SPECTRUM CONTROLS

An **Allient** *Company*

Micro800™ Expansion I/O 16-Channel Analog Input Module

Catalog Number: 2085sc-IF16C/2085sc-IF16V

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

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^{TM} 16-Channel 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.
	Keep in mind that Version 2.1 of the module firmware is required for operation with 870 controllers.

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**^{TM}** 16-Channel 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

For	Refer to this Document	Allen-Bradley Pub. No.
	Micro870 24V DC Expansion Power Supply Installation Instructions	2085-IN008
Installing 24-point PLC	Micro850 24-Point Programmable Controllers Installation Instructions	2080-IN007
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: https://spectrumcontrols.com	

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

Documentation

If you would like a manual, you can download a free electronic version from the Internet at 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 covers the following topics:

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

The Micro800™ 16-Channel Analog Input Modules (2085sc-16C/16V Expansion I/O Modules) are 16-point analog modules designed to expand the local I/O capability of Rockwell Automation Micro850 and Micro870 Systems over their Expansion I/O buses. The minimum system requirement in which Expansion I/O Modules can be installed is a Micro850 or Micro870 Controller and a controller power supply.

The number of 2085sc-16C/16V 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
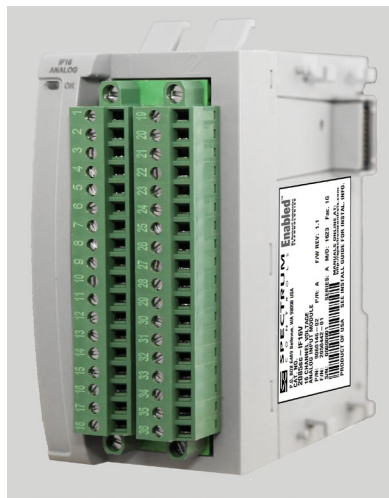
NOTE	Module firmware released as revision 1.1 is only compatible with the Micro850 Series A PLC and its PLC firmware revision 10.011 and under. Module firmware released as revision 2.1 is compatible with the Micro850 Series A and B PLCs and Micro870 Series A PLC with its PLC firmware revision 11.011 and under.

The 2085sc-IF16C/V Expansion I/O modules measure current or voltage input data. The module supports:

- Sixteen input channels.
- 2085sc-IF16C module: Current measurements. The module measures the channel input current across a low-drift precision resistor, measures the voltage, and converts the voltage to a current reading.
- 2085sc-IF16V module: Direct voltage measurements. There is no low-drift precision resistor installed, and the channel accepts the voltage source directly.
- Open-wire detection (voltage ranges and current 4-20 mA range).
- Range scaling of input data.
- High and low process alarms that provide a warning on under- or over-range detection (from user-defined values).
- Four data formats.
- Four filter frequency setup.
- Disabling open-wire detection for any, or all, channels.

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. Individual channels are not isolated from each other.

The 2085sc-IF16 modules use two sets of 20-bit Sigma-Delta analog-to-digital converters to achieve a 16-bit resolution. The modules digitally convert and store analog data from either the current or voltage input type. Each input channel is individually configured via Rockwell-provided Connected Component Workbench (CCW) software for the Micro850 and Micro870 family of PLC controllers, or with the Module Configuration Converter 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:

- The default configuration for the 2085sc-IF16C is for all channels enabled in the 4 to 20 mA range with the 17 Hz filter in Engineering ×1 units.
- The default configuration for the 2085sc-IF16V is for all channels enabled in the ±10 V range with the 17 Hz filter in Engineering ×1 units.

Section 1.2
Input Specifications

The 2085sc-IF16C/2085sc-IF16V modules have the following input specifications:

Table 1-1 Input/Performance/Environmental Requirements

Input Description	Value
Operating Temperature	-20 ºC to 65 ºC (-4 ºF to 149 ºF)
Storage/Non-Operating Temperature	-40 ºC to 85 ºC (-40 ºF to 203 ºF)
Operating Humidity	5% to 95%, non-condensing
Storage/Non-Operating Humidity	5% to 85%, non-condensing

Input Description	Value		
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.		
ESD	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 1 kHz sine-wave 80% AM from 80…6000 MHz 10 V/M with 200 Hz square-wave 50% Pulse 100% AM at 900 MHz 10 V/M with 200 Hz square-wave 50% Pulse 100% AM at 1890 MHz		
Inputs per module	16 current or voltage differential input channels		
Input ranges	**Current (IF16C)**: 0-20 mA, 4-20 mA **Voltage (IF16V)**: 0-5 V, 0-10 V, ±10 V		
Input filters	4 Hz, 17 Hz, 62 Hz, 470 Hz		
Current accuracy **(4 and 17 Hz filters)**	**Error at 25 °C, Max**		**Error over -20 °C to 65 °C, Max**
0-20 mA	±20 µA		±50 µA
4-20 mA	±20 µA		±50 µA
Voltage accuracy **(4 and 17 Hz filters)**	**Error at 25 °C, Max**		**Error over -20 °C to 65 °C, Max**
0-5 V	±3 mV		±6 mV
0-10 V	±10 mV		±20 mV
±10 V	±10 mV		±20 mV
Repeatability (at 25 ºC)	**4 Hz filter**	**17 Hz filter**	**60 and 470 Hz filters[1]**
0-5 V, 0-10 V, ±10 V 2085sc-IF16V	±1.0 mV	±2 mV	±3 mV
0-20 mA, 4-20 mA 2085sc-IF16C	±2 µA	±3 µA	±10 µA
Filters			

[1] 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	
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	
Input Bias Currents and Impedance		
Open Wire Detection Current (Voltage range only)	Approximately 100 µA during open wire checks for a duration of one channel scan time, with a 470 Hz filter.	
Current input impedance (2085sc-IF16C)	249.5 Ω ±0.5%	
Voltage input impedance (2085sc-IF16V)	15 MΩ (except during open wire checks).	
Input protection: (2085sc-IF16C) (2085sc-IF16V)	Current: 32 mA continuous (approximately 8 V). Voltage: ±28 VDC continuous. (Note: maximum voltage between any two pins must be limited to 28 VDC as well.)	
Peak Inrush Current	Less than 150 mA for +5 V. Less than 400 mA for +24 V.	
Isolation		
Input to backplane isolation	50 VAC working Reinforced isolation tested at 2 kV DC for 1 minute.	
Input to Chassis GND isolation	50 VAC working Reinforced isolation tested at 2 kV DC for 1 minute.	
Power Requirements		
Bus +5 V (4.75 V to 5.4 V)	100 mA maximum	
Bus +24 V (19.9 V to 26.4 V)	20 mA maximum	
Power Dissipation (within module)	1.0 W max, for 16V. 2.8 W max for 16C, with all inputs at 21 mA.	
Fault detection	Over/under range for all types. Open Circuit detection is supported on all ranges except the 0-20 mA range. NOTE: Voltage open circuit (open wire) is periodically checked to keep input impedance high during normal measurements.	
Wire size	#16 to #28 AWG	
Wire Strip Length	0.375 in.	
Recommended Tightening Torque:	0.25 N-m (2.2 lb-in)	
RoHS	Meets European RoHS component standards (January 2015 and earlier).	
REACH	Meets European REACH 7 requirements.	

Input Description	Value
Dimensions	110 mm × 87 mm × 51 mm (plastics)
	110 mm × 89 mm × 51 mm (with RTBs installed.)

Table 1-2. EMC Specification Table

Environmental Tests	Test Level Limits
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 RF immunity (Performance Criteria A)	10 V/M with 1 kHz sine-wave 80% AM from 80…6000 MHz 10 V/M with 200 Hz square-wave 50% Pulse 100% AM at 900 MHz 10 V/M with 200 Hz square-wave 50% Pulse 100% AM at 1890 MHz
EFT/B immunity (Performance Criteria B)	Signal Ports: ± 2 kV @ 5 kHz for 5 minutes, Criteria B Power Ports: ±2 kV at 5 kHz for 5 minutes, Criteria B
Surge transient immunity (Performance Criteria B)	Signal Ports: ±2 kV line-earth {CM}at 2Ω on shielded ports Power Ports ±2 kV CM at 12 Ω ±1 kV DM at 2 Ω
Conducted RF immunity (Performance Criteria A)	10 V RMS 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

Safety Tests	Industry Standards
UL Safety	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)
UL Hazardous Locations	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
CE EMC Directive	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
UKCA	Electromagnetic Compatibility Regulations 2016 BS EN 61131-2, BS EN 61000-6-4, BS EN 61000-6-2
FCC	27 CFR Part 15, Class A
CMIM	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 ×1
- Engineering units ×10
- Raw/proportional count
- Percent Range

Section 1.4
Hardware
Features

Channels are wired as differential inputs. Open-circuit detection is available in the form of open circuit inputs going over-range for the voltage and current ranges. Inputs are protected from electrostatic discharge up to 6 kV for indirect and contact discharge, 8 kV for air discharge. Inputs are also fault-protected up to 28 VDC for voltage inputs, and up to 32 mA for current inputs.

1.4.1 LED Blink Codes

Revision 1.1 and Revision 2.1 of the Module firmware use different LED status operations for module status or power indication. Tables for 1.1 and 2.1 LED

operation are provided below.

A 2085sc-IF16 module with Version 1.1 firmware 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 Blink Codes Table for Firmware 1.1

Indicator	State	Description
Module OK LED Status	Off	No power applied to device or the module may have failed to pass its self-test.
	Solid Green	RUN mode. Module has power and passed self-test. No action is required.
	Blinking Green	LED blink status: 1. Internal use only. 2. Internal use only. 3. Internal use only. 4. Internal use only. 5: Indicates ADC communication error. 6: Indicates Watchdog reset.

 A 2085sc-IF16 module with Version 2.1 firmware 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. This indicates RUN mode.

- If the LED remains off, there is an error with the module: it may not have power or failed to pass the self-test.

- Any time the system is not in Run mode (and showing no faults), the LED blinks rapidly, indicating the module is Offline. All inputs and outputs are disabled in this instance.

The LED identifies different conditions using specific, numeric, blink patterns. The module blinks a specific number of times, pauses, and then repeats the same blink pattern indefinitely. Blink codes are shown in the following table.

**Table 1-5 LED Blink Codes Table For Firmware 2.1**

Blink Code	Name and Description	Resolution
rapid	**Offline** Rapid continuous blinking indicates the module is offline and outputs are disabled.	Set controller to RUN mode. This will also be seen during power-on while it is initializing.
ON	**Run Mode** The LED is solid green.	Module is initialized with no hardware fault detected. Module is in Run mode.
OFF	**Major Fault or Power-up or Power Off** The module is just powering up and not initialized yet or there is a major hardware fault causing the module to be held in reset by the controller. LED control is not possible for this condition and will remain off.	Give plenty of time for power-on. Power-cycle to try and clear the error condition. If unsuccessful, the module must be replaced.
3	**Calibration invalid or corrupted** This code will be seen for newly manufactured boards that have yet to be calibrated.	Factory calibration must be performed. Return the module to Spectrum Controls, Inc. for recalibration.
4	**Serial Number Invalid or Corrupted** This code will only be seen if the module has been calibrated but the serial number is not programmed, or the flash memory sector is corrupted.	Serial number must be programmed. Return the module to Spectrum Controls, Inc. for recalibration.
5	**Analog Communications Error – Input** A communications error or connection error took place between the MCU and ADC or PGA circuitry.	Power-cycle to try and clear the error condition. If unsuccessful, the module must be replaced.

Section 1.5
System
Overview

The 2085sc-IF16 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:
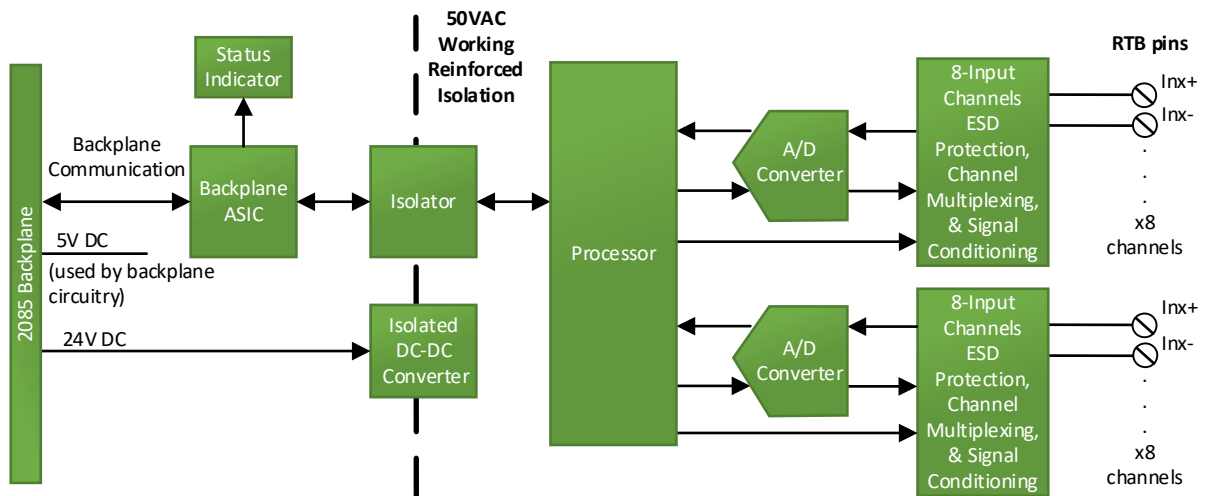
Chapter 2
Installation and Wiring

This chapter will cover:

- Compliance to European union directives
- Power requirements
- General considerations
- Mounting
- 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

WARNING	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 +5 VDC/+24 VDC system power supply.

Current rating for + 5 V is 100 mA maximum; for +24 V it is 20 mA maximum:

5 VDC	24 VDC
100 mA	20 mA

Section 2.3
General
Considerations

The 2085sc-IF16 modules are 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[2].

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.

WARNING ⚠️	**EXPLOSION HAZARD**
	• 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.
	• Do not connect or disconnect components unless power has been switched off or the area is known to be non-hazardous.
	• This product must be installed in an enclosure.
	• 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.

---

[2] 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.

2.3.2 Prevent Electrostatic Discharge

WARNING	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:
	• Touch a grounded object to discharge static potential.
	• Wear an approved wrist-strap grounding device.
	• Do not touch the port connector or connector pins.
	• Do not touch circuit components inside the module.
	• If available, use a static-safe workstation.
	• When it is not in use, keep the module in its static-shield bag.

2.3.3 Remove Power

WARNING	**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:
	• Sending an erroneous signal to your system's field devices, causing unintended machine motion.
	• Causing an explosion in a hazardous environment.
	• 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.

2.3.4 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. 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

| WARNING	Keeping module free of debris and avoiding overheating: • Do not remove protective debris strip until after the module and all other equipment near the module is mounted and the wiring is complete. • Once wiring is complete, and the module is free of debris, carefully remove protective strip. • Failure to remove strip before operating can cause overheating.

2.4.1 Minimum Spacing

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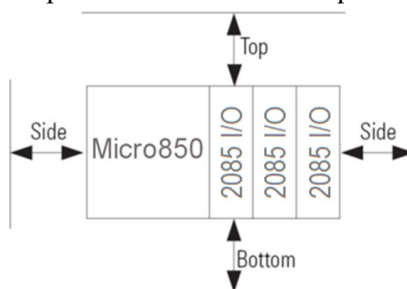
2.4.2 Parts List

Your package contains one Micro800 2085sc-IF16C or 2085sc-IF16V Plug-in Module and one Quick Start Guide.

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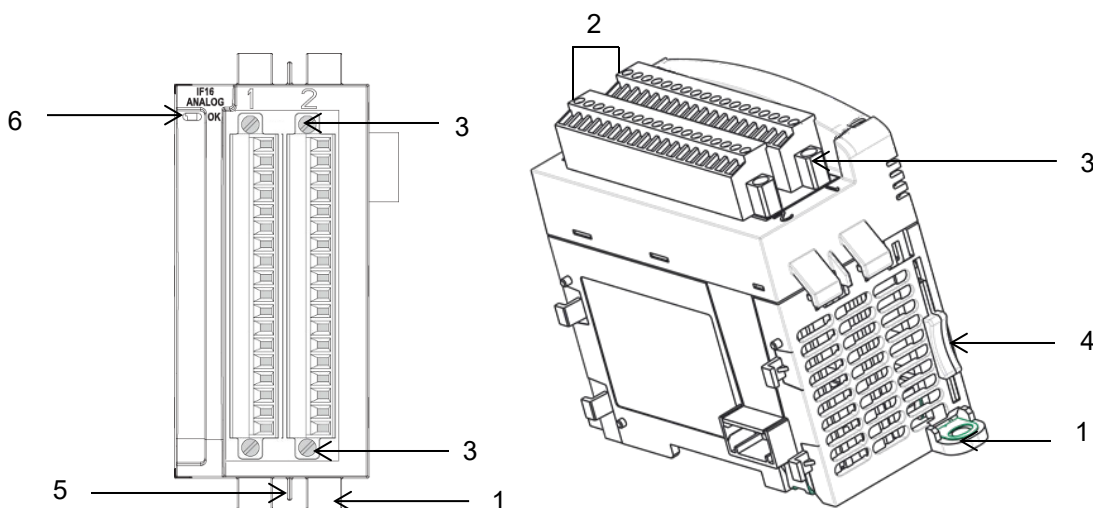
	Description			Description
1	Mounting screw hole/mounting foot		4	Module interconnect latch
2	Removable Terminal Block (RTB)		5	DIN rail mounting latch
3	RTB hold down screws		6	I/O Status LED

You can choose to wire the plug-in before inserting it into the controller or wire it once the module is secured in place.

| NOTE	• 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.
	• 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.
	• Do not wire more than 2 conductors on any single terminal.
	• 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.
	• Cable length should be less than 10 meters.

2.4.4 Insert Module Next to the Controller

Follow the instructions to insert and secure the plug-in module to the controller:

NOTE	The module expansion may only be mounted horizontally.

NOTE	For environments with greater vibration and shock concerns, use the panel mounting method, instead of DIN rail mounting.

Mounting Dimensions and DIN Rail Mounting

Micro850 Controller   2085sc-IF16V/C
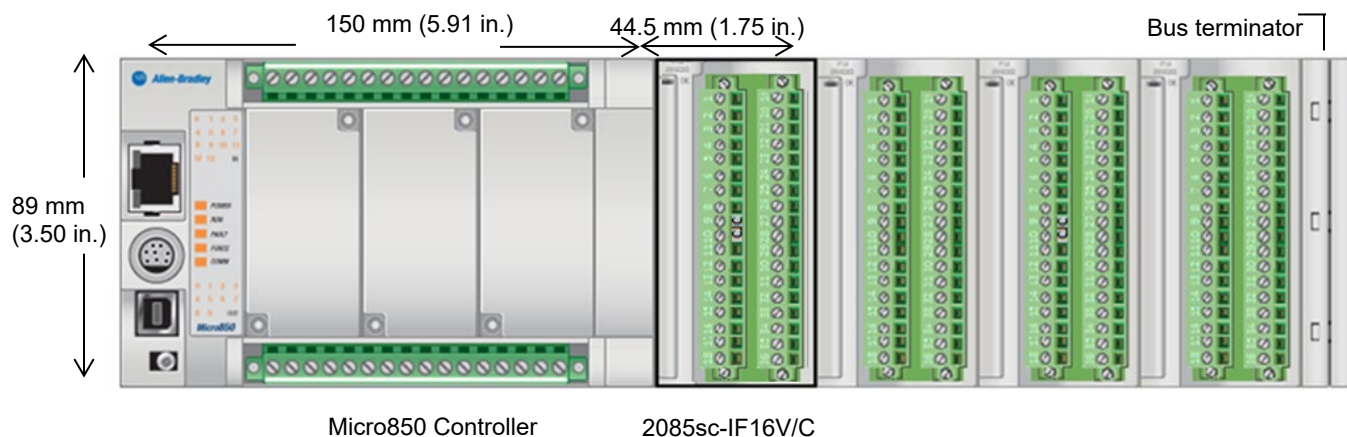
You can install the module on DIN rails of dimension 35 mm × 7.5 mm × 1 mm (EN 50 022-35×7.5), or on a panel.

WARNING ⚠️	**Hazard of intermittent grounding.**
	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.
	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.
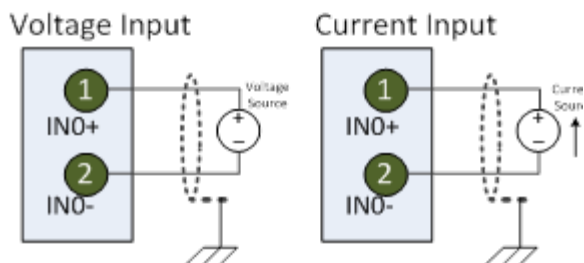
To install:

1. Place the module next to the controller against the panel where you are mounting the module.

2. Mark drilling holes through the mounting screw holes and mounting feet, and then remove the module.

3. Drill the holes at the markings.

4. Replace the module and mount it. Leave the protective debris strip in place until you are finished wiring the module, and any other devices.

2.4.5 Wiring Diagram

WARNING	Hazard of damage to the terminal connector.
⚠️	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.
	Failure to follow these guidelines may result in damage to your connector.

The following images explain the general layout of the module terminal blocks and the associated wiring diagrams for the various input signals and the 2085sc-IF16C or 2085sc-IF16V module:

RTB1#	Name
1	IN0+
2	IN0-
3	IN1+
4	IN1-
5	IN2+
6	IN2-
7	IN3+
8	IN3-
9	IN4+
10	IN4-
11	IN5+
12	IN5-
13	IN6+
14	IN6-
15	IN7+
16	IN7-
17	NC
18	NC

RTB2#	Name
19	IN8+
20	IN8-
21	IN9+
22	IN9-
23	IN10+
24	IN10-
25	IN11+
26	IN11-
27	IN12+
28	IN12-
29	IN13+
30	IN13-
31	IN14+
32	IN14-
33	IN15+
34	IN15-
35	NC
36	NC

Terminal Block Input signal descriptions are as follows:

RTB1#	Name	Description	RTB2#	Name	Description
1	IN0+	Ch. 0 Voltage/Current Input	19	IN8+	Ch. 8 Voltage/Current Input
2	IN0-	Ch. 0 Voltage/Current Return	20	IN8-	Ch. 8 Voltage/Current Return
3	IN1+	Ch. 1 Voltage/Current Input	21	IN9+	Ch. 9 Voltage/Current Input
4	IN1-	Ch. 1 Voltage/Current Return	22	IN9-	Ch. 9 Voltage/Current Return
5	IN2+	Ch. 2 Voltage/Current Input	23	IN10+	Ch. 10 Voltage/Current Input
6	IN2-	Ch. 2 Voltage/Current Return	24	IN10-	Ch. 10 Voltage/Current Return
7	IN3+	Ch. 3 Voltage/Current Input	25	IN11+	Ch. 11 Voltage/Current Input
8	IN3-	Ch. 3 Voltage/Current Return	26	IN11-	Ch. 11 Voltage/Current Return
9	IN4+	Ch. 4 Voltage/Current Input	27	IN12+	Ch. 12 Voltage/Current Input
10	IN4-	Ch. 4 Voltage/Current Return	28	IN12-	Ch. 12 Voltage/Current Return
11	IN5+	Ch. 5 Voltage/Current Input	29	IN13+	Ch. 13 Voltage/Current Input
12	IN5-	Ch. 5 Voltage/Current Return	30	IN13-	Ch. 13 Voltage/Current Return
13	IN6+	Ch. 6 Voltage/Current Input	31	IN14+	Ch. 14 Voltage/Current Input
14	IN6-	Ch. 6 Voltage/Current Return	32	IN14-	Ch. 14 Voltage/Current Return
15	IN7+	Ch. 7 Voltage/Current Input	33	IN15+	Ch. 15 Voltage/Current Input
16	IN7-	Ch. 7 Voltage/Current Return	34	IN15-	Ch. 15 Voltage/Current Return
17	NC	No Connect	35	NC	No Connect
18	NC	No Connect	36	NC	No Connect

Chapter 3
Configuring the 2085sc-IF16 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.
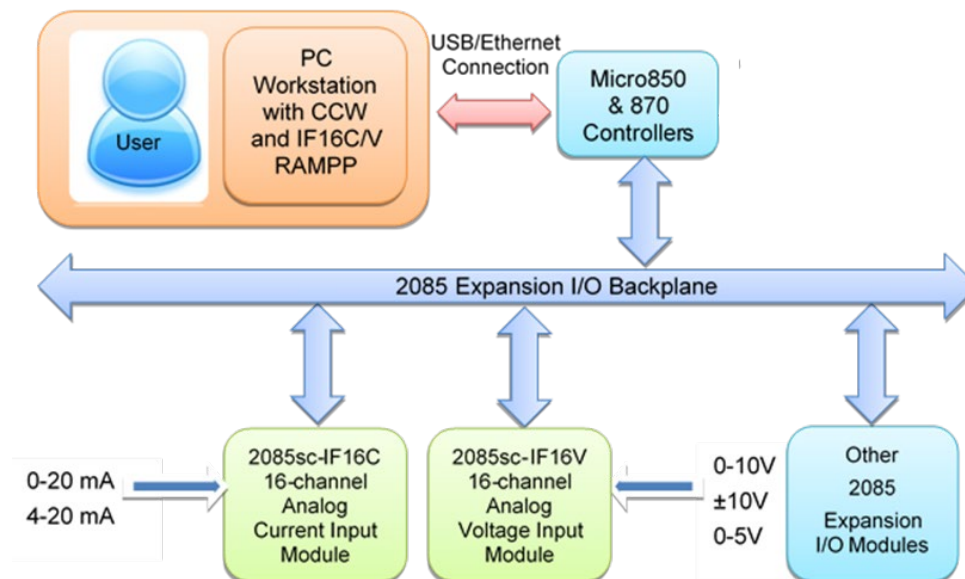
Section 3.1
Introduction

You use CCW software (v 9.00.00 and above) to configure the 2085sc-IF16 Expansion I/O Module. Your controller firmware must be at v. 9.011 and above as well. You then send the configuration setup to the module. Starting from CCW version 11.00.00 and later, the software provides a module-specific Add-On Profile (AOP) to configure the module. The process for manually importing AOP to CCW is no longer required.

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

- Micro850/870 Controller.
- 2085 Expansion I/O Modules.
- 2085-ECR Bus Terminator.

Optional:

- 2080-PS120-240VAC Power Supply (separate module or built-in the main controller).
- 2080 Plug-in Modules.
- 2085-EP24VDC Expansion Power Supply for Micro870 Controller with more than four 2085 Expansion I/O Modules installed.

Spectrum Controls, Inc. also provides a custom configuration software utility that you may use to provide configuration settings to the profile.

Section 3.2
2085sc-IF16C
and 2085sc-IF16V AOP

You use the module's AOP to configure your module. The AOP 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 AOP:

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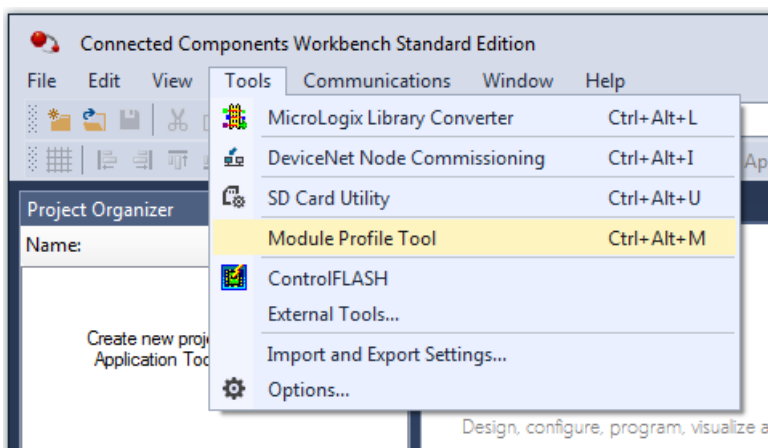
2. When prompted by Windows User Account Control, to confirm that you wish to run the program, click **Yes** button.

The Module Profile Tool window appears.

If necessary, confirm with the Windows operating system that you wish to run the software.
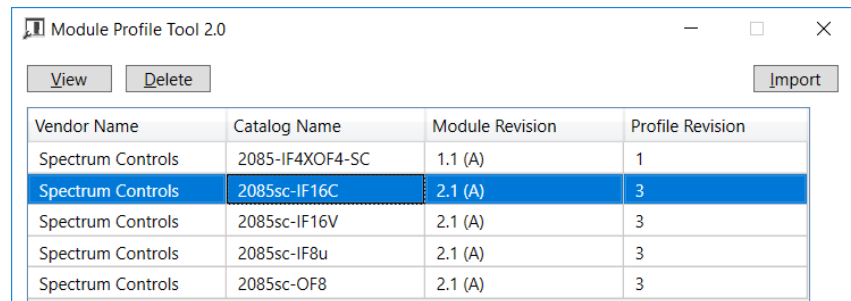
3. Select the row showing the module catalog name (16C is example used here, but this information is applicable to both modules), and then click the **View** button.

The View Module Profile window appears (both modules are shown below):
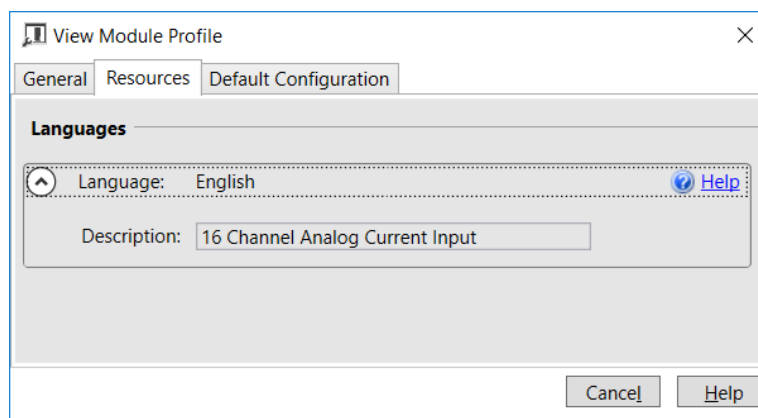
16C:
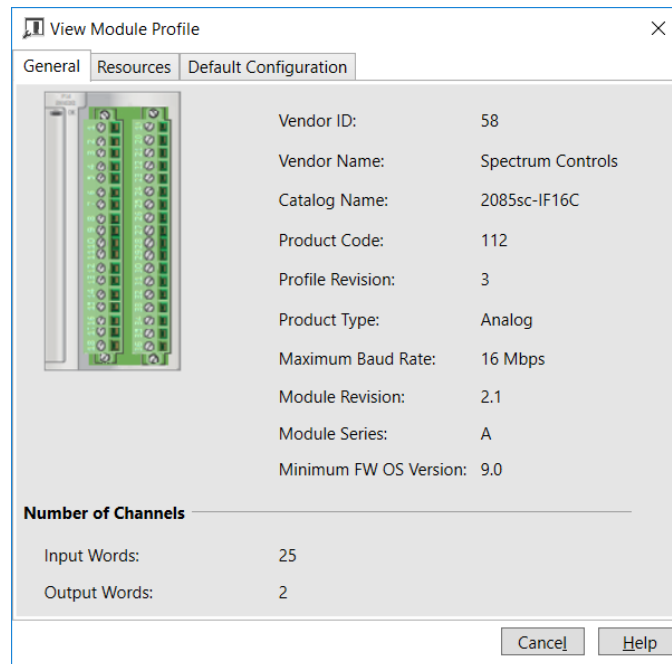
16V:
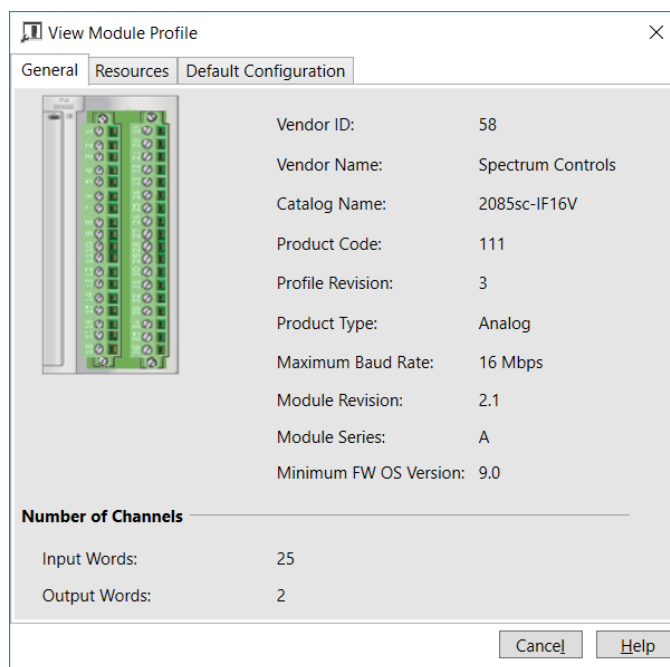
The first tab of the window provides the module identity information. This information is described in greater detail in **Module Identity**, later in this section.

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

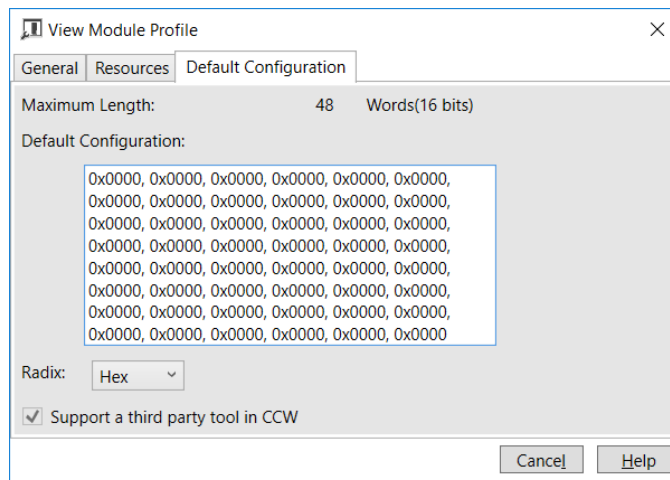   The Resources tab appears:

    16C:

16V:
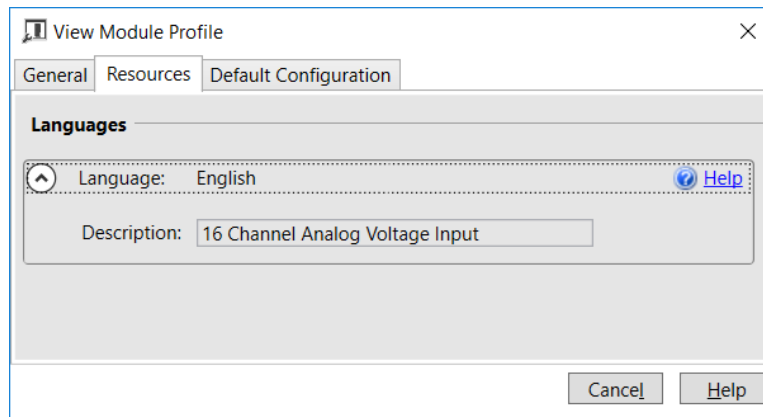
The window lists the language chosen for the module, and the module description. You may also use this tab to access the help file provided for the module.

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

16C/16V

6. The enabled checkbox shown on the bottom of the tab indicates that the module AOP 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
CCW
Configuration
Tab

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 2085sc-IF16C or 2085sc-IF16V AOP into CCW software is necessary <u>only</u> 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:
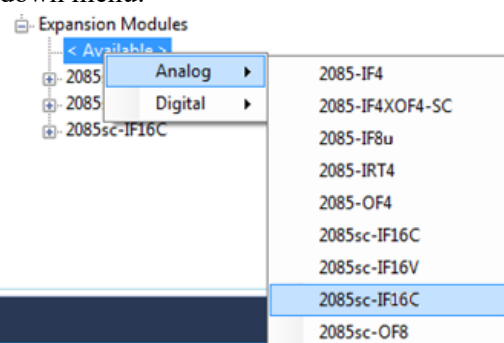
To add the module to your project, and see its configuration parameters on the CCW configuration tab:

1. From your CCW project, load the module AOP to a first **Available** slot from the Expansion Modules drop-down list.
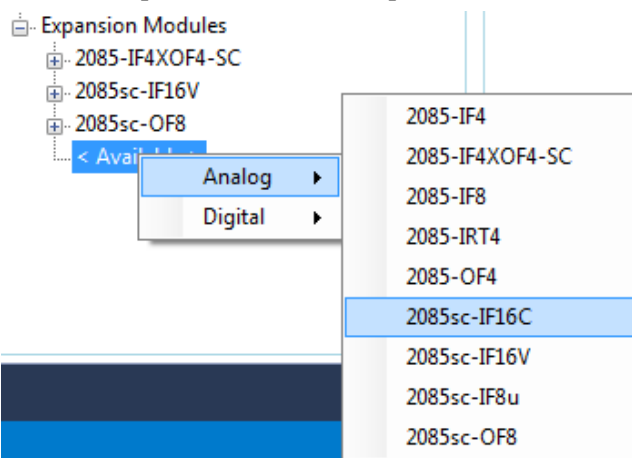
2. Once the module AOP is loaded, to view the associated variables, click the **Module Catalog Name** option.

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:

- <u>Hex</u>. Default option. Characters represented as hexadecimal. Example: 0×7FFF as 32767 in decimal format.
- <u>ASCII</u>: Characters represented as ASCII. Example: \7F\FF
- <u>Binary</u>: Characters represented as 0 and 1. Example: 0111111111111111
- <u>Decimal</u>. Characters represented as decimals. Example: 32767[3]

- **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.

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 IF16 module, you must provide the file path of the utility to the CCW software. Navigate to the CCW Configuration Tab and click in the file path textbox below the **Launch** button.

Launch the configuration tool:
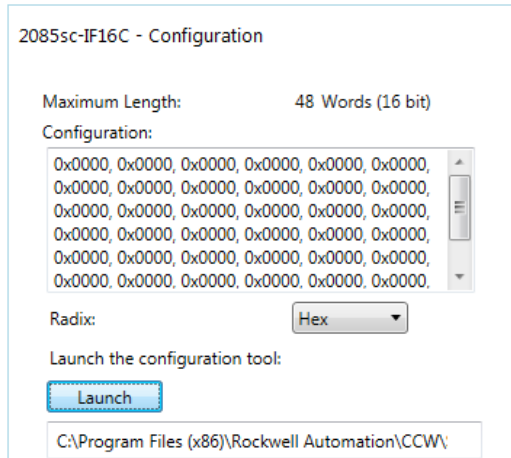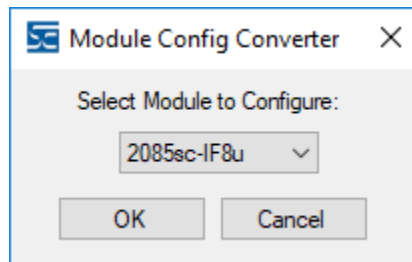
Launch

The **Browse** button appears.

---

[3] 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. Click the button, navigate to the directory where you installed the CCW program, and select the ModuleConfigConverter tool located in the Spectrum Tool directory:
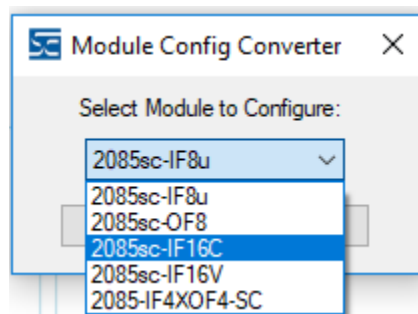
    Example. **C:\Program Files (x86)\Rockwell Automation\CCW\SpectrumTool**

    2085sc-IF16C - Configuration

Maximum Length:	48 Words (16 bit)

    Configuration:

    0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000,
    0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000,
    0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000,
    0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000,
    0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000,
    0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000,

    Radix: Hex

    Launch the configuration tool:

    Launch

    C:\Program Files (x86)\Rockwell Automation\CCW\

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

    Module Config Converter   X

    Select Module to Configure:

    2085sc-IF8u

    OK   Cancel

4. From the drop-down menu, select the **2085sc-IF16C** option and click **OK**.

    Module Config Converter   X

    Select Module to Configure:

    2085sc-IF8u
    2085sc-IF8u
    2085sc-OF8
    2085sc-IF16C
    2085sc-IF16V
    2085-IF4XOF4-SC

The 2085sc-IF16C Configuration Setup dialog appears:

You use the same procedure to access the 16V Configuration Setup dialog:

5. View and specify the following options as needed. Differences between the 16C/16V modules are described where relevant under **Range Type**. See Channel Configuration Bit locations listed later in this section for details on the settings for every configuration bit:

    • **Channel**. Lists number of input channel from **0** to **15**. Click to select.

    • **Enable**. Specifies whether to enable use of this channel. **Enabled** by default (checkmark selected).

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

- **Process Alarm**. Specifies process alarm enabling or disabling. Select type from drop-down list. **Disabled** is default:

- **Range Type**. For 16C specifies current range to use. Default is 4 to 20 mA. For 16V, specifies voltage range to use. Default is **-10 to 10 V**:

- **Open Circuit Detection**. Specifies how to respond to an open circuit condition. Default is **Upscale**.

- **ADC Filter**. Specifies which filter to use. Default is **16.7 Hz**.

- **Low Alarm Value**. Specifies value below which alarm is triggered. Default value is **0**. Example: Low alarm value for current is **0**. Low alarm value for ±10 Volts is **-10 V**.

- **High Alarm Value**. Specifies value above which alarm is triggered. Default value is **0**. Example: High Alarm value for current is **0**. High alarm value for ±10 Volts is **+10 V**.

6. When finished making selections, click **Generate**.

The Configuration Text dialog appears, with your configuration settings for each enabled channel.

You can manually copy the settings and paste it to the textbox of the CCW Configuration tab[4].

The example below shows example channel 0 selections in the utility and the associated channel 0 configuration text generated from those selections:
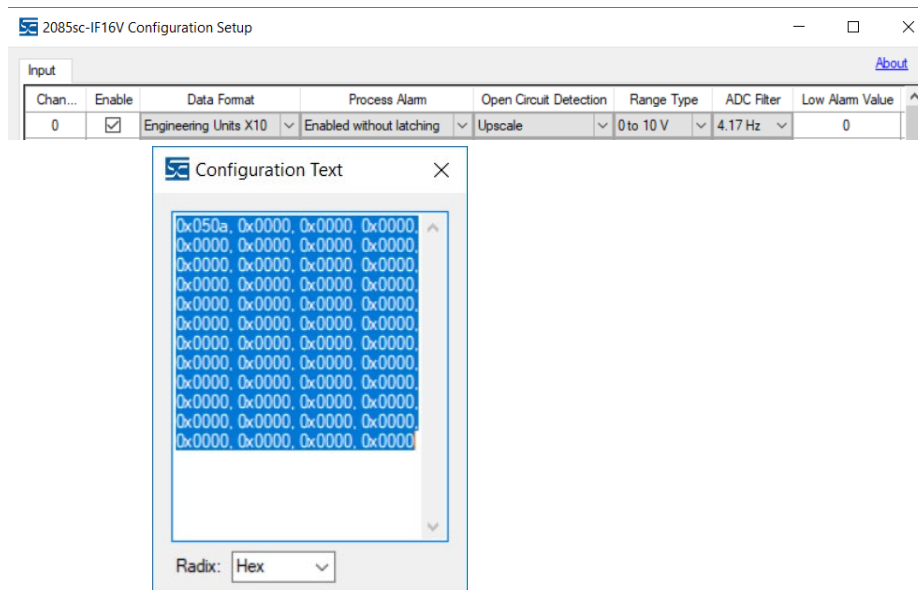
7. To automatically copy the generated settings into the textbox of the CCW Configuration tab, have the textbox visible on the monitor screen, and then click **Copy to CCW** button[4].

The utility copies the configuration settings and shows it inside the textbox. Example shown below is for 16V:

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

---

[4] 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 modules run with default configurations as specified in the Configuration Assembly.

- The default configuration for the IF16C is for all channels enabled in the 4-20 mA range with the 17 Hz filter in Engineering ×1 units.
- The default configuration for the IF16V is for all channels enabled in the ±10 V range with the 17 Hz filter in Engineering ×1 units.

Module Identity

The following values will be stored in the Vendor ID, Product_Type, Product_Code, Series_Rev, and Mod_Features arrays:

Parameter	2085sc-IF16C	2085sc-IF16V
Vendor ID	58 (Spectrum Controls)	58 (Spectrum Controls)
Product Type	10 (Analog)) [0×0A]	10 (Analog)) [0×0A]
Product Code	112 [0×70]	111 [0×06F]
Series Rev (1.1)	0×C420	50208 (First release revision is 1.1)
Series Rev (2.1)	0×C440	50240 (Second release revision is 2.1)
Module Catalog String	2085sc-IF16C	2085sc-IF16V

3.5.4 Connection Types and Assembly Sizes

The size of each assembly is listed in the table below. Each word is 2 bytes. These values are stored in the Mod_Size array:

Table	Size (words)
Configuration Assembly	48
Input Assembly	25
Output Assembly	5

3.5.5 Configuration Assembly

The Configuration Assembly table (Mod_Config array) is organized as follows:

Word	Name	Type	Length (Words)	Description
Config 0	Ch 0 Configuration	STRUCT	1	Channel 0 configuration data
Config 1 – 2	Ch 0 Alarm Values	STRUCT	2	Channel 0 alarm values
…	…	…	…	…
Config 45	Ch 15 Configuration	STRUCT	1	Channel 15 configuration data
Config 46 - 47	Ch 15 Alarm Values	STRUCT	2	Channel 15 alarm values

3.5.6 Channel Configuration Bit Location Data

Channel Configuration Bit location details are listed below.

Descriptions of each section are provided following this table. Unused bits must remain 0.

To Select		Make these bit settings															
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Channel Enable	Enable																	0
	Disable																	1
Data Format	Engineering Unit ×1															0	0	
	Engineering Unit ×10															0	1	
	Raw/Proportional Data															1	0	
	Percentage															1	1	
Process Alarm	Disabled													0	0			
	Enabled without latching													0	1			
	Enabled with latching													1	1			
Open Circuit Detection	Upscale											0	0					
	Downscale											0	1					
	Zero											1	0					
	Disable											1	1					
Range Type	4 to 20 mA (IF16C only)								0	0								
	0 to 20 mA (IF16C only)								0	1								
	-10 to 10 V (IF16V only)								0	0								

To Select		Make these bit settings															
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	0 to 10 V (IF16V only)							0	1								
	0 to 5 V (IF16V only)							1	0								
ADC Filter	16.7 Hz					0	0										
	4.17 Hz					0	1										
	62 Hz					1	0										
	470 Hz					1	1										

3.5.7 Configuration Bit Definitions

The structure definition for each 'Ch *n* Configuration' in the Configuration Assembly table is defined as follows. Unused bits must be 0.

Name	Bit	Description
Channel Enable	Bit 0	0: Enable (default) 1: Disable
Data Format	Bit 1 – 2	0: Engineering Unit ×1 (default) 1: Engineering Unit ×10 2: Raw/Proportional Data 3: Percentage
Process Alarm Enable	Bit 3	0: Disable (default) 1: Enable
Process Alarm Latch	Bit 4	0: Disable (default) 1: Enable
Open Circuit Detection[5]	Bit 5 – 6	0: Upscale (default) 1: Downscale 2: Zero 3: Disable
(Unused)	Bit 7	

[5] The Open Circuit Detection bits are ignored if the Range Type is set to 0 to 20 mA (IF16C only).

Name	Bit	Description
Range Type	Bit 8 – 9	IF16C: 0: 4 to 20 mA (default) 1: 0 to 20 mA 2: (invalid) 3: (invalid) IF16V: 0: -10 to +10 V (default) 1: 0 to 10 V 2: 0 to 5 V 3: (invalid)
ADC Filter	Bit 10 – 11	0: 16.7 Hz (default) 1: 4.17 Hz 2: 62 Hz 3: 470 Hz
(unused)	Bit 12 – 15	

3.5.8 Channel Alarm Values Struct

The structure definition for each 'Ch *n* Alarm Values' in the Configuration Assembly table is defined as follows. If process alarms are disabled, their values must be 0:

Word Offset	Name	Type	Length (Words)	Description
0	Process Alarm Low Value	INT	1	Channel low alarm value
1	Process Alarm High Value	INT	1	Channel high alarm value

3.5.9 Input Assembly

The input array is organized as follows:

Word	Name	Type	Length (Words)	Description
Input 0	Ch 0 Data	INT	1	Analog Channel Data Channel 0
Input 1	Ch 1 Data	INT	1	Analog Channel Data Channel 1
Input 2	Ch 2 Data	INT	1	Analog Channel Data Channel 2
Input 3	Ch 3 Data	INT	1	Analog Channel Data Channel 3
Input 4	Ch 4 Data	INT	1	Analog Channel Data Channel 4
Input 5	Ch 5 Data	INT	1	Analog Channel Data Channel 5
Input 6	Ch 6 Data	INT	1	Analog Channel Data Channel 6

Word	Name	Type	Length (Words)	Description
Input 7	Ch 7 Data	INT	1	Analog Channel Data Channel 7
Input 8	Ch 8 Data	INT	1	Analog Channel Data Channel 8
Input 9	Ch 9 Data	INT	1	Analog Channel Data Channel 9
Input 10	Ch 10 Data	INT	1	Analog Channel Data Channel 10
Input 11	Ch 11 Data	INT	1	Analog Channel Data Channel 11
Input 12	Ch 12 Data	INT	1	Analog Channel Data Channel 12
Input 13	Ch 13 Data	INT	1	Analog Channel Data Channel 13
Input 14	Ch 14 Data	INT	1	Analog Channel Data Channel 14
Input 15	Ch 15 Data	INT	1	Analog Channel Data Channel 15
Input 16	Ch 0-1 Status	STRUCT	1	Channel Status Bits Channel 0-1
Input 17	Ch 2-3 Status	STRUCT	1	Channel Status Bits Channel 2-3
Input 18	Ch 4-5 Status	STRUCT	1	Channel Status Bits Channel 4-5
Input 19	Ch 6-7 Status	STRUCT	1	Channel Status Bits Channel 6-7
Input 20	Ch 8-9 Status	STRUCT	1	Channel Status Bits Channel 8-9
Input 21	Ch 10-11 Status	STRUCT	1	Channel Status Bits Channel 10-11
Input 22	Ch 12-13 Status	STRUCT	1	Channel Status Bits Channel 12-13
Input 23	Ch 14-15 Status	STRUCT	1	Channel Status Bits Channel 14-15
Input 24	Module Status	STRUCT	1	Module Status Bits

3.5.10 Channel Status Struct Bit Definition

The structure definition for each 'Ch *n* Status' in the Input Assembly table is described below.

Each channel status struct is only one byte. Two channel status structs are stored in each input word. The low byte (bits 0-7) of each channel status word is for the first channel; the high byte (bits 8-15) is for the second channel. For example, **Input 23** word bits 0-7 represent channel 14 and bits 8–15 represent channel 15.

Unused bits are 0.

Bit	Name	Description
Bit 0/ Bit 8	Channel Fault	0: No Channel Fault 1: Channel Fault This bit is set when the channel has an open circuit condition, data error, or under/over range condition. It is also set if the Module Power Up bit is set or the Module General Fault bit is set.
Bit 1/ Bit 9	Data Error	0: No Data Error 1: Data Error This bit is set for an enabled channel that is not receiving a reading from the ADC. When set, the respective channel data value remains the same as the previous sample.
Bit 2/ Bit 10	Process Alarm Low	0: No Alarm 1: Alarm
Bit 3/ Bit 11	Process Alarm High	0: No Alarm 1: Alarm
Bit 4/ Bit 12	Under-range	0: Not Under-range 1: Input Signal Under-range
Bit 5/ Bit 13	Over-range	0: Not Over-range 1: Input Signal Over-range
Bit 6/ Bit 14	Open Circuit	0: No Open Circuit 1: Open Circuit Condition Detected
Bit 7/ Bit 15	(unused)	(unused)

3.5.11 Module Status Struct Bit Definitions

The structure definition for the 'Module Status' word in the Input Assembly table is described below. These struct is provided for convenient monitoring for any module errors. Unused bits are 0.

Bit	Name	Description
Bit 0-12	(unused)	(unused)
Bit 13	Invalid Serial Number Data	0: Serial Number Valid 1: Serial Number Invalid This bit is set if the factory-programmed serial number data is missing or has become corrupt.
Bit 14	Invalid Calibration Data	0: Calibration Valid 1: Calibration Invalid This bit is set if the module's calibration data has not been programmed or has become corrupt.

Bit	Name	Description
Bit 15	Module Fault	0: No Fault 1: Fault This bit is set if any of the above bits are set or if any channel has its fault bit set.

3.5.12 Output Assembly Words

The Output array is organized as follows:

Word	Bit	Name	Description
Output 0	Bit 0	Ch 0 Process Alarm High Latch Clear	0: Normal Operation 1: Clear Alarm Latch
	Bit 1	Ch 0 Process Alarm Low Latch Clear	0: Normal Operation 1: Clear Alarm Latch
	Bit 2	Ch 1 Process Alarm High Latch Clear	0: Normal Operation 1: Clear Alarm Latch
	Bit 3	Ch 1 Process Alarm Low Latch Clear	0: Normal Operation 1: Clear Alarm Latch
	Bit 4	Ch 2 Process Alarm High Latch Clear	0: Normal Operation 1: Clear Alarm Latch
	Bit 5	Ch 2 Process Alarm Low Latch Clear	0: Normal Operation 1: Clear Alarm Latch
	Bit 6	Ch 3 Process Alarm High Latch Clear	0: Normal Operation 1: Clear Alarm Latch
	Bit 7	Ch 3 Process Alarm Low Latch Clear	0: Normal Operation 1: Clear Alarm Latch
	Bit 8	Ch 4 Process Alarm High Latch Clear	0: Normal Operation 1: Clear Alarm Latch
	Bit 9	Ch 4 Process Alarm Low Latch Clear	0: Normal Operation 1: Clear Alarm Latch
	Bit 10	Ch 5 Process Alarm High Latch Clear	0: Normal Operation 1: Clear Alarm Latch
	Bit 11	Ch 5 Process Alarm Low Latch Clear	0: Normal Operation 1: Clear Alarm Latch
	Bit 12	Ch 6 Process Alarm High Latch Clear	0: Normal Operation 1: Clear Alarm Latch
	Bit 13	Ch 6 Process Alarm Low Latch Clear	0: Normal Operation 1: Clear Alarm Latch
	Bit 14	Ch 7 Process Alarm High Latch Clear	0: Normal Operation 1: Clear Alarm Latch

Word	Bit	Name	Description
	Bit 15	Ch 7 Process Alarm Low Latch Clear	0: Normal Operation 1: Clear Alarm Latch
Output 1	Bit 0	Ch 8 Process Alarm High Latch Clear	0: Normal Operation 1: Clear Alarm Latch
	Bit 1	Ch 8 Process Alarm Low Latch Clear	0: Normal Operation 1: Clear Alarm Latch
	Bit 2	Ch 9 Process Alarm High Latch Clear	0: Normal Operation 1: Clear Alarm Latch
	Bit 3	Ch 9 Process Alarm Low Latch Clear	0: Normal Operation 1: Clear Alarm Latch
	Bit 4	Ch 10 Process Alarm High Latch Clear	0: Normal Operation 1: Clear Alarm Latch
	Bit 5	Ch 10 Process Alarm Low Latch Clear	0: Normal Operation 1: Clear Alarm Latch
	Bit 6	Ch 11 Process Alarm High Latch Clear	0: Normal Operation 1: Clear Alarm Latch
	Bit 7	Ch 11 Process Alarm Low Latch Clear	0: Normal Operation 1: Clear Alarm Latch
	Bit 8	Ch 12 Process Alarm High Latch Clear	0: Normal Operation 1: Clear Alarm Latch
	Bit 9	Ch 12 Process Alarm Low Latch Clear	0: Normal Operation 1: Clear Alarm Latch
	Bit 10	Ch 13 Process Alarm High Latch Clear	0: Normal Operation 1: Clear Alarm Latch
	Bit 11	Ch 13 Process Alarm Low Latch Clear	0: Normal Operation 1: Clear Alarm Latch
	Bit 12	Ch 14 Process Alarm High Latch Clear	0: Normal Operation 1: Clear Alarm Latch
	Bit 13	Ch 14 Process Alarm Low Latch Clear	0: Normal Operation 1: Clear Alarm Latch
	Bit 14	Ch 15 Process Alarm High Latch Clear	0: Normal Operation 1: Clear Alarm Latch
	Bit 15	Ch 15 Process Alarm Low Latch Clear	0: Normal Operation 1: Clear Alarm Latch

The bits in output words 0 and 1 are written during run mode to clear any latched low or high process alarms. The alarm is unlatched when the Latch Clear bit is set (1) and the alarm condition no longer exists. If the alarm condition persists, then the Latch Clear bit has no effect until the alarm condition no longer exists.

You need to keep the Latch Clear bit set (1) until the corresponding Process

Alarm status bit from the input table has been cleared (0). After that you are able to reset (0) the Latch Clear bit. The module does not latch an alarm condition if there is an alarm transition from no alarm to alarm while the channel's Latch Clear bit is set.

**Section 3.6
Product Features**

The following sections provide information on user-configurable parameters.

3.6.1 Channel Enable or Disable Description

Specify whether to enable use of each selected channel. Each channel is **Enabled** by default (checkmark selected).

3.6.2 Input ADC Filter Frequencies

The Input ADC Filter configuration parameter allows you to select a filter setting that attenuates the input signal beginning at the specified frequency. The actual filtering is performed in hardware (internal to ADC).

The filter for each channel is programmable, allowing you to select from four different filter frequencies:

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

The software uses the following channel scan times. The 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/filter] + 1 ms), and microcontroller processing overhead.

The module contains two ADC filters and scans two sets of 8 channels in parallel.

Below is the approximate timing for each input filter selection:

ADC Filter Selection	Total Channel Scan Rate Measurement per Channel
16.7 Hz	138 ms
4.17 Hz	498 ms
62 Hz	50 ms
470 Hz	22 ms

The module scan rate can be determined by adding up the scan time of each individual channel connected to a particular ADC. The module contains two ADCs, and scans two sets of 8 channels in parallel. The channels are scanned sequentially on each ADC as follows:

ADC 0: Ch0, Ch1, Ch2, Ch3, Ch8, Ch9, Ch10, Ch11

ADC 1: Ch4, Ch5, Ch6, Ch7, CH12, Ch13, Ch14, Ch15

The scan time of each channel is based on the channel's Input ADC Filter

configuration and is the sum of the multiplexer settling time, ADC conversion period (which is 2/filter + 1 ms), and processing overhead.

> **NOTE** (i) (IF16V only): If open circuit detection is enabled, it will be checked every 3 seconds using the 470 Hz filter, which will add an additional 22 ms to the total channel scan time listed in the table above.

Input Range Values

Input Range Values are:

Input Range Selection	IF16V	IF16C
±10 V	√	
0-10 V	√	
0-5 V	√	
0-20 mA		√
4-20 mA		√

Input Data Format

The data format allows you to select how the analog input data is presented. The raw analog input data is scaled according to the data format selection and the input range selection. User-defined scaling is not supported.

Refer to the following table for a summary of the data formats available. Refer to the range limits next to determine the range limits associated with each data format, input range, and signal value.

Data Format	Description
Engineering Unit ×1	The module scales analog input data to the actual current/voltage values in mA or mV for the selected input range.
Engineering Unit ×10	The module scales analog input data to the actual current/voltage values in mA * 10 or mV * 10 for the selected input range.
Raw/Proportional	The value presented to the controller is proportional to the selected input and scaled to the maximum data range allowed by the bit resolution of the ADC.
Percentage Full Scale	The value presented to the controller is a percentage of the user range.

You may scale input data using the following range limits:

Input Range	Signal		Raw/ Proportional	Engineering Units ×1	Engineering Units ×10	Percentage Full Scale
-10 to +10 V (IF16V only)	Low Limit	-10.500 V	-32768	-10500	-1050	-250
	Low Range	-10.000 V	-31208	-10000	-1000	0
	High Range	+10.000 V	31207	10000	1000	10000
	High Limit	+10.500 V	32767	10500	1050	10250
0 to 10 V (IF16V only)	Low Limit	-0.500 V	-32768	-500	-50	-500
	Low Range	0.000 V	-29789	0	0	0
	High Range	+10.000 V	29788	10000	1000	10000

Input Range	Signal		Raw/ Proportional	Engineering Units ×1	Engineering Units ×10	Percentage Full Scale
	High Limit	+10.500 V	32767	10500	1050	10500
0 to 5 V (IF16V only)	Low Limit	-0.500 V	-32768	-500	-50	-1000
	Low Range	0.000 V	-27069	0	0	0
	High Range	+5.000 V	29918	5000	500	10000
	High Limit	+5.250 V	32767	5250	525	10500
4 to 20 mA (IF16C only)	Low Limit	+3.200 mA	-32768	3200	320	-500
	Low Range	+4.000 mA	-29823	4000	400	0
	High Range	+20.000 mA	29085	20000	2000	10000
	High Limit	+21.000 mA	32767	21000	2100	10625
0 to 20 mA (IF16C only)	Low Limit	+0.000 mA	-32768	0	0	0
	Low Range	+0.000 mA	-32768	0	0	0
	High Range	+20.000 mA	29646	20000	2000	10000
	High Limit	+21.000 mA	32767	21000	2100	10500

The scaling formula is:

$y = mx + b + calbias$[6]

Where:

y is the user scaled data in the input table in engineering units.

m is the slope: $(HighEngineering - LowEngineering)/(HighSignal - LowSignal)$

x is the ADC signal data at the terminal block converted to corresponding data format.

b is the offset: $LowEngineering - (m * LowSignal)$

Once the module receives the configuration, the Range Scaling feature is always active.

3.6.3 Process Alarms

Process alarms allow you to specify alarm limits for the input signal, and to have the module report when those signal limits have been exceeded. The feature is active if enabled in the channel(s) configuration.

To set up, input the desired alarm values (Enable Process Alarms, Process Alarm Latch, Process Alarm High Value, Process Alarm Low Value) for each channel into the configuration table, as described in Configuration Assembly. Report a configuration error if any alarm value in the configuration table has been set incorrectly.

Set the Process Alarm High status bit in the channel status struct when the channel input value is greater than the Process Alarm High Value in the

---

[6] $calbias$ is not applied to this module and is fixed at zero.

configuration table.

Set the Process Alarm Low status bit in the channel status struct when the channel input value is less than the Process Alarm Low Value in the configuration table.

- If the Process Alarm Latch bit is disabled, then clear the appropriate alarm status bit when the channel input value is no longer within the alarm value range.
- If the Process Alarm Latch bit is enabled, then clear the appropriate alarm status bit when both of the following conditions are satisfied:
  - The channel input value is no longer within the alarm value range, and
  - The Set Latch Clear bit in the output table is set.

NOTE	This bit must remain set until the appropriate Alarm Status bit is cleared. This bit can then be cleared again. The module does not latch an alarm condition if a transition from no alarm to alarm occurs while a channel's Set Latch Clear bit is set.

3.6.4 Under/Over Range Alarms

The alarm is not latched; if the input signal 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 section the Channel Status Struct table.

- Set the Under-range status bit when a channel input is lower than the Low Range value indicated in the input ranges table.
- Set the Over-range status bit when a channel input is higher than the High Range value indicated in the input ranges table.
- Clear the Under-range and Over-range status bits when the channel input is within the Low/High range values indicated in the input ranges table.

3.6.5 Open Circuit Detection

The open circuit detection feature alerts you to an open circuit condition by setting the open circuit status bit and displaying 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	

The open circuit detection behavior depends on the channel input range selection and the open circuit detection selection bits for each channel:

- For voltage range selections (IF16V only):
  - Open circuit detection takes place on a periodic basis, every 3 seconds, by temporarily enabling the PGA burnout current, and initiating an ADC conversion at the fastest filter frequency (470 Hz).
  - 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 3 seconds of an open circuit condition, transitional data may be reported prior to the open circuit status bit being set.
- For the Upscale open circuit detection setting, an open circuit condition causes the channel input data to report the high limit data value for the selected input range and data format and the open circuit status bit is set. As a side effect of this, the over range status bit is also set.
- For the Downscale open circuit detection setting, an open circuit condition causes the channel input data to report the low limit data value for the selected input range, and data format and the open circuit status bit is set. As a side effect of this, the under range status bit is also set.
- For the Zero open circuit detection setting, an open circuit condition causes the channel input data to report a value equivalent to zero for the selected input range, and data format and the open circuit status bit is set. As a side effect of this, depending on the selected range, the under range status bit may also be set.
- For the Disabled open circuit detection setting (IF16V only), an open circuit condition is not reported. Also, the periodic open circuit detection does not take place.
- For the 0-20 mA current range selection (IF16C only), an open circuit condition cannot be detected, and the open circuit status bit is not set.
- An open circuit condition may also be triggered by applying an input value well beyond the specified Low or High Limit values indicated in the table earlier in this Chapter.

3.6.6 Module Specific Hardware Errors

A Micro850 or 870 PLC can generate a series of $0 \times F2xy$ error codes specific to an Expansion I/O module. The Fault code is $0 \times F29z$, where z indicates the slot number of the expansion I/O. If z=0, then the slot number cannot be identified.

Fault Code	Extended Fault Code	Error Description
$0 \times F29z$[7]	0×301	MCU Watchdog reset
	0×302	MCU board power brownout
	0×303	Unused by the 2085sc-IF16
	0×304	ADC communications error

---

[7] z indicates the slot number of the expansion I/O. If z=0, then the slot number cannot be identified

Fault Code	Extended Fault Code	Error Description
	0×305	Unused by the 2085sc-IF16
	0×306	PLC communications error

3.6.7 Module Specific Channel Configuration Errors

If you set invalid configuration values in the PLC, the CCW will generate a high-level configuration fault. The connection status will be defaulted and disconnected.

Fault Code	Extended Fault Code	Error Description
$0×F2Bz$[8]	0×410-41F	**Invalid Input Range** Check the Range Type setting in the Channel Configuration data.
	0×420-42F	**Invalid Input ADC Filter** Check the ADC Filter setting in the Channel Configuration data.
	0×430-43F	**Invalid Input Data Format** Check the Data Format setting in the Channel Configuration data.
	0×440-44F	**Alarm Not Enabled** Check the Channel Enable, Process Alarm Enable, and Process Alarm Latch bits in the Channel Configuration data. This error occurs if the channel is enabled and the Process Alarm Latch bit is set, but the Process Alarm Enable bit is not set.
	0×450-45F	**Invalid Alarm Data** 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: Range Max less than AHV Range Min greater than ALV AHV less than or equal to ALV ALV is the Process Alarm Low Value AHV is the Process Alarm High Value Range Max and Range Min are the full-scale values for the selected Input Range and Input Data Formats as defined in the Range Limits table.

---

[8] 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:
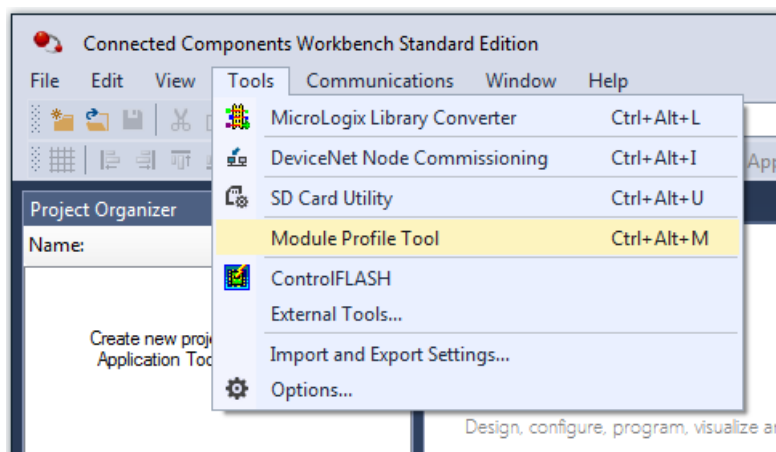
4. When prompted by Windows User Account Control, to confirm that you wish to run the program, click **Yes** button.

    The Module Profile Tool 2.0 window appears:
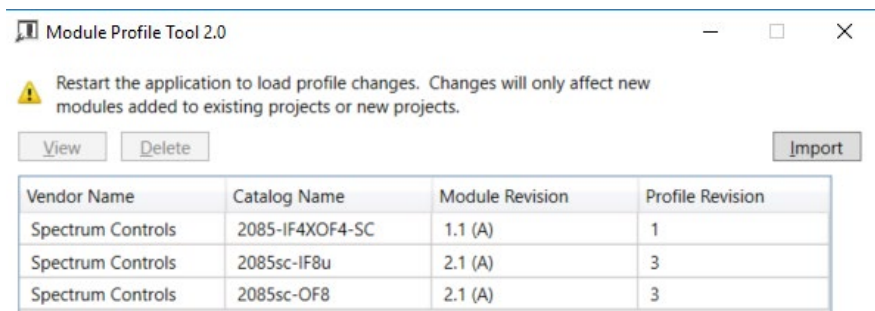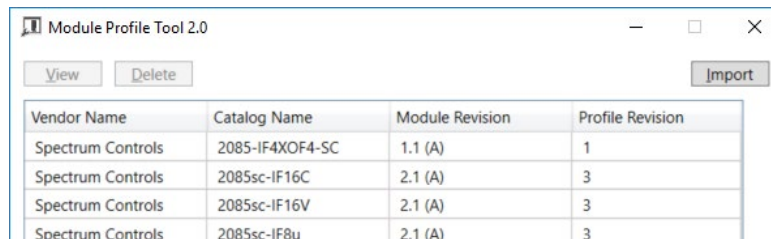
5. Click the **Import** button.

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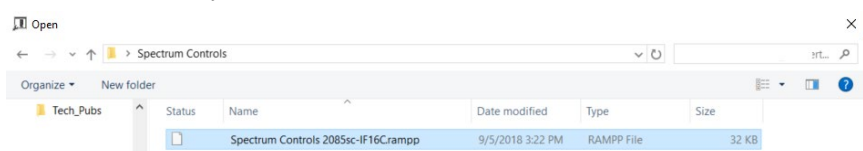
7. Click **Open** to import the file.

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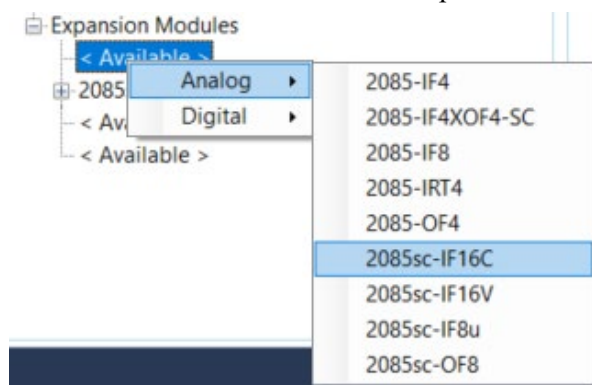
The newly imported module is now available as a selection from the Expansion Modules list.

Index