



RTD Input Module (Catalog Number 1771-IR Series C)

Contents



This icon is used when additional information is available in the *RTD Input Module User Manual*, publication 1771-6.5.76.

If you need a copy of this manual, fax the enclosed User Manual Request Card to 1-800-576-6340. If you are outside the U.S., fax the card to 1-330-723-4036.

Use this document as a guide when installing the 1771-IR/C input module.

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Prevent Electrostatic Discharge

The RTD 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

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:

Publication	Publication number
<i>Industrial Automation Wiring and Grounding Guidelines For Noise Immunity</i>	1770-4.1
<i>Guidelines for Handling Lithium Batteries</i>	AG-5.4
<i>Automation Systems Catalog</i>	B111

Understand Product Compatibility

The 1771-IR/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-IR/C	8	8	8/9	14/15	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.

Calculate Power Requirements

The module receives its power through the 1771 I/O power supply. The maximum current drawn by the RTD module is 950mA (4.75 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

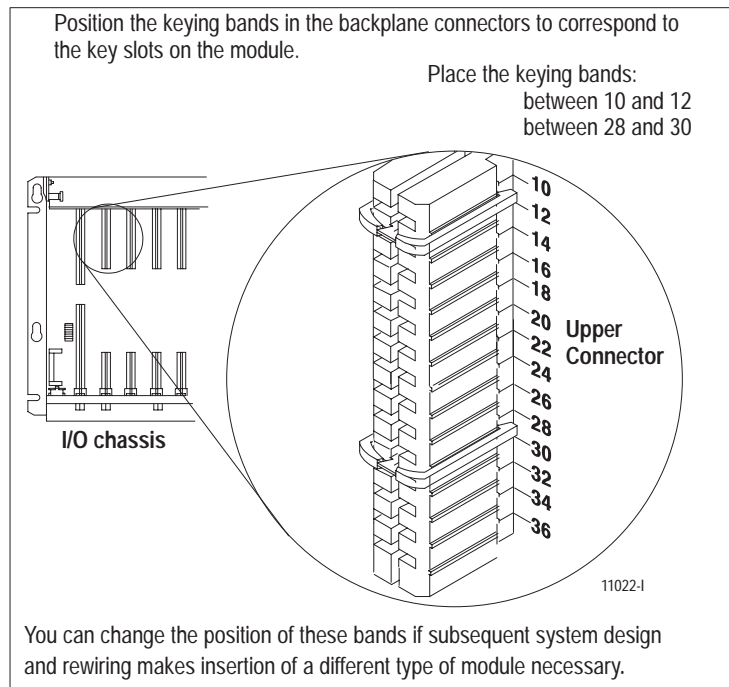
Place your module in any slot in the chassis except the leftmost slot which is reserved for processors or adapters.



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.



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:

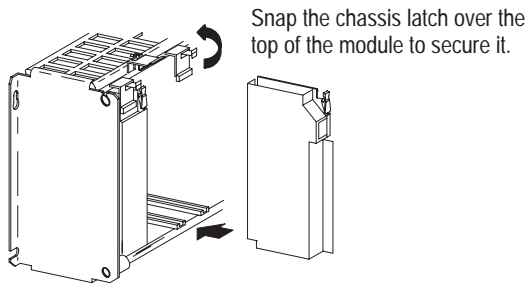
- module damage
- degradation of performance
- injury or equipment damage due to possible unexpected operation

1

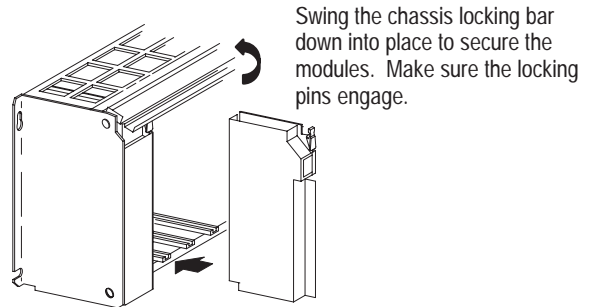
Place the module in the card guides on the top and bottom of the chassis that guide the module into position.

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

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



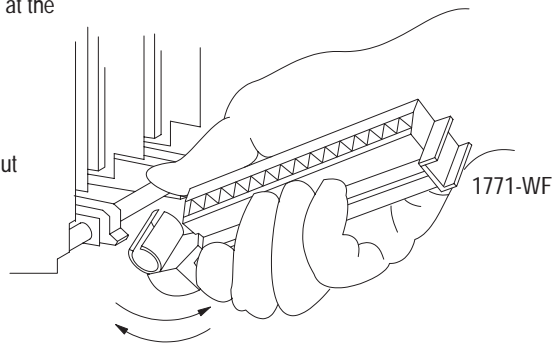
1771-A1B, -A2B, -A4B Series B I/O chassis



2

Attach the wiring arm (1771-WF) 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.



Connect Wiring to the Field Wiring Arm

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

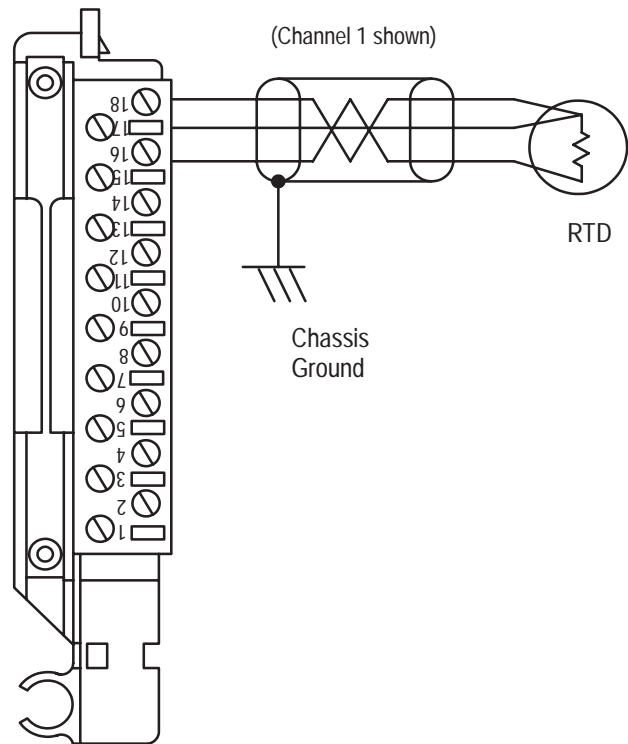


ATTENTION: Remove power from the 1771 I/O chassis backplane and field wiring arm before removing or installing an I/O module.

- 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 RTD Input Module (1771-IR/C)

Channel	Terminal Identification	
	Terminal No.	Label
1	18	C
	17	B
	16	A
2	15	C
	14	B
	13	A
3	12	C
	11	B
	10	A
4	9	C
	8	B
	7	A
5	6	C
	5	B
	4	A
6	3	C
	2	B
	1	A



Field Wiring Arm
Cat. No. 1771-WF

11846-1

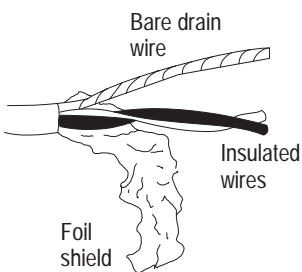
Ground the Chassis and Module

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.



- 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.

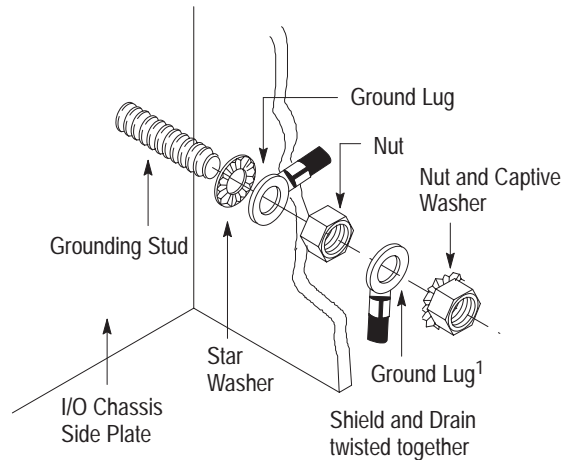


When using shielded cable wire, ground the foil shield and drain wire only at one end of the cable. We recommend that you wrap the foil shield and drain wire together and connect them to a chassis mounting bolt. At the opposite end of the cable, tape exposed shield and drain wire with electrical tape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

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

Chassis Ground

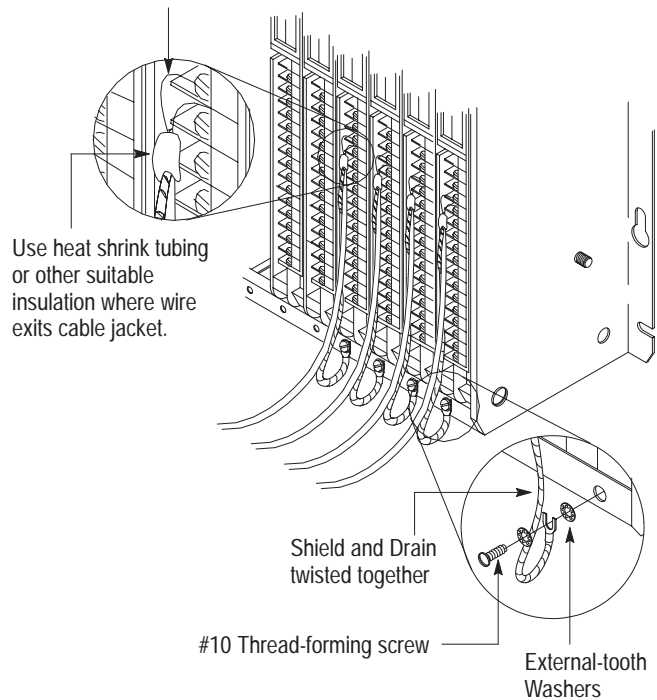
When you connect grounding conductors to the I/O chassis grounding stud, place a star washer under the first lug, then place a nut with captive lock washer on top of each ground lug.



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

Single-point Grounding

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



Configure the Module

Use the configuration information below to configure your module to your specifications.



For detailed configuration information, see chapter 5 of your *RTD Input Module User Manual* (publication 1771-6.5.76).

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	Real Time Sampling - default = no RTS					Data Format	RTD Type	Units of Measure	Single channel in ohms								Real time sampling, data format, RTD type units of measure, and single channel in ohms																											
No RTS (50ms)	0	0	0	0	0	<p>If any of these bits are set, the corresponding input channel will be reported in ohms. If RTDs other than 10 ohm copper or 100 ohm platinum are used you must report those channels in ohms, not degrees. Data format on a channel displayed in ohms will default to binary.</p> <p>Determines what units of measure the module reports.</p> <p>In temperature mode: 0 = Entire module is platinum 1 = Entire module is 10 ohm copper. Enter exact value in word 2.</p> <p>In ohms mode: 0 = 30mohm/count resolution 1 = 10mohm/count resolution</p> <table border="1"> <thead> <tr> <th>Units of measure</th> <th>Bit 07</th> <th>Bit 06</th> </tr> </thead> <tbody> <tr> <td>Degrees C</td> <td>0</td> <td>0</td> </tr> <tr> <td>Degrees F</td> <td>0</td> <td>1</td> </tr> <tr> <td>Ohms</td> <td>1</td> <td>0</td> </tr> <tr> <td>Not used</td> <td>1</td> <td>1</td> </tr> </tbody> </table>	Units of measure	Bit 07	Bit 06	Degrees C	0	0	Degrees F	0	1	Ohms	1	0	Not used	1	1	<table border="1"> <thead> <tr> <th>Bit 10</th> <th>Bit 09</th> <th>Set to match your processor.</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>0</td> <td>BCD (default)</td> </tr> <tr> <td>0</td> <td>1</td> <td>Reserved</td> </tr> <tr> <td>1</td> <td>0</td> <td>Two's complement binary</td> </tr> <tr> <td>1</td> <td>1</td> <td>Signed magnitude binary</td> </tr> </tbody> </table>								Bit 10	Bit 09	Set to match your processor.	0	0	BCD (default)	0	1	Reserved	1	0	Two's complement binary	1	1	Signed magnitude binary
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0.3s	0	0	0	1	1																																							
0.4s	0	0	1	0	0																																							
0.5s	0	0	1	0	1																																							
0.6s	0	0	1	1	0																																							
0.7s	0	0	1	1	1																																							
0.8s	0	1	0	0	0																																							
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1.0s	0	1	0	1	0																																							
1.5s	0	1	1	1	1																																							
2.0s	1	0	1	0	0																																							
2.5s	1	1	0	0	1																																							
3.0s	1	1	1	1	0																																							
3.1s	1	1	1	1	1																																							

Important: Use decimally addressed bit locations for PLC-5 processors.

2	If bit 10 is set in word 1, and temperature readings are desired, word 2 must also be used. Enter the exact resistance of 10 ohm RTD at 25°C in BCD. Range is 9.00 to 11.00 ohms. Values less than 9.00 ohms or greater than 11.00 ohms will default to 10.00 ohms. Non-BCD values will also default to 10.00 ohms.										10 ohm resistance @ 25°C	
3, 4, 5, 6, 7, 8	Individual channel bias - entered in BCD. This value is subtracted from the channel data in the BTR. The bias value is always a positive number. Bias value range is 0≤bias≤9999.										Channel 1-6 bias	
9, 10, 11, 12, 13, 14, 15	Channel 1-6 calibration										Individual channel calibration	
15	Not used	Channel failed calibration	FC	EE	Not used	S	G	O	auto-calibration request word			
		Faulty calibration (no save)	↑	EEPROM fault	↑	Save complete	↑	Gain calibration complete	↑	Offset calibration complete	↑	

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		RTS	Channel overrange						EE	PU	Channel underrange						

Real time sample fault bit – (RTS) Real time sample time-out bit.

Ovrange bits for each channel. set when the input is above the normal operating range. Bit 10 for input 1, bit 11 for input 2, etc.

Underrange bits for each channel; set when input is below the normal operating range for copper or platinum RTD. Bit 00 for input 1, bit 01 for input 2, etc.

Power up bit – (PU) Set when the module is alive but not yet configured.

EEPROM status bit – (EE) This bit is set if EEPROM values could not be read.

2	Not used	Channel Polarity	Not Used	Channel overflow	Channel overflow, channel polarity				
<p>Channel overflow – When set, indicate that default bias has been subtracted from the input value. Only the remainder is shown in the data word. Bit 00 for input 1, bit 01 for input 2, etc. Default bias is automatically applied when BCD formatted data cannot be displayed. This will occur when measuring temperatures in Fahrenheit larger than 999.9 degrees. The default bias value which is subtracted is 1000.0.</p> <p>Channel Polarity – Sign bits for each channel. When set indicate that a certain input is negative. Bit 10 corresponds to input 1, bit 11 to input 2, etc. These bits are used for BCD and signed magnitude data formats.</p>									
3, 4, 5, 6, 7, 8	Channel 1-6 Data – Input data words for each channel. Word 3 to channel 1, word 4 to channel 2, etc. The data words must be multiplied or divided by a factor if whole numbers need to be displayed. See table below.				Channel 1-6 Data				
	If		Then						
	you are reading temperature in °F or °C		there is an implied decimal point (XXX.X) after the least significant digit. Resolution is 0.1°.						
	you are reading resistance in milliohms (copper RTDs) (BTW word 1, bit 10 = 1)		there is an implied decimal point (XXX.XX).						
	you are reading resistance in milliohms (all other RTDs) (BTW word 1, bit 10 = 0)		multiply the data word by 30 to get the actual value in milliohms. Resolution is 30 milliohms.						
9	Not used	Channel failed calibration	FC	EE	Not used	S	G	O	Auto-calibration status

Faulty calibration (no save)

EEPROM fault

Offset calibration complete

Gain calibration complete

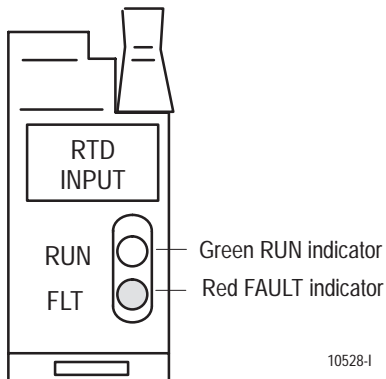
Save complete

Default Configuration

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

- BCD data format
- 100 ohm platinum RTD
- temperature in degrees C
- real time sampling (RTS) = inhibited (sample time = 50ms)

Interpret Status Indicators



The front panel of the RTD 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



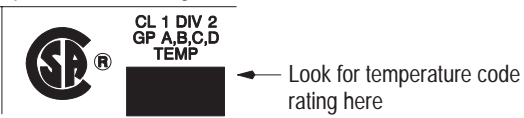
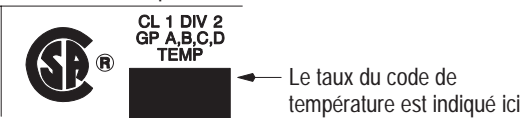




For detailed troubleshooting information, see chapter 8 of your *RTD Input Module User Manual* (publication 1771-6.5.76).

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. Recycle as necessary.
	Possible short	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	Replace module.
	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.	Check ladder logic program. If correct, 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.

CSA Hazardous Location Approval	Approbation d'utilisation dans des emplacements dangereux par la CSA
<p>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.</p>	<p>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.</p>
<p>Example of the CSA certification product label</p> 	<p>Exemple d'étiquette de certification d'un produit par la CSA</p> 
<p>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.</p> <ul style="list-style-type: none"> • 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. 	<p>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.</p> <ul style="list-style-type: none"> • 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.
<p>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.</p>	<p>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.</p>
<p>Temperature code rating</p> 	<p>Taux du code de température</p> 
<p>The following warnings apply to products having CSA certification for use in hazardous locations.</p>	<p>Les avertissements suivants s'appliquent aux produits ayant la certification CSA pour leur utilisation dans des emplacements dangereux.</p>
 <p>ATTENTION: Explosion hazard —</p> <ul style="list-style-type: none"> • 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. 	 <p>AVERTISSEMENT: Risque d'explosion —</p> <ul style="list-style-type: none"> • La substitution de composants peut rendre ce matériel inacceptable pour les emplacements de Classe I, Division 2. • Couper le courant ou s'assurer que l'emplacement est désigné non dangereux avant de remplacer les composants. • 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.

Specifications

Description	Value
Number of Inputs	6 RTD input channels
Module Location	1771 I/O Chassis
Sensor Type	100 ohm platinum (alpha = 0.00385) or 10 ohm copper (alpha = 0.00386) Other types may be used with report in ohms only
Units of measure	Temperature in °C Temperature in °F RTD resistance in ohms (10milliohms or 30milliohms resolution)
Temperature Range	Platinum: -200 to +870°C (-328 to 1598°F) Copper: -200 to +260°C (-328 to +500°F)
Resistance Range	1.00 to 600.00 ohms
Resolution	Platinum: 0.1°C (0.1°F) Copper: 0.3°C (0.5°F)
Sensor Excitation	1mA constant current source supplied by module
Common Mode Rejection	120db @ 60Hz up to 1000V peak
Common Mode Impedance	Greater than 10 megohms
Normal Mode Rejection	60db @ 60Hz
Input Overvoltage Protection	120V rms continuous
Open RTD Response Time	Open excitation (terminal A) to overrange: <0.5sec Open common (terminal C) to underrange: <0.5sec Open sense (terminal B): drift high
Scan Time	50ms for 6 channels
Isolation Voltage	This isolation meets or exceeds the requirements of UL Standard 508, and CSA Standard C22.2 No. 142.
Backplane Current	950mA at 5V
Power Dissipation	4.75W maximum
Thermal Dissipation	16.2 BTU/hr
Environmental Conditions Operating Temperature: Rate of Change: Storage Temperature: Relative Humidity: Operating Storage	0 to 60°C (32 to 140°F) Ambient changes greater than 1.0°C/minute may temporarily degrade performance during periods of change. -40 to 85°C (-40 to 185°F) 5 to 95% noncondensing 5 to 95% noncondensing
Keying	Between 10 and 12 Between 28 and 30
Field Wiring Arm	Cat. No. 1771-WF
Wiring Arm Screw Torque	7-9 inch-pounds
Specifications continued on next page	

Description	Value
Agency Certification (when product or packaging is marked)	<ul style="list-style-type: none"> • CSA certified • CSA Class I, Division 2, Groups A, B, C, D certified • UL listed • CE marked for all applicable directives
User Manual	Publication 1771-6.5.76

Differences Between Series A, Series B and Series C Modules

Major differences between series of the 1771-IR RTD Input module are shown below.

Description	Series A	Series B and C
Use of Data Table	8 in; 8 out; 8 read words, 14 write words	8 in; 8 out; 9 read words, 15 write words
Resistance Range	18.4 to 400.00 ohms	1.00 to 600.00 ohms
Common Mode Impedance	<50 megohms shunted by <4700pF	Greater than 10 megohms
Input Overvoltage Protection	40V rms continuous	120V rms continuous
Scan Time	50ms for 6 channels	50ms for 6 channels
Real Time Sampling	None	50ms to 3.1s
Auto-Calibration	None	Yes – Uses Block Transfer Write word 15
Open RTD Response Time	None	Open excitation (terminal A) to overrange: <0.5sec Open common (terminal C) to underrange: <0.5sec Open sense (terminal B): drift high
Power Dissipation	5.0W maximum	4.75W maximum
Thermal Dissipation	15.0 BTU/hr	16.2 BTU/hr
Agency Certification (when product or packaging is marked)	<ul style="list-style-type: none"> • CSA certified • CSA Class I, Division 2, Groups A, B, C, D certified • UL listed 	<ul style="list-style-type: none"> • CSA certified • CSA Class I, Division 2, Groups A, B, C, D certified • UL listed • CE marked for all applicable directives



Allen-Bradley, a Rockwell Automation Business, has been helping its customers improve productivity and quality for more than 90 years. We design, manufacture and support a broad range of automation products worldwide. They include logic processors, power and motion control devices, operator interfaces, sensors and a variety of software. Rockwell is one of the world's leading technology companies.



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