



**SPECTRUM**  
C O N T R O L S

An **Allied Motion** Company

User's Manual Pub. 0300241-03 Rev. A

# 1769 6-Channel Isolated RTD/ Resistance Input Module

Catalog Number: 1769sc-IR6I, 1769sc-IR6IK



SILVER  
**Technology Partner**

A ROCKWELL AUTOMATION PARTNER

## Important Notes

1. Please read all the information in this owner's guide before installing the product.
2. The information in this owner's guide applies to hardware Series A and firmware version 1.00 or later.
3. This guide assumes that the reader has a full working knowledge of the relevant processor.

### Notice

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## Preface

<p><b>NOTE</b></p> 	<p>This is a re-issue of an existing manual, with some corrections, and updated Certification information.</p>
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Read this preface to familiarize yourself with the rest of the manual. This preface covers the following topics:

- Who should use this manual
- How to use this manual
- Related documentation
- Technical support
- Documentation
- Conventions used in this manual

### Who Should Use This Manual

Use this manual if you are responsible for designing, installing, programming, or troubleshooting control systems that use Allen-Bradley Compact™ I/O and/or compatible controllers, such as MicroLogix 1500 or CompactLogix.

### How to Use This Manual

As much as possible, we organized this manual to explain, in a task-by-task manner, how to install, configure, program, operate and troubleshoot a control system using the 1769sc-IR6I/1769sc-IR6K.

### Related Documentation

The table below provides a listing of publications that contain important information about Allen-Bradley PLC systems.

For	Refer to this Document	Allen-Bradley Pub. No.
User instructions	MicroLogix™ 1500 User Manual	1764-UM001A
Product information	1769 Compact Discrete Input/Output Modules Product Data	1769-2.1
Overview of MicroLogix 1500 system	MicroLogix™ 1500 System Overview	1764-SO001B
Overview of Compact IO system	Compact™ I/O System Overview	1769-SO001A

For	Refer to this Document	Allen-Bradley Pub. No.
User Instructions	CompactLogix User Manual	1769-UM007B
Wiring and grounding information	Allen-Bradley Programmable Controller Grounding and Wiring Guidelines	1770-4.1

## Technical Support

For technical support, please contact your local Rockwell Automation TechConnect Office for all Spectrum products. Contact numbers are as follows:

- USA 1-440-646-6900
- United Kingdom 01-908-635-230
- Australia 1-800-809-929
- Mexico 001-888-365-8677
- Brazil 55-11-3618-8800
- Europe +49-211-41553-63

or send an email to [support@spectrumcontrols.com](mailto:support@spectrumcontrols.com)


## Documentation


If you would like a manual, you can download a free electronic version from the Internet at [www.spectrumcontrols.com](http://www.spectrumcontrols.com)

## Conventions Used in This Manual

The following conventions are used throughout this manual:

- Bulleted lists (like this one) provide information not procedural steps.
- lists provide sequential steps or hierarchical information.
- *Italic* type is used for emphasis.
- Bold type identifies headings and sub-headings.

<b>WARNING</b> 	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. These messages help you to identify a hazard, avoid a hazard, and recognize the consequences.
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<b>ATTENTION</b> 	Actions ou situations risquant d'entraîner des blessures pouvant être mortelles, des dégâts matériels ou des pertes financières. Les messages « Attention » vous aident à identifier un danger, à éviter ce danger et en discerner les conséquences.
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**NOTE**

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



# Chapter 1

## Module Overview

This chapter describes the 1769sc-IR6I and the conformally coated 176sc-IF6IK Isolated RTD/Resistance input modules and explains how the controller reads resistance temperature detector (RTD) or direct resistance-initiated analog input data from the modules. Other than the conformal coating, both modules are identical so all information applicable to the 1769sc-IR6I also applies to the K version. The following section covers:

- The module's hardware and diagnostic features.
- An overview of system and module operation.
- Compatibility.

### Section 1.1 General Description

The 1769sc-IR6I (isolated RTD/Resistance input) module supports RTD and direct resistance signal measurement applications that require up to six channels. The module digitally converts analog data, and then stores the converted data in its image table.

The module supports connections from any combination of up to six input devices. Each channel is individually configurable via software for 2- or 3-wire RTD or direct resistance input devices. Channels are compatible with 4-wire sensors, but the fourth sense wire is not used. Two programmable excitation current values (0 to 42 mA and 1.0 mA) are provided, to limit RTD self-heating. When configured for RTD inputs, the module can convert the RTD readings into linearized digital temperature readings in °C or °F. When configured for resistance analog inputs, the module can convert voltages into linearized resistance values in ohms. The module assumes that the direct resistance input signal is linear prior to input to the module.

Each channel provides open-circuit (all wires), short-circuit (all wires work – resistance ranges don't apply), and over- and under-range detection and indication.

#### NOTE



The module accepts input from RTDs with up to 3 wires. If your application requires a 4-wire RTD, one of the two lead compensation wires is not used, and the RTD is treated like a 3-wire sensor. The third wire provides lead wire compensation. See Chapter 2, Installation and Wiring, for more information.

## Section 1.2

### RTD/Resistance Inputs and Ranges

The table below lists the RTD and resistance types and their associated full-scale ranges, supported by the IR6I module.

**Table 1-1. RTD/Resistance Input Ranges**

Input Type	Input Range	
	° Celsius	° Fahrenheit
Pt 385	-200 to +850	-328 to 1562
Pt 3916	-200 to +630	-328 to 1166
10 Cu 426	-100 to +260	-148 to 500
100 Ni 618	-100 to +260	-148 to 500
120 Ni 672	-80 to +260	-112 to 500
604 NiFe 518	-100 to +200	-148 to 392
150 $\Omega$	0 to +1500	
500 $\Omega$	0 to +500	
1000 $\Omega$	0 to +1000	
3000 $\Omega$	0 to +3000	

## Section 1.3

### Data Formats

The data can be configured on board each module as:

- Engineering units  $\times$  1
- Engineering units  $\times$  10
- Scaled-for-PID
- Percent of full scale
- Raw/proportional data

## Section 1.4

### Filter Frequencies

The module uses a digital filter that provides high frequency noise rejection for the input signals. The filter is programmable, allowing you to select from six different filter frequencies for each channel:

- 4.17 Hz
- 10 Hz
- 16.7 Hz
- 19.6 Hz
- 62 Hz
- 470 Hz

## Section 1.5 Hardware Features

The Isolated RTD/resistance module contains a removable terminal block (spare part number 1769-RTBN18) providing connections for six 3-wire inputs for any combination of RTD and resistance input devices. Channels are wired as differential inputs.

Module configuration is normally done via the controller's programming software. In addition, some controllers support configuration via the user program. In either case, the module configuration is stored in the memory of the controller. Refer to your controller's user manual for more information.

### 1.5.1 General Diagnostic Features

The module contains a diagnostic LED that helps you identify the source of problems that may occur during power-up or during normal channel operation. The LED indicates both status and power. Power-up and channel diagnostics are explained in Chapter 4, Diagnostics and Troubleshooting.

## Section 1.6 System Overview

The modules communicate to the controller through the bus interface. The modules also receive 5 and 24 VDC power through the bus interface.

### 1.6.1 Module Power-Up

At power-up, the module performs a check of its internal circuits, memory, and basic functions. During this time, the module status LED remains off. If no faults are found during power-up diagnostics, the module status LED is turned on.

After power-up checks are complete, the module waits for valid channel configuration data. If an invalid configuration is detected, the module generates a configuration error. Once a channel is properly configured and enabled, it continuously converts the RTD or resistance input to a value within the range selected for that channel.

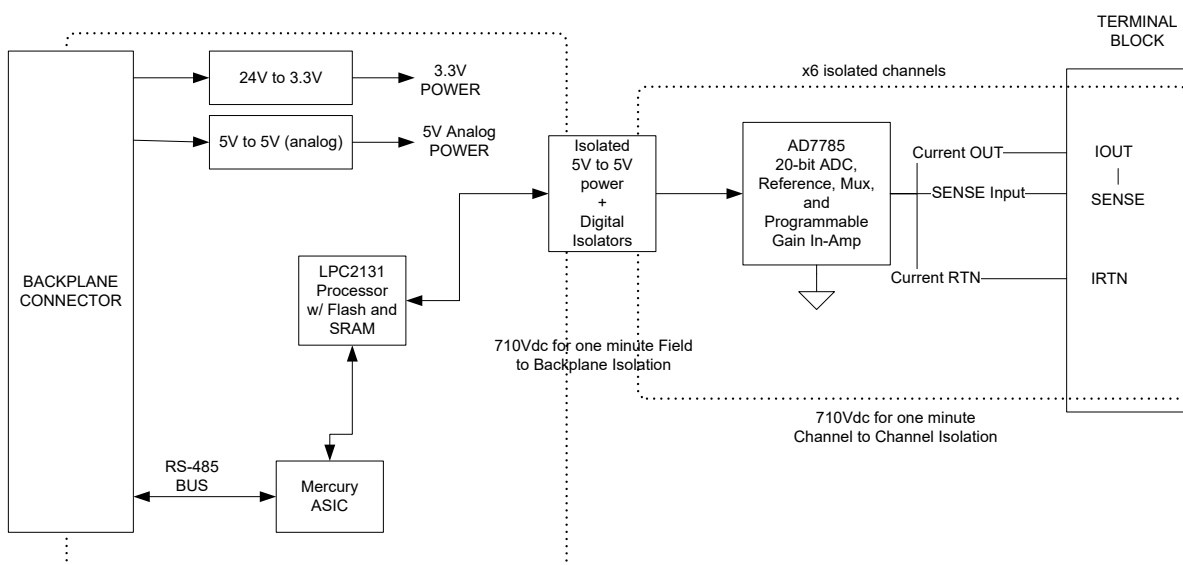
Each time a channel is read by the input module, that data value is tested by the module for an over-range, under-range, open-circuit, or "input data not valid" condition. If such a condition is detected, a unique bit is set in the channel status word. The channel status word is described in the Input Data File section in Chapter 3.

Using the module image table, the controller reads the two's complement binary converted RTD or resistance data from the module. This typically occurs at the end of the program scan or when commanded by the control program. If the controller and the module determine that the data transfer has been made without error, the data is used in the control program.

### 1.6.2 Module Operation

As shown in the block diagram below, each input channel of the module consists of an RTD/resistance connection that accepts excitation current (that is, current out); a sense connection that detects lead wire resistance; and a return

connection. Each channel has an A/D converter that reads the RTD or resistance value and the lead wire resistance.



From the readings taken by the converter, the module returns an accurate temperature or resistance to the controller user program through the microprocessor. The module uses two bidirectional serial ports for communication, each using an optocoupler for isolation. A third optocoupler is used to reset the microprocessor if the module detects a loss of communication.

# Chapter 2

## Installation and Wiring

### Section 2.1 Before you Begin

This chapter covers:

- Tools and Equipment
- Compliance to European Union directives
- Power requirements
- General considerations
- Mounting

### Section 2.2 Required Tools and Equipment

You need the following tools and equipment:

- Medium blade or cross-head screwdriver
- RTD or direct resistance input device
- Shielded, twisted-pair cable for wiring (Belden™ 9501 or equivalent)
- Controller (for example, a MicroLogix™ 1500 or CompactLogix™ controller)
- Programming device and software (for example, RSLogix 500™ or RSLogix 5000™)

### Section 2.3 Compliance to European Union Directives

This product is approved for installation within the European Union and EEA regions. It has been designed and tested to meet the following directives.

#### 2.3.1 EMC Directive

The 1769sc-IR6I module is tested to meet Council Directive 2014/30/EU Electromagnetic Compatibility (EMC) and the following standards, in whole or in part, documented in a technical construction file:

- EN 61131-2 Programmable controllers, Part 2 - Equipment requirements and tests.
- EN 61000-6-2 Electromagnetic compatibility (EMC) – Part 6-2: Generic standards – Immunity standard for industrial environments.
- EN 61000-6-4 Electromagnetic compatibility (EMC) – Part 6-4: Generic standards – Emission standard for industrial environments.

## UKCA Electromagnetic Compatibility Regulations 2016

- BS EN 61131-2, BS EN 61000-6-4, BS EN 61000-6-2

## Section 2.4

### Power Requirements

The module receives power through the bus interface from the +5 VDC/+24 VDC system power supply. The maximum current drawn by the module is shown in the table below:

5 VDC	24 VDC
190 mA	35 mA

The system power supply may be a 1769-PA2, -PB2, -PA4, -PB4, or the internal supply of the MicroLogix 1500 packaged controller. The module cannot be located more than 8 modules away from the system power supply.

## Section 2.5

### General Considerations

Compact I/O is suitable for use in an industrial environment when installed in accordance with these instructions. Specifically, this equipment is intended for use in clean, dry environments (Pollution degree 2<sup>1</sup>) and to circuits not exceeding Over Voltage Category II<sup>2</sup> (IEC 60664-1)<sup>3</sup>

### 2.5.1 Hazardous Location Considerations


This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D or non-hazardous locations only. Operating temperature code T5 is assumed. The following WARNING statement applies to use in hazardous locations.

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<sup>1</sup> Pollution Degree 2 is an environment where, normally, only non-conductive pollution occurs except that occasionally a temporary conductivity caused by condensation shall be expected.

<sup>2</sup> Over Voltage Category II is the load-level section of the electrical distribution system. At this level, transient voltages are controlled and do not exceed the impulse voltage capability of the product's insulation.


<sup>3</sup> . Pollution Degree 2 and Over Voltage Category II are International Electrotechnical Commission (IEC) designations.

<p><b>WARNING</b></p> 	<p><b>EXPLOSION HAZARD</b></p> <ul style="list-style-type: none"> <li>• Substitution of components may impair suitability for Class I, Division 2. Do not replace components or disconnect equipment unless power has been switched off or the area is known to be non-hazardous.</li> <li>• Do not connect or disconnect components unless power has been switched off or the area is known to be non-hazardous.</li> <li>• Device shall be installed in an enclosure which can only be opened with the use of a tool.</li> <li>• All wiring must comply with N.E.C. article 501-4(b), 502-4(b), or 503-3(b), as appropriate for Class I, Class II, and Class III equipment.</li> </ul>
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### 2.5.2 Prevent Electrostatic Discharge

<p><b>WARNING</b></p> 	<p>Electrostatic discharge can damage integrated circuits or semiconductors if you touch analog I/O module bus connector pins or the terminal block on the input module. Follow these guidelines when you handle the module:</p> <ul style="list-style-type: none"> <li>• Touch a grounded object to discharge static potential.</li> <li>• Wear an approved wrist-strap grounding device.</li> <li>• Do not touch the bus connector or connector pins.</li> <li>• Do not touch circuit components inside the module.</li> <li>• If available, use a static-safe workstation.</li> <li>• When it is not in use, keep the module in its static-shield bag.</li> </ul>
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### 2.5.3 Remove Power

<p><b>WARNING</b></p> 	<p>Remove power before removing or inserting this module. When you remove, or insert, a module with power applied, an electrical arc may occur. An electrical arc can cause personal injury or property damage by:</p> <ul style="list-style-type: none"> <li>• Sending an erroneous signal to your system's field devices, causing unintended machine motion.</li> <li>• Causing an explosion in a hazardous environment.</li> <li>• Causing an electrical arc. Such arcing causes excessive wear to contacts on both the module and its mating connector and may lead to premature failure.</li> </ul>
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### 2.5.4 Selecting a Location

#### Reducing Noise

Most applications require installation in an industrial enclosure to reduce the effects of electrical interference. Analog inputs are highly susceptible to electrical noise. Electrical noise coupled to the analog inputs will reduce the performance (accuracy) of the module.

Group your modules to minimize adverse effects from radiated electrical noise and heat. Consider the following conditions when selecting a location for the analog module. Position the module:

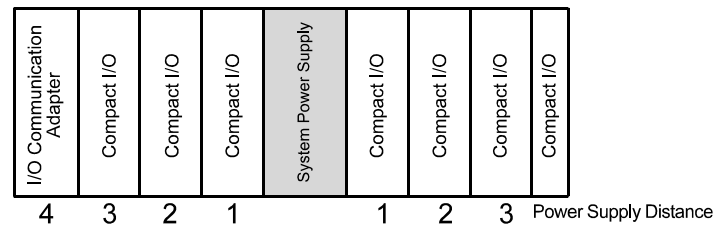
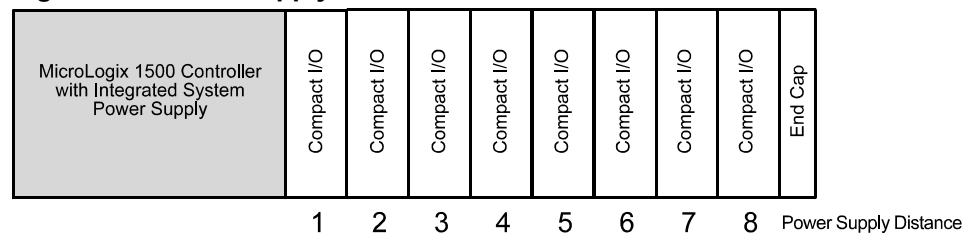
- Away from sources of electrical noise such as hard-contact switches, relays, and AC motor drives
- Away from modules which generate significant radiated heat, such as the 1769-IA16. Refer to the module's heat dissipation specification.

In addition, route shielded, twisted-pair analog input wiring away from any high voltage I/O wiring.

### Power Supply Distance


You can install as many modules as your power supply can support. However, all 1769 I/O modules have power supply distance ratings. The maximum I/O module rating is 8, which means that a module may not be located more than 8 modules away from the system power supply.

**Figure 2-1. Power Supply Distance**





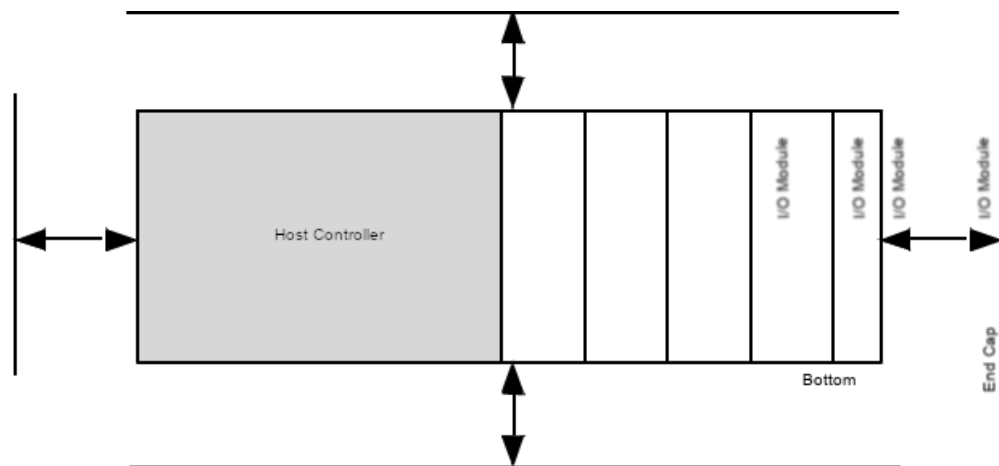
## Section 2.6 Mounting

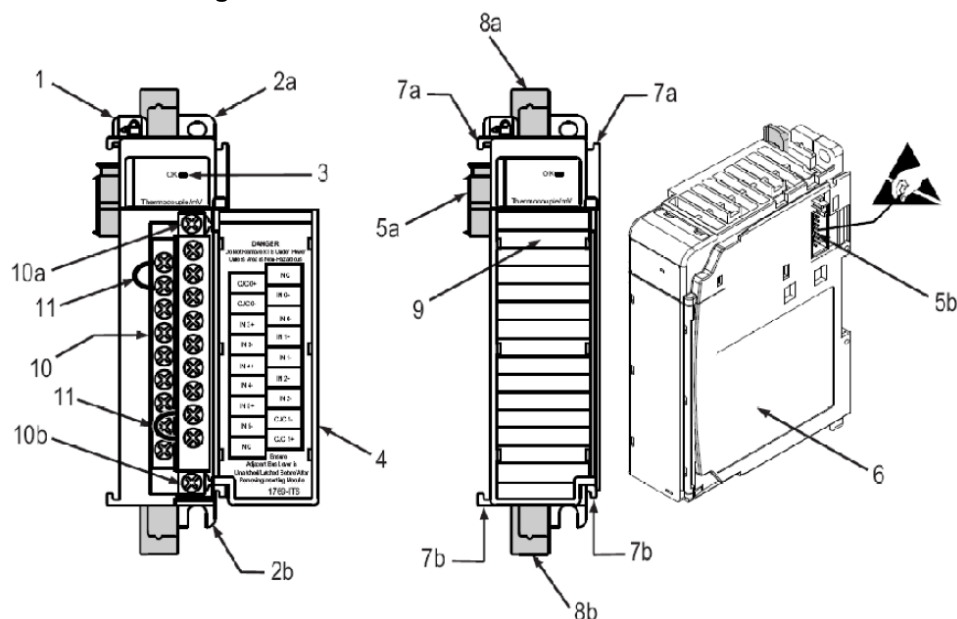
<b>WARNING</b> 	<p>Keeping module free of debris and avoiding overheating:</p> <ul style="list-style-type: none"><li>• Do not remove protective debris strip until after the module and all other equipment near the module is mounted and the wiring is complete.</li><li>• Once wiring is complete, and the module is free of debris, carefully remove protective strip.</li><li>• Failure to remove strip before operating can cause overheating.</li></ul>
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### 2.6.1 Minimum Spacing

Maintain spacing from enclosure walls, wire ways, adjacent equipment, etc. Allow 50.8 mm (2 in.) of space on all sides for adequate ventilation, as shown:

**Figure 2-2. Minimum Spacing**



**Figure 2-3. Module Parts List**

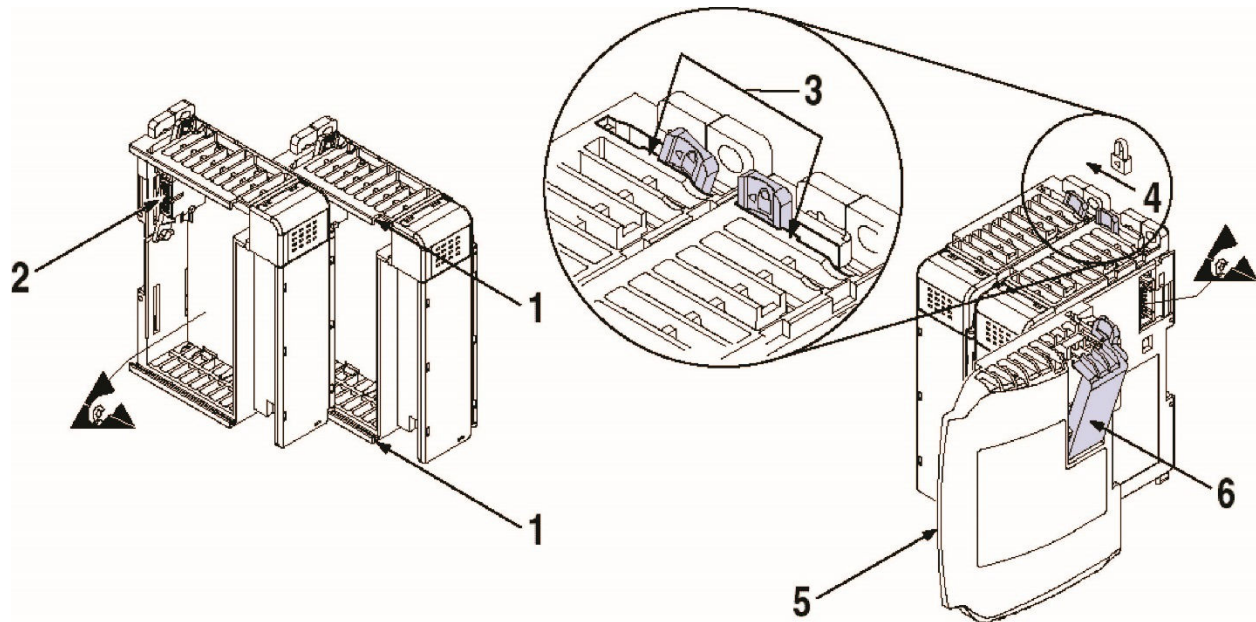
Item	Description
1	Bus lever
2a	Upper panel mounting tab
2b	Lower panel mounting tab
3	Module status LED
4	Module door with terminal identification label
5a	Movable bus connector (bus interface) with female pins
5b	Stationary bus connector (bus interface) with male pins
6	Nameplate label
7a	Upper tongue-and-groove slots
7b	Lower tongue-and-groove slots
8a	Upper DIN rail latch
8b	Lower DIN rail latch
9	Write-on label for user identification tags
10	Removable terminal block (RTB) with finger-safe cover
10a	RTB upper retaining screw
10b	RTB lower retaining screw
11	CJC sensors

## Section 2.7 System Assembly

The module can be attached to the controller or an adjacent I/O module before or after mounting. For mounting instructions, see Panel Mounting Using the Dimensional Template below, or DIN Rail Mounting. To work with a system that is already mounted, see Replacing a Single Module within a System.

The following procedure shows you how to assemble the Compact I/O system.

**Figure 2-4. Module Assembly**




1. Disconnect power.
2. Check that the bus lever of the module to be installed is in the unlocked (fully right) position.

### NOTE




If the module is being installed to the left of an existing module, check that the right-side adjacent module's bus lever is in the unlocked (fully right) position.


3. Use the upper and lower tongue-and-groove slots (1) to secure the modules together (or to a controller).
4. Move the module back along the tongue-and-groove slots until the bus connectors (2) line up with each other.
5. Push the bus lever back slightly to clear the positioning tab (3). Use your fingers or a small screwdriver.
6. To allow communication between the controller and module, move the bus lever fully to the left (4) until it clicks. Ensure it is locked firmly in place.

<b>WARNING</b> 	When attaching I/O modules, it is very important that the bus connectors are securely locked together to ensure proper electrical connection.
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7. Attach an end cap terminator (5) to the last module in the system by using the tongue-and-groove slots as before.
8. Lock the end cap bus terminator (6).

<b>WARNING</b> 	A 1769-ECR or 1769-ECL right or left end cap respectively must be used to terminate the end of the 1769 communication bus.
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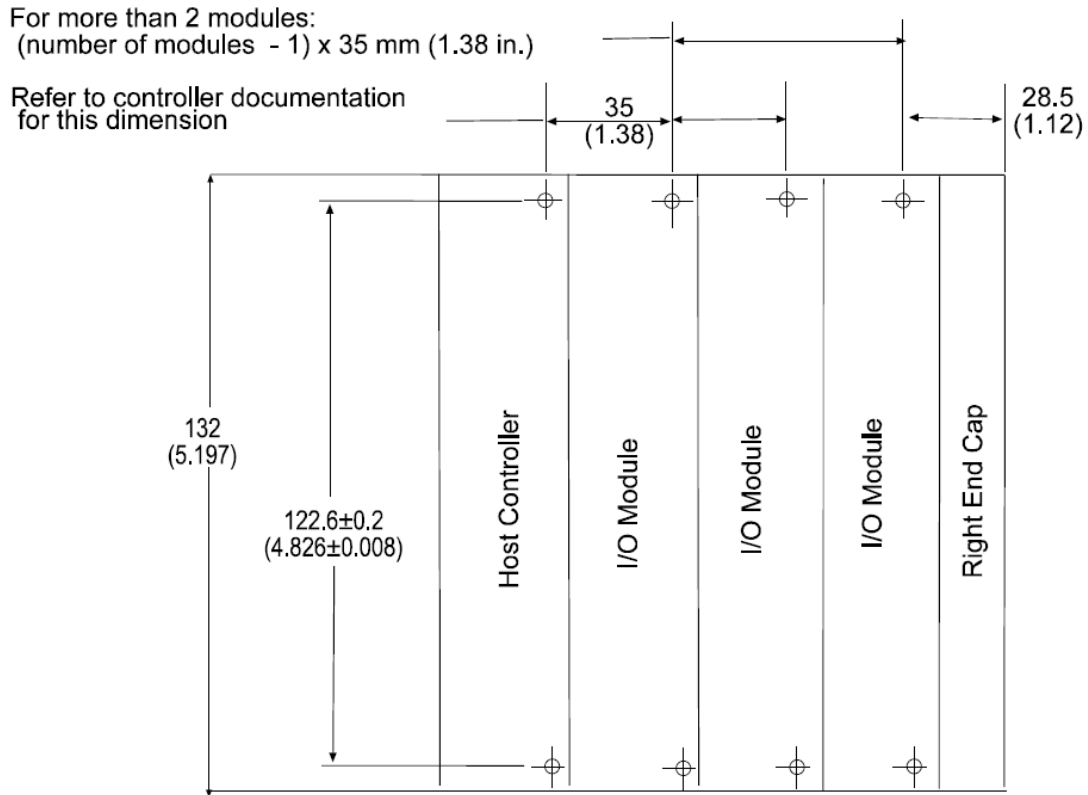
### 2.7.1 Panel Mounting

<b>WARNING</b> 	During panel or DIN rail mounting of all devices, be sure that all debris (metal chips, wire strands, etc.) is kept from falling into the module. Debris that falls into the module could cause damage at power up.
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Mount the module to a panel using two screws per module. Use M4 or #8 pan head screws. Mounting screws are required on every module.

## Panel Mounting Using the Dimensional Template

**Figure 2-5. Dimensional Template**



## Panel Mounting Procedure Using Modules as a Template

The following procedure allows you to use the assembled modules as a template for drilling holes in the panel. If you have sophisticated panel mounting equipment, you can use the dimensional template provided. Due to module mounting hole tolerance, it is important to follow these procedures:

1. On a clean work surface, assemble no more than three modules.
2. Using the assembled modules as a template, carefully mark the center of all module-mounting holes on the panel.
3. Return the assembled modules to the clean work surface, including any previously mounted modules.
4. Drill and tap the mounting holes for the recommended M4 or #8 screw.
5. Place the modules back on the panel, and check for proper hole alignment.
6. Attach the modules to the panel using the mounting screws.

### NOTE



If mounting more modules, mount only the last one of this group and put the others aside. This reduces remounting time during drilling and tapping of the next group.

7. Repeat steps 1 to 6 for any remaining modules.

### DIN Rail Mounting

The module can be mounted using the following DIN rails:

- 35 × 7.5 mm (EN 50 022 – 35 × 7.5)
- 35 × 15 mm (EN 50 022 - 35 × 15)

Before mounting the module on a DIN rail, close the DIN rail latches. Press the DIN rail mounting area of the module against the DIN rail. The latches will momentarily open and lock into place.

### 2.7.2 Replacing a Single Module within a System

The module can be replaced while the system is mounted to a panel (or DIN rail). Follow these steps in order:

1. Remove power. See important note at the beginning of this chapter.
2. On the module to be removed, remove the upper and lower mounting screws from the module (or open the DIN latches using a flat-blade or Phillips head screwdriver).
3. Move the bus lever to the right to disconnect (unlock) the bus.
4. On the right-side adjacent module, move its bus lever to the right (unlock) to disconnect it from the module to be removed.
5. Gently slide the disconnected module forward. If you feel excessive resistance, check that the module has been disconnected from the bus, and that both mounting screws have been removed (or DIN latches opened).

#### NOTE



It may be necessary to rock the module slightly from front to back to remove it, or, in a panel-mounted system, to loosen the screws of adjacent modules.

6. Before installing the replacement module, be sure that the bus lever on the module to be installed and on the right-side adjacent module or end cap are in the unlocked (fully right) position.
7. Slide the replacement module into the open slot.
8. Connect the modules together by locking (fully left) the bus levers on the replacement module and the right-side adjacent module.
9. Replace the mounting screws (or snap the module onto the DIN rail).

## Section 2.8 Field Wiring Connections

### 2.8.1 System Wiring Guidelines

Consider the following when wiring your system:

- Channels are isolated from one another by ±500 VDC maximum.
- As a general rule, allow at least 15.2 cm (6 in.) of separation for every 120 V of power.

- Routing field wiring in a grounded conduit can reduce electrical noise.
- If field wiring must cross AC or power cables, ensure that they cross at right angles.
- To ensure optimum accuracy, limit overall cable impedance by keeping your cable as short as possible. Locate the I/O system as close to your sensors or actuators as your application will permit.
- Route field wiring away from any other wiring and as far as possible from sources of electrical noise, such as motors, transformers, contactors, and AC devices.
- Tighten terminal screws with care. Excessive tightening can strip a screw.

### Shield Grounding

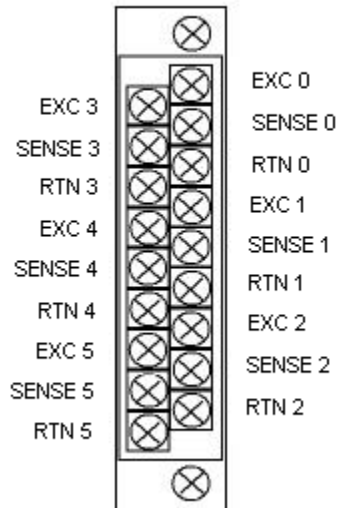
- This product is intended to be mounted to a well-grounded mounting surface such as a metal panel. Additional grounding connections from the module's mounting tabs or DIN rail (if used) are not required unless the mounting surface cannot be grounded.
- Keep cable shield connections to ground as short as possible.
- Use Belden shielded, twisted-pair wire to ensure proper operation and high immunity to electrical noise. Refer to the following table and the RTD Wiring Considerations below.

Configuration	Recommended Cable
2-wire	Belden™ 9501 or equivalent
3-wire Less than 30.38 m (100 ft.)	Belden™ 9533 or equivalent
3-wire Greater than 30.48 m (100 ft.) or high humidity conditions	Belden™ 83503 or equivalent

- Under normal conditions, the drain wire and shield junction should be connected to earth ground, via a panel or DIN rail mounting screw at the 1769sc-IR6I module end.
- If noise persists for a device, try grounding the opposite end of the cable. (You can only ground one end at a time.)  
Refer to Industrial Automation Wiring and Grounding Guidelines, Allen-Bradley publication 1770-4.1, for additional information.
- Ground the shield drain wire at one end only. The preferred location is as follows.
  - If it is necessary to connect the shield drain wire at the module end, connect it to earth ground using a panel or DIN rail mounting screw.
  - Refer to Industrial Automation Wiring and Grounding Guidelines, Allen-Bradley publication 1770-4.1, for additional information.

## 2.8.2 RTD Wiring Considerations

1769sc-IR6I Terminal Block



Since the operating principle of the RTD module is based on the measurement of resistance, take special care when selecting your input cable. For 2-wire or 3-wire configurations, select a cable that has a consistent impedance throughout its entire length.

### NOTE



The RTD module requires three wires to compensate for lead resistance error. We recommend that you do not use 2-wire RTDs if long cable runs are required, as it reduces the accuracy of the system. However, if a two-wire configuration is required, reduce the effect of the lead wire resistance by using a lower gauge wire for the cable (for example, use AWG #16 instead of AWG #24). The module's terminal block accepts two AWG #14-gauge wires.

When using a 3-wire configuration, the module compensates for resistance error due to lead wire length. For example, in a 3-wire configuration, the module reads the resistance due to the length of one of the wires and assumes that the resistance of the other wire is equal. If the resistances of the individual lead wires are much different, an error may exist. The closer the resistance values are to each other, the greater the amount of error that is eliminated.

### NOTE



To ensure temperature or resistance value accuracy, the resistance difference of the cable lead wires must be equal to or less than  $0.01\Omega$ .

To ensure that the lead values match as closely as possible:

- Keep lead resistance as small as possible and less than  $25\Omega$ .
- Use quality cable that has a small tolerance impedance rating, and consistent impedance throughout its length.



- Use a heavy-gauge lead wire which has less resistance per foot.

### Terminal Door Label

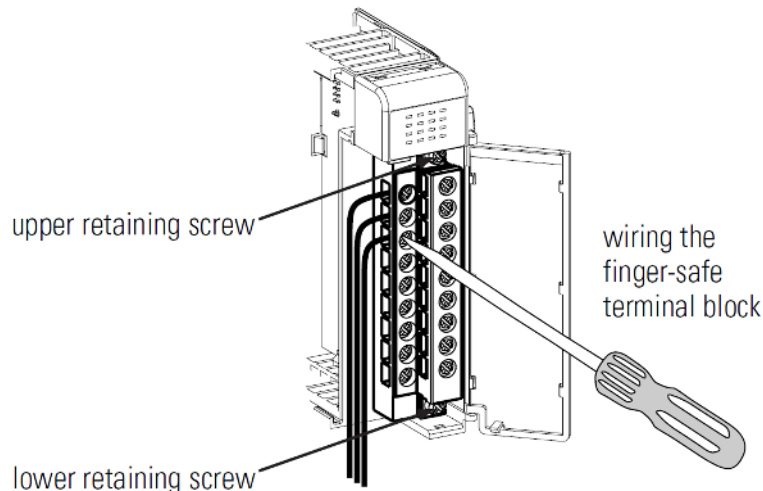
A removable, write-on label is provided with the module. Remove the label from the door, mark your unique identification of each terminal with permanent ink, and slide the label back into the door. Your markings (ID tag) will be visible when the module door is closed.

### Removing and Replacing the Terminal Block

When wiring the module, you do not have to remove the terminal block. If you remove the terminal block, use the write-on label located on the side of the terminal block to identify the module location and type.




To remove the terminal block, loosen the upper and lower retaining screws. The terminal block will back away from the module as you remove the screws. Be careful not to damage the CJC sensors. When replacing the terminal block, torque the retaining screws to 0.46 Nm (4.1 in-lbs).




### 2.8.3 Wiring the Finger Safe Terminal Block

When wiring the terminal block, keep the finger-safe cover in place:

1. Loosen the terminal screws to be wired.
2. Route the wire under the terminal pressure plate. You can use the bare wire or a spade lug. The terminals accept a 6.35 mm (0.25 in.) spade lug.

<p><b>NOTE</b></p> 	<p>The terminal screws are non-captive. Therefore, it is possible to use a ring lug [maximum ¼-inch o.d. with a 0.139-inch minimum i.d. (M3.5)] with the module.</p>
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3. Tighten the terminal screw making sure the pressure plate secures the wire. Recommended torque when tightening terminal screws is 0.68 Nm (6 in-lbs).


<p><b>NOTE</b></p> 	<p>If you need to remove the finger-safe cover, insert a screwdriver into one of the square wiring holes and gently pry the cover off. If you wire the terminal block with the finger-safe cover removed, you may not be able to put it back on the terminal block because the wires will be in the way.</p>
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### Wire Size and Terminal Screw Torque

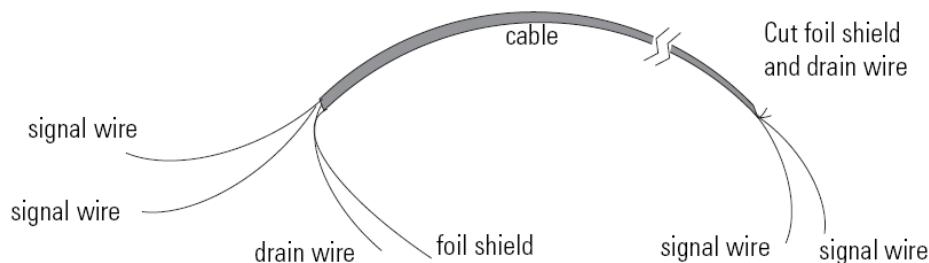
Each terminal accepts up to two wires with the following restrictions:

Wire Type	Wire Size	Terminal Screw Torque	Retaining Screw Torque
Solid Cu-90 °C (194 °F)	#14 to #22 AWG (1.63 to 0.65 mm)	0.68 Nm (6 in-lbs)	0.46 Nm (4.1 in-lbs)
Stranded Cu-90 °C (194 °F)	#16 to #22 AW (1.29 to 0.65 mm)	0.68 Nm (6 in-lbs)	0.46 Nm (4.1 in-lbs)

### 2.8.4 Wiring the Module

<p><b>WARNING</b></p> 	<p><b>SHOCK HAZARD</b></p> <p>To prevent shock hazard, care should be taken when wiring the module to analog signal sources. Before wiring any module, disconnect power from the system power supply and from any other source to the module.</p>
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After the module is properly installed, follow the wiring procedure below, using the Belden 8761 cable.



To wire your module follow these steps.

1. At each end of the cable, strip some casing to expose the individual wires.

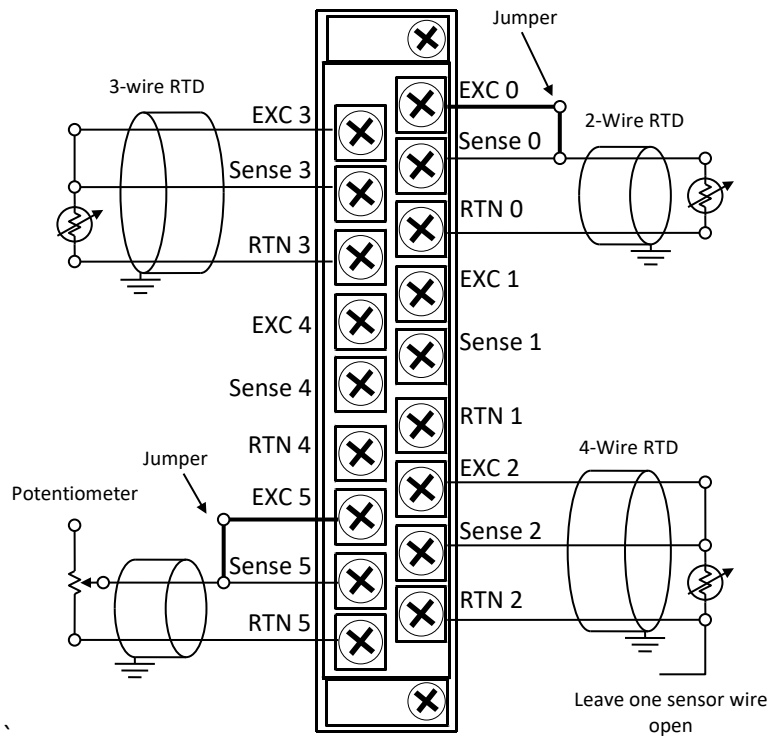
2. Trim the signal wires to 2-inch (5 cm) lengths. Strip about 3/16-inch (5 mm) of insulation away to expose the end of the wire.

**WARNING****HAZARD OF DAMAGE TO EQUIPMENT**

Be careful when stripping wires. Wire fragments that fall into a module could cause damage at power up.

3. At one end of the cable, twist the drain wire and foil shield together, bend them away from the cable, and apply shrink wrap. Then earth ground at the preferred location based on the type of sensor you are using. See Grounding earlier in this section.
4. At the other end of the cable, cut the drain wire and foil shield back to the cable and apply shrink wrap.
5. Connect the signal wires to the terminal block. Connect the other end of the cable to the analog input device.
6. Repeat steps 1 through 5 for each channel on the module.

**Figure 2-1. Wiring Diagram**



## Section 2.9 Calibration

The isolated RTD/resistance module is initially calibrated at the factory. The module must be returned to the factory for calibration.

### 2.9.1 Perform the Startup Procedure

1. Apply power to the controller system.
2. Download your program, which contains the module configuration settings, to the controller.
3. Put the controller in Run mode. During a normal start-up, the module status LED turns on.

**NOTE**

If the module status LED does not turn on, cycle power. If the condition persists, contact your local distributor or Spectrum Controls for assistance.

### 2.9.2 Monitor Module Status to Check if the Module is Operating Correctly

Module and channel configuration errors are reported to the controller. These errors are typically reported in the controller's I/O status file. Channel status data is also reported in the module's input data table, so these bits can be used in your control program to flag a channel error.

# Chapter 3

## Module Data, Status, and Channel Configuration

After installing the 1769sc-IR6I Isolated RTD/Resistance Input Module, you must configure it for operation, usually using the programming software compatible with the controller (for example, RSLogix 500 or RSLogix 5000). Once configuration is complete and reflected in the ladder logic, you need to operate the module and verify its configuration.

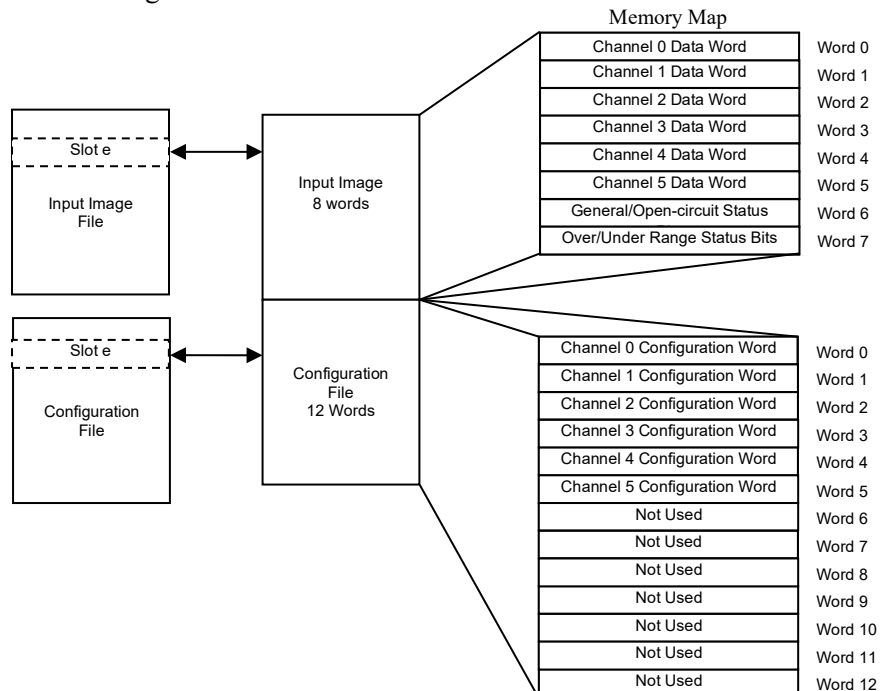
This chapter contains information on the following:

- Module memory map
- Configuring channels
- Accessing input image file data

### Section 3.1

#### Module Memory Map

The module uses eight input words for data and status bits (input image), and seven configuration words.



#### NOTE



Not all controllers support program access to the configuration file. Refer to your controller's user manual.

## Section 3.2 Configuring Channels

After module installation, you must configure operation details, such as RTD type, temperature units, etc., for each channel. Channel configuration data for the module is stored in the controller configuration file, which is both readable and writable.

The configuration data file is shown below. Bit definitions are provided in Channel Configuration, below. Detailed definitions of each of the configuration parameters follow the table.

### 3.2.1 Configuration Data File

The default value of the configuration data is represented by zeros in the data file. The structure of the channel configuration file is shown below.

**Table 3-1. Configuration Data File**

Word/ Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	Disable Channel 0	Data Format Channel 0			Input Type Channel 0				Temp Units Channel 0	Open Circuit Response Channel 0		Cyclic Lead Compensation Ch0	Not Used	ADC Filter Frequency Channel 0		
1	Disable Channel 1	Data Format Channel 1			Input Type Channel 1				Temp Units Channel 1	Open Circuit Response Channel 1		Cyclic Lead Compensation Ch1	Not Used	ADC Filter Frequency Channel 1		
2	Disable Channel 2	Data Format Channel 2			Input Type Channel 2				Temp Units Channel 2	Open Circuit Response Channel 2		Cyclic Lead Compensation Ch2	Not Used	ADC Filter Frequency Channel 2		
3	Disable Channel 3	Data Format Channel 3			Input Type Channel 3				Temp Units Channel 3	Open Circuit Response Channel 3		Cyclic Lead Compensation Ch3	Not Used	ADC Filter Frequency Channel 3		
4	Disable Channel 4	Data Format Channel 4			Input Type Channel 4				Temp Units Channel 4	Open Circuit Response Channel 4		Cyclic Lead Compensation Ch4	Not Used	ADC Filter Frequency Channel 4		
5	Disable Channel 5	Data Format Channel 5			Input Type Channel 5				Temp Units Channel 5	Open Circuit Response Channel 5		Cyclic Lead Compensation Ch5	Not Used	ADC Filter Frequency Channel 5		
6	Not Used															
7	Not Used															
8	Not Used															
9	Not Used															
10	Not Used															
11	Not Used															

Word/ Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
12	Not Used															
13	Not Used															
14	Not Used															
15	Not Used															

The configuration file can also be modified through the control program, if supported by the controller. For information on configuring the module using RSLogix 500 (with MicroLogix 1500 controller), see Appendix B; for RSLogix 5000 (CompactLogix controller), see Appendix C; for RSNetwork (1769-ADN), see Appendix D. The structure and bit settings are shown in the section below.

### 3.2.2 Channel Configuration

Each channel configuration word consists of bit fields, the settings of which determine how the channel operates. See the table below and the descriptions that follow for valid configuration settings and their meanings.

**Table 3-2. Channel Configuration**

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Filter Frequency																
4.17 Hz														1	1	0
10 Hz														0	0	0
16.7 Hz														0	0	1
19.6 Hz														0	1	1
62 Hz														1	0	0
470 Hz														1	0	1
Unused													0			
Cyclic Lead Compensation																
Enable												0				
Disable												1				
Open Circuit																
Upscale										0	0					
Downscale										0	1					
Last State										1	0					
Zero										1	1					
Temp Units																
Degrees C									0							
Degrees F									1							

Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Input Type																
100 Pt 385					0	0	0	0								
200 Pt 385					0	0	0	1								
500 Pt 385					0	0	1	0								
1000 Pt 385					0	0	1	1								
100 Pt 3916					0	1	0	0								
200 Pt 3916					0	1	0	1								
500 Pt 3916					0	1	1	0								
1000 Pt 3916					0	1	1	1								
10 Cu 426					1	0	0	0								
100 Ni 618					1	0	0	1								
120 Ni 672					1	0	1	0								
604 NiFe 518					1	0	1	1								
150Ω					1	1	0	0								
500Ω					1	1	0	1								
1000Ω					1	1	1	0								
3000Ω					1	1	1	1								
Data Format																
Raw/Proportional Data		0	0	0												
Engineering Units		0	0	1												
Engineering Units ×10		1	0	0												
Scaled for PID		0	1	0												
Percent Range		0	1	1												
Chan. Enable																
Enable	0															
Disable	1															

**NOTE**

Default settings for a particular function are indicated by zero(s). For example, the default filter frequency is 10 Hz.

### 3.2.3 Enabling or Disabling a Channel (Bit 15)

You can enable or disable each of the six channels individually using bit 15. The module only scans enabled channels. Enabling a channel forces it to be recalibrated before it measures input data. Disabling a channel sets the channel data word to zero.



### 3.2.4 Selecting Data Formats (Bits 12 through 14)

This selection configures channels 0 through 5 to present analog data in any of the following formats:

- Raw/Proportional Data
- Engineering Units  $\times 1$
- Engineering Units  $\times 10$
- Scaled for PID
- Percent Range

**Table 3-3. Channel Data Word Format**

Input Type	Data Format						
	Engineering Units $\times 10$		Engineering Units $\times 1$		Scaled For PID	Proportional Counts	Percentage
	° Celsius	° Fahrenheit	° Celsius	° Fahrenheit			
Pt 385	-200 to +850	-328 to 1562	-2000 to +8500	-3280 to 15620	0 to 16383	-32767 to 32767	0 to 10000
Pt 3916	-200 to +630	-328 to 1166	-2000 to +6300	-3280 to 11660	0 to 16383	-32767 to 32767	0 to 10000
10 Cu 426	-100 to +260	-148 to 500	-1000 to +2600	-1480 to 5000	0 to 16383	-32767 to 32767	0 to 10000
100 Ni 618	-100 to +260	-148 to 500	-1000 to +2600	-1480 to 5000	0 to 16383	-32767 to 32727	0 to 10000
120 Ni 672	-80 to +260	-112 to 500	-800 to +2600	-1120 to 5000	0 to 16383	-32767 to 32767	0 to 10000
604 NiFe 518	-100 to +200	-148 to 392	-1000 to +2000	-1480 to 3920	0 to 16383	-32767 to 32767	0 to 10000
150Ω	0 to +1500 <sup>4</sup>		0 to +15000 <sup>4</sup>		0 to 16383	-32767 to 32767	0 to 10000
500Ω	0 to +500 <sup>4</sup>		0 to +5000 <sup>4</sup>		0 to 16383	-32767 to 32767	0 to 10000
1000Ω	0 to +1000 <sup>4</sup>		0 to +10000 <sup>4</sup>		0 to 16383	-32767 to 32767	0 to 10000
3000Ω	0 to +3000 <sup>4</sup>		0 to +30000 <sup>4</sup>		0 to 16383	-32767 to 32767	0 to 10000

#### NOTE



The engineering unit data formats represent real engineering temperature units provided by the module to the controller. The raw/proportional counts, scaled-for-PID and percent of full-scale data formats may yield the highest effective resolutions, but may also require that you convert channel data to real engineering units in your control program.

<sup>4</sup> When resistances are selected, the temperature setting is ignored, and the input data is the same for either °C or °F selection.

### Raw/Proportional Data

The value presented to the controller is proportional to the selected input and scaled into the maximum data range allowed by the bit resolution of the A/D converter and filter selected. The raw/proportional data format also provides the best resolution of all the data formats.

If you select the raw/proportional data format for a channel, the data word will be a number between -32767 and +32767. For example, if a Pt 385 RTD is selected, the lowest temperature of -200 °C corresponds to -32767 counts. The highest temperature of 850 °C corresponds to +32767.

### Engineering Units ×1

When using this data format for a RTD or resistance input, the module scales the RTD or resistance input data to the actual engineering values for the selected RTD or resistance input type. It expresses temperatures in 0.1 °C or 0.1 °F units for RTDs. For resistance inputs, the module expresses resistance in 0.01Ω increments.

#### NOTE



Use the engineering units ×10 setting to produce temperature readings in whole degrees Celsius or Fahrenheit.

### Engineering Units ×10

When using a RTD input with this data format, the module scales the input data to the actual temperature values for the selected RTD type. With this format, the module expresses temperatures in 1 °C or 1 °F units. For resistance inputs, the module expresses resistance in 0.1Ω increments.

### Scaled for PID

The value presented to the controller is a signed integer with 0 representing the lower input range and +16383 representing the upper input range.

To obtain the value, the module scales the input signal range to a 0 to +16383 range, which is standard to the PID algorithm for the MicroLogix 1500 and other Allen-Bradley controllers (e.g., SLC). For example, if a Pt 385 RTD is used, the lowest temperature for the RTD is -200 °C, which corresponds to 0 counts. The highest temperature in the input range, 850 °C, corresponds to +16383 counts.

### Percent Range

Input data is presented to the user as a percent of the specified range. The module scales the input signal range to a 0 to +10000 range. For example, using a Pt 385 RTD, the range -200 °C to +850 °C is represented as 0% to 100%.

## 3.2.5 Selecting Input Type (Bits 8 through 11)

Bits 8 through 11 in the channel configuration word indicate the type of RTD or resistance input device. Each channel can be individually configured for any type of input.

### 3.2.6 Selecting Temperature Units (Bit 7)

The module supports two different linearized/scaled ranges for RTDs, degrees Celsius (°C) and degrees Fahrenheit (°F). Bit 7 is ignored for resistance input types, or when raw/proportional, scaled-for-PID, or percent data formats are used.

### 3.2.7 Determining Open-Circuit Response (Bits 5 and 6)

An open-circuit condition occurs when an input device or its extension wire is physically separated or open. This can happen if the wire is cut or disconnected from the terminal block.

Bits 5 and 6 define the state of the channel data word when an open-circuit condition is detected for the corresponding channel. The module overrides the actual input data depending on the option that you specify when it detects an open circuit. The open-circuit options are explained in the table below.

**Table 3-4. Open-Circuit Response**

Response Option	Definition
Upscale	Sets the input data value to full upper scale value of channel data word. The full-scale value is determined by the selected input type and data format.
Downscale	Sets the input data value to full lower scale value of channel data word. The low scale value is determined by the selected input type and data format.
Last State	Sets the input data value to the last input value prior to the detection of the open-circuit.
Zero	Sets the input data value to 0 to force the channel data word to 0.

### 3.2.8 Cyclic Lead Compensation (Bit 4)

For each channel, the module measures lead resistance in one of two ways. Set bit 4 to 0 to enable measurement and compensation of lead resistance every 6 module scans. One channel is measured per module update to limit the impact to channel throughput. You can also implement a lead wire calibration cycle any time, at your command, by enabling and then disabling this bit in your control program.<sup>5</sup> Regardless of the state of bit 4, lead wire compensation occurs automatically on a system mode change from Program-to-Run or if any online configuration change is made to a channel.

### 3.2.9 Selecting Input Filter Frequency (Bits 0 through 2)

The input filter selection field allows you to select the filter frequency for each channel 0 through 5. The filter frequency affects noise rejection, cut-off frequency, repeatability, and update time. The table below describes the effects for each of the 6 user-selectable filters.

<sup>5</sup> Not all controllers allow online configuration changes. Refer to your controller's user manual for details. During an online configuration change, input data for that channel is not updated by the module.

The input filter selection field allows you to select the filter frequency for each channel 0 through 5. The filter frequency affects the following, as explained later in this chapter:

- Noise rejection characteristics for module inputs
- Cut-Off frequency
- Repeatability
- Module update time

The table below summarizes the effects of each filter selection.

**Table 3-5. Filter Effects**

<b>Input Filter</b>	<b>Channel Update Time Lead Compensation Disabled</b>	<b>Channel Update Time Lead Compensation Enabled<sup>6</sup></b>	<b>Cut-Off Frequency</b>	<b>Repeatability</b>	<b>NMRR 50 Hz Rejection</b>	<b>NMRR 60 Hz Rejection</b>
4.17 Hz	242 ms	964 ms	1 Hz	See Appendix A	74 dB	74 dB
10.0 Hz	102 ms	404 ms	2 Hz	See Appendix A	70 dB	70 dB
16.7 Hz	62 ms	244 ms	4 Hz	2 × (4.17 Hz values) From Appendix A	65 dB	NA
19.6 Hz	53 ms	208 ms	5 Hz	2 × (4.17 Hz values) From Appendix A	NA	74 dB
62 Hz	18 ms	68 ms	14 Hz	4 × (4.17 Hz values) From Appendix A)	NA	NA
470 Hz	4 ms	10 ms	109 Hz	10 × (4.17 Hz values) From Appendix A	NA	NA

### Effects of Filter Frequency on Noise Rejection

The filter frequency that you choose for a module channel determines the amount of noise rejection for the inputs. A lower frequency (4.17 Hz versus 470 Hz) provides better noise rejection and improves repeatability, but also increases channel update time. A higher filter frequency provides lower noise rejection but decreases the channel update time and negatively affects repeatability.

When selecting a filter frequency, be sure to consider the cut-off frequency to obtain acceptable noise rejection. Choose a filter frequency so that your fastest-changing signal is below that of the filter's cut-off frequency.

The above table lists the expected normal mode rejection for each of the filter settings.

Common Mode Rejection is better than 115 dB at 50 and 60 Hz, with the 50 and 60 Hz filters selected, respectively, or with the 10 Hz filter selected. The module

<sup>6</sup> If lead compensation is enabled, use this column for channel update times.

performs well in the presence of common mode noise as long as the signals applied to the user positive and negative input terminals do not exceed the common mode voltage rating ( $\pm 10\text{V}$ ) of the module. Improper earth ground may be a source of common mode noise.

**NOTE**

Transducer power supply noise, transducer circuit noise, or process variable irregularities may also be sources of normal mode noise.

### Cut-Off Frequency

The filter cut-off frequency, -3 dB, is the point on the frequency response curve where frequency components of the input signal are passed with 3 dB of attenuation. Table 3-5 shows cut-off frequencies for the supported filters.

All input frequency components at or below the cut-off frequency are passed by the digital filter with less than 3 dB of attenuation. All frequency components above the cut-off frequency are increasingly attenuated.

The cut-off frequency for each channel is defined by its filter frequency selection. Choose a filter frequency so that your fastest changing signal is below that of the filter's cut-off frequency. The cut-off frequency should not be confused with the update time. The cut-off frequency relates to how the digital filter attenuates frequency components of the input signal. The update time defines the rate at which an input channel is scanned, and its channel data word is updated.

### Repeatability

Repeatability is the ability of the input module to register the same reading in successive measurements for the same input signal. The repeatability for an input channel depends upon the filter frequency selected for that channel. Table 3-5, above, describes the repeatability for each of the range selections at the six available frequencies. This table does not include the effects of unfiltered input noise. Choose the frequency that most closely matches your requirements.

### Module Update Time

The module update time is defined as the total time required for the module to sample and convert the input signals of all enabled input channels and provide the resulting data values to the processor. On an isolated module with one ADC per channel, all channels convert the signal in parallel, so the module update time is equal to the slowest channel update time. When lead compensation is enabled (default setting) one out of six channels in each module scan has both the RTD/resistance voltage measured AND the lead compensation voltage measured. This repeats in a round robin fashion cycling through all enabled channels. An internal multiplexor in the ADC switches between measuring the lead voltage and RTD/resistance voltage. This switching increases the settling time for each measurement and the overall channel update rate increases to the slower update rates listed in Table 3-.

Channel update time is also dependent upon the input filter selection. Table 3-5 shows the channel update times based on filter selection.

Example 1	<p>Channels enabled for different input types:</p> <p>Channel 0 Input: 3-wire 100<math>\Omega</math> Pt 385 RTD with 4.17 Hz Filter, Lead Compensation enabled.</p> <p>Channel (1 – 5) Input: 3000<math>\Omega</math> resistance with 10 Hz Filter Lead Compensation enabled</p> <p>Module update time with lead compensation enabled:</p> <p>= slowest channel update time</p> <p>= 964 ms</p>
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Example 2	<p>All Channel enabled for 3-wire RTD:</p> <p>Channel (0 – 5) Input: 3-Wire 100 Pt 385 RTD with 470 Hz Filter</p> <p>Module update time with lead compensation enabled:</p> <p>= slowest channel update time</p> <p>= 10 ms</p>
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Example 3	<p>All Channel enabled for 3-wire RTD:</p> <p>Channel (0 – 5) Input: 3-Wire 100 Pt 385 RTD with 470 Hz Filter</p> <p>Module update time with lead compensation disabled:</p> <p>= slowest channel update time</p> <p>= 4 ms</p>
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### Section 3.3

#### Input Image File

The input image file represents data words and status words. Input words 0 through 5 hold the input data that represents the value of the analog inputs for channels 0 through 5. These data words are valid only when the channel is enabled and there are no errors. Input words 6 and 7 hold the status bits. To receive valid status information, the channel must be enabled.

You can access the information in the input image file using the programming software configuration screen. For information on configuring the module in a MicroLogix 1500 system using RSLogix 500, see Appendix B; for CompactLogix using RSLogix 5000, see Appendix C.

### Section 3.4

#### Input Data File

The input data table allows you to access module read data for use in the control program, via word and bit access. The data table structure is shown in table below.

**Table 3-6. Input Data File**

Word/Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	Analog Input Data Channel 0															
1	Analog Input Data Channel 1															
2	Analog Input Data Channel 2															
3	Analog Input Data Channel 3															
4	Analog Input Data Channel 4															
5	Analog Input Data Channel 5															
6	n/a	n/a	OC5	OC4	OC3	OC2	OC1	OC0	n/a	n/a	S5	S4	S3	S2	S1	S0
7	n/a	n/a	O5	O4	O3	O2	O1	O0	n/a	n/a	U5	U4	U3	U2	U1	U0

### 3.4.1 Input Data Values

Data words 0 through 5 correspond to channels 0 through 5 and contain the converted analog input data from the input device. The most significant bit, bit 15, is the sign bit (SGN).

### 3.4.2 General Status Bits (S0 to S7)

Bits S0 through S5 of word 6 contain the general status information for channels 0 through 5, respectively. If set (1), these bits indicate an error (over- or under-range, open-circuit or input data not valid condition) associated with that channel. The data not valid condition is described below.

#### Input Data Not Valid Condition

The general status bits S0 to S5 also indicate whether or not the input data for a particular channel, 0 through 5, is being properly converted (valid) by the module. This “invalid data” condition can occur (bit set) when the download of a new configuration to a channel is accepted by the module (proper configuration) but before the A/D converter can provide valid (properly configured) data to the 1769 bus master/controller. The following information highlights the bit operation of the Data Not Valid condition.

1. The default and module power-up bit condition is reset (0).
2. The bit condition is set (1) when a new configuration is received and determined valid by the module. The set (1) bit condition remains until the module begins converting analog data for the previously accepted new configuration. When conversion begins, the bit condition is reset (0). The amount of time it takes for the module to begin the conversion process depends on the number of channels being configured and the amount of configuration data downloaded by the controller.

#### NOTE



If the new configuration is invalid, the bit function remains reset (0) and the module posts a configuration error. See Configuration Errors.

3. If A/D hardware errors prevent the conversion process from taking

place, the bit condition is set (1).

### **3.4.3 Open-Circuit Flag Bits (OC0 to OC7)**

Bits OC0 through OC5 of word 6 contain open-circuit error information for channels 0 through 5, respectively. The bit is set (1) when an open-circuit condition exists. See Open-Circuit Detection for more information on open-circuit operation.

### **3.4.4 Over-Range Flag Bits (O0 to O7)**

Over-range bits for channels 0 through 5 are contained in word 7, even-numbered bits. They apply to all input types. When set (1), the over-range flag bit indicates an input signal that is at the maximum of its normal operating range for the represented channel or sensor. The module automatically resets (0) the bit when the data value falls below the maximum for that range.

### **3.4.5 Under Range Flag Bits (U0 to U7)**

Under-range bits for channels 0 through 5 are contained in word 7, odd-numbered bits. They apply to all input types. When set (1), the under-range flag bit indicates an input signal that is at the minimum of its normal operating range for the represented channel or sensor. The module automatically resets (0) the bit when the under-range condition is cleared, and the data value is within the normal operating range.



# Chapter 4

## Diagnostics and Troubleshooting


This chapter describes troubleshooting the isolated RTD/Resistance input module. This chapter contains information on:

- Safety considerations while troubleshooting
- Internal diagnostics during module operation
- Module errors

### Section 4.1 Safety Considerations

Safety considerations are an important element of proper troubleshooting procedures. Actively thinking about the safety of yourself and others, as well as the condition of your equipment, is of primary importance.

The following sections describe several safety concerns you should be aware of when troubleshooting your control system.

<b>WARNING</b> 	Never reach into a machine to actuate a switch because unexpected motion can occur and cause injury. Remove all electrical power at the main power disconnect switches before checking electrical connections or inputs/outputs causing machine motion.
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#### 4.1.1 Indicator Lights

When the green LED on the module is illuminated, it indicates that power is applied to the module and that it has passed its internal tests.

#### 4.1.2 Stand Clear of Equipment

When troubleshooting any system problem, have all personnel remain clear of the equipment. The problem could be intermittent, and sudden unexpected machine motion could occur. Have someone ready to operate an emergency stop switch in case it becomes necessary to shut off power.

#### 4.1.3 Program Alteration

There are several possible causes of alteration to the user program, including extreme environmental conditions, Electromagnetic Interference (EMI), improper grounding, improper wiring connections, and unauthorized tampering. If you suspect a program has been altered, check it against a previously saved master program.

### 4.1.4 Safety Circuits

Circuits installed on the machine for safety reasons, like over-travel limit switches, stop push buttons, and interlocks, should always be hard-wired to the master control relay. These devices must be wired in series so that when any one device opens, the master control relay is de-energized, thereby removing power to the machine. Never alter these circuits to defeat their function. Serious injury or machine damage could result.

## Section 4.2 Module Operation vs. Channel Operation

The module performs diagnostic operations at both the module level and the channel level. Module-level operations include functions such as power-up, configuration, and communication with a 1769 bus master, such as a MicroLogix 1500 controller, 1769-ADN DeviceNet Adapter, or CompactLogix controller.

Channel-level operations describe channel related functions, such as data conversion and over- or under-range detection.

Internal diagnostics are performed at both levels of operation. When detected, module error conditions are immediately indicated by the module status LED. Both module hardware and channel configuration error conditions are reported to the controller. Channel over-range or under-range and open-circuit conditions are reported in the module's input data table. Module hardware errors are typically reported in the controller's I/O status file. Refer to your controller manual for details.

## Section 4.3 Power-Up Diagnostics

At module power-up, a series of internal diagnostic tests are performed. If these diagnostic tests are not successfully completed, the module status LED remains off and a module error is reported to the controller.

<b>If module status LED is:</b>	<b>Indicated condition:</b>	<b>Corrective action:</b>
On	Proper Operation	No action required
Off	Module Fault	Cycle power. If condition persists, replace the module. Call your local distributor or Rockwell Automation for assistance.

## Section 4.4 Channel Diagnostics

When an input channel is enabled, the module performs a diagnostic check to see that the channel has been properly configured. In addition, the channel is tested on every scan for configuration errors, over-range and under-range, and open-circuit conditions.

### 4.4.1 Invalid Channel Configuration Detection

Whenever a channel configuration word is improperly defined, the module reports an error. See a description of module errors later in this chapter.

### 4.4.2 Over or Under Range Detection

Whenever the data received at the channel word is out of the defined operating range, an over-range or under-range error is indicated in input data word 7.

Possible causes of an out-of-range condition include:

- The temperature is too hot or too cold for the type of RTD being used.
- The wrong RTD is being used for the input type selected, or for the configuration that was programmed.
- The input device is faulty.
- The signal input from the input device is beyond the scaling range.

### 4.4.3 Open Circuit Detection

On each scan, the module performs an open-circuit test on all enabled channels. Whenever an open-circuit condition occurs, the open-circuit bit for that channel is set in input data word 6.

Possible causes of an open circuit include:

- The input device is broken.
- A wire is loose or cut.
- The input device is not installed on the configured channel.
- A RTD is installed incorrectly.

## Section 4.5 Non-critical vs. Critical Module Errors

Non-critical module errors are typically recoverable. Channel errors (over-range or under-range errors) are non-critical. Non-critical error conditions are indicated in the module input data table.

Critical module errors are conditions that may prevent normal or recoverable operation of the system. When these types of errors occur, the system typically leaves the run or program mode of operation until the error can be dealt with. Critical module errors are indicated in Extended Error Codes.

## Section 4.6

### Module Error Definition Table

Analog module errors are expressed in two fields as four-digit Hex format with the most significant digit as “don’t care” and irrelevant. The two fields are “Module Error” and “Extended Error Information”. The structure of the module error data is shown below.

**Table 4-1. Module Error Table**

“Don’t Care” Bits				Module Error			Extended Error Information								
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hex Digit 4				Hex Digit 3			Hex Digit 2				Hex Digit 1				

#### 4.6.1 Module Error Field

The purpose of the module error field is to classify module errors into three distinct groups, as described in the table below. The type of error determines what kind of information exists in the extended error information field. These types of module errors are typically reported in the controller’s I/O status file. Refer to your controller manual for details.

**Table 4-2. Module Error Types**

Error Type	Module Error Field Value Bitts 9 through 11 (Binary)	Description
No Errors	000	No error is present. The extended error field holds no additional information.
Hardware Errors	001	General and specific hardware error codes are specified in the extended error information field.
Configuration Errors	010	Module-specific error codes are indicated in the extended error field. These error codes correspond to options that you can change directly. For example, the input range or input filter selection.

#### 4.6.2 Extended Error Information Field

Check the extended error information field when a non-zero value is present in the module error field. Depending upon the value in the module error field, the extended error information field can contain error codes that are module-specific or common to all 1769 analog modules.

**NOTE**

If no errors are present in the module error field, the extended error information field is set to zero.

### 4.6.3 Hardware Errors

General or module-specific hardware errors are indicated by module error code 001. See Extended Error Codes below.

### 4.6.4 Configuration Errors

If you set the fields in the configuration file to invalid or unsupported values, the module generates a critical error.

The Extended Error Codes table lists the possible module-specific configuration error codes defined for the modules.

## Section 4.7 Error Codes

The table below explains the extended error code.

**Table 4-3. Extended Error Codes**

Error Type	Hex Equivalent	Module Error Code (Binary)	Extended Error Information Code (Binary)	Error Description
No Error	X000	000	0 0000 0000	No Errors
General Common Hardware Error	X200	001	0 0000 0000	General Hardware error; no additional information
	X201	001	0 0000 0001	Power-up reset state
Hardware Specific Error	X300	001	1 0000 0000	General Hardware Error (ASIC)
	X301	001	1 0000 0001	H/W ROM Error (Calibration Error)
	X30B	001	1 0000 1011	Channel 0 ADC Error
	X30C	001	1 0000 1100	Channel 1 ADC Error
	X30D	001	1 0000 1101	Channel 2 ADC Error
	X30E	001	1 0000 1110	Channel 3 ADC Error
	X30F	001	1 0000 1111	Channel 4 ADC Error
	X310	001	1 0001 0000	Channel 5 ADC Error
Module Specific Configuration Error	X400	010	0 0000 0000	General Config Error: no additional information
	X401	010	0 0000 0001	invalid input type selected ch0
	X402	010	0 0000 0010	invalid input type selected ch1
	X403	010	0 0000 0011	invalid input type selected ch2
	X404	010	0 0000 0100	invalid input type selected ch3
	X405	010	0 0000 0101	invalid input type selected ch4
	X406	010	0 0000 0110	invalid input type selected ch5
	X407	010	0 0000 0111	invalid input filter selected ch0
	X408	010	0 0000 1000	invalid input filter selected ch1
	X409	010	0 0000 1001	invalid input filter selected ch2
	X40A	010	0 0000 1010	invalid input filter selected ch3
	X40B	010	0 0000 1011	invalid input filter selected ch4

Error Type	Hex Equivalent	Module Error Code (Binary)	Extended Error Information Code (Binary)	Error Description
	X40C	010	0 0000 1100	invalid input filter selected ch5
	X40D	010	0 0000 1101	Invalid input format selected ch0
	X40E	010	0 0000 1110	Invalid input format selected ch1
	X40F	010	0 0000 1111	Invalid input format selected ch2
	X410	010	0 0001 0000	Invalid input format selected ch3
	X411	010	0 0001 0001	Invalid input format selected ch4
	X412	010	0 0001 0010	Invalid input format selected ch5
	X413	010	0 0001 0011	An unused bit has been set for ch0 (C:e.0)
	X414	010	0 0001 0100	An unused bit has been set for ch1 (C:e.1)
	X415	010	0 0001 0101	An unused bit has been set for ch2 (C:e.2)
	X416	010	0 0001 0110	An unused bit has been set for ch3 (C:e.3)
	X417	010	0 0001 0111	An unused bit has been set for ch4 (C:e.4)
	X418	010	0 0001 1000	An unused bit has been set for ch5 (C:e.5)
	X419	010	0 0001 1001	An unused bit has been set for Module Configuration Register (C:e.6)

## Section 4.8

### Module Inhibit Function

Some controllers support the module inhibit function. See your controller manual for details.

Whenever the 1769sc-IR6I module is inhibited, the module continues to provide information about changes at its inputs to the 1769 CompactBus master (for example, a CompactLogix controller).

# Appendix A

## Specifications

Specification	Description
Module ID Codes	Vendor ID = 58 (Decimal) Product Type = 10 (Decimal) Product Code = 101 (Decimal)
Configuration	6 isolated channels of RTD/resistance inputs
Input Modes	Temperature or resistance
Input Types	100Ω PT 385 200Ω PT 385 500Ω PT 385 1000Ω PT 385 100Ω PT 3916 200Ω PT 3916 500Ω PT 3916 1000Ω PT 3916 10Ω Cu 426 120Ω Ni 618 120Ω Ni 672 604Ω NiFe 0 - 150Ω resistance, 0 - 500Ω resistance, 0 - 1000Ω resistance, 0 - 3000Ω resistance
Excitation Current	420 uA excitation current used with: 100Ω m PT 385, 500Ω PT 385, 1000Ω PT 385, 500Ω PT 3916, 1000Ω PT 3916, 604Ω NiFe 518, 0 - 1000Ω resistance, 0 - 3000Ω resistance  1 mA excitation current used with: 200Ω PT 385, 100Ω PT 3916, 200Ω PT 3916, 120Ω Ni 618, 120Ω Ni 672, 10Ω Cu 426, 0 - 150Ω resistance, 0 - 500Ω resistance
Dimensions	118 mm (height) × 87 mm (depth) × 35 mm (width) Height including mounting tabs is 138 mm (4.65 in. height) × 3.43 in (depth) × 1.38 in (width) Height including mounting tabs is 5.43 in.
Approximate Shipping Weight (with carton)	276 g (0.61 lbs.)

Specification	Description
Storage Temperature	-40 °C to +85 °C (-40 °F to +185 °F)
Operating Temperature	0 °C to +60 °C (32 °F to +140 °F)
Operating Humidity	5% to 95% non-condensing
Operating Altitude	2000 meters (6561 feet)
Vibration	5 g at 10–500 Hz
Shock	
Unpackaged (Non-operating)	½ Sine Shockwave 20 g at 9 ms, 3 shock/axis
Unpackaged (Operating)	½ Sine Shockwave 30 g at 11 ms, 1 shock/axis
Agency Certification	C-UL certified (under CSA C22.2 No. 142) UL 508 listed CE compliant for all applicable directives
Hazardous Environment Class	Class I, Division 2, Hazardous Location, Groups A, B, C, D (ISA 12.12.01, C-UL under CSA C22.2 No. 213) Operating Temperature Code T5
Radiated and Conducted Emissions	IEC61000-6-4 FCC Part 15B Class A
Electrical /EMC:	The module has passed testing at the following levels:
ESD Immunity (IEC61000-4-2)	4 kV contact, 8 kV air
Radiated Immunity (IEC61000-4-3)	10 V/m, 80 to 1000 MHz, 80% amplitude modulation, 900 MHz and 1890 MHz 100% amplitude modulation
Fast Transient Burst (IEC61000-4-4)	4 kV
Surge Immunity (IEC61000-4-5)	2 kV Line - Line, 4 kV Line - GND
Conducted Immunity (IEC61000-4-6)	10 V, 0.15 to 80 MHz
Fault detection	Open circuit detection, over-range and under-range error bits. Open circuit detection time is equal to the channel update time.
CMRR	Greater than 100 dB at 50 Hz (4.17 Hz, 10 Hz, 16.7 Hz filter) Greater than 100 dB at 60 Hz (4.17 Hz, 10 Hz, 19.6 Hz filter)
NMRR	Greater than 65 dB at 50 Hz (4.17 Hz, 10 Hz, 16.7 Hz filter) Greater than 65 dB at 60 Hz (4.17 Hz, 10 Hz, 19.6 Hz filter)
Input Impedance	Greater than 500kΩs



Specification	Description
Calibrated Accuracy <sup>7</sup>	
Accuracy 25 °C	$\pm 0.5$ °C for Platinum 385 $\pm 0.4$ °C for Platinum 3916 $\pm 0.2$ °C for Nickel $\pm 0.3$ °C for Nickel-Iron $\pm 0.6$ °C for Copper $\pm 0.15\Omega$ s for 150 $\Omega$ range $\pm 0.5\Omega$ s for 500 $\Omega$ range $\pm 1.0\Omega$ s for 1000 $\Omega$ range $\pm 1.5\Omega$ s for 3000 $\Omega$ range
Accuracy 0 °C to 60 °C	$\pm 0.9$ °C for Platinum 385 $\pm 0.8$ °C for Platinum 3916 $\pm 0.4$ °C for Nickel $\pm 0.5$ °C for Nickel-Iron $\pm 1.1$ °C for Copper $\pm 0.25\Omega$ s for 150 $\Omega$ range $\pm 0.8\Omega$ s for 500 $\Omega$ range $\pm 1.5\Omega$ s for 1000 $\Omega$ range $\pm 2.5\Omega$ s for 3000 $\Omega$ range
Repeatability (at 25 °C) <sup>8</sup>	4.17 Hz and 10 Hz filter
	$\pm 0.2$ °C for Platinum 385 $\pm 0.2$ °C for Platinum 3916 $\pm 0.1$ °C for Nickel $\pm 0.1$ °C for Nickel-Iron $\pm 0.2$ °C for Copper $\pm 0.04\Omega$ s for 150 $\Omega$ range $\pm 0.2\Omega$ s/°C for 500 $\Omega$ range $\pm 0.2\Omega$ s/°C for 1000 $\Omega$ range $\pm 0.2\Omega$ s/°C for 3000 $\Omega$ range
Data formats	Raw/Proportional data, Engineering units $\times 1$ , Engineering units $\times 10$ , Scaled for PID, Percent Range
Input Filter	4.17 Hz, 10 Hz, 16.7 Hz, 19.6 Hz, 62 Hz and 470 Hz
Channel Update Time	See Module Update Time in Chapter 3.
Module or Single Channel Minimum	4 ms with 470 Hz filter, lead compensation disabled. 10 ms with 470 Hz, lead compensation enabled

<sup>7</sup> Accuracy is dependent on the ADC frequency selection, data format, and input noise.

<sup>8</sup> Repeatability for:

16.7 Hz filter is 2 $\times$  the repeatability of the 4.17 Hz filter; 19.6 Hz filter is 2 $\times$  the repeatability of the 4.17 Hz filter; 62 Hz filter is 4 $\times$  the repeatability of the 4.17 Hz filter; 470 Hz filter is 10 $\times$  the repeatability of the 4.17 Hz filter.

Specification	Description
Module or Single Channel Maximum	242 ms with 4.17 Hz filter, lead compensation disabled. 964 ms with 4.17 Hz filter, lead compensation enabled
Open Circuit Detection Time	Less than 1 second
Isolation	
Channel to Rack	500 VDC Continuous; 710 VDC for 1 minute
Channel to Channel	500 VDC Continuous; 710 VDC for 1 minute
Cable Impedance	25Ωs maximum for specified accuracy, 10Ωs maximum for Copper RTD
Input Protection	Voltage Mode $\pm 35$ VDC continuous
	Max Current input is limited due to input impedance
Power Requirements	
Internal rack +5 V	190 mA maximum (continuous)
Internal rack +24 V	35 mA maximum (continuous)
Thermal Dissipation	Less than 2 W
Distance Rating	8

### Regulatory Compliance

<p>Certifications (when product is marked)<sup>9</sup></p> <p><b>eULus</b></p> <p><b>CE</b></p> <p><b>UKCA</b></p> <p><b>CMIM</b></p>	<p>UL Listed for Class I, Division 2 Group A, B, C, D Hazardous Locations, certified for U.S. and Canada. See UL File E180101.</p> <p>UL Listed Industrial Control Equipment, certified for U.S. and Canada. See UL File E140954.</p> <p><b>CE</b> European Union 2014/30/EU EMC Directive, compliant with:</p> <p>EN 61000-6-4; Industrial Emissions  EN 61000-6-2; Industrial Immunity  EN 61326; Meas./Control/Lab., Industrial Requirements  EN 61131-2; Programmable Controllers  (Clause 8, Zone A &amp; B) Electromagnetic Compatibility Regulations 2016:</p> <p>BS 61131-2, BS 61000-6-4, BS 61000-6-2</p> <p>Arrêté ministériel n° 6404-15 du 29 ramadan 1436 (16 juillet 2015):</p> <p>NM EN 61131-2, NM EN 61000-6-4, NM EN 61000-6-2</p>
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<sup>9</sup> For the latest up-to-date information, see the Product Certification link at [www.spectrumcontrols.com](http://www.spectrumcontrols.com) for Declarations of Conformity, Certificates and other certification details.

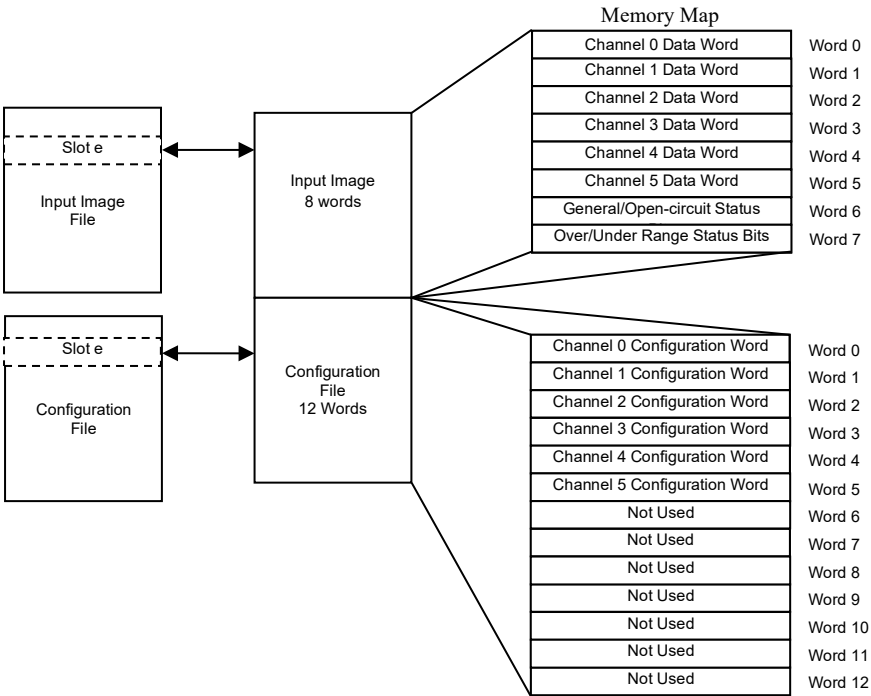
# Appendix B

## Module Configuration Using MicroLogix 1500 and RSLogix 500

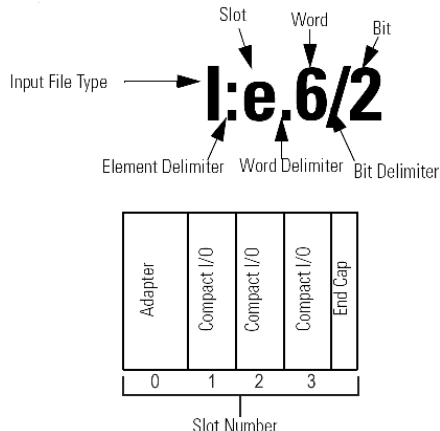
This appendix examines the 1769sc-IR6I module’s addressing scheme and describes module configuration using RSLogix 500 and a MicroLogix 1500 controller.

### Module Addressing

The following memory map shows the input and configuration image tables for the module. Detailed information on the image table is located in Chapter 3.



For example, to obtain the general status of channel 2 of the module located in slot e, use address I:e.6/2.



#### NOTE



The end-cap does not use a slot address.

## 1769sc-IR6I Configuration File

The configuration file contains information you use to define the way a specific channel functions. The configuration file is explained in more detail in *Configuring Channels*.

The configuration file is modified using the programming software configuration screen. For an example of module configuration using RSLogix 500, see *Configuring the 1769sc-IR6I in a MicroLogix 1500 System*.

**Table B-1. Software Configuration Channel Defaults**<sup>10</sup>

Parameter	Default Setting
Filter Frequency	10 Hz
Cyclic Lead Compensation	Yes
Open-Circuit Response	Upscale
Temperature Units	C°
Input Type	100Ω Pt 385
Data Format	Raw/Proportional
Disable/Enable Channel	Enable

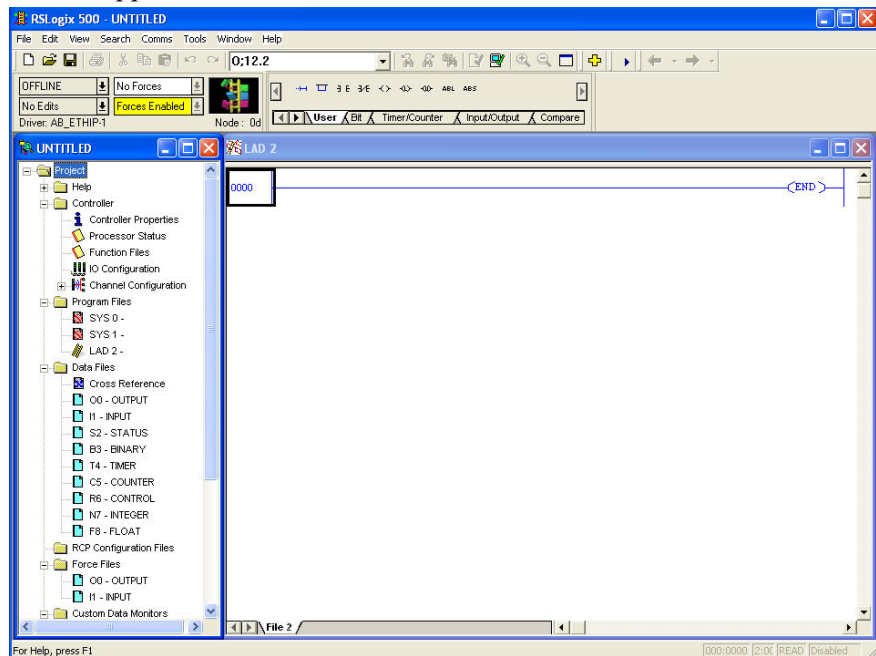
<sup>10</sup> May be overridden by the software.

## Configuring the 1769sc-IR6I in a MicroLogix 1500 System

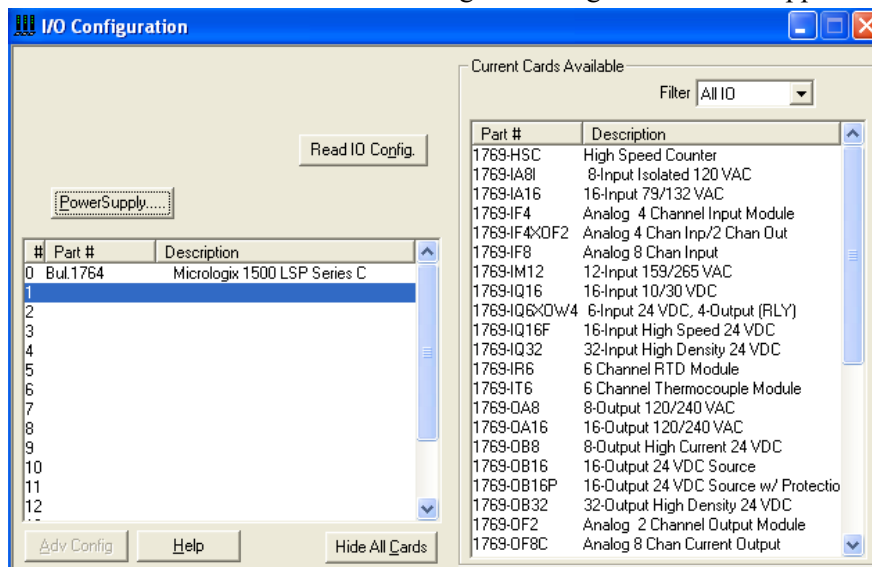
This example takes you through configuring your 1769sc-IR6I Isolated RTD/Resistance input module with RSLogix 500 programming software, assumes your module is installed as expansion I/O in a MicroLogix 1500 system, and that RSLinx™ is properly configured and a communications link has been established between the MicroLogix processor and RSLogix 500.

To configure the system:

1. Start RSLogix and create a MicroLogix 1500 application. The following screen appears:



2. While offline, double-click on the **IO Configuration** icon under the controller folder and the following IO Configuration screen appears:



3. This dialog allows you to manually enter expansion modules into expansion slots, or to automatically read the configuration of the controller. This example shows how to manually insert the module using the Other option.
4. Click on an empty slot in the chassis. From the **Current Cards Available** list, select the **Other** option. The following dialog appears:

5. Enter the settings from the table below:

**Table B-2. Module ID Codes**

Vendor ID	58
Product Type	10
Product Code	101
Series	A
Input Words	8
Output Words	0
Extra Data Length	12

6. After entering the data from the table above, the dialog should look like

the one shown below.

The dialog box is titled "Other" type IO card. It contains the following fields:

- Vendor ID: 58
- Product Type: 10
- Product Code: 101
- Series/Major Rev/Minor Rev: A
- Input Words: 8
- Output Words: 0
- Input Bits: 0
- Output Bits: 0
- Extra Data Length: 12
- Ignore Configuration Error: ☐

Buttons: OK, Cancel

7. When finished, click **OK**.
8. To complete the configuration, double-click on the module from the IO configuration screen and select the **Generic Extra Data Config** tab.

The following dialog appears:

The dialog box is titled "Module #1: OTHER - I/O Module - ID Code = 101". It has two tabs: "Expansion General Configuration" and "Generic Extra Data Config". The "Generic Extra Data Config" tab is active.

Offset

0	0	0	0	0	0
5	0	0	0	0	0
10	0	0			

Decimal  Radix

Buttons: OK, Cancel, Apply, Help

9. Enter the decimal equivalent of each configuration word. There is a total of 12 words that need to be configured. If all the configuration words are left at zero, the default module settings are used.
10. Refer to Chapter 3 for a complete description of each configuration word.





# Appendix C

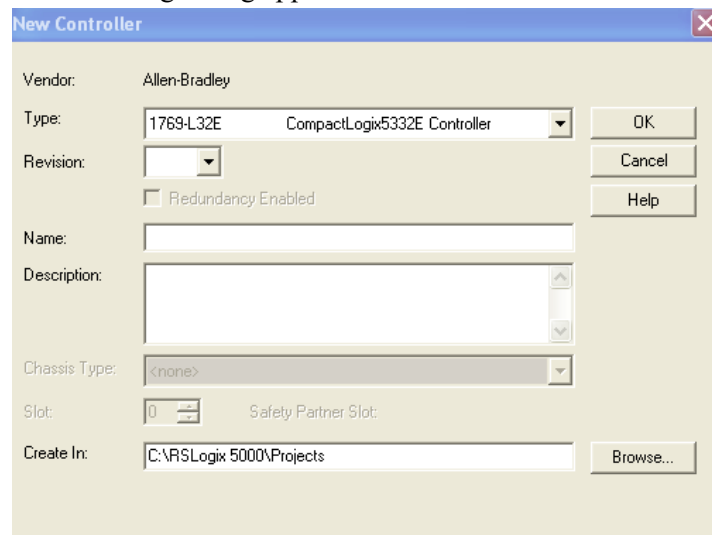
## Configuring the IR6I for CompactLogix Controllers in RSLogix 5000

The procedure in this example is used only when your 1769sc-IR6I Isolated RTD/resistance module add-on profile is not available. An add-on profile for the 1769sc-IR6I will be made available on our website ([www.spectrumcontrols.com](http://www.spectrumcontrols.com)) after the initial release of the module.

To configure a 1769sc-IR6I Isolated RTD/resistance module for a CompactLogix Controller using RSLogix 5000 with the 1769 Generic Profile:

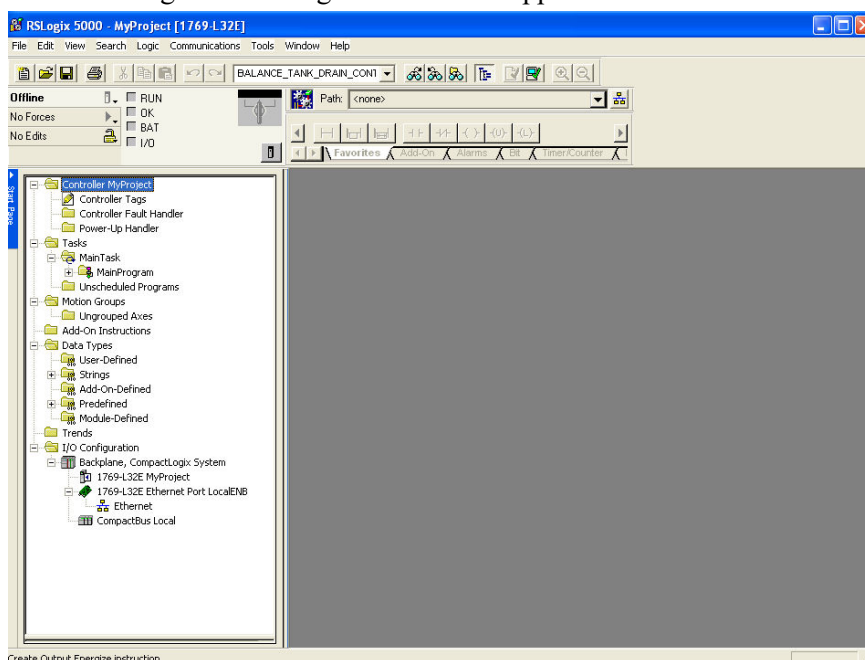
1. Begin a new project in RSLogix 5000. Click on the new project icon or on the **FILE** pull-down menu and select **NEW**.

The following dialog appears:



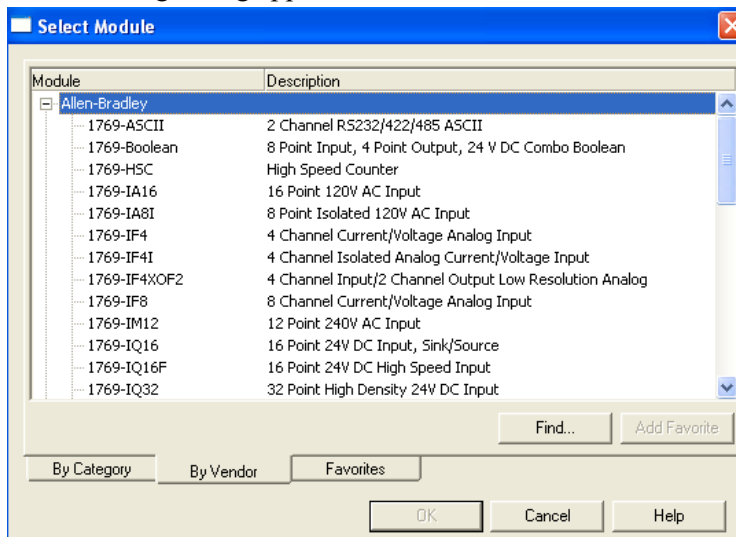
2. Choose your controller type and enter a name for your project, then click **OK**.

The following main RSLogix 5000 screen appears:



3. In the Controller Organizer on the left of the screen, right click on **CompactBus Local**, and select **New Module**.

The following dialog appears:



4. Use this dialog to narrow your search for I/O modules to configure into your system. From the list select the **Generic 1769 Module**.
5. Click the **OK** button.

The following default Generic Profile dialog appears:

6. Select **Comm Format (Input Data – INT)** for the 1769sc-IR6I and fill in the **Name** field. For this example, IR6I is used to help identify the module type in the Controller Organizer. The **Description** field is optional and may be used to provide more details concerning this I/O module in your application.
7. Next, select the slot number, although it will begin with the first available slot number, 1, and increments automatically for each subsequent Generic Profile you configure. For this example, the 1769sc-IR6I Isolated RTD/resistance module is located in slot **1**.
8. Enter the Comm Format, Assembly Instance, and Size values for the 1769sc-IR6I RTD/resistance module using the following table:

**Table C-1. Generic Profile Settings**

1769 I/O Module	Comm. Format	Parameter	Assembly Instance	Size (16-Bit)
IR6I	Input Data - INT	Input	101	8
		Output	104	0
		Config.	102	12

9. Enter the Assembly Instance numbers and their associated sizes for the 1769sc-IR6I module into the Generic Profile.

When complete, the Generic Profile for a 1769sc-IR6I module should look like the following, filled-in dialog:

10. Click **Finish** to complete the configuration of your I/O module.
11. Configure each I/O module in this manner.

## Configuring I/O Modules

Once you have created a Generic Profile for 1769sc-IR6I Isolated RTD/resistance module, you must enter configuration information into the tag database that is automatically created from the Generic Profile information you entered. This configuration information is downloaded to each module at program download, at power up, and when an inhibited module is uninhibited.

1. First, enter the Controller Tag database by double-clicking on Controller Tags in the upper portion of the Controller Organizer.

Based on the Generic Profile created earlier for 1769sc- IR6I module, the Controller Tags screen looks like the following:

Name	Value	Force Mask	Style	Data Type	Description
Local1:C	(...)	(...)		AB:1769_MODULE:C:0	
Local1:I	(...)	(...)		AB:1769_MODULE_INT_20Bytes:I:0	

2. Tag addresses are automatically created for configured I/O modules. All local I/O addresses are preceded by the word Local. These addresses have the following format:
  - Input Data: **Local:s:I**

- Configuration Data: **Local:s:C**

Where *s* is the slot number assigned to the I/O modules in the Generic Profiles.

3. In order to configure an I/O module, you must open up the configuration tag for that module by clicking on the plus sign to the left of its configuration tag in the Controller Tag data base.

### Configuring a 1769sc-IR6I Isolated RTD/resistance Module

To configure the 1769sc-IR6I module in slot 1:

1. Click on the plus sign left of Local:1:C. Configuration data is entered under the **Local:1:C.Data** tag. Click the plus sign to the left of Local:1:C.Data to reveal the 13 integer data words where configuration data may be entered for the 1769sc-IR6I module. The tag addresses for these 13 words are **Local:1:C.Data[0]** through **Local:1:C.Data[12]**. Only the first 13 words of the configuration file apply.
2. The first 6 configuration words, 0 through 5, apply to 1769sc-IR6I channels 0 through 5 respectively. All 6 words configure the same parameters for the 6 different channels. The seventh configuration word is unused. The following table shows the various parameters to configure in each channel configuration word. For a complete description of each of these parameters and the choices available for each of them, see Configuration Data File on page 3-2.

Bit(s) (Words 0 to 5)	Parameter
0 to 2	Filter Frequency
3	Not Used
4	Cyclic Lead Compensation
5 to 6	Open Circuit Condition
7	Temperature Units
8 to 11	Input Type
12 to 14	Data Format
15	Enable Channel

3. Once you have entered your configuration selections for each channel, enter your program logic, save your project, and download it to your CompactLogix Controller. Your module configuration data is downloaded to your I/O modules at this time.

Your 1769sc-IR6I module input data is located in the following tag addresses when the controller is in Run mode:

<b>1769sc-IR6I Channel</b>	<b>Tag Address</b>
0	Local:1:I.Data[0]
1	Local:1:I.Data[1]
2	Local:1:I.Data[2]
3	Local:1:I.Data[3]
4	Local:1:I.Data[4]
5	Local:1:I.Data[5]

Where 1 represents the slot number of the 1769sc-IR6I module.

# Appendix D

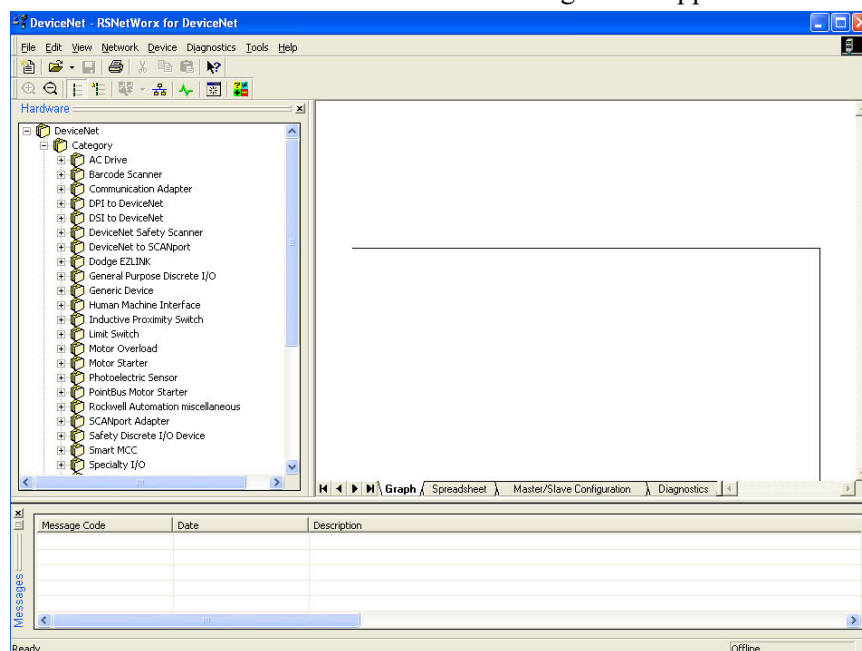
## Configuring the IR6I to be Used with a 1769-ADN DeviceNet Adapter

This application example assumes your 1769sc-IR6I isolated RTD/resistance input module is in a remote DeviceNet system controlled by a 1769-ADN DeviceNet adapter. RSNetworx for DeviceNet is not only used to configure your DeviceNet network but is also used to configure individual I/O modules in remote DeviceNet adapter systems.

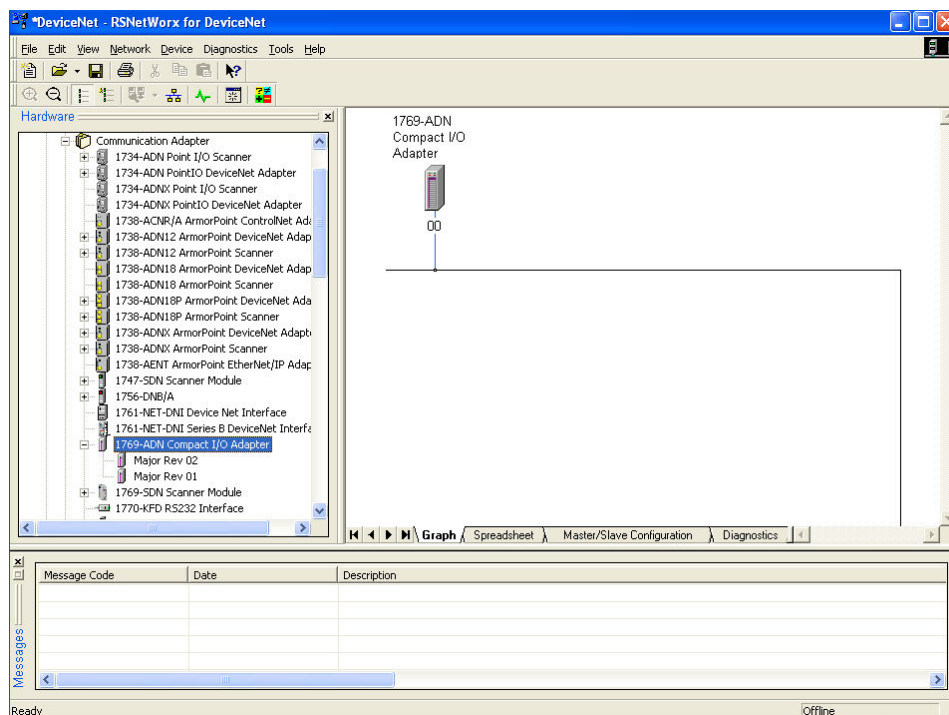
For additional information on configuring your DeviceNet scanners and adapters, please refer to the documentation for these products, including the *Compact™ I/O 1769-ADN DeviceNet Adapter user's manual*, publication 1769-UM001A-US-P. The adapter manual also contains examples on how to modify I/O module configuration with Explicit Messages while the system is running. Whether you are configuring an I/O module offline and downloading to the adapter or you accomplish the configuration online, the 1769sc-IR6I isolated RTD/resistance module must be configured prior to configuring the DeviceNet adapter in the DeviceNet scanner's scan list. The only ways to configure or re-configure I/O modules after the adapter is placed in the scanners scan list are via Explicit Messages or by removing the adapter from the scanner's scan list, modifying the configuration of the I/O module, then adding the adapter back into the scanner's scan list.

This example takes you through configuring your 1769sc-IR6I isolated RTD/resistance input module with RSNetworx for DeviceNet, version 6.00 or later, prior to adding your adapter to the scan list of your DeviceNet scanner.

1. Start RSNetworx for DeviceNet. The following screen appears:



2. In the left column under Category, click on the “+” sign next to Communication Adapters. The list of products under Communication Adapters contains the 1769-ADN/A. Should this adapter not appear under Communication Adapters, your RSNetworx for DeviceNet software is not version 6.00 or later. To continue, you will need to obtain an upgrade for your software. If the 1769-ADN/A does appear, double-click it and it will be placed on the network to the right as shown below.



3. To configure I/O for the adapter, double-click on the adapter that you





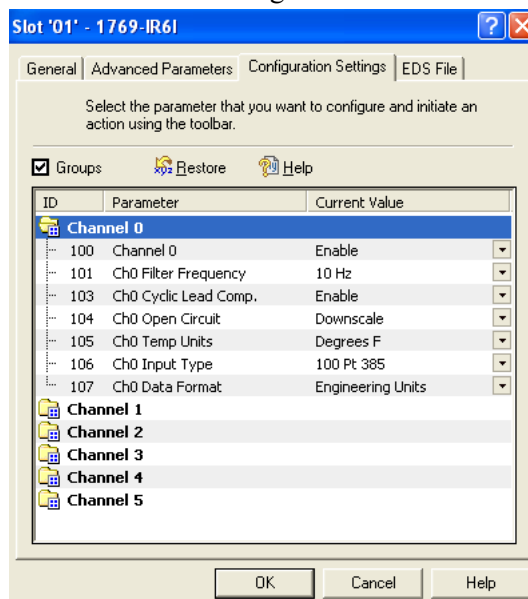
1769-ADN. From the module list on the left, select the 1769sc-IR6I. The module should appear in the empty slot. Double-click on the 1769sc-IR6I module in slot 1 and the following 1769sc-IR6I configuration screen appears:

2. Enter **1** into the blank field at the bottom of the screen.
3. By default, the 1769sc-IR6I module contains eight input words and no output words. Click on the **Advanced Parameters** tab. This screen allows you to change the input data size. You can select from 1 word all the way up to the default, which is 8 words. Click **OK** or **Cancel** to exit this screen and return to the Configuration screen.

You may leave the **Electronic Keying to Compatible Module**. It is not recommended to **Disable Keying**, but if you are not sure of the exact revision of your module, selecting Compatible Module requires that a 1769sc-IR6I module be installed in slot 1.

4. Click on the **Configuration Settings** tab. Each of the 6 RTD/resistance input channels are enabled by default. To disable a channel, double-click on the channel number and change the enable state to **disabled**.
5. Finish the module configuration by choosing your **Data Format, Input Type, Temperature Units, Open-Circuit Condition**, and **Filter Frequency** for each channel you intend to use. See Channel Configuration on page 3-3 for a complete description of each of these configuration categories.
6. In this example, channels 0 through 5 are being used. All 6 channels have 100 $\Omega$  Pt 385 RTDs connected. A 10 Hz Filter Frequency (the default) is used for all 6 channels, along with receiving the RTD/resistance input data in Engineering Units. We also chose  $^{\circ}\text{F}$  for the Temperature Units. This selection, coupled with choosing Engineering Units for the data format allows us to receive the data into the controller's tag database as actual temperature data in  $^{\circ}\text{F}$ . The Open-Circuit Detection is Upscale. This means that if an open-circuit condition should occur at any of the 6 RTD/resistance input channels, the input value for that channel is the full-scale value selected by the

input type and data format. We can therefore monitor each channel for full scale (open-circuit) as well as monitor the Open-Circuit bits in Input word 6, for each channel. When complete, the configuration screen looks like the following:



7. Click **OK** and your configuration for the 1769sc-IR6I isolated RTD/resistance input module is complete.
8. Refer to your *Compact™ I/O 1769-ADN DeviceNet Adapter user's manual*, publication number 1769-UM001A-US-P, for information concerning DeviceNet network configuration and operation.



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