



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

*An **Allient** Company*

User's Manual Pub. 0300321-02 Rev. A0

# Micro800™ Expansion I/O 8-Channel RTD and Resistance Analog Input Module

Catalog Number: 2085-IR8-SC

## 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 1.1, or later.
3. This guide assumes that the reader has a full working knowledge of the relevant processor.

### Notice

The products and services described in this owner's guide are useful in a wide variety of applications. Therefore, the user and others responsible for applying the products and services described herein are responsible for determining their acceptability for each application. While efforts have been made to provide accurate information within this owner's guide, Spectrum Controls, Inc. assumes no responsibility for the accuracy, completeness, or usefulness of the information herein.

Under no circumstances will Spectrum Controls, Inc. be responsible or liable for any damages or losses, including indirect or consequential damages or losses, arising out of either the use of any information within this owner's guide or the use of any product or service referenced herein.

No patent liability is assumed by Spectrum Controls, Inc. with respect to the use of any of the information, products, circuits, programming, or services referenced herein.

The information in this owner's guide is subject to change without notice.

### Limited Warranty

Spectrum Controls, Inc. warrants that its products are free from defects in material and workmanship under normal use and service, as described in Spectrum Controls, Inc.'s literature covering this product, for a period of 1 year. The obligations of Spectrum Controls, Inc. under this warranty are limited to replacing or repairing, at its option, at its factory or facility, any product which shall, in the applicable period after shipment, be returned to the Spectrum Controls, Inc. facility, transportation charges prepaid, and which after examination is determined, to the satisfaction of Spectrum Controls, Inc. to be thus defective.

This warranty shall not apply to any such equipment which shall have been repaired or altered except by Spectrum Controls, Inc. or which shall have been subject to misuse, neglect, or accident. In no case shall the liability of Spectrum Controls, Inc. exceed the purchase price. The aforementioned provisions do not extend the original warranty period of any product which has either been repaired or replaced by Spectrum Controls, Inc.

# Table of Contents

<b>IMPORTANT NOTES.....</b>	<b>II</b>
<b>CHAPTER 1 MODULE OVERVIEW .....</b>	<b>1-1</b>
SECTION 1.1 GENERAL DESCRIPTION .....	1-1
SECTION 1.2 INPUT SPECIFICATIONS .....	1-3
SECTION 1.3 DATA FORMATS.....	1-7
SECTION 1.4 HARDWARE FEATURES .....	1-7
1.4.1 LED Blink Codes .....	1-7
SECTION 1.5 SYSTEM OVERVIEW .....	1-8
<b>CHAPTER 2 INSTALLATION AND WIRING.....</b>	<b>2-1</b>
SECTION 2.1 COMPLIANCE TO EUROPEAN UNION DIRECTIVES.....	2-1
2.1.1 EMC Directive .....	2-1
SECTION 2.2 POWER REQUIREMENTS .....	2-1
SECTION 2.3 GENERAL CONSIDERATIONS .....	2-2
2.3.1 Hazardous Location Considerations.....	2-2
2.3.2 Prevent Electrostatic Discharge .....	2-2
2.3.3 Remove Power.....	2-3
2.3.4 Selecting a Location .....	2-3
SECTION 2.4 MOUNTING .....	2-3
2.4.1 Minimum Spacing .....	2-4
2.4.2 Parts List.....	2-4
2.4.3 Module Description .....	2-4
2.4.4 Insert Module Next to the Controller .....	2-5
Wiring Diagram.....	2-7
<b>CHAPTER 3 CONFIGURING THE 2085-IR8-SC USING CCW .....</b>	<b>3-1</b>
SECTION 3.1 INTRODUCTION .....	3-1
SECTION 3.2 IMPORTING A PROFILE INTO CCW SOFTWARE .....	3-2
SECTION 3.3 2085-IR8-SC TAB ON CCW .....	3-5
SECTION 3.4 SETTING CONFIGURATION PARAMETERS USING MCC .....	3-7
SECTION 3.5 SOFTWARE INFORMATION .....	3-12
3.5.1 Software Versioning.....	3-12
3.5.2 Software Updates.....	3-12
3.5.3 Startup and Factory Default Conditions.....	3-12
3.5.4 PLC Interfaces.....	3-12
3.5.5 Connection Types and Assembly Sizes .....	3-12
3.5.6 Configuration Table.....	3-13
3.5.7 Channel Configuration Bit Location Data.....	3-13
3.5.8 Channel Configuration Values.....	3-14
3.5.9 Input Table .....	3-15
3.5.10 Input Bit and Value Allocation .....	3-15
3.5.11 Module and Channel Fault Bit and Value Description .....	3-16
3.5.12 Software Revision.....	3-16
3.5.13 Channel Status .....	3-16
3.5.14 Channel Data.....	3-17
3.5.15 Output Table .....	3-17
3.5.16 Output Bit Allocation.....	3-18
3.5.17 Output Bit Description.....	3-18
SECTION 3.6 PRODUCT FEATURES .....	3-18
3.6.1 Data Format .....	3-18
3.6.2 Input Type.....	3-18

3.6.3 Channel Bias .....	3-21
3.6.4 Channel Temperature.....	3-22
3.6.5 Connection Method.....	3-22
3.6.6 Input ADC Filter .....	3-24
3.6.7 Open Circuit Detection .....	3-24
3.6.8 Stimulus/Response Sequences .....	3-24
3.6.9 Process Alarm and Latching.....	3-26
3.6.10 Under/Over Range Alarms .....	3-27
3.6.11 ADC Alarm .....	3-28
3.6.12 Channel Scan Rate.....	3-28
3.6.13 Module Specific Hardware Errors.....	3-29
3.6.14 Module Specific Configuration Errors .....	3-29
SECTION 3.7 TECHNICAL ASSISTANCE.....	3-31
SECTION 3.8 DECLARATION OF CONFORMITY .....	3-31
<b>APPENDIX A MANUALLY IMPORTING AN AOP .....</b>	<b>A-1</b>
<b>INDEX .....</b>	<b>I-1</b>

## Preface

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 the Micro800™ 8-Channel RTD and Resistance Analog Input Module.

### NOTE



Before you access any equipment or begin to install any IO modules, review all safety material and warnings in the Micro830, Micro850, and Micro870 Programmable Controllers User Manual. Be sure to review the warnings provided in this document before you start installing a module in a system.

## 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 Micro800™ 8-Channel RTD and Resistance Analog Input Module.

## Related Documentation

The table below provides a listing of publications that contain important information about Allen-Bradley Micro800™ Expansion I/O Module systems.

For	Refer to this Document	Allen-Bradley Pub. No.
Product outline	Micro850 Programmable Logic Controller Product Profile	2080-PP003
Selection information	Micro800 Programmable Controllers Family Selection Guide	2080-SG001
General instructions for using	Micro800 Programmable Controllers General Instructions	2080-RM001
Installing an external power supply	Micro800 External AC Power Supply Installation Instructions	2080-IN001
	Micro870 24V DC Expansion Power Supply Installation Instructions	2085-IN008

<b>For</b>	<b>Refer to this Document</b>	<b>Allen-Bradley Pub. No.</b>
Installing 48-point PLC	Micro850 48-Point Programmable Controllers Installation Instructions	2080-IN008
Installing 24-point PLC	Micro870 24-Point Programmable Controllers Installation Instructions	2080-IN012
User manual information	Micro830, Micro850, and Micro870 Programmable Controllers User Manual	2080-UM002
Environment and Enclosure Information	Industrial Automation Wiring and Grounding Guidelines, Allen-Bradley publication 1770-4.1, for additional installation requirements. NEMA Standards publication 250 and IEC publication 60529, as applicable, for explanations of the degrees of protection provided by different types of enclosure.	1770-4.1  NEMA 250-2014 IEC 60529
Declarations of conformity, certificates, and other certification details.	Product Certification website: <a href="https://spectrumcontrols.com">https://spectrumcontrols.com</a>	

## 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- 41553-630

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.
- Numbered lists provide sequential steps or hierarchical information.
- *Italic* type is used for emphasis
- **Bold** type identifies headings and sub-headings

### WARNING



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.

### ATTENTION



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.

### NOTE



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





# Chapter 1

## Module Overview

This chapter describes the following topics:

- General description
- Input specifications
- Data formats
- Hardware features
- System overview

The Micro800™ 2085-IR8-SC is an isolated, 8-channel RTD/Resistance module designed to expand the local I/O capability of Rockwell Automation Micro850 and Micro870 Systems over its Expansion I/O buses. The minimum system requirement in which an Expansion I/O Module can be installed is a Micro850 or Micro870 Controller and a controller power supply.

The number of 2085-IR8-SC modules that can be installed with a Micro850/870 PLC is based on the current controller firmware revision and CCW software revision.

### Section 1.1 General Description



The module provides up to eight, concurrent channels of or 4-wire RTD and resistance measurements. It provides RTD types Pt 385, Pt 3916, Cu 426, Ni 618, Ni 672, Ni-Fe 518, and direct ohm (0-150, 0-500, 0-1000, 0-3000) measurements.

The module provides:

- 8 input channels of RTD and resistance measurements.

- Four data formats.
- Range scaling of input data.
- Four filter frequencies.
- Units in Degrees Centigrade and Fahrenheit.
- Channel bias adjustment.
- Alarm notification on each channel status:
  - Over or under range detection (from user-defined values).
  - Process alarm and latching.
  - Open wire detection.
  - ADC communication fault.

All inputs have fault tolerance and ESD protection to avoid damage to circuitry on the board. The modules use 50 VAC working Reinforced Insulation between the inputs and the backplane.

The 2085-IR8-SC module uses a 20-bit Sigma-Delta analog-to-digital converter to achieve 16-bit resolution.

Each input channel is individually configurable via Rockwell-provided Connected Component Workbench (CCW) software for the Micro850 and Micro870 family controllers or with the Module Configuration Converter (MCC) utility from Spectrum Controls, Inc.

The module is factory calibrated and tested before shipping. After installation, the modules begin operation in a default, usable condition without user parameters first being set up or defined. During power startup, all inputs are disabled and off until a valid configuration has been received. The default configuration is for all channels enabled in the 3-wire, 100PT385 range with the 17 Hz filter in Engineering  $\times 1$  units.

## Section 1.2

### Input Specifications

The 2085-IR8-SC module has the following input specifications:

**Table 1-1. Input/Performance/Environmental Requirements**

Input Description	Value	
Operating Temperature	-20 °C to 65 °C (-4 °F to 149 °F)	
Storage/Non-Operating Temperature	-40 °C to 85 °C (-40 °F to 185 °F)	
Operating Humidity	5% to 95%, non-condensing	
Storage/Non-Operating Humidity	5% to 85%, non-condensing	
Vibration/Operating	10 Hz to 500 Hz, 2 G, 0.030 max peak-to-peak	
Operating Shock	25 G, peak acceleration, 11±1 ms pulse, half sine	
Storage/Non-Operating Shock	25 G peak acceleration, 11±1 ms pulse, half sine; 35 G for panel mount.	
Pollution Level	Meets Pollution Degree 2 requirements.	
Inputs per module	Eight 2-wire, 3-wire, or 4-wire resistance, or RTD differential input channels	
Input ranges	RTD: 100 Ω, 200 Ω, 500 Ω and 1000 Ω PT385 and Pt3916, 10 0Ω Ni618, 120 Ω Ni672, 10 Ω Cu 426, 604 Ω NiFe 518 Resistance: 0-150 Ω, 0-500 Ω, 0-1000 Ω, 0-3000 Ω	
Input filters	4 Hz, 17 Hz, 60 Hz, 470 Hz	
RTD accuracy	Error at 25 °C Max	Error over -20 °C to 65 °C Max
100 Ω PT385, -200 °C to 850 °C	±0.6	±0.9
200 Ω PT385, -200 °C to 850 °C	±0.5	±0.8
500 Ω PT385, -200 °C to 850 °C	±0.5	±0.7
1000 Ω PT385, -200 °C to 850 °C	±0.5	±0.7
100 Ω PT3916, -200 °C to 630 °C	±0.6	±0.8
200 Ω PT3916, -200 °C to 630 °C	±0.5	±0.7
500 Ω PT3916, -200 °C to 630 °C	±0.5	±0.6
1000 Ω PT3916, -200 °C to 630 °C	±0.5	±0.6
100 Ω Ni618, -100 °C to 260 °C	±0.4	±0.4
120 Ω Ni672, -80 °C to 260 °C	±0.3	±0.4
10 Ω Cu 426, -100 °C to 260 °C	±3.6	±4.0
604 Ω NiFe 518, -100 °C to 200 °C	±0.3	±0.4
Resistance accuracy	Error at 25 °C, (Ohms) Max	Error over -20 °C to 65 °C, (Ohms) Max
0 to 150 Ω	±0.2	±0.3

Input Description	Value		
0 to 500 Ohm	±0.4		±0.5
0 to 1 kΩ	±0.6		±1
0 to 3 k Ω	±1.4		±1.8
Repeatability (at 25 °C)	4 Hz filter	17 Hz filter	60 and 470 Hz filters <sup>1</sup>
RTD			
Platinum 385	± 0.2 °C	± 0.2 °C	± 2.0 °C
Platinum 3916	± 0.2 °C	± 0.2 °C	± 2.0 °C
Copper	± 0.3 °C	± 0.3 °C	± 2.6 °C
Nickel	± 0.1 °C	± 0.1 °C	± 1.0 °C
Nickel-Iron	± 0.1 °C	± 0.1 °C	± 0.5 °C
Resistance			
0 to 150 Ω	± 0.05 Ω	± 0.1 Ω	± 0.5 Ω
0 to 500 Ohm	± 0.08 Ω	± 0.15 Ω	± 0.7 Ω
0 to 1 kΩ	± 0.1 Ω	± 0.2 Ω	± 1.5 Ω
0 to 3 kΩ	± 0.2 Ω	± 0.3 Ω	± 2.0 Ω
Filters			
CMRR	84 dB minimum at 50 and 60 Hz for 4 Hz and 17 Hz filters		
NMRR	4 Hz filter	72 dB minimum at 50 and 60 Hz	
	17 Hz filter	62 dB minimum at 50 and 60 Hz	
Crosstalk	-70 dB maximum		
Cable resistance (applies only to 3-wire and 4-wire RTD & resistance measurements)	25 Ω maximum, 10 Ω maximum for 10 Ω Cu 426		

<sup>1</sup> These filters do not reject 50/60 Hz. Repeatability for these filters is strongly dependent on how much 50/60 Hz noise is in the system.

Input Description	Value	
<b>RES/RTD Current source (Excitation current)</b>	Excitation Current*	Range
	420 $\mu$ A	150 $\Omega$ , 500 $\Omega$ , 100 $\Omega$ Ni 618, 120 $\Omega$ Ni 672, 100 $\Omega$ PT 385, 200 $\Omega$ PT 385, 100 $\Omega$ PT 3916, 200 $\Omega$ PT 3916, 10 $\Omega$ Cu 426
	210 $\mu$ A	1000 $\Omega$ , 3000 $\Omega$ , 500 $\Omega$ PT 385, 1000 $\Omega$ PT 385, 500 $\Omega$ PT 3916, 1000 $\Omega$ PT 3916, 604 $\Omega$ NiFe 518
	* typically, $\pm 5\%$ at 25 $^{\circ}$ C, $\pm 8\%$ from -20 $^{\circ}$ C to 65 $^{\circ}$ C	
Isolation		
Input to backplane isolation	50 VAC RMS working Reinforced isolation tested at 2 k VDC for 1 minute.	
Input to chassis GND isolation	50 VAC RMS working Reinforced isolation tested at 2 k VDC for 1 minute.	
Channel-to-channel, low-level isolation	10 VDC measured between the IN-leads. Maximum voltage between any two pins must be limited to 28 VDC.	
Power Requirements		
Bus +5 V (4.75 V to 5.4 V)	94 mA maximum	
Bus +24 V (19.9 V to 26.4 V)	15 mA maximum	
Power dissipation within module	0.9 W maximum	
Peak Inrush current	Less than 150 mA at 5 V. Less than 400 mA at 24 V.	
Fault detection	Over/under range for all types. Open Circuit detection is supported on all ranges and wire types.	
Wire Installation		
Wire size	#16 to #28 AWG	
Wire Strip Length	0.375 in.	
Recommended Tightening Torque:	2.25 N-m (2.2 lb-in)	
<b>RoHS</b>	Meets European RoHS component standards (January 2015 and earlier).	
<b>REACH</b>	Meets European REACH 7 requirements.	
Module Dimensions	110 mm $\times$ 87 mm $\times$ 51 mm (plastic only). (4.33 in $\times$ 3.43 in $\times$ 2.00 in) 110 mm $\times$ 89 mm $\times$ 51 mm (with RTBs installed). (4.33 in $\times$ 3.5 in $\times$ 2.00 in)	

**Table 1-2. EMC Specification Table**

<b>Environmental Tests</b>	<b>Test Level Limits</b>
Radiated Emissions	(Enclosure) Class A, 30 MHz – 1 GHz
Conducted Emissions	Group 1, Class A (AC Mains), 150 kHz – 30 MHz
ESD immunity (Performance Criteria B)	6 kV Indirect (Coupling Plate) 6 kV Contact Discharge (to points of initial contact) 8 kV Air Discharge (to points of initial contact)
Radiated Immunity	10 V/M with 200 Hz square-wave 50% Pulse 100% AM at 900 and at 1890 MHz 10 V/M with 1 kHz sine-wave 80% AM from 80...2000 MHz 10 V/M with 1 kHz sine-wave 80% AM from 2000...6000 MHz
EFT/B immunity (Performance Criteria B)	Signal Ports: ±2 kV @ 5 kHz for 5 minutes, Criteria B Power Ports: ±2 kV @ 5 kHz for 5 minutes, Criteria B
Surge transient immunity (Performance Criteria B)	Signal Ports: ±2 kV line-earth {CM} at 2 $\Omega$ on shielded ports  Power Ports ±2 kV CM at 12 $\Omega$ ±1 kV DM at 2 $\Omega$
Conducted RF immunity (Performance Criteria A)	10 VRMS with 1 kHz sine wave 80% AM from 150 kHz...80 MHz on signal and power ports
Magnetic Field (Performance Criteria A)	30 Arms/m
AC Mains Voltage Dips, Interruptions and Variations	Follow the 61000-4-11.

**Table 1-3. Safety Test Specification Table**

<b>Safety Tests</b>	<b>Industry Standards</b>
<b>UL Safety</b>	UL 61010-2-201 Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use - Part 2-201: Particular Requirements for Control Equipment (NRAQ, NRAQ7) CAN/CSA C22.2 No. 61010-1-12 (Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use – Part 1: General Requirements)

Safety Tests	Industry Standards
<b>UL Hazardous Locations</b>	ANSI/ISA–12.12.01 Nonincendive Electrical Equipment for Use in Class I, Division 2 Hazardous (Classified) Locations (NRAG) CSA C22.2 No. 213-M1987 - Non-incendive Electrical Equipment for use in Class I Division 2 Hazardous Locations - March 1987 (NRAG7) Temp code T4 or better, Pollution degree 2, gas groups A, B, C, & D
<b>CE EMC Directive</b>	EN 61131-2 Programmable Controllers: Third Edition 2007-02, Clause 8, Zones A&B EN 61000-6-2: Generic Industrial Immunity EN 61000-6-4: Generic Industrial Emissions
<b>UKCA</b>	Electromagnetic Compatibility Regulations 2016 BS EN 61131-2, BS EN 61000-6-4, BS EN 61000-6-2
<b>FCC</b>	27 CFR Part 15, Class A
<b>CMIM</b>	Arrêté ministériel n° 6404-15 du 29 ramadan 1436 (16 juillet 2015) NM EN 61131-2, NM EN 61000-6-4, NM EN 61000-6-2

### Section 1.3 Data Formats

There are four data input types:

- Engineering units  $\times 1$
- Engineering units  $\times 10$
- Raw/proportional count
- Percentage Full Scale

### Section 1.4 Hardware Features

Channels are wired as differential inputs. Open-circuit detection is available in the form of open circuit inputs on all ranges and wire types. Inputs are protected from electrostatic discharge up to 6 kV for indirect and contact discharge, 8 kV for air discharge.

#### 1.4.1 LED Blink Codes

A 2085-IR8-SC module uses a single, green **OK** LED to show power or module operational status.

When startup is completed, and all internal tests have passed, the LED is solid GREEN. If the LED remains off, there is an error with the module: it may not have power, or the module failed to pass the self-test.

**Table 1-4 LED Status Indicators**

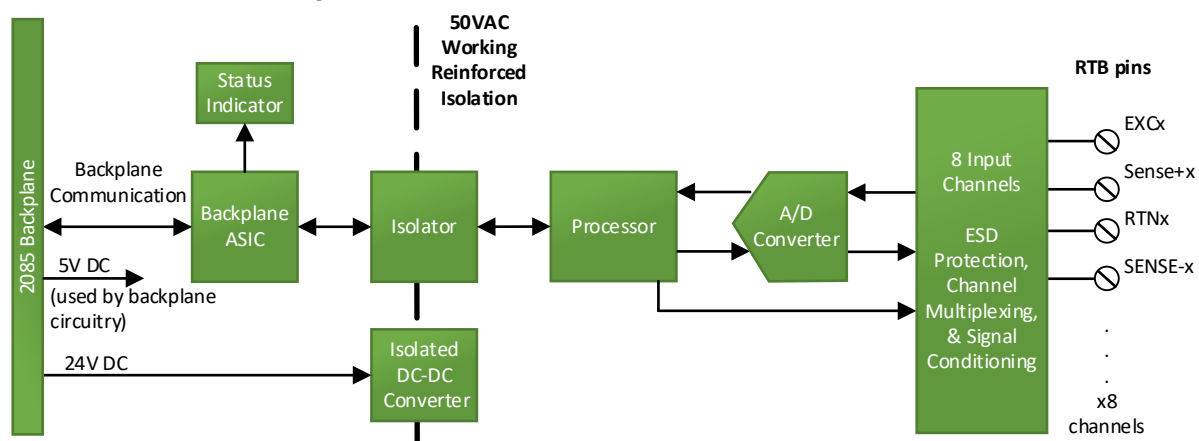
Indicator	State	Description
	Fast blink green	Offline mode. This means the module has power but not yet been configured. Use CCW to download the configuration, then module will go into run mode.
<b>Module OK LED Status</b>	Off	No power applied to device, or the module may have failed to pass its self-test.
	Solid Green	RUN mode. Module has power runs normally.
	Blinking Green	LED blink status: 1. Internal use only. 2. Internal use only. 3: Calibration Data Invalid. 4: Serial Number Invalid. 5: Indicates ADC communication error.

## Section 1.5

### System Overview

The 2085-IR8-SC module is expected to operate indefinitely. It does not require periodic maintenance or calibration. The module communicates to the controller through the bus interface. The module also receives 5 VDC and 24 VDC through the bus interface.

Block diagram:





# Chapter 2

## Installation and Wiring

This chapter will cover:

- Compliance to European union directives
- Power requirements
- General considerations
- Installing the module
- Field wiring connections

### Section 2.1 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.

#### 2.1.1 EMC Directive


This product 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 61000-6-4 Electromagnetic compatibility (EMC)–Part 6-4: Generic standards–Emission standard for industrial environments.
- EN 61000-6-2 Electromagnetic compatibility (EMC)–Part 6-2: Generic standards–Immunity for industrial environments.

UKCA Electromagnetic Compatibility Regulations 2016

- BS EN 61131-2, BS EN 61000-6-4, BS EN 61000-6-2.
- This product is intended for use in an industrial environment.

### Section 2.2 Power Requirements

<b>WARNING</b> 	The backplane power and the analog inputs of the device shall only be supplied by an Isolated Secondary Limited Energy Low Voltage source.
---	--

The module receives power through the bus interface from the +5 VDC/+24 VDC system power supply, and a 24 VDC field power supply. Both must be present for the module to operate.

Current rating at + 5 V is 94 mA maximum; for +24 V it is 15 mA maximum.

Power rating is 0.9 Watts maximum:

<b>5 VDC</b>	<b>24 VDC</b>
94 mA	15 mA


## Section 2.3

### General Considerations


The 2085-IR8-SC module 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>2</sup>.

#### 2.3.1 Hazardous Location Considerations

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


<b>WARNING</b>  	<b>EXPLOSION HAZARD</b> <ul style="list-style-type: none"> <li>• Substitution of components may impair suitability for Class I, Division 2; Class II, Division 2; and Class III, 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>• This product must be installed in an enclosure.</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>
---	---

#### 2.3.2 Prevent Electrostatic Discharge

<b>WARNING</b>  	<p>Electrostatic discharge can damage integrated circuits or semiconductors if you touch I/O expansion port connector pins or the terminal block on the 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 port 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>
---	--

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

### 2.3.3 Remove Power

<p><b>WARNING</b></p> 	<p><b>Remove power before removing or inserting this module.</b> 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. Electrical arcing causes excessive wear to contacts on both the module and its mating connector and may lead to premature failure.</li> </ul>
---	---

### 2.3.4 Selecting a Location


#### Reducing Noise

Most applications require installation in an industrial enclosure to reduce the effects of electrical interference. Analog channels are highly susceptible to electrical noise. Electrical noise coupled to the analog channels 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. Refer to the module's heat dissipation specification.

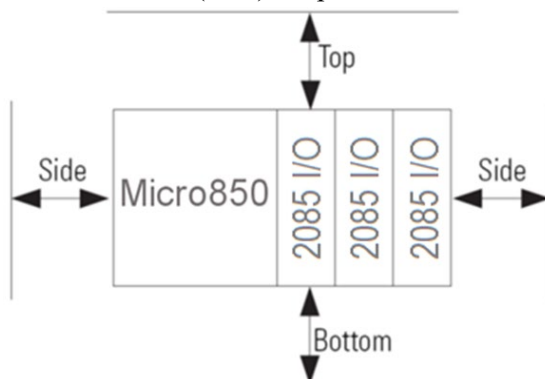
In addition, route shielded, twisted-pair analog input wiring away from any high voltage I/O wiring.

## Section 2.4 Mounting

<p><b>WARNING</b></p> 	<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>
---	--

### 2.4.1 Minimum Spacing

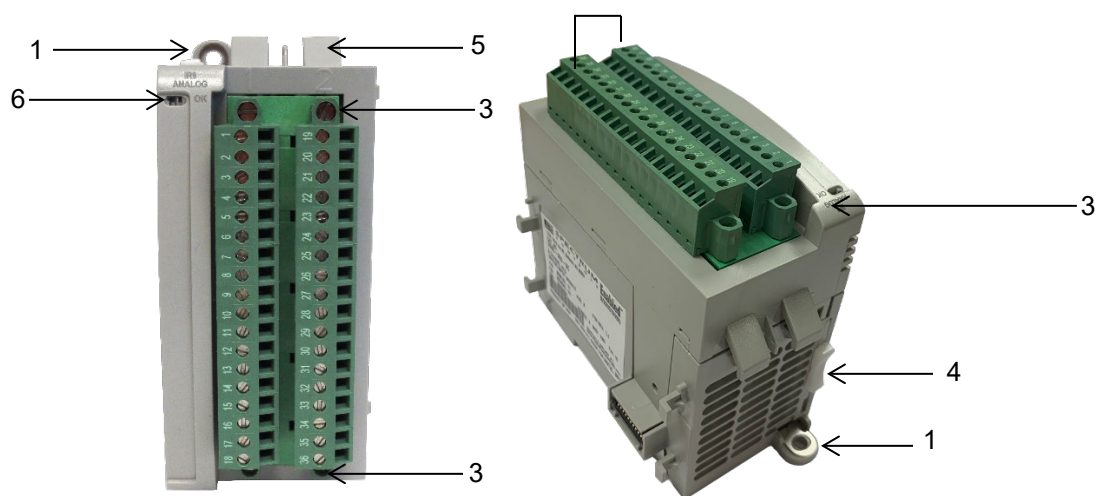
Maintain spacing from enclosure walls, wire ways, adjacent equipment, etc. Allow 50.8 mm (2 in.) of space on all sides for adequate ventilation, as shown:



### 2.4.2 Parts List

Your package contains one Micro800 Expansion I/O 2085-IR8-SC Module and one Quick Start Guide.


### 2.4.3 Module Description



	Description		Description
1	Mounting screw hole/mounting foot	4	Module interconnect latch
2	Removable Terminal Block (RTB)	5	DIN rail mounting latch
3	RTB hold down screws	6	I/O Status LED


You can choose to wire the expansion I/O module before installing it next to the controller or wire it once the module is secured in place.


Place the module next to the controller against the panel where you are mounting it. Make sure the controller and module are spaced properly.

<p><b>NOTE</b></p> 	<ul style="list-style-type: none"> <li>• This equipment is considered Group 1, Class A industrial equipment according to IEC/CISPR 11. Without appropriate precautions, there may be difficulties with electromagnetic compatibility in residential and other environments due to conducted and radiated disturbance.</li> <li>• Be careful when stripping wires. Wire fragments that fall into the controller could cause damage. Once wiring is complete, make sure the controller is free of all metal fragments before removing the protective debris strip.</li> <li>• Do not wire more than 2 conductors on any single terminal.</li> <li>• If you insert or remove the expansion I/O module while power is on, an electrical arc can occur. This could cause an explosion in hazardous location installations. Be sure that power is removed or the area is nonhazardous before proceeding.</li> <li>• Cable length should be less than 10 meters.</li> </ul>
--	--

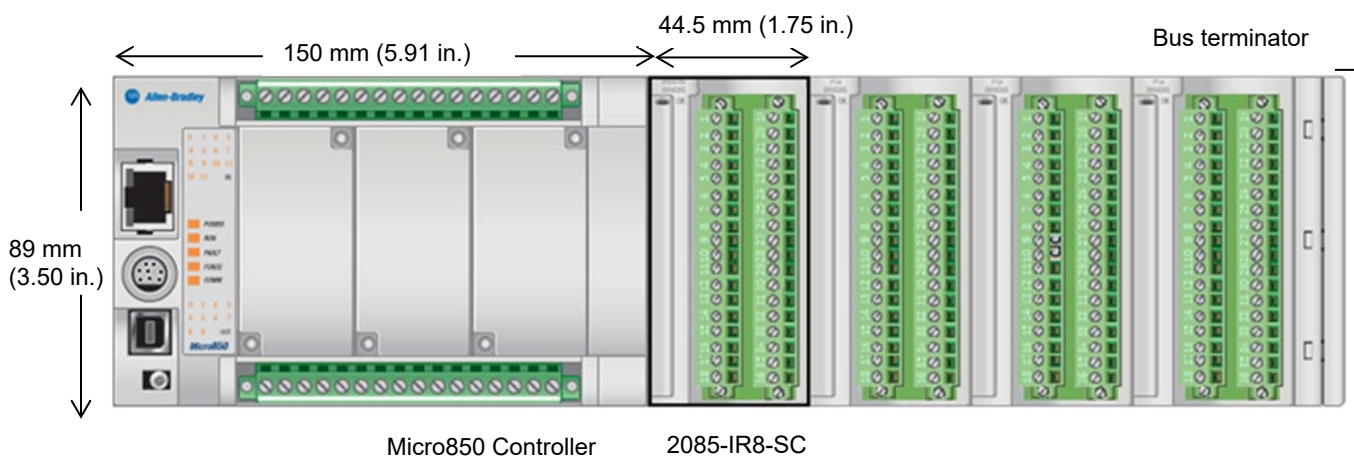
#### 2.4.4 Insert Module Next to the Controller

Follow the instructions to insert and secure the expansion I/O module to the controller:


<p><b>NOTE</b></p> 	<p>The module expansion may only be mounted horizontally.</p>
---	---

<p><b>NOTE</b></p> 	<p>For environments with greater vibration and shock concerns, use the panel mounting method, instead of DIN rail mounting.</p>
--	---

#### Mounting Dimensions and DIN Rail Mounting



You can install the module on DIN rails of dimension 35 mm × 7.5 mm × 1 mm (EN 50 022-35×7.5), or on a panel.

<b>WARNING</b> 	<b>Hazard of intermittent grounding.</b> <b>This product is grounded through the DIN rail to chassis ground. To assure proper grounding, use zinc-plated, yellow-chromate steel DIN rail. Using other DIN rail materials such as aluminum or plastic, that can corrode, oxidize, or are poor conductors, may result in improper or intermittent grounding.</b> Use the correct DIN rail type, and secure DIN rail to mounting surface approximately every 200 mm (7.8 in.) and use end-anchors appropriately.
---	---

1. Before mounting the module on a DIN rail, use a flat-bladed screwdriver in the DIN rail latch and pry it downwards until it is in the unlatched position.
2. Hook the top of the DIN rail mounting area of the module onto the DIN rail, and then press the bottom until the module snaps onto the DIN rail.
3. Push the DIN rail latch back into the latched position. Use DIN rail end anchors for vibration or shock environments.
4. Snap the module into the module bay.
5. Using a screwdriver, tighten the 10...12 mm (0.39...0.47 in.) M3 self-tapping screw to torque specifications: 0.25 N-m (2.2 lb-in).


### Panel Mounting

The preferred mounting method is to use two M4 (#8) screws per module. Hole spacing tolerance is ±0.4 mm (0.016 in.). For mounting dimensions, refer to Micro830, Micro850, and Micro870 Programmable Controllers User Manual 2080-UM002.

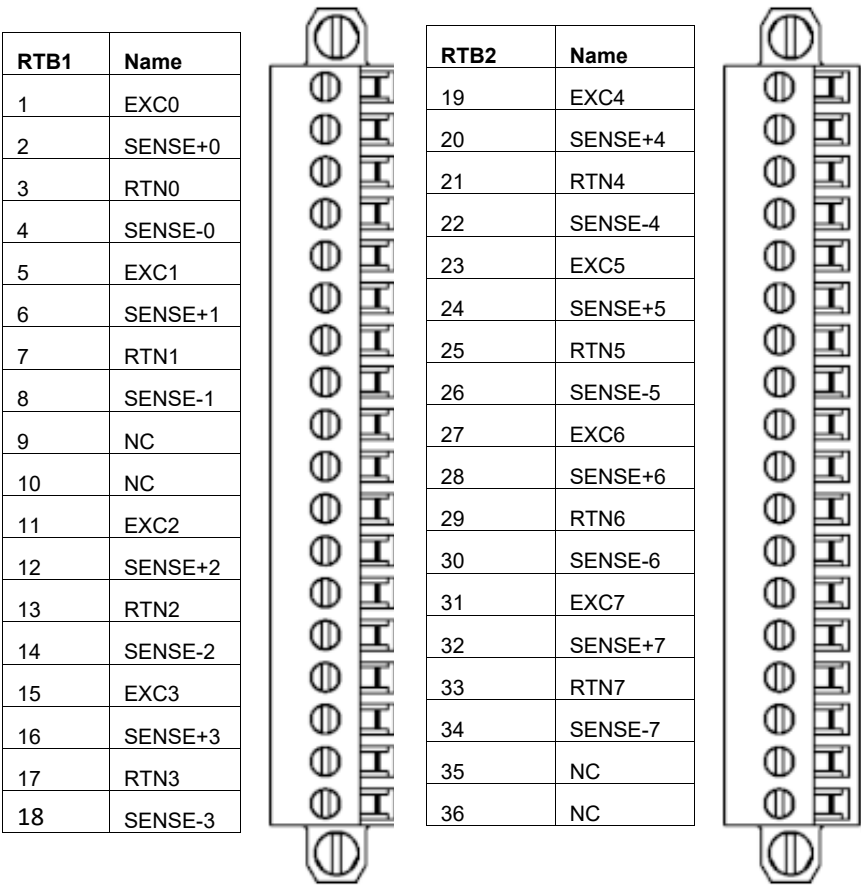
To install:

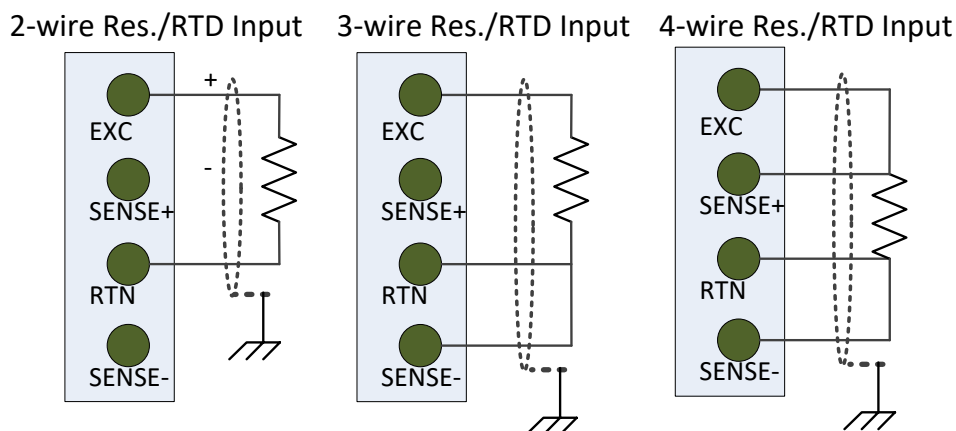
6. Place the module next to the controller against the panel where you are mounting the module.
7. Mark drilling holes through the mounting screw holes and mounting feet, and then remove the module.
8. Drill the holes at the markings.
9. Replace the module and mount it. Leave the protective debris strip in place until you are finished wiring the module, and any other devices.

# Wiring Diagram

<p><b>WARNING</b></p> 	<p><b>Hazard of damage to the terminal connector.</b></p> <p>The Spectrum Controls RTB hold down and terminal screws must be tightened by hand using the guidelines. They must <u>not</u> be tightened using a power tool. Use a screwdriver of 0.8 × 2 mm and tighten to no more than 0.25 N-m (2.2 lb-in) torque.</p> <p>Failure to follow these guidelines may result in damage to your connector.</p>
---	---

Wire the module using the following images, which explain the layout of the 2-row, 18-pin terminal block, and the associated wiring diagrams for the various input signals and the Micro800 Expansion I/O 2085-IR8 module.





Terminal Block Input signal descriptions are as follows:

RTB1	Name	Desc.	RTB2	Name	Desc.
1	EXC0	Ch. 0 Excitation Current	19	EXC4	Ch. 4 Excitation Current
2	SENSE+0	Ch. 0 Positive Sense Lead	20	SENSE+4	Ch. 4 Positive Sense Lead
3	RTN0	Ch. 0 Return Current Path	21	RTN4	Ch. 4 Return Current Path
4	SENSE-0	Ch. 0 Negative Sense Lead	22	SENSE-4	Ch. 4 Negative Sense Lead
5	EXC1	Ch. 1 Excitation Current	23	EXC5	Ch. 5 Excitation Current
6	SENSE+1	Ch. 1 Positive Sense Lead	24	SENSE+5	Ch. 5 Positive Sense Lead
7	RTN1	Ch. 1 Return Current Path	25	RTN5	Ch. 5 Return Current Path
8	SENSE-1	Ch. 1 Negative Sense Lead	26	SENSE-5	Ch. 5 Negative Sense Lead
9	NC	No Connect	27	EXC6	Ch. 6 Excitation Current
10	NC	No Connect	28	SENSE+6	Ch. 6 Positive Sense Lead
11	EXC2	Ch. 2 Excitation Current	29	RTN6	Ch. 6 Return Current Path
12	SENSE+2	Ch. 2 Positive Sense Lead	30	SENSE-6	Ch. 6 Negative Sense Lead
13	RTN2	Ch. 2 Return Current Path	31	EXC7	Ch. 7 Excitation Current
14	SENSE-2	Ch. 2 Negative Sense Lead	32	SENSE+7	Ch. 7 Positive Sense Lead
15	EXC3	Ch. 3 Excitation Current	33	RTN7	Ch. 7 Return Current Path
16	SENSE+3	Ch. 3 Positive Sense Lead	34	SENSE-7	Ch. 7 Negative Sense Lead
17	RTN3	Ch. 3 Return Current Path	35	NC	No Connect
18	SENSE-3	Ch. 3 Negative Sense Lead	36	NC	No Connect



# Chapter 3

## Configuring the 2085-IR8-SC

### Using CCW

This chapter covers the following subjects:

- How to use Connected Components Workbench (CCW) and optionally ModuleConfigConverter.exe software to configure the Module.
- Analog Data and Status settings.
- Data Links settings.
- Setting configuration parameters and associated values.

#### Section 3.1

##### Introduction

You use CCW software (v 9.00.00 and above) to configure the 2085-IR8-SC Expansion I/O Module. Spectrum Controls, Inc. provides a custom configuration software utility that you may use to provide configuration settings to the profile. You then send the configuration setup to the module.

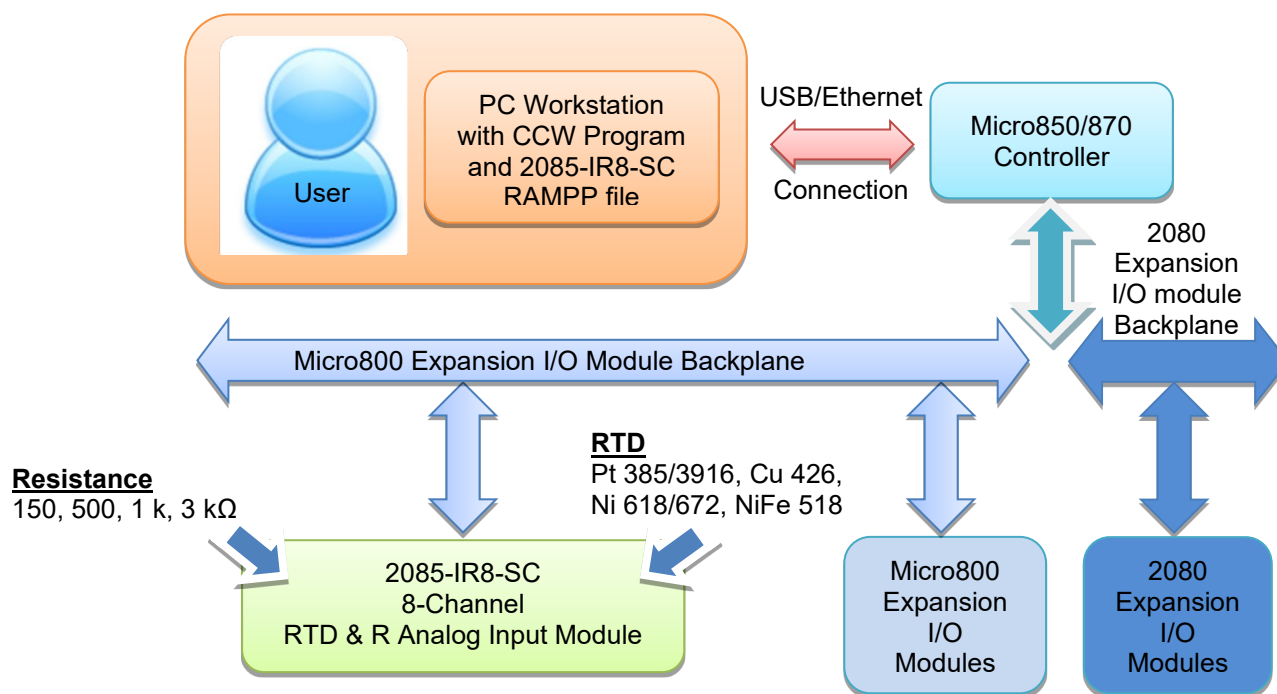
Your controller firmware must be at v. 9.011 and above as well.

The Micro850/870 Controller (Bus master) subsystem is located at the left end of the bus. This subsystem is comprised of:

- Micro800 Controller
- Micro800 Expansion I/O Modules
- 2085-ECR Bus Terminator

Optional:

- 2080-PS120-240VAC Power Supply (separate module or built-in the main controller).
- 2080 Expansion Modules
- 2085-EP24VDC Expansion Power Supply for Micro870 Controller.



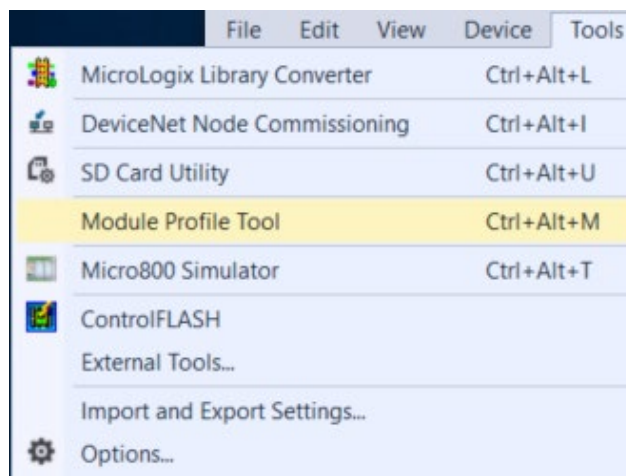
## Section 3.2

### Importing a Profile into CCW Software

You use the module's add-on-profile to configure your module. The profile is available in the CCW software. If not available, or a newer revision is released, see Appendix A about how to manually import a module AOP to CCW.

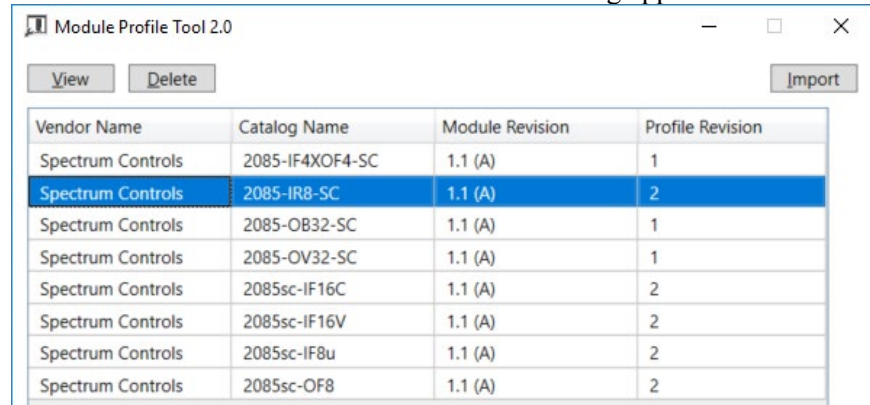
To view information about the profile:

1. Use RA's Module Profile Tool 2.0. This tool may be launched from within CCW by selecting the **Module Profile Tool** option from the CCW Tools menu:



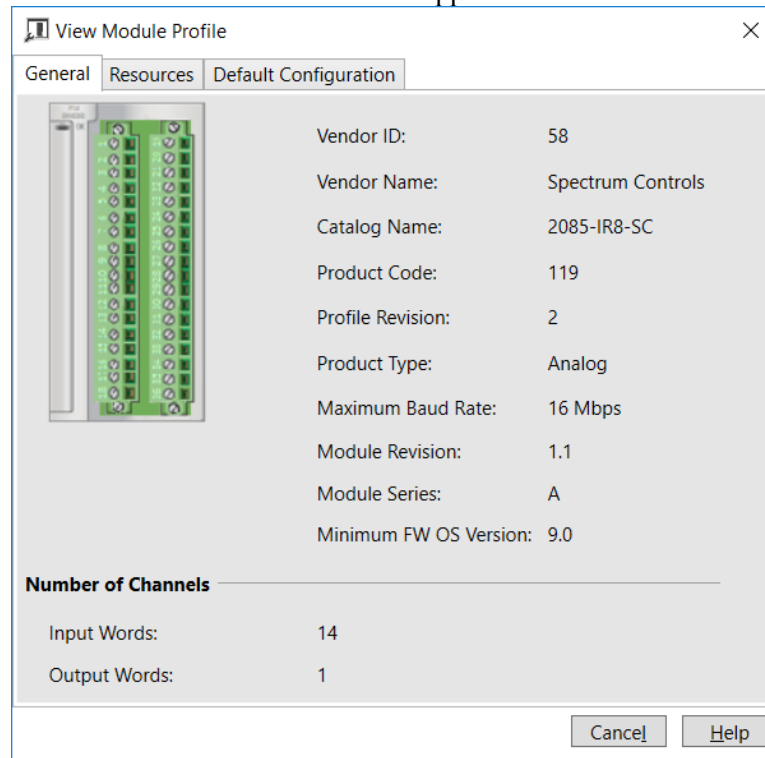
2. When prompted by Windows User Account Control, to confirm that you wish to run the program, click **Yes** button.

If necessary, confirm with the Windows operating system that you wish to run the software. The Module Profile Tool dialog appears:



3. Select the row showing the module catalog name, and then click the **View** button.

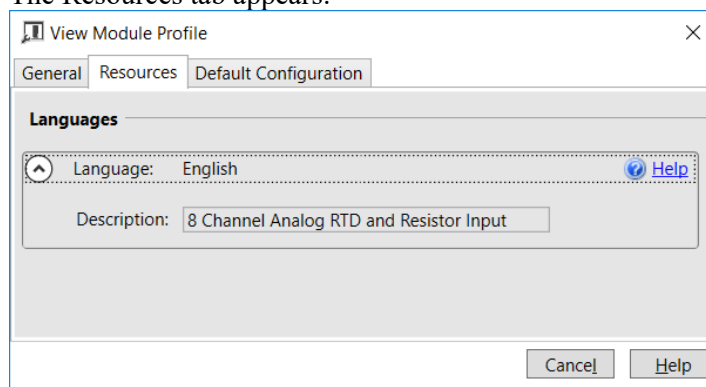
The View Module Profile window appears:



The first tab of the window provides the module identity information. This information is described in greater detail in **Module Identity**, later in this section.

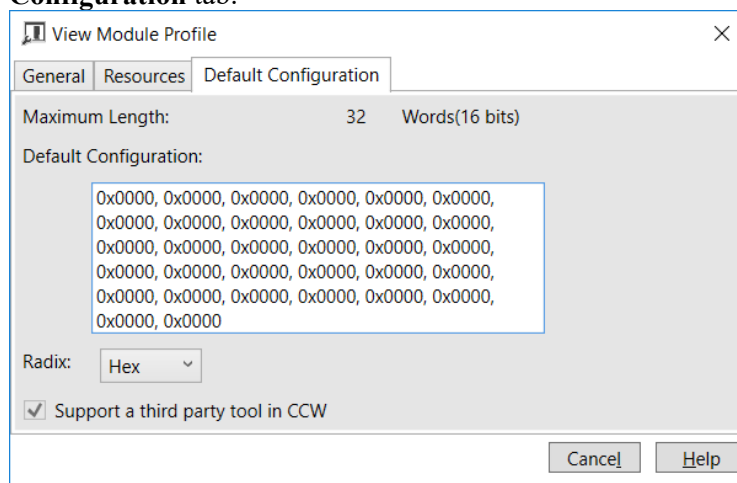
4. To view software language availability, module description, and a help file for the module, click the **Resources** tab.

The Resources tab appears:



The window lists the language chosen for the module, and the module description. You may also use this tab to access the help file provided for the module.

5. To view default configuration information, click the **Default Configuration** tab:



6. The enabled checkbox shown on the bottom of the tab indicates that the software provides the service for launching the MCC utility to help you configure your module. More information is described in Setting Configuration Parameters Using MCC, later in this section.

### Section 3.3

#### 2085-IR8-SC

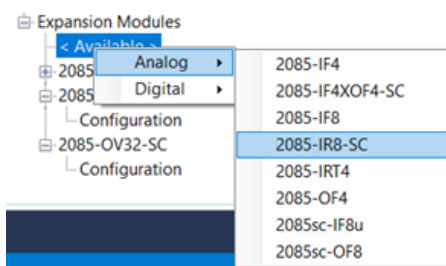
#### Tab on CCW

Before you start, if needed, install the latest version of Rockwell Automation's Connected Components Workbench (CCW) Standard Edition.

#### NOTE

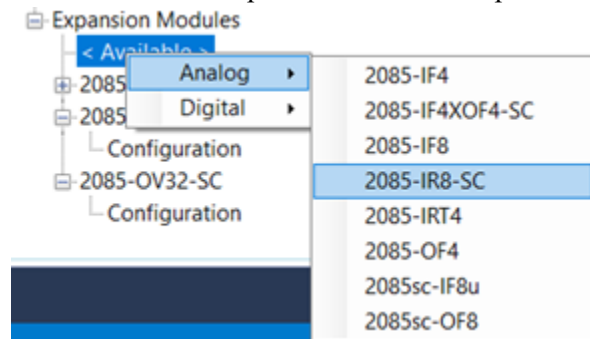


Using the Module Profile Tool to import the 2085-IR8 AOP into CCW software is necessary only if you are using a CCW version earlier than 11.00.00. For information on manually importing an AOP file, see Appendix A. For Version 11.00.00 and later, the module is already available as a selection from the CCW Expansion Modules drop-down menu:



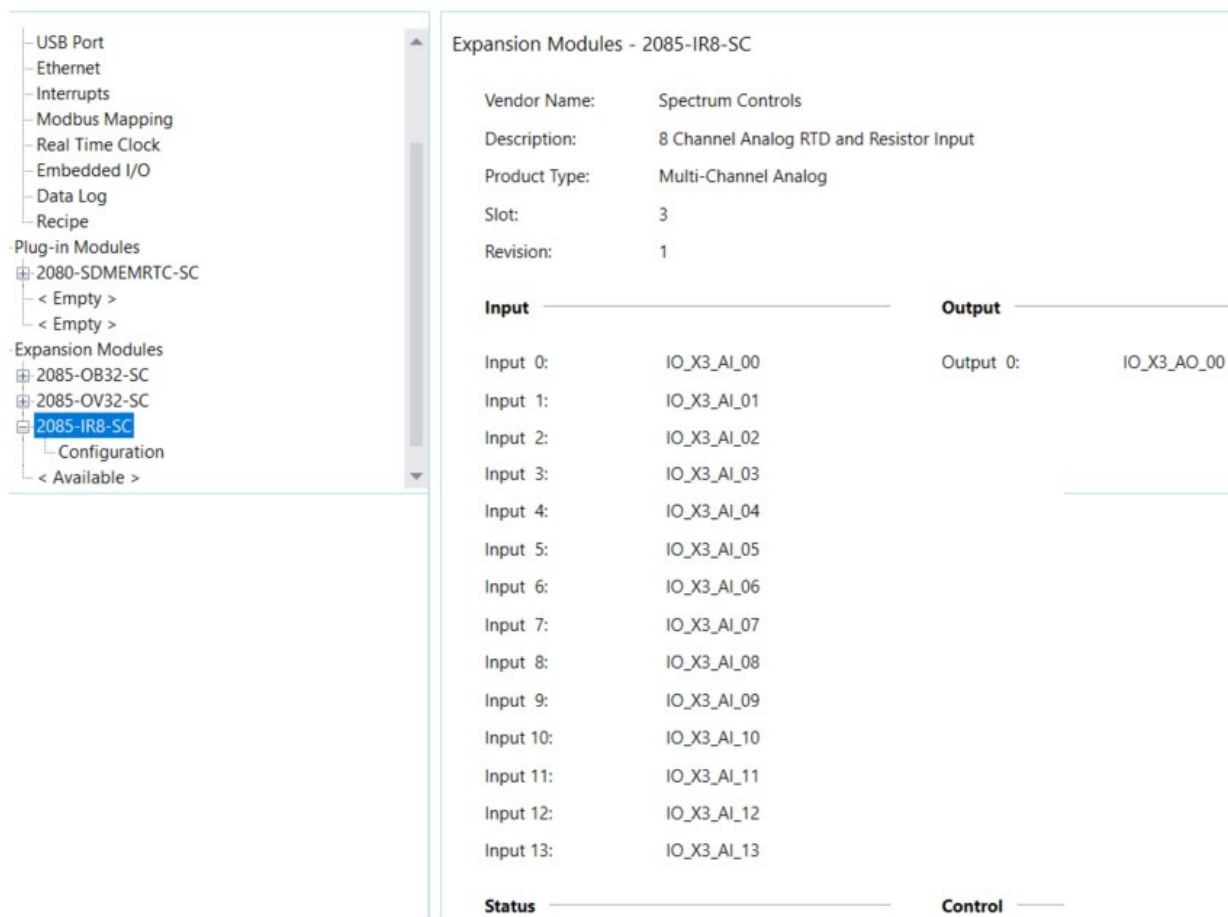
To add the module to your project, and see its configuration parameters on the CCW configuration tab:

1. From your CCW project, load the module AOP to a first **Available** slot from the Expansion Modules drop-down list.

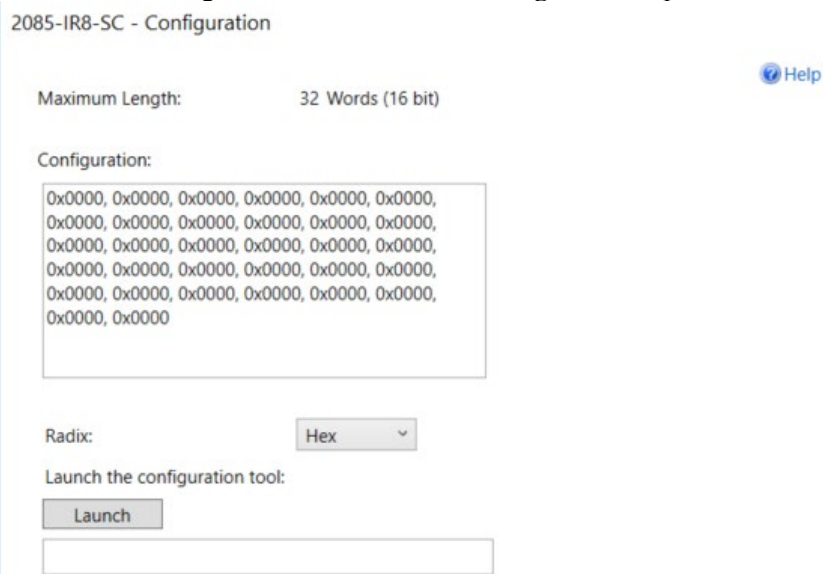


2. Once the module AOP is loaded, to view the associated variables, click the **Module Catalog Name** option.

The same variables can also be found on the CCW Global Variables Tab:



- To view the configuration tab, click the **Configuration** option:



- **Maximum Length.** Shows maximum number of words available. Each word is 16-bit.

- **Configuration.** The textbox lists out the whole module configuration value.
- **Radix.** The drop-down menu contains the following number formats for indicating module configuration value. Options are:
  - Hex. Default option. Characters represented as hexadecimal. Example: 0×7FFF as 32767 in decimal format.
  - ASCII. Characters represented as ASCII. Example: \7F\FF
  - Binary. Characters represented as 0 and 1. Example: 0111111111111111
  - Decimal. Characters represented as decimals. Example: 32767<sup>3</sup>
- **Launch.** Use to populate the file path field. The file path lets you enter the file path for opening the MCC utility program to assist you in configuring the module. Use the Browse ellipse to navigate to where the utility is stored. Then click the **Launch** button to start the utility.

### Section 3.4

#### Setting Configuration Parameters Using MCC

You may create the configuration for each channel using the utility provided by Spectrum Controls, Inc. You download the utility from the Spectrum Controls website at [www.spectrumcontrols.com](http://www.spectrumcontrols.com).

#### NOTE



It is recommended that when you generate your configuration, that you use the **Binary Radix** selection. If you choose the **Decimal Radix**, the utility is unable to work with negative values.

You may create the configuration for each channel using the MCC utility provided by Spectrum Controls, Inc. You download the utility from the Spectrum Controls website at <https://www.spectrumcontrols.com>.

To use the MCC utility:

1. The first time you configure a Spectrum Controls 2085 analog module, you must provide the file path of the utility to the CCW software.

<sup>3</sup> The valid range for the Decimal Radix indication is from 0 to 65535. It does not accept negative values. If you need to receive negative values, select the **Hex Radix** option instead.

2. Navigate to the CCW Configuration Tab and click in the file path textbox below the **Launch** button.

Launch the configuration tool:

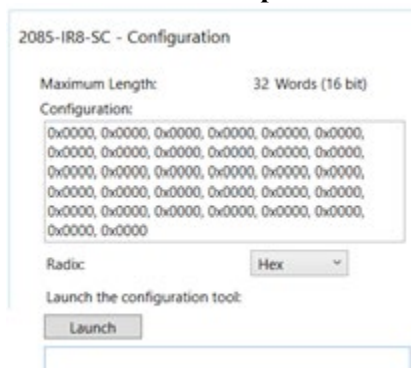


A screenshot showing a button labeled 'Launch' above a text input field. The text input field is empty and has a small '...' button to its right.

The **Browse** button appears.

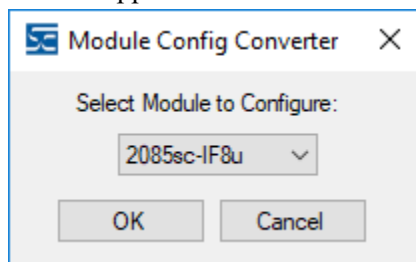
3. Click the button, navigate to the directory where you installed the CCW program, and select the ModuleConfigConverter tool located in the Spectrum Tool directory:

Example. **C:\Program Files (x86)\Rockwell Automation\CCW\SpectrumTool**



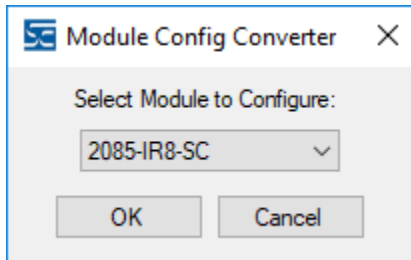
A screenshot of a dialog box titled '2085-IR8-SC - Configuration'. It shows 'Maximum Length: 32 Words (16 bit)' and a 'Configuration:' section with a list of 32 hex values (0x0000). Below this is a 'Radio:' section with a 'Hex' dropdown. At the bottom, there is a 'Launch the configuration tool:' label and a 'Launch' button.

4. To run the tool, click **Launch**. The Module Config Converter dialog appears:



A screenshot of a dialog box titled 'Module Config Converter'. It has a 'Select Module to Configure:' label and a dropdown menu showing '2085sc-IF8u'. Below the dropdown are 'OK' and 'Cancel' buttons.

5. Select the 2085-IR8-SC module from the drop-down menu, and click **OK**:



A screenshot of a dialog box titled 'Module Config Converter'. It has a 'Select Module to Configure:' label and a dropdown menu showing '2085-IR8-SC'. Below the dropdown are 'OK' and 'Cancel' buttons.



The 2085-IR8-SC Configuration Setup dialog appears:

Chan...	Enable	Input Type	Data Format	Temp Units	Connection	Filter	Open Circuit Response	Process Alarm	Process Alarm High	Process Alarm Low	Channel Bias
0	<input checked="" type="checkbox"/>	100 Ω Platinum 385	Engineering Units X1	°C	3-Wire with compensation	17 Hz	Upscale	Disable Both	0	0	0
1	<input checked="" type="checkbox"/>	100 Ω Platinum 385	Engineering Units X1	°C	3-Wire with compensation	17 Hz	Upscale	Disable Both	0	0	0
2	<input checked="" type="checkbox"/>	100 Ω Platinum 385	Engineering Units X1	°C	3-Wire with compensation	17 Hz	Upscale	Disable Both	0	0	0
3	<input checked="" type="checkbox"/>	100 Ω Platinum 385	Engineering Units X1	°C	3-Wire with compensation	17 Hz	Upscale	Disable Both	0	0	0
4	<input checked="" type="checkbox"/>	100 Ω Platinum 385	Engineering Units X1	°C	3-Wire with compensation	17 Hz	Upscale	Disable Both	0	0	0
5	<input checked="" type="checkbox"/>	100 Ω Platinum 385	Engineering Units X1	°C	3-Wire with compensation	17 Hz	Upscale	Disable Both	0	0	0
6	<input checked="" type="checkbox"/>	100 Ω Platinum 385	Engineering Units X1	°C	3-Wire with compensation	17 Hz	Upscale	Disable Both	0	0	0
7	<input checked="" type="checkbox"/>	100 Ω Platinum 385	Engineering Units X1	°C	3-Wire with compensation	17 Hz	Upscale	Disable Both	0	0	0

Copy To CCW Generate Cancel

6. View and specify the following options as needed. See Channel Configuration Bit locations listed later in this section for details on the settings for every configuration bit:

- **Chan.** Lists number of input channel from **0** to **7**.
- **Enable.** Specifies whether to enable use of this channel. **Enabled** by default (checkbox enabled).
- **Input Type.** Specifies which input type to use. Select type from drop-down list. **100 Ω Platinum 385** is default:

Input Type

500 Ω Platinum 385

100 Ω Platinum 385

200 Ω Platinum 385

500 Ω Platinum 385

1000 Ω Platinum 385

100 Ω Platinum 3916

200 Ω Platinum 3916

500 Ω Platinum 3916

1000 Ω Platinum 3916

10 Ω Copper 426

100 Ω Nickel 618

120 Ω Nickel 672

604 Ω Nickel-Iron 518

150 Ω

500 Ω

1000 Ω

3000 Ω

- **Data Format.** Specifies which data format to use for reporting input values. Default is **Engineering Units X1**:

Data Format

Engineering Units X1

Engineering Units X1

Engineering Units X10

Raw/Proportional

Percentage Range

- **Temp Units.** Specifies the temperature units the module reports in Centigrade or Fahrenheit. Default is **Centigrade**:

Temp Units

°C

°C

°F

- **Connection.** Defines connection type. Default is **3-Wire With Compensation**:

Connection
3-Wire with compensation ▾
3-Wire with compensation
4-Wire
2-Wire

- **Filter.** Specifies which filter to use. Default is **17 Hz**.

Filter
17 Hz ▾
17 Hz
4 Hz
62 Hz
470 Hz

- **Open Circuit Response.** Specifies how to respond to an open circuit condition. Default is **Upscale**<sup>4</sup>.

Open Circuit Response
Upscale ▾
Upscale
Downscale
Zero
Disable

- **Process Alarm .** Specifies whether a warning on under- or over-range detection (from user-defined values) is turned on for the channel, disabled, or enabled for both alarm and latch.

Process Alarm	Process
Disable Both ▾	
Disable Both	
Enable Alarm	
Enable Alarm and Latch	

- **Process Alarm High.** Specify over range value of a user-defined value for the module to monitor.

Process Alarm High
0

- **Process Alarm Low.** Specify under range value of a user-defined pair of high and low values for the module to monitor.

Process Alarm Low
0

- **Channel Bias.** Specifies individual channel bias values. Default bias is **0**. Range may be **-32768** to **32767**.

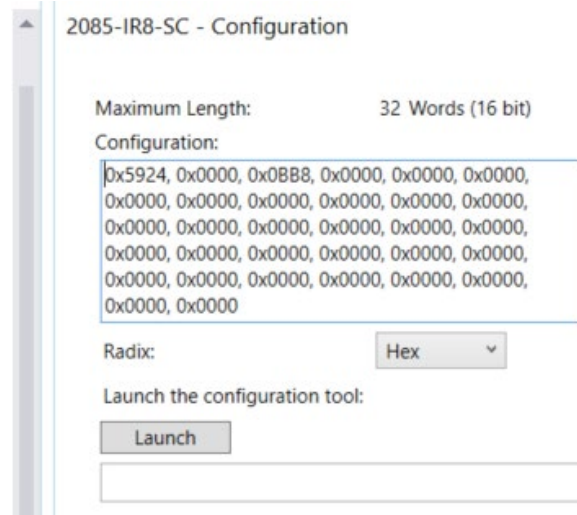
Channel Bias
0

<sup>4</sup> The **Disable** option is only available for voltage measurement.

7. When finished making selections, click **Generate**.  
The Configuration Text dialog appears with your configuration settings for all the channels.  
You can manually copy the settings and paste it to the textbox of the CCW Configuration tab<sup>5</sup>.



8. To automatically copy the generated settings into the textbox of the CCW Configuration tab, have the textbox visible on the monitor screen, and then click **Copy to CCW** button<sup>5</sup>.
9. The utility copies the configuration settings and shows it inside the textbox.



10. Download the CCW project to controller and start to run the module operation.

<sup>5</sup> It is recommended that before manually or automatically pasting your configuration settings to the textbox of the CCW Configuration tab, be sure to select the **Hex Radix** indication on both software packages. The CCW software is unable to receive negative values under **Decimal Radix** indication.

## Section 3.5 Software Information

### 3.5.1 Software Versioning

The software version tracks major and minor revisions for end users.

The shipped software version begins at version 1.1.

Once released, the major revision is typically incremented if new features are introduced to the product. Otherwise only the minor revision is incremented.

### 3.5.2 Software Updates

In-field updating of the software by the end user is not supported.

### 3.5.3 Startup and Factory Default Conditions

After the module boots and before the initial configuration is received, the module holds the default configuration as specified in the Configuration Assembly. There is no input data communication and no signal outputting before the controller goes into run mode. The default configuration is for all channels enabled in the 3-wire, 100PT385 range with the 17 Hz filter in Engineering  $\times 1$  units.

### 3.5.4 PLC Interfaces

The 2085 platform treats all data on an I/O module as a member of a named Array of Words.

#### Module Identity

The following values will be stored in the Vendor\_ID, Product\_Type, Product\_Code, Series\_Rev, and Mod\_Features arrays:

Parameter	Description
Vendor ID	58 (Spectrum Controls) [0 $\times$ 03A]
Product Type	10 (Analog) [0 $\times$ 0A]
Product Code	119 [0 $\times$ 77]
Series Rev	50208 [0 $\times$ C420] (First release revision is 1.1)
Module Catalog String	2085-IR8-SC

### 3.5.5 Connection Types and Assembly Sizes

The size of each assembly is listed in the table below. Each word takes 2 bytes.

These values are stored in the Mod\_Size array:

Table	Size (words)
Configuration Assembly	32
Input Assembly	14
Output Assembly	1

### 3.5.6 Configuration Table

The configuration table size for the module is 32 words. Each Configuration Bit is formed in an unsigned 16-bit Data Type. Each value input is assigned to a signed 16-bit Data Type with a range of -32768 to +32767.

Word Index	Tag Name for 2085-IR8-SC (32 Words)
Config. 0	Ch0 Configuration Bits
Config. 1	Ch0 Process Alarm High Value
Config. 2	Ch0 Process Alarm Low Value
Config. 3	Ch0 Channel Bias Value
...	Ch1 to Ch6 Configurations
Config. 28	Ch7 Configuration Bits
Config. 29	Ch7 Process Alarm High Value
Config. 30	Ch7 Process Alarm Low Value
Config. 31	Ch7 Channel Bias Value

### 3.5.7 Channel Configuration Bit Location Data

Feature	Option	Decimal Value	Configuration Bit																
			15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
Channel Enable	Enable	0																	0
	Disable	1																	1
Input Type	Pt 385 100 Ω	0													0	0	0	0	
	Pt 385 200 Ω	1													0	0	0	1	
	Pt 385 500 Ω	2													0	0	1	0	
	Pt 385 1000 Ω	3													0	0	1	1	
	Pt 3916 100 Ω	4													0	1	0	0	
	Pt 3916 200 Ω	5													0	1	0	1	
	Pt 3916 500 Ω	6													0	1	1	0	
	Pt 3916 1000 Ω	7													0	1	1	1	
	Cu 426 10 Ω	8													1	0	0	0	
	Ni 618 100 Ω	9													1	0	0	1	
	Ni 672 120 Ω	10													1	0	1	0	
	NiFe 518 604 Ω	11													1	0	1	1	
	150 Ω	12													1	1	0	0	
	500 Ω	13													1	1	0	1	
	1000 Ω	14													1	1	1	0	
	3000 Ω	15													1	1	1	1	
Data Format	Engineering Units ×1	0											0	0					
	Engineering Units ×10	1											0	1					

Feature	Option	Decimal Value	Configuration Bit															
			15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	Raw/Proportional Data	2											1	0				
	Percentage Range	3											1	1				
Temperature Scale <sup>6</sup>	°C	0									0							
	°F	1															1	
Connection Method	3-wire with compensation	0							0	0								
	4-wire	1							0	1								
	2-wire	2							1	0								
	Invalid	NA							NA									
Filter Frequency	17 Hz	0					0	0										
	4 Hz	1					0	1										
	62 Hz	2					1	0										
	470 Hz	3					1	1										
Open Circuit Detection	Upscale	0			0	0												
	Downscale	1			0	1												
	Zero	2			1	0												
	Disable	3			1	1												
Process Alarm & Latching	Both Disabled	0	0	0														
	Alarm Enabled Only	1	0	1														
	Alarm & Latching Enabled	2	1	0														
	Invalid	NA	NA															

### 3.5.8 Channel Configuration Values

The module provides 3 words for you to enter each channel's Process Alarm High value, Process Alarm Low value, and Channel Bias value. Each value is specified as a full-scale integer which starts from -32768 to +32767. See the related information in the Process Alarm and Latching feature and the Channel Bias sections later in this manual.

Feature	Type	Length
Process Alarm High	INT	1 word
Process Alarm Low	INT	1 word
Channel Bias	INT	1 word

<sup>6</sup> Effective only when the "Input Type" of the selected input channel is configured to use "RTD" type and EU×1 or EU×10 Data Format.

### 3.5.9 Input Table

The input table size for the module is 16 words. Each channel data is assigned to a signed 16-bit data byte and displays value between -32768 to +32767. The actual display value is clamped by each Input Type limit, or by the signed 16-bit data byte, whichever comes first. Other status indication bits, fault bits, and software revision information are in an unsigned 16-bit Data Type.

Word Index	Tag Name for 2085-IR8-SC (14 Words)	
AI_00	Ch0 Data	
AI_01	Ch1 Data	
AI_02	Ch2 Data	
AI_03	Ch3 Data	
AI_04	Ch4 Data	
AI_05	Ch5 Data	
AI_06	Ch6 Data	
AI_07	Ch7 Data	
AI_08	Ch1 Status	Ch 0 Status
AI_09	Ch3 Status	Ch 2 Status
AI_10	Ch5 Status	Ch 4 Status
AI_11	Ch7 Status	Ch 6 Status
AI_12	Module Status	
AI_13	Software Revision	

### 3.5.10 Input Bit and Value Allocation

Status & Reading Indication	Word Index	High Byte								Low Byte							
		Bits															
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Ch0 Data	AI_00	Signed INT															
Ch1 Data	AI_01	Signed INT															
Ch2 Data	AI_02	Signed INT															
Ch3 Data	AI_03	Signed INT															
Ch4 Data	AI_04	Signed INT															
Ch5 Data	AI_05	Signed INT															
Ch6 Data	AI_06	Signed INT															
Ch7 Data	AI_07	Signed INT															
Ch 1 & 0 Status	AI_08	-	OC	OR	UR	PAH	PAL	ADC	FT1	-	OC	OR	UR	PAH	PAL	ADC	FT0
Ch 3 & 2 Status	AI_09	-	OC	OR	UR	PAH	PAL	ADC	FT3	-	OC	OR	UR	PAH	PAL	ADC	FT2
Ch 5 & 4 Status	AI_10	-	OC	OR	UR	PAH	PAL	ADC	FT5	-	OC	OR	UR	PAH	PAL	ADC	FT4

Status & Reading Indication	Word Index	High Byte								Low Byte							
		Bits															
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Ch 7 & 6 Status	AI_11	-	OC	OR	UR	PAH	PAL	ADC	FT7	-	OC	OR	UR	PAH	PAL	ADC	FT6
Module & Channel Fault	AI_12	MF	CAL	SN	Unused					-	-	-	-	-	-	-	-
Software Revision	AI_13	Signed INT															

### 3.5.11 Module and Channel Fault Bit and Value Description

Module and Channel Fault	
Name	Description
<b>Unused</b>	Bits marked as Not Used are set to 0.
<b>CAL</b>	Invalid Cal Data The stored calibration data or checksum is corrupt or invalid. The module must be factory calibrated before it will operate normally.
<b>SN</b>	Invalid Serial Number Data The stored serial number checksum is corrupt or invalid. The module must be factory calibrated before it will operate normally.
<b>MF</b>	Module Fault Set as global fault if any channel fault.

### 3.5.12 Software Revision

Name	Description
	Displayed as an integer value. Example: 1101 is version 1.1.01

### 3.5.13 Channel Status

Channel Status	
Name	Description
<b>FT&lt;n&gt;</b>	Channel Fault <Channel> Channel Fault bit. If a bit is set (1) then there is an error associated with that input channel.
<b>ADC&lt;n&gt;</b>	ADC Communication Failure or PGA Connection Failure When set to 1, indicates there is a channel ADC communication failure or PGA connection error. This is a hardware fault.
<b>PAL&lt;n&gt;</b>	Process Alarm Low When set to 1, indicates the channel input value is less than or equal to the user-defined Process Alarm Low Value in the configuration table.



<b>Channel Status</b>	
<b>Name</b>	<b>Description</b>
<b>PAH&lt;n&gt;</b>	Process Alarm High When set to 1, indicates the channel input value is greater than or equal to the user-defined Process Alarm High Value in the configuration table.
<b>UR&lt;n&gt;</b>	Under Range When set to 1, indicates the channel input reading is less than or equal to the minimum point of the selected Input Type range or the Data Type low limit, -32768.
<b>OR&lt;n&gt;</b>	Over Range When set to 1, indicates the channel input reading is greater than or equal to the maximum point of the selected Input Type range or the Data Type high limit, +32767.
<b>OC&lt;n&gt;</b>	Open Circuit When set to 1, indicates the channel connection on the terminal block is open.
<b>Unused</b>	Bits marked as Not Used are set to 0.

### 3.5.14 Channel Data

<b>Channel Data</b>		
<b>Length</b>	<b>Name</b>	<b>Description</b>
<b>1 word</b>	Ch<n> Data	Channel Input Data <Channel> The Data Type for the Channel Input Data is a signed 16-bit integer. The integer ranges from -32768 to +32767.  See additional indication information about the Under/Over Range Alarm feature and information about the Open Circuit Detection.

### 3.5.15 Output Table

The output table size for the module is 1 word. The 16 bits in each word are the control bits on clearing the Low and High Process Alarm Latches for 8 channels a group. To operate the control bits, see the information about the Process Alarm and Latching feature.

<b>Word Index</b>	<b>Tag Name for 2085-IR8-SC (1 Word)</b>
AO_00	Ch 7:0 Clear High/Low Process Alarm Latch

### 3.5.16 Output Bit Allocation

Process Alarm Latch	Word Index	High Byte								Low Byte							
		Bits															
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Ch 7:0	AO_00	CH 7	CL 7	CH 6	CL 6	CH 5	CL 5	CH 4	CL 4	CH 3	CL 3	CH 2	CL 2	CH 1	CL 1	CH 0	CL 0

### 3.5.17 Output Bit Description

AO_00: Clear High/Low Process Alarm Latches		
Bit	Name	Description
Even	CL<n>	Clear Low Process Alarm Latch 0: Normal Operation 1: Clear low process alarm latch
Odd	CH<n>	Clear High Process Alarm Latch 0: Normal Operation 1: Clear high process alarm latch

## Section 3.6 Product Features

The following sections provide information on user-configurable parameters.

### 3.6.1 Data Format

The Data Format is used to define the display scale of the measured input data. Each channel can display different formats, based on user-defined choices. This module provides four options for channel input display:

Index	Data Format	Note
0	Engineering Unit $\times 1$	Default
1	Engineering Unit $\times 10$	
2	Raw/Proportional	
3	Percentage Full Scale	

### 3.6.2 Input Type

The maximum range to display a measured input data in the input table is from -32768 to +32767 as a signed 16-bit integer. The actual range is scaled to fit the selected Input Type. For example, the valid range for Pt 385 types is from -200°C to 850°C. In Engineering Unit  $\times 1$  format, the valid display range is from -2000 to 8500, which provides the resolution down to 1 decimal place.

The defined, data display resolution for each input type is listed in the following table.

If the Data Format of the Input Type supports the resolution up to after the decimal point, the fractional part of the input reading is shifted up to display in integers:

Input Type	EUx1	EUx10	Raw Prop	Percentage
RTD	1 decimal point (DP)	Integer	56K	10 K
Resistance	2 DP for 150 $\Omega$ 1 DP for 500/1 K/3 K $\Omega$	1 DP for 150 $\Omega$ Integer for 500/1 K/3 K $\Omega$		10.5 K

In Engineering Unit  $\times 10$  format, the valid display range is from -200 to 850 in integers. The Raw/Proportional format provides 65 K resolution based on the valid range in EU $\times 1$  format of the selected Input Type. The same scaling requirement applies to the Percentage format, which has 10 K resolution.

Index	Selection	Note
0	Pt 385 100 $\Omega$	Default
1	Pt 385 200 $\Omega$	
2	Pt 385 500 $\Omega$	
3	Pt 385 1000 $\Omega$	
4	Pt 3916 100 $\Omega$	
5	Pt 3916 200 $\Omega$	
6	Pt 3916 500 $\Omega$	
7	Pt 3916 1000 $\Omega$	
8	Cu 426 10 $\Omega$	
9	Ni 618 100 $\Omega$	
10	Ni 672 120 $\Omega$	
11	NiFe 518 604 $\Omega$	
12	150 $\Omega$	
13	500 $\Omega$	
14	1000 $\Omega$	
15	3000 $\Omega$	

Range points and limits for Input Types are provided in the following table. For each Input Type, the limits are set to the maximum and minimum values of its range:

Input Type	Input Value	Condition	EU x1	EU x10	Raw Prop	Percentage
<b>RTD</b>						
<b>100 <math>\Omega</math> Pt 0.385</b>	850.00 $^{\circ}\text{C}$	High Limit	8500	850	32767	10000
	850.00 $^{\circ}\text{C}$	High Range	8500	850	32767	10000
	-200.00 $^{\circ}\text{C}$	Low Range	-2000	-200	-32768	0
	-200.00 $^{\circ}\text{C}$	Low Limit	-2000	-200	-32768	0

Input Type	Input Value	Condition	EU x1	EU x10	Raw Prop	Percentage
<b>RTD</b>						
<b>200 <math>\Omega</math> Pt 0.385</b>	850.00 °C	High Limit	8500	850	32767	10000
	850.00 °C	High Range	8500	850	32767	10000
	-200.00 °C	Low Range	-2000	-200	-32768	0
	-200.00 °C	Low Limit	-2000	-200	-32768	0
<b>500 <math>\Omega</math> Pt 0.385</b>	850.00 °C	High Limit	8500	850	32767	10000
	850.00 °C	High Range	8500	850	32767	10000
	-200.00 °C	Low Range	-2000	-200	-32768	0
	-200.00 °C	Low Limit	-2000	-200	-32768	0
<b>1000 <math>\Omega</math> Pt 0.385</b>	850.00 °C	High Limit	8500	850	32767	10000
	850.00 °C	High Range	8500	850	32767	10000
	-200.00 °C	Low Range	-2000	-200	-32768	0
	-200.00 °C	Low Limit	-2000	-200	-32768	0
<b>100 <math>\Omega</math> Pt 0.3916</b>	630.00 °C	High Limit	6300	630	32767	10000
	630.00 °C	High Range	6300	630	32767	10000
	-200.00 °C	Low Range	-2000	-200	-32768	0
	-200.00 °C	Low Limit	-2000	-200	-32768	0
<b>200 <math>\Omega</math> Pt 0.3916</b>	630.00 °C	High Limit	6300	630	32767	10000
	630.00 °C	High Range	6300	630	32767	10000
	-200.00 °C	Low Range	-2000	-200	-32768	0
	-200.00 °C	Low Limit	-2000	-200	-32768	0
<b>500 <math>\Omega</math> Pt 0.3916</b>	630.00 °C	High Limit	6300	630	32767	10000
	630.00 °C	High Range	6300	630	32767	10000
	-200.00 °C	Low Range	-2000	-200	-32768	0
	-200.00 °C	Low Limit	-2000	-200	-32768	0
<b>1000 <math>\Omega</math> Pt 0.3916</b>	630.00 °C	High Limit	6300	630	32767	10000
	630.00 °C	High Range	6300	630	32767	10000
	-200.00 °C	Low Range	-2000	-200	-32768	0
	-200.00 °C	Low Limit	-2000	-200	-32768	0
<b>10 <math>\Omega</math> Cu 0.426</b>	260.00 °C	High Limit	2600	260	32767	10000
	260.00 °C	High Range	2600	260	32767	10000
	-100.00 °C	Low Range	-1000	-100	-32768	0
	-100.00 °C	Low Limit	-1000	-100	-32768	0
<b>100 <math>\Omega</math> Ni</b>	260.00 °C	High Limit	2600	260	32767	10000
	260.00 °C	High Range	2600	260	32767	10000

Input Type	Input Value	Condition	EU x1	EU x10	Raw Prop	Percentage
<b>RTD</b>						
<b>0.618</b>	-100.00 °C	Low Range	-1000	-100	-32768	0
	-100.00 °C	Low Limit	-1000	-100	-32768	0
<b>120 Ω Ni 0.672</b>	260.00 °C	High Limit	2600	260	32767	10000
	260.00 °C	High Range	2600	260	32767	10000
	-80.00 °C	Low Range	-800	-80	-32768	0
	-80.00 °C	Low Limit	-800	-80	-32768	0
<b>604 Ω Ni-Fe 0.518</b>	200.00 °C	High Limit	2000	200	32767	10000
	200.00 °C	High Range	2000	200	32767	10000
	-100.00 °C	Low Range	-1000	-100	-32768	0
	-100.00 °C	Low Limit	-1000	-100	-32768	0

Input Type	Input Value	Condition	EU x1	EU x10	Raw Prop	Percentage
<b>Resistance</b>						
<b>0-150 Ω</b>	150.00 Ω	High Limit	15000	1500	32767	10000
	150.00 Ω	High Range	15000	1500	32767	10000
	0.00 Ω	Low Range	0	0	-32768	0
	0.00 Ω	Low Limit	0	0	-32768	0
<b>0-500 Ω</b>	500.00 Ω	High Limit	5000	500	32767	10000
	500.00 Ω	High Range	5000	500	32767	10000
	0.00 Ω	Low Range	0	0	-32768	0
	0.00 Ω	Low Limit	0	0	-32768	0
<b>0-1000 Ω</b>	1000.00 Ω	High Limit	10000	1000	32767	10000
	1000.00 Ω	High Range	10000	1000	32767	10000
	0.00 Ω	Low Range	0	0	-32768	0
	0.00 Ω	Low Limit	0	0	-32768	0
<b>0-3000 Ω</b>	3000.00 Ω	High Limit	30000	3000	32767	10000
	3000.00 Ω	High Range	30000	3000	32767	10000
	0.00 Ω	Low Range	0	0	-32768	0
	0.00 Ω	Low Limit	0	0	-32768	0

### 3.6.3 Channel Bias

The module provides a signed 16-bit integer for user to enter a channel bias value in the configuration table. It can be used to adjust the channel input reading if the inserted Input Type sensor has measurement offset. The available range is from -32768 to +32767.

The scaling formula with the channel bias applied is:

$$y = mx + b + \text{Channel Bias}$$

Where:

$y$  is the final scaled reading shown in the input table.

$m$  is the gain:

$$m = \frac{(\text{User High Limit} - \text{User Low Limit})}{(\text{Actual High Limit} - \text{Actual Low Limit})}$$

The User High/Low Limit value is based on the selected Input Type and the selected Data Format. The Actual High/Low Limit value used is the actual limit of the selected Input Type without scaling. For example, if Pt 385 type and EU×1 are selected in the configuration table, the gain will be  $10 = (8500 - (-2000)) / (850 - (-200))$ ,  $m = 10$ .

$x$  is the ADC signal data acquired at the terminal block and converted to the corresponding Data Format.

If you have an RTD input, this  $x$  is the actual temperature in degree C. The firmware reads in the ADC data count. Next, the data count is converted to the resistor value in ohms based on the gain setting of the ADC and the setting of the 2-wire, or 3-wire; the resistor value is then converted to temperature in degree C based on the RTD curve specification.

$b$  is the offset:  $\text{User Low Limit} - (m * \text{Actual Low Limit})$ .

*Channel Bias* is an offset in integer format.

The Channel Bias value is only applied to the raw measured value. It will not be applied to shift the minimum and the maximum points and the limits of the selected Input Type range. If the final channel input reading is equal to or goes beyond the minimum or the maximum point of the selected Input Type range, a Channel Fault and an Over/Under Range Fault bits will be set in the input table.

### 3.6.4 Channel Temperature

The module provides a feature to select the temperature display unit for each channel input reading if the channel is configured to use RTD measurement with EU×1 or EU×10 Data Format used. Temperature is not used if the channel is being used to run resistance measurements, or a non-engineering unit data format is selected.

Index	Unit	Note
0	°C	Default
1	°F	

### 3.6.5 Connection Method

The default option is used when the 3-wire RTD or resistance device is connected. The module will run additional compensation to cancel out the lead-wire resistance value. The next option provides more accurate measurement when the connected RTD or resistance device is a 4-wire type. The last option can be used to measure the value across the main resistance load plus the doubled lead-wire resistance value if the 2-wire RTD or resistance device is connected.

Index	Connection Method	Note
0	3-wire with Compensation	Default
1	4-wire	
2	2-wire	
3	Invalid	

### 3-Wire Method

When using the 3-wire measurement with one-side sense-wire connected, two measurements will be executed. The first measurement acquires the reading across the main resistance load plus the doubled lead-wire resistance value. The acquisition rate of this measurement is based on the channel scan rate. The second measurement acquires the reading across the main resistance load plus the single lead-wire resistance value through the one-side sense-wire. This measurement is triggered by a microprocessor timer happens every 60 seconds.

If any open wires happen when using this option, the timer will be reset and both measurements will happen sequentially. Until all the open circuit conditions are resolved, the acquisition timing of the secondary measurement will be reset back to the 6-second timeframe. Below are the steps on running 3-wire measurement with compensation.

Measurement I:

$$\frac{V_{VI-COM}}{I} = (R_{main} + 2R_{lead-wire})$$

Measurement II:

$$\frac{V_{VI-RS}}{I} = (R_{main} + R_{lead-wire})$$

Where  $I$  is the injected excitation current.

Calculation:

$$R_{lead-wire} = (R_{main} + 2R_{lead-wire}) - (R_{main} + R_{lead-wire})$$

$$R_{main} = (R_{main} + 2R'_{lead-wire}) - 2R_{lead-wire}$$

Where  $R'_{lead-wire}$  is the previous measured lead-wire value triggered by the timer.

### 4-Wire Method

When using the 4-wire measurement with two-side sense-wire pair connected, the only required measurement is to measure the voltage drop across the main resistance load. It will be converted to the corresponding temperature reading or resistance value based on the selected Input Type. The data acquisition is executed periodically based on the channel scan rate.

Single Measurement:

$$\frac{V_{RS+ - RS-}}{I} = R_{subject}$$

### 2-Wire Method

When using the 2-wire measurement with no sense-wire connected, the measured voltage drop is across the main resistance load plus the doubled lead-wire

resistance value. No lead-wire resistance compensation is executed on this option. The data acquisition is also executed periodically based on the channel scan rate.

Single Measurement:

$$\frac{V_{VI-COM}}{I} = (R_{subject} + 2R_{lead\ wire})$$

A configuration error is reported if an invalid Connection Method option is entered in the configuration table.

When the 3-wire measurement with compensation option is enabled, using a faster ADC filter means the channel input reading becomes noisy. If the second measurement value is bigger than the first measurement, the lead wire value is clipped to zero.

### 3.6.6 Input ADC Filter

This configuration parameter allows you to select a filter setting that attenuates the input signal beginning at the specified frequency.

The module applies the filter setting to each input channel in sequence during data acquisition.

Index	Filter (Hz)	Note
0	17	Default
1	4	
2	62	
3	470	

### 3.6.7 Open Circuit Detection

The open circuit detection feature alerts you to a channel open circuit condition by selecting the open circuit behavior option in the configuration table to display a high limit, low limit, or zero data value for the appropriate channel(s) in the input table. Open circuit detection may also be disabled for any or all channels.

Index	Open Circuit Detection	Note
0	Upscale	Default
1	Downscale	
2	Zero	
3	Disable	

### 3.6.8 Stimulus/Response Sequences

Once the module receives the configuration, the channel open circuit detection will be activated on the channel with the feature enabled.

- In 2-wire or 3-wire mode, open circuit detection is achieved during normal data acquisition. There is no additional time added for open circuit detection. 2-wire mode open circuit detection and 3-wire primary pair open circuit detection occur on every scan.



- When the 3-wire excitation wire is open, it causes the secondary pair to open. This results in both lead and excitation wire detection by the software. In this instance, the open excitation wire is immediately detected, but it takes 6 to 10 seconds to detect that the excitation wire is reconnected.
- 3-wire lead resistance is measured at 60-seconds intervals; 3-wire lead open circuit is also detected once every 60 seconds.
- 3-wire lead resistance needs the following conditions present to be measured at a faster rate than once every 6 seconds. These conditions are not considered normal conditions. Once any of these conditions is removed, lead wire returns to being measured at the rate of once every 60 seconds.
  - When any channel has the lead wire open, and open circuit detection is enabled, lead wire is measured once every 6 seconds until there is no longer an open wire on any of the channels.
  - If a previous lead wire measurement and the current lead wire measurement difference is more than 0.5 ohms, the lead wire is measured once every 6 seconds until the read difference between the two is less than 0.5 ohms.
  - If measured lead wire resistance is larger than 25 ohms, lead wire is measured once every 6 seconds until it is less than 25 ohms.
  - In the above cases, it takes about 6 to 10 seconds to detect the lead wire open or to recover.
- In 4-wire mode, open circuit detection takes place on a periodic basis, every 5 seconds, alternating between the primary wire pair and the secondary wire pair, by temporarily enabling the PGA burnout current and initiating an ADC conversion at the fastest filter frequency (470 Hz). This open circuit detection also adds about 23 ms delay per channel, on top of normal scan time. If all channels are configured as 4-wire mode and enabled, there will be an additional 184 ms scan time added for open circuit detection once every 5 seconds. Depending on the filter setting, any open wire in 4-wire mode is detected within 5 to 15 seconds.
- The previous measurement remains in the input table during the open circuit detection procedure (that is, the measurement value with the burnout current enabled is not reported).
- Within the period of an open circuit condition, transitional data may be reported before the open circuit status bit is set.

Each channel has its own status bits to indicate open circuit fault in the input table. Below are the cases on handling open circuit condition based on the Open Circuit Detection selection:

- For the Upscale option, the channel input reading is set to the high limit point based on the selected Input Type and Data Format. The Channel Fault bit and the OC bit are set.
- For the Downscale option, the channel input reading is set to the low limit point based on the selected Input Type and Data Format. The Channel Fault bit and the OC bit are set.

- For the Zero option, the channel input reading is set to 0 no matter what Input Type and Data Format is configured. The Channel Fault bit and the OC bit are set.
- For the Disable option, an open circuit condition is not reported. Also, the periodic open circuit detection does not take place.
- The Channel Fault bit and the OC bit are cleared once the open circuit condition on the channel has been resolved. The time to update the bit status is controlled by the 3-second or the module scan rate, whichever takes longer.
- An open circuit condition may also be triggered by feeding channel input resistance or temperatures well beyond the defined limit values indicated in the Points and Limits for Input Type.

### 3.6.9 Process Alarm and Latching

The Process Alarm feature allows you to enter a pair of user-defined high and low values for the module to monitor between the channel input reading. The maximum range you may enter is based on the limits of the selected Input Type and the Data Format. This alarm feature can also be used as an Over or Under Input Type Limit alarm. Once the channel input reading is equal to, or greater/less than, the user-defined value, the corresponding channel Process Alarm status bit is set in the input table.

The lowest value for the Process Alarm Low Value you can set is the low limit of the selected Input Type. The same requirement applies to the highest value for the Process Alarm High Value. It can be set only to the high limit of the selected Input Type.

The Process Alarm Latching decides whether the status bit is to be cleared automatically or kept latched until manual cleanup is triggered by a user or the ladder software. The latching feature is useful for capturing whenever the channel input reading has reached, or exceeded, the user-defined value.

The latch can be cleared by making a bit value transition on the control bit in the output table.

Index	Process Alarm & Latching	Note
0	Disable Both	Default
1	Enable Alarm Only	
2	Enable Both	
3	Invalid	

The firmware reports a configuration error if an invalid Process Alarm option is entered in the configuration table:

- If Option 0 is selected, both the Process Alarm and Latching functionality are disabled, and the validation on the channel Low and High Process Alarm Values is ignored.
- If Option 1 or 2 is selected, the firmware reports a configuration error if any Process Alarm value set in the configuration table is invalid as follows:

- The Process Alarm Low Value is equal to, or greater than, the Process Alarm High Value.
- The Process Alarm Low Value is less than the low limit of the selected Input Type.
- The Process Alarm High Value is greater than the high limit of the selected Input Type.

The firmware sets the Process Alarm Low status bit in the Channel Status byte and the Channel Fault bit when the channel input reading is equal to, or less than, the user-defined Process Alarm Low Value entered in the configuration table.

The firmware sets the Process Alarm High status bit in the Channel Status byte and the Channel Fault bit when the channel input reading is equal to, or greater than, the user-defined Process Alarm High Value entered in the configuration table.

If Option 1 is selected,

- The module automatically clears the Process Alarm Low status bit in the Channel Status byte and its Channel Fault bit when the channel input reading is greater than the user-defined Process Alarm Low Value entered in the configuration table.
- The module automatically clears the Process Alarm High status bit in the Channel Status byte and its Channel Fault bit when the channel input reading is less than the user-defined Process Alarm High Value entered in the configuration table.

If Option 2 is selected, latching operates as follows:

- Once the channel Process Alarm Low or High status bit is set as latched, it is not cleared even when the channel input reading is no longer:
  - equal to, or less than, the user-defined Process Alarm Low Value  
OR
  - equal to, or greater than, the user-defined Process Alarm High Value.
- To clear the channel Process Alarm High or Low status bits when both of the following conditions are satisfied:
  - The channel input reading is no longer
    - equal to, or less than, the user-defined Process Alarm Low Value  
OR
    - equal to, or greater than, the user-defined Process Alarm High Value
  - The corresponding Clear Low or High Process Alarm Latch bit in the output table has a value transition from 0 to 1.

### 3.6.10 Under/Over Range Alarms

An Under Range or Over Range alarm is set if the channel input reading reaches or exceeds the normal operating range. The alarm is not latched; if the reading goes back into normal operating range, the alarm is automatically cleared. This feature applies to all input types.

The Under Range and Over Range status bits are defined in the Channel Bit and

value allocation of the Input Table.

- When the channel input reading is equal to, or less than, the minimum point of the selected Input Type range, the Channel Under Range status bit and the Channel Fault bit are set. If the channel input reading reaches the Input Type low limit or less, the channel input reading is clamped at that low limit value.
- When the channel input reading is equal to or greater than the maximum point of the selected Input Type range, the Channel Over Range status bit and the Channel Fault bit are set. If the channel input reading reaches the Input Type high limit or greater, the channel input reading is clamped at the high limit value.
- The channel Under or Over range status bits is cleared when the channel input reading is greater than the minimum point or less than the maximum point of the selected Input Type range.

### 3.6.11 ADC Alarm

When each input channel is acquiring its channel data in sequence on the corresponding ADC measurement circuit, to ensure the validity of the data reading, the ADC and PGA IDs and the signal reading are validated for reporting potential acquisition failure in time.

If there is a communication failure, the channel ADC Fault bit and the Channel Fault bit are set in the input table. This can happen when the ESD environment is out of the hardware specification tolerance or the hardware connection on the ADC and PGA component is damaged.

To clear the fault bit, cycle power the module. If the fault fails to clear, please send the module back to Spectrum Controls for further inspection.

### 3.6.12 Channel Scan Rate

The module scan rate can be determined by adding up the scan time of each individual channel connected to the pair of the ADC and PGA measurement circuitry. The module has one pair of the ADC and PGA measurement circuitry with 8 channels grouped.

The channel scan time is based on each channel's Input ADC Filter configuration, and is the sum of the multiplexer settling time, PGA register setup time, ADC conversion period (which is  $2/\text{filter} + 1$  ms), and microcontroller processing overhead.

On the channel that has the open circuit detection feature enabled, the module performs one regular measurement on channel input, and another measurement on open circuit check when the OC timer expires. The channel scan rate may vary.

Below is the approximate timing for each input filter selection<sup>7</sup>.

ADC Filter Selection	Total Channel Scan Rate Measurement per Channel <sup>7</sup>
17 Hz	139
4 Hz	499
62 Hz	51
470 Hz	23

### 3.6.13 Module Specific Hardware Errors

The module notifies the host PLC of critical and non-critical errors. The Micro850 or Micro870 PLCs can generate a series of 0xF2xy errors specifically for the installed module.

If any of the following faults occur, refer to the Configuration table to use appropriate values:

Fault Code	Extended Fault Code	Error Description
0xF29z* <sup>8</sup>	0×302	MCU board power brownout
	0×303	Unused
	0×304	ADC communications error

The extended fault code is only available when connecting with the Micro850 Series A & B PLCs and Micro870 Series A PLC with its PLC firmware revision 11.011 and above. The extended fault code will show as 0×0000 if connecting with the Micro850 Series A PLC and its PLC firmware revision 10.011 and under.

The following example shows module hardware errors in CCW:

Fault Code	Fault Location	Description
0xF291	N/A	Expansion IO Module Fault.The extended fault code is 0x0304.

### 3.6.14 Module Specific Configuration Errors

If you attempt to set the fields in the configuration file to invalid (unsupported) values, the module generates a non-critical error:

- The CCW connection status is faulted
- The module is disconnected as Offline mode

<sup>7</sup> Channel configuration setup for 1 measurement only. This applies to all Input Types.

All timing units are in ms.

In 3-wire measurement, rate will double periodically when 3<sup>rd</sup> wire (lead wire) is checked.

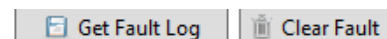
In 4-wire mode, open circuit detection (if enabled) happens every 5 seconds which will add 23 ms per enabled channel.

<sup>8</sup> z indicates the slot number of the expansion I/O. If z=0, then the slot number cannot be identified

If any of the following faults has happened, look up the Configuration Table to use appropriate values:

Fault Code	Extended Fault Code	Error Description
<b>0×F2Bz<sup>9</sup></b>	0×450	General Channel Configuration Error No additional information
	0×410 – 0×417	Configuration error on Invalid Connection Method Connection Method selection error. Valid selections are 2-wire, 3-wire with compensation, and 4-wire.
	0×430 – 0×437	Invalid Process Alarm and Latching The selected Process Alarm option is out of the valid selectable range.
	0×440 – 0×447	Invalid Process Alarm Value Check the Process Alarm Low Value and Process Alarm High Value for legal ranges. If the module receives any of the following illegal data, this error is detected: PALV greater than or equal to PAHV PAHV greater than Input Type High Limit PALV less than Input Type Low Limit (PALV is the Process Alarm Low Value) (PAHV is the Process Alarm High Value)

The extended configuration fault code is not available and will be displayed as 0×0000 in Micro850 Series A & B PLCs and Micro870 Series A PLC.



#### Recoverable Fault

Index	Fault Code	Fault Location	Description
1	0xF2B1	N/A	Expansion IO Configuration Fault. The extended fault code is 0x0000.

#### Non-recoverable Fault

Index	Fault Code	Fault Location	Description
-------	------------	----------------	-------------

<sup>9</sup> z indicates the slot number of the expansion I/O. If z=0, then the slot number cannot be identified.

## Section 3.7

### Technical Assistance

Note that your module contains electronic components which are susceptible to damage from electrostatic discharge (ESD). An electrostatic charge can accumulate on the surface of ordinary plastic wrapping or cushioning material. **In the unlikely event that the module should need to be returned to Spectrum Controls, please ensure that the unit is enclosed in approved ESD packaging (such as static-shielding / metalized bag or black conductive container).** Spectrum Controls reserves the right to void the warranty on any unit that is improperly packaged for shipment.

RMA (Return Merchandise Authorization) form required for all product returns.

For further information or assistance, please contact your local distributor, or call the Spectrum Controls Technical Support at:

For Rockwell Automation-Compatible I/O Products:

- |                  |                    |
|------------------|--------------------|
| • 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- 41553-630 |

## Section 3.8 Declaration of Conformity

Available upon request



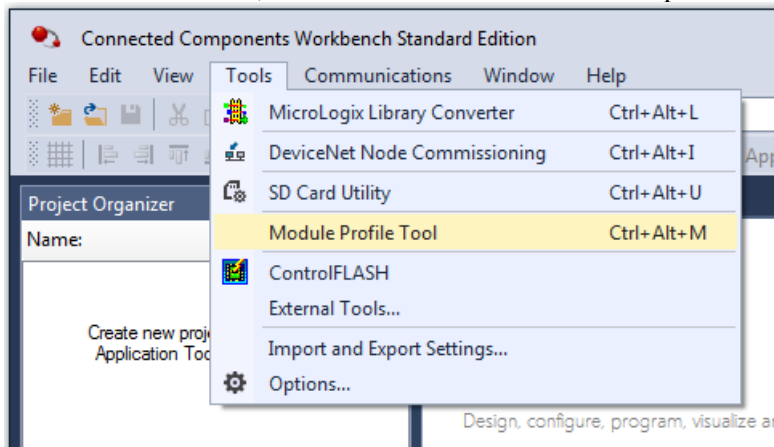


# Appendix A

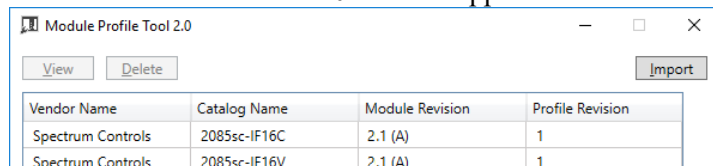
## Manually Importing an AOP

This appendix explains how to manually import an AOP rampp file into CCW software.

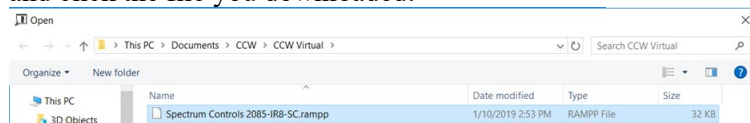
1. Download the latest module AOP from Spectrum Controls website, <https://www.spectrumcontrols.com>, and save the file to a local folder on your computer (normally the Downloads folder).
2. Run CCW.
3. From the Tools menu, select the **Module Profile Tool** option:



4. When prompted by Windows User Account Control, to confirm that you wish to run the program, click **Yes** button.  
The Module Profile Tool 2.0 window appears:

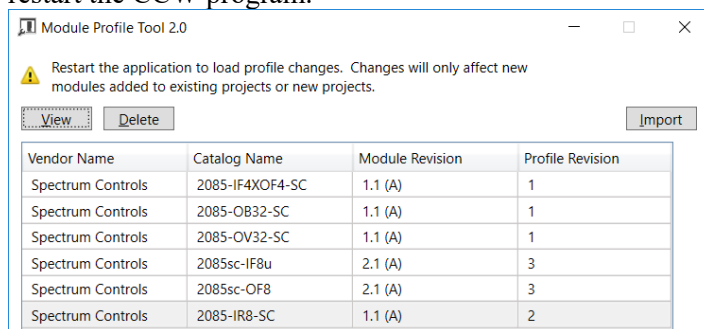


5. Click the **Import** button.
6. An Open dialog appears. Navigate to the provided .rampp file location, and click the file you downloaded:

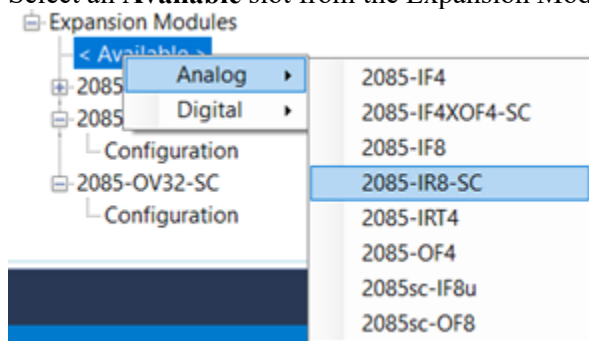


7. Click **Open** to import the file.

8. The program loads the .rampp file and informs you that you need to restart the CCW program.



9. After the program restarts, create a new project or reload your project. Select an **Available** slot from the Expansion Modules drop-down list:



The newly imported module is now available as a selection from the Expansion Modules list.

# Index

- 2085-IR8-SC AOP
  - import 3-5
- 2-Wire Method 3-23
- 3-Wire Method 3-23
- 4-Wire Method 3-23
- ADC Alarm 3-28
- Add On Profile (AOP) 3-2
- AOP
  - manual importation A-1
- ASCII
  - option 3-7
- Binary
  - option 3-7
- block diagram 1-8
- Browse
  - button 3-8
- CCW tab 3-5
- Channel
  - bias 3-21
  - field 3-9
  - temperature 3-22
- Channel Bias
  - field 3-10
- Channel Configuration Bit Location Data 3-13
- Channel Configuration Values, 3-14
- Channel Data 3-17
- Channel Scan Rate 3-28
- Channel Status 3-16
- Configuration
  - textbox 3-7
- Configuration option 3-6
- Configuration Table 3-13
- Connection
  - field 3-10
- Connection Method 3-22
- Copy to CCW 3-11
- Data Format
  - field 3-9
- Data Format 3-18
- Data Formats 1-7
- Decimal
  - option 3-7
- Declaration of Conformity 3-31
- Default Configuration tab 3-4
- EMC Directive, 2-1
- Enable
  - field 3-9
- Environmental
  - specifications 1-6
- Expansion Modules
  - drop-down list 3-5
- Factory default
  - on startup 3-12
- Filter
  - field 3-10
- General
  - description 1-1
- Generate
  - configuration 3-11
- Hardware
  - specifications 1-3
- Hardware Features 1-7
- Hazardous Location 2-2
- Hex
  - option 3-7
- Input ADC Filter 3-24
- Input Bit and Value Allocation 3-15
- Input Table, 3-15
- Input Table 3-15
- Input Type
  - field 3-9
- Input Type 1-1
- Input Type 3-18
- Launch
  - MCC utility 3-7
- LED indicators 1-7
- Maximum Length
  - information 3-6
- Minimum spacing 2-4
- Module
  - configuration errors 3-29
  - mounting 2-3
  - Overview 1-1
- Module and Channel Fault Bit and Value Description 3-16
- Module Catalog Name 3-5
- Module Identity 3-12
- Mounting
  - module 2-3
- Noise reduction 2-3
- Open Circuit Detection 3-24
- Open Circuit Response
  - field 3-10
- Output Bit Allocation 3-18
- Output Bit Description 3-18
- Output Table 3-17
- Parts List 2-4
- PLC Interfaces 3-12
- Power
  - remove 2-3
- Power Requirements 2-1
- Process Alarm
  - field 3-10
- Process Alarm and Latching 3-26
- Process Alarm High
  - field 3-10
- Process Alarm Low

## Index I-2

---

field 3-10	Stimulus/Response Sequences 3-24
Product Features 3-18	System
Radix	overview 1-8
menu 3-7	Technical support
Remove Power 2-3	contact information, vi
Safety Test	Temp Units
specifications 1-6	field 3-9
Software updating 3-12	Under/Over Range Alarms 3-27
Specifications	Version of Software 3-12
environmental 1-6	View Module Profile window 3-3
hardware 1-3	Wiring Diagram 2-7
safety test 1-6	





**Technology Partner**

A ROCKWELL AUTOMATION PARTNER

©2009-2025, Spectrum Controls, Inc. All rights reserved. Specifications subject to change without notice. All product names, logos, brands, trademarks and registered trademarks are property of their respective owners.

**Corporate Headquarters**

Spectrum Controls Inc.  
1705 132<sup>nd</sup> Ave NE, Bellevue, WA 98005  
Fax: 425-641-9473  
Tel: 425-746-9481

**Web Site: [www.spectrumcontrols.com](http://www.spectrumcontrols.com)**  
**E-mail: [spectrum@spectrumcontrols.com](mailto:spectrum@spectrumcontrols.com)**

