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Find the *Rockwell / Allen-Bradley 1771-IXE/D* at our website: *Click HERE*

High Resolution Thermocouple/Millivolt Input Module

(Catalog Number 1771-IXHR Series C)

Contents



This icon is used when additional information is available in the *High Resolution Thermocouple/Millivolt Input Module User Manual*, publication 1771-6.5.131.

Use this document as a guide when installing the 1771-IXHR/C High Resolution Thermocouple/mV input module.

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Prevent Electrostatic Discharge

The High Resolution Thermocouple/Millivolt 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

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Understand Compliance to European Union Directives

This product has the CE mark and 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

This equipment is classified as open equipment and must be mounted in an enclosure during operation to provide safety protection.

Understand Product Compatibility

The 1771-IXHR/C 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-IXHR/C	8	8	12/13	27/28	Yes	Yes	Yes	A, B

A = Compatible with 1771-A1, -A2, -A4 chassis
B = Compatible with 1771-A1B, -A2B, -A3B, -A4B chassis
Yes = Compatible without restriction
No = Restricted to complementary module placement

Do not use this module with Cat. No. 1771-AL adapter, PLC-2/20 or 2/30 programmable controllers.

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Calculate Power Requirements

The module receives its power through the 1771 I/O power supply. The maximum current drawn by the module is 850mA (4.25 Watts).

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.

Determine Module Placement in the I/O Chassis

You can 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.

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.

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

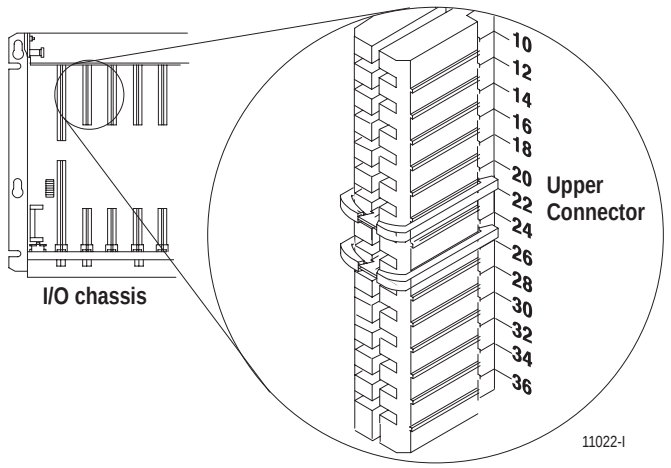
Place your module in any slot in the chassis except the leftmost slot which is reserved for processors or adapters.

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.

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



You can change the position of these bands if subsequent system design and rewiring makes insertion of a different type of module necessary.

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ATTENTION: The High Resolution Thermocouple/Millivolt Input Module uses the same keying slots as the 1771–IXE Thermocouple/Millivolt Input Module. If you are replacing a 1771–IXE with a 1771–IXHR, the ladder program must be modified to accept the new block transfer format.

Install the Module and Field Wiring Arm

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

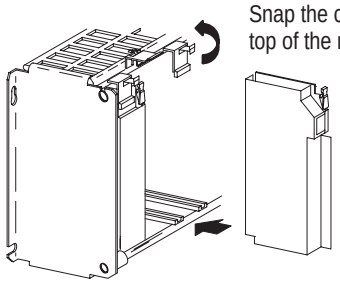
- module damage
- degradation of performance
- injury or equipment damage due to possible unexpected operation

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

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

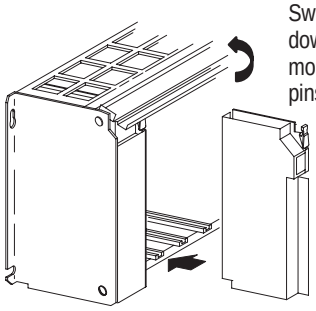
1771-A1B, -A2B, -A3B, -A4B I/O chassis

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



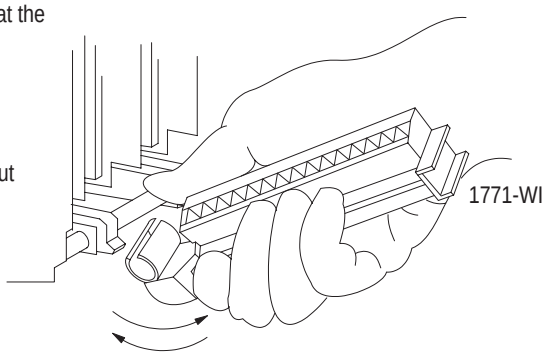
1771-A1B, -A2B, -A4B Series B I/O chassis

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



2 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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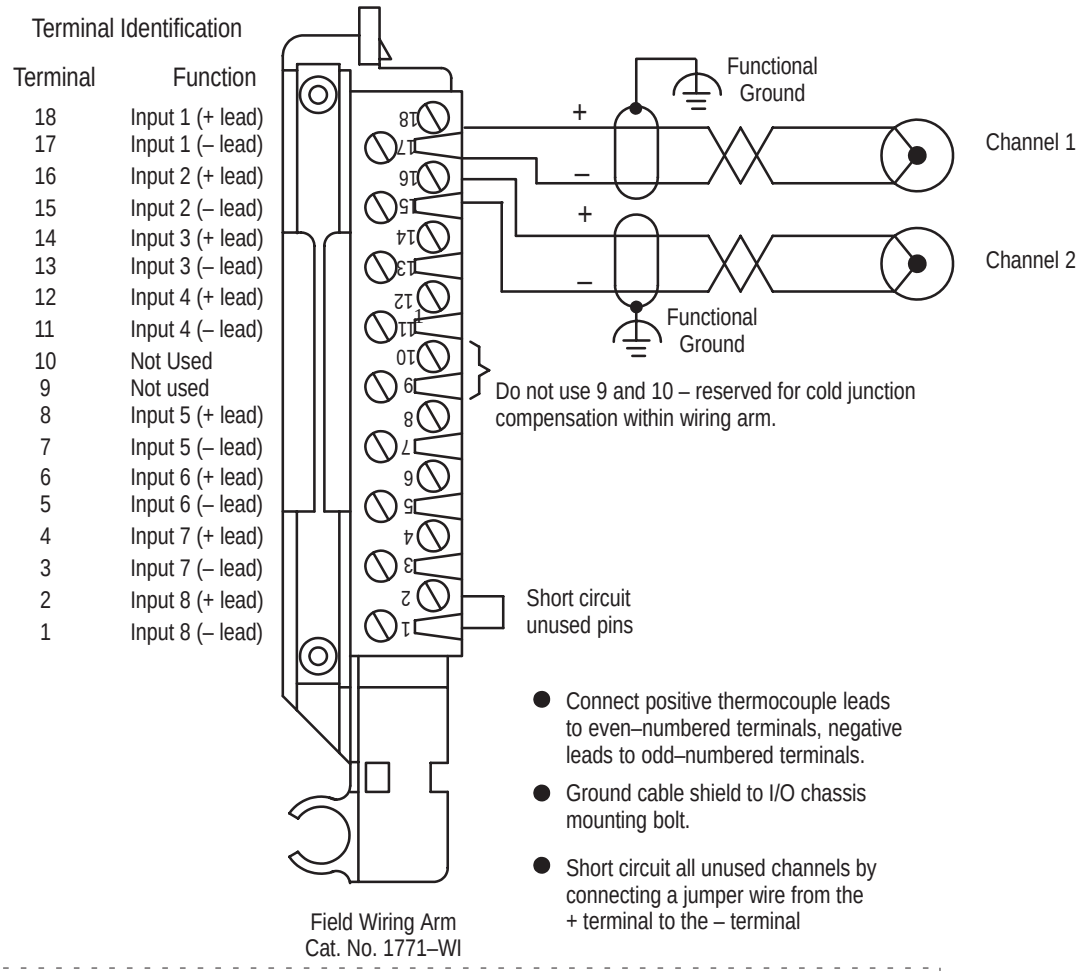
Connect Wiring to the Field Wiring Arm

Connect your I/O devices to the field wiring arm (cat. no. 1771-WI) 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.

Connection Diagram for the High Resolution Thermocouple/mV Input Module (cat. no. 1771-IXHR/D)



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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Ground the Chassis and Module

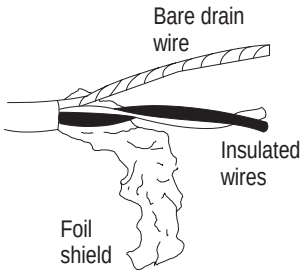
Use the following diagrams to ground your I/O chassis and input module. Follow these steps to prepare the cable:

1 Remove a length of cable jacket from the Belden 8761 cable (mV) or shielded thermocouple wire.



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.

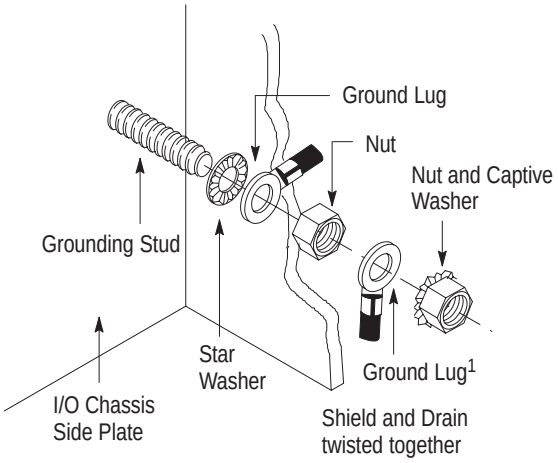


When using shielded cable wire, ground the foil shield and drain wire only at one end of the cable. We recommend that you wrap the foil shield and drain wire together and connect them to a chassis mounting bolt.
At the opposite end of the cable, tape exposed shield and drain wire with electrical tape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

Refer to Wiring and Grounding Guidelines, publication 1770-4.1 for additional information.

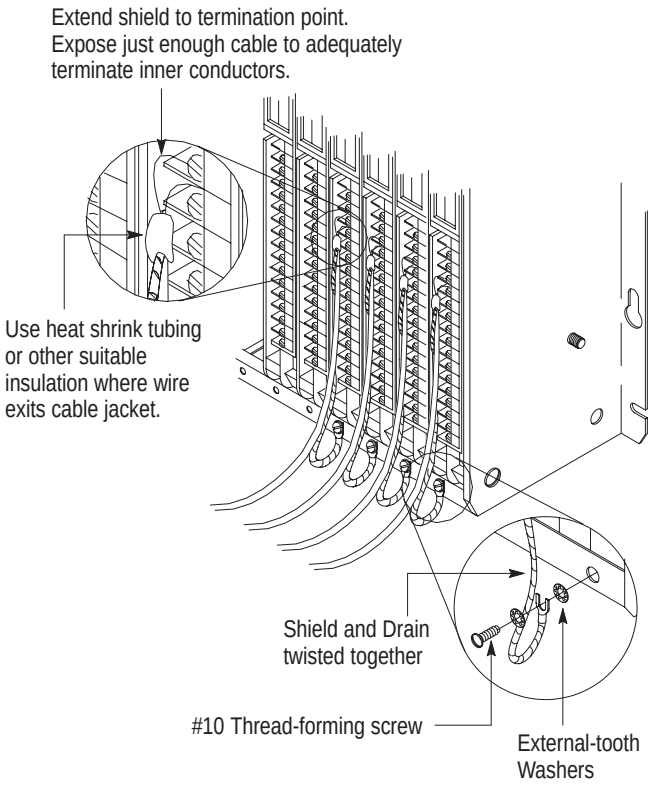
Chassis Ground

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.



[1]Use the cup washer if crimp-on lugs are not used.

Single-point Grounding



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Configure the Module

Use the configuration information below to configure your module to your specifications.For detailed configuration information, see chapter 5 of your *High Resolution Thermocouple/mV Input Module User Manual* (publication 1771-6.5.131).

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	Sample time							T	Z	E	Type			Type			
0.1s	0	0	0	0	1	0	0				0	0	0	0	0	0	Millivolt input
0.5s	0	0	1	0	1	0	0				1	1	1	1	1	1	“B” thermocouple
0.6s	0	0	1	1	0	0	0				0	0	1	0	0	1	“E” thermocouple
0.7s	0	0	1	1	1	0	0				0	1	0	0	1	0	“J” thermocouple
0.8s	0	1	0	0	0	0	0				0	1	1	0	1	1	“K” thermocouple
0.9s	0	1	0	0	1	0	0				1	0	1	1	0	1	“R” thermocouple
1.0s	0	1	0	1	0	0	0				1	1	0	1	1	0	“S” thermocouple
1.5s	0	1	1	1	1	0	0				1	0	0	1	0	0	“T” thermocouple
2.0s	1	0	1	0	0	0	0										
2.5s	1	1	0	0	1	0	0										
3.0s	1	1	1	1	0	0	0										

Real time sample interval bits - determine the sample time for updating module inputs. You select sample time in 0.025 second intervals using binary code. (All values between 0.025 and 3.1 seconds in 0.025 second intervals are available.) **Important:** Use decimally addressed bit locations for PLC-5 processors.

Temperature scale bit (T) - when set (1), reports temperature in ^{0}F; when reset (0), in ^{0}C. The module ignores this bit for millivolt inputs.

(Bits 00-02) Input type codes for inputs 1 thru 8 (or 1 thru 4 if bit 06 is set to 1) - tells the module what type of input device you connected to the module. See table above.

(Bits 03-05) Input type codes for inputs 5 thru 8 (bit 06 must be set to 1) - tells the module what type of input device you connected to inputs 5 thru 8. See table above.

Enable bit for input types (E) - 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 bit 03–05 defines input type for channels 5–8.

Zoom enable (Z) - Enables X10 magnification when millivolt inputs have been selected. Enabling this feature causes the BTR data to display ±30.000mV around the value selected by word 2. Use the digital filter (word 3) to stabilize the readings when using this mode. 0 = normal 10μV; 1 = X10 (1μV)

2	Zoom value for group 2 (channels 5-8)	Zoom value for group 1 (channels 1-4)	Zoom values
	Zoom center value for channels 1–8. These values are used when millivolt inputs have been selected and bit 07 of word 1 has been set to enable zoom (i.e. 1μV display resolution). Enter a value in 2’s complement binary format ranging from –70mV to +70mV. The displayed range will then be ±30.000mV around the selected value, displayed in 1μV increments.		
3	Filter value for group 2 (channels 5-8)	Filter value for group 1 (channels 1-4)	Filter values
	Filter values for channels 1–8. The filter operates on the display data only. Alarms, underrange and overrange operate in real time. The filter constant is equal to: TC = 0.025(1 + filter value).		
4, 6, 8, 10, 12, 14, 16, 18	Low Alarm Values for channels 1-8		Low channel alarm values
5, 7, 9, 11, 13, 15, 17, 19	High Alarm Values for channels 1-8		High channel alarm values
	Low and High channel alarm values that you enter via the terminal in 2’s complementary binary. 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. Alarms are disabled by setting the low alarm equal to the high alarm. If the zoom feature is enabled, the alarm values should be the difference between the ”actual alarm limit” and ”zoom center value” in word 2.		
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 08–15) for offset correction, the low byte (bits 00–07) for gain correction for each channel.		Channel 1-8 calibration values
28	**Auto-calibration Request Word -** Used to automatically calibrate selected channels and save the calibration constants in EEPROM.		Auto-calibration Request Word

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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	Not used								EE	DCB	HCJ	LCJ		RTS	OR	PU	Diagnostics

EEPROM status bit – (EE) calibration values could not be read.

Dynamic clamp bit - (DCB) Prevents rapid changes in data due to data corruption over the opto–isolation barrier as a result of ESD, radiation bursts, etc.
0 = feature active
1 = feature inhibited

High cold junction temperature bit - (HCJ) set when the cold junction temperature exceeds 60.0°C or 140.0°F.

Low cold junction temperature bit - (LCJ) set when the cold junction temperature is less than 0.0°C or 32.0°F.

Power up bit – (PU) set to indicate that the module is waiting for its first write block transfer.

Out of range bit – (OR) set if one or more channel inputs are above or below the range for which you configured the module.

Real time sample fault bit – (RTS) 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.

Octal Bits	17	16	15	14	13	12	11	10	07	06	05	04	03	02	01	00	Description
2	Inputs overrange								Inputs underrange								Inputs overrange and underrange for channels 1-8
	Underrange bit for each channel is set to indicate an input is out of range: bit 00 for channel 1 thru bit 07 for channel 8. **Overrange bit** for each channel is set to indicate an input is out of range: bit 08 for channel 1 thru bit 15 for channel 8. Also set for open channel detection.																
3	Inputs > high alarms								Inputs < low alarms								High and low alarms for channels 1-8
	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 (BTW word 4, 6, 8, 10, 12, 14, 16, or 18): bit 00 for channel 1 thru bit 07 for channel 8. **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 (BTW word 5, 7, 9, 11, 13, 15, 17, or 19): bit 08 for channel 1 thru bit 15 for channel 8.																
4, 5, 6, 7, 8, 9, 10, 11	Input for channels 1-8 respectively in 0.1°C or 0.1°F resolution for temperature and 10µV or 1µV resolution for millivolts.																Input for channels 1-8
12	Cold junction temperature is provided in 0.1°C or 0.1°F resolution. The filter time constant (Tau) for this value is fixed at 6.4 seconds.																Cold Junction Temperature in °C or °F
13	Uncalibrated channel bits								CF	EE	Not used			S	G	O	Auto-calibration word

Calibration fault bit

EEPROM fault bit

Offset calibration complete bit

Gain calibration complete bit

Save to EEPROM bit

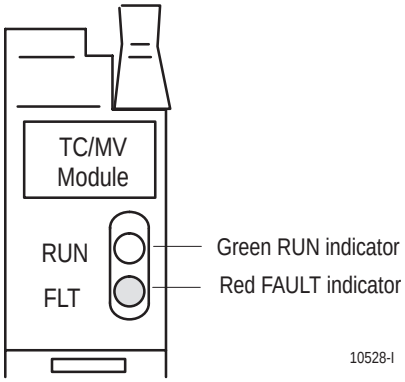
Default Configuration

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

- millivolt input
- zoom center = 0mV
- temperature reported in degrees Celsius
- real time sampling (RTS) inhibited
- no filtering
- no auto-calibration

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Interpret Status Indicators



The front panel of the input module contains a green RUN indicator and a red FAULT indicator. At power-up, the module momentarily turns on both indicators 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.

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



For detailed troubleshooting information, see chapter 7 of your *High Resolution Thermocouple/Millivolt Input Module User Manual* (publication 1771-6.5.131).

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

Indicators	Probable Cause	Recommended Action
RUN (green) off FLT (red) off	No power to module	Check power to I/O chassis. Cycle as necessary.
	Possible short on module	Replace module.
	LED driver failure	
RUN (green) on FLT (red) on	Microprocessor, oscillator or EPROM failure	
RUN (green) off FLT (red) on	If immediately after power–up, indicates RAM or EPROM failure.[1]	
	If during operation, indicates possible microprocessor or backplane interface failure.[1]	
RUN (green) blinking, FLT (red) off	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.
RUN (green) on FLT (red) off	Normal operation	None

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

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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.

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Specifications

Description	Value
Number of Inputs	8, all of the same type or 4 each of 2 different types
Module Location	1771 I/O chassis – 1 module slot
Type of Input (Selectable)	Type B, Pt–30% Rh/Pt–6% Rh (320 to 1800°C) Type E, chromel/constantan (–270 to 1000°C) Type J, iron/constantan (–210 to 1200°C) Type K, chromel/alumel (–270 to 1380°C) Type R, Pt/Pt–13% Rh (–50 to 1770°C) Type S, Pt/Pt–10% Rh (–50 to 1770°C) Type T, copper/constantan (–270 to 400°C) Millivolt (–100 to +100mV dc)
Thermocouple Linearization	IPTS–68 standard, NBS MN–125
Cold Junction Compensation	Range: 0 to 60°C Accuracy: ±0.5°C
Temperature Scale (Selectable)	°C or °F
Input Resolution	3.2328µV
Display Resolution	0.1°C, 0.1°F; or 1.0µV, 10µV
Isolation Voltage	This isolation meets or exceeds the requirements of UL Standard 508, and CSA Standard C22.2 No. 142.
Common Mode Rejection	120dB at 60Hz, up to 1000V peak
Common Mode Impedance	Greater than 10 megohms
Normal Mode Rejection	60dB at 60Hz over ±100mV
Input Overvoltage Protection	120V rms, continuous
Open Input Detection	Open input produces an overrange in less than 10 seconds
Data Format	2's complement binary
Calibration Methods	Auto – Auto-calibration for offset and gain Manual – Zero offset and gain adjustment for each channel via programming terminal Verify every six months for maintaining absolute accuracy
Processor Compatibility	PLC-3 or PLC-5 family processor using the 1771 I/O structure and block transfer. (Not recommended for use with PLC-2 family processors.)
Backplane Power Consumption	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)
Keying	Between 20 and 22 Between 24 and 26
Specifications continued on next page	

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Description		Value
Conductors	Wiring	Use Belden 8761 shielded twisted pair for mV Use thermocouple manufacturer recommended shielded thermocouple wire for all thermocouple inputs.
	Category	2
Field Wiring Arm		Cat. No. 1771-WI
Wiring Arm Screw Torque		7-9 inch-pounds
Agency Certification (when product 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 1771-6.5.80

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

Differences Between Series A, Series B and Series C Modules

The Series B and C versions of the High Resolution Thermocouple/Millivolt module have CE certification. In all other respects, the modules are equal.

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Allen-Bradley Headquarters, 1201 South Second Street, Milwaukee, WI 53204 USA, Tel: (1) 414 382-2000 Fax: (1) 414 382-4444

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