temperature Range °C	Column A	Column B
		Max Error @ Calibration Temperature (25°C)[1]	Temperature Drift °C/°C (0–60°C) or °F/°F (32–140°F)
E	–270 to 1000	±0.74°C/±1.08°F	±0.0400
J	–210 to 1200	±0.78°C/±1.10°F	±0.0423
K	–270 to 1380	±0.77°C/±1.15°F	±0.0640
T	–270 to 400	±0.77°C/±1.17°F	±0.0183
R	–50 to 1770	±1.50°C/±2.11°F	±0.0914
S	–50 to 1770	±1.50°C/±2.31°F	±0.0926

[1] Error is specified from 0°C (32°F) to the maximum range of the thermocouple. Error does not include thermocouple error (see appendix F). The error does include cold junction compensation errors.

Modules are typically calibrated at 25ºC.

- If the I/O chassis in which the 1771-IXE is operating is at 25ºC, column A represents the maximum error for that thermocouple type.
- If the chassis operating temperature is less than or greater than 25ºC, use the formula below to calculate the maximum error.

Maximum Error = Col–A + (ΔT x Col–B)

Where: Col–A = the value from column A
ΔT = the I/O chassis operating temperature minus 25ºC
Col–B = the value from column B

For Example:

If the I/O chassis is operating at 60ºC, and a Type J Thermocouple is being used, then:

Maximum Error = Column A + (ΔT x Column B)
= 0.78+ [(60 – 25) x 0.0423]
= 0.78 + (35 x 0.0423)
= 0.78 + 1.4805
= 2.2605ºC

Millivolt Range Accuracy

Millivolt Range	Max Error @ Calibration Temperature (25ºC)	Millivolt Drift
–100 to 100	±8.85uV	±3.856uV/ºC

Radiated Noise Susceptibility

Radiated Noise	Susceptibility Error
300–1000MHz Circular Wave, Field Strength = 10V/M	< ±1%

Lead Resistance Compensation

Allowable Distances

The open thermocouple detection circuit injects a current of approximately 7.3 nanoamps into the thermocouple cable. A total lead resistance of 1370 ohms (685 ohms one–way) cable resistance will produce +1 count (10uV) of error.

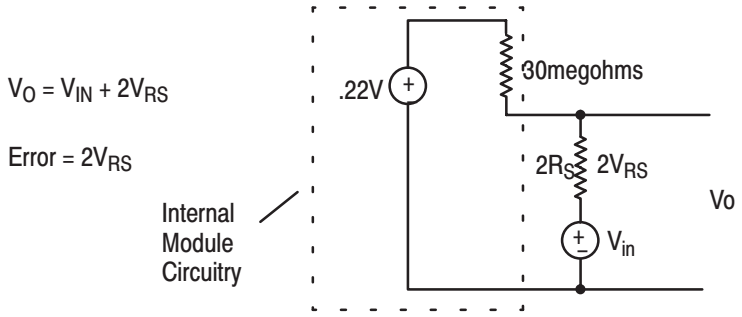
Source Impedance Compensation for Millivolt Inputs

Source resistance causes similar errors to occur with millivolt inputs. If source resistance is less than 100 ohms, no compensation is necessary to maintain stated accuracy. If source resistance is greater than 100 ohms, the error can be calculated as follows:

$$\text{Error (in calibration counts)} = - \frac{309329\ R_s\ (0.22 - Vin)}{R_s + 15M\ \text{ohms}}$$

Where R_s = source resistance (one–way cable resistance)
V_{in} = applied input voltage

When using thermocouples, Vin is the approximate thermocouple voltage of the temperature of interest.

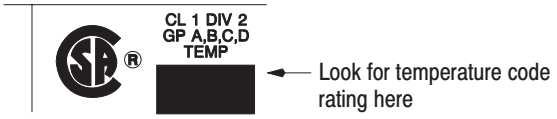
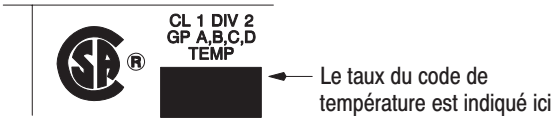


To maintain a display error of < 5uV at V_{in} = OV, R_S should be < 341 ohms. Refer to NBS NM–125 Thermocouple Reference Tables for determining actual thermocouple voltage versus temperature readings.

Filtering

The analog input module has hardware–based high frequency filters on all channels to reduce the effect of electrical noise on the input signal. These are 6–pole filters, which begin rolling off at 8.0Hz.

This filtering is in addition to the software-based digital filtering selected in the module's BTW configuration.

CSA Hazardous Location Approval	Approbation d'utilisation dans des emplacements dangereux par la CSA
CSA® certifies products for general use as well as for use in hazardous locations. **Actual CSA certification is indicated by the product label** as shown below, and not by statements in any user documentation.	La CSA® certifie les produits d'utilisation générale aussi bien que ceux qui s'utilisent dans des emplacements dangereux. **La certification CSA en vigueur est indiquée par l'étiquette du produit** et non par des affirmations dans la documentation à l'usage des utilisateurs.
Example of the CSA certification product label 	Exemple d'étiquette de certification d'un produit par la CSA 
To comply with CSA certification for use in hazardous locations, the following information becomes a part of the product literature for CSA-certified Allen-Bradley industrial control products. • This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D, or non-hazardous locations only. • The products having the appropriate CSA markings (that is, Class I Division 2, Groups A, B, C, D), are certified for use in other equipment where the suitability of combination (that is, application or use) is determined by the CSA or the local inspection office having jurisdiction.	Pour satisfaire à la certification de la CSA dans des endroits dangereux, les informations suivantes font partie intégrante de la documentation des produits industriels de contrôle Allen-Bradley certifiés par la CSA. • Cet équipement convient à l'utilisation dans des emplacements de Classe 1, Division 2, Groupes A, B, C, D, ou ne convient qu'à l'utilisation dans des endroits non dangereux. • Les produits portant le marquage approprié de la CSA (c'est à dire, Classe 1, Division 2, Groupes A, B, C, D) sont certifiés à l'utilisation pour d'autres équipements où la convenance de combinaison (application ou utilisation) est déterminée par la CSA ou le bureau local d'inspection qualifié.
Important: Due to the modular nature of a PLC® control system, the product with the highest temperature rating determines the overall temperature code rating of a PLC control system in a Class I, Division 2 location. The temperature code rating is marked on the product label as shown.	**Important:** Par suite de la nature modulaire du système de contrôle PLC®), le produit ayant le taux le plus élevé de température détermine le taux d'ensemble du code de température du système de contrôle d'un PLC dans un emplacement de Classe 1, Division 2. Le taux du code de température est indiqué sur l'étiquette du produit.
Temperature code rating 	Taux du code de température 
The following warnings apply to products having CSA certification for use in hazardous locations.	Les avertissements suivants s'appliquent aux produits ayant la certification CSA pour leur utilisation dans des emplacements dangereux.
ATTENTION: Explosion hazard — • Substitution of components may impair suitability for Class I, Division 2. • Do not replace components unless power has been switched off or the area is known to be non-hazardous. • Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous. • Do not disconnect connectors unless power has been switched off or the area is known to be non-hazardous. Secure any user-supplied connectors that mate to external circuits on an Allen-Bradley product using screws, sliding latches, threaded connectors, or other means such that any connection can withstand a 15 Newton (3.4 lb.) separating force applied for a minimum of one minute.	**AVERTISSEMENT:** Risque d'explosion — • La substitution de composants peut rendre ce matériel inacceptable pour lesemplacements de Classe I, Division 2. • Couper le courant ou s'assurer quel'emplacement est désigné non dangereux avant de remplacer lescomposants. • Avant de débrancher l'équipement, couper le courant ou s'assurer que l'emplacement est désigné non dangereux. • Avant de débrancher les connecteurs, couper le courant ou s'assurer que l'emplacement est reconnu non dangereux. Attacher tous connecteurs fournis par l'utilisateur et reliés aux circuits externes d'un appareil Allen-Bradley à l 'aide de vis, loquets coulissants, connecteurs filetés ou autres moyens permettant aux connexions de résister à une force de séparation de 15 newtons (3,4 lb. - 1,5 kg) appliquée pendant au moins une minute.

Le sigle CSA est la marque déposée de l'Association des Standards pour le Canada.

PLC est une marque déposée de Allen-Bradley Company, Inc.

CSA logo is a registered trademark of the Canadian Standards Association

PLC is a registered trademark of Allen-Bradley Company, Inc.

Major Differences between Series

The following is a list of major differences between Series A, Series B and Series C Thermocouple/Millivolt Input module (cat. no. 1771–IXE).

Definition	Series A	Series B	Series C
Calibration	Uses potentiometers for calibration settings with calibration done at –99 and +99mV.	Calibration is done automatically using auto–calibration feature, or manually through programming.	
Offset, Gain Calibrations	User offset calibration range of +1270uV. Offset correction of 3.2328 uV/bit. User gain correction of .012207%/LSB with a maximum of 1.5503%.	User offset calibration range is ±410.5uV maximum. An offset correction is 3.2328 uV/bit User gain correction is now .00152588%/LSB for a maximum of ±0.193787%.	
Real Time Sampling	Series A default value was 500ms.	The default RTS setting (RTS = 0) makes data available every 50ms.	
Cold Junction Calibration	In Series A, BTR word 12 was the cold junction calibration word.	BTR WORD 12 is the rounded Cold Junction Temperature resolute to 1 degree C displayable in the programmed format (BCD, 2s complement or signed magnitude).	
	Cold Junction calibration done by user.	Cold Junction calibration automatically calibrated at power up.	
	Cold junction temperature is updated once per 15 second interval.	Cold junction temperature is digitally filtered with a filter time constant of 12.8 seconds.	
		Cold junction value is updated continously	
High and Low Alarms Limits	When a low alarm is programmed greater than a high alarm, the Series A displayed only low alarm.	When a low alarm is programmed greater than a high alarm both low and high alarms will be activated when the input is between the two values.	
Backplane Current	1200mA at 5V.	750mA at 5V.	850mA at 5V.
Agency Certification (when product or packaging is marked)	• CSA certified • CSA Class I, Division 2, Groups A, B, C, D certified • UL listed		• CSA certified • CSA Class I, Division 2, Groups A, B, C, D certified • UL listed • CE marked for all applicable directives

Publication 1771-5.49 – October 1996

PN 955126–07