

USER MANUAL



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Micro800™ Expansion I/O Analog Combination I/O Module

Catalog Number: 2085-IF4XOF4-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

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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™ Analog Combination I/O Module.

 <p>NOTE</p>	<p>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. Also, be sure to review the warnings provided in this document before you start installing a module in a system.</p>
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How to Use This Manual

As much as possible, we organized this manual to explain, in a task-by-task manner, explaining how to install, configure, program, operate, and troubleshoot a control system using the Micro800™ Analog Combination I/O 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

For	Refer to this Document	Allen-Bradley Pub. No.
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.
- Lists provide sequential steps or hierarchical information.
- *Italic* type is used for emphasis.
- **Bold** type identifies headings and sub-headings:

<p>WARNING</p> 	<p>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.</p>
<p>ATTENTION</p> 	<p>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.</p>
<p>NOTE</p> 	<p>Identifies information that is critical for successful application and understanding of the product.</p>

Chapter 1

Module Overview

This chapter covers the following topics:

- General description
- Performance specifications
- Output specifications
- Input specifications
- Environmental specifications
- Safety Test specifications
- Hardware features
- System overview and module operation

The Micro850™ Analog Combination I/O Module (2085-IF4XOF4-SC Expansion I/O Module) is a 4-channel, analog input and 4-channel, analog output 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-IF4-SCXOF4 modules that can be installed with a Micro850/870 PLC is based on the current controller firmware revision and CCW software revision.

- Each one of the 4 input channels is individually selectable between voltage and current inputs.
- The voltage input is aimed at control systems to input analog voltage varying from -10 to +10 volts.
- The current input is aimed at control systems to input analog current varying from 0 to 20 mA.
- Each one of the 4 output channels is individually selectable between voltage and current outputs.
- The voltage output is designed for control systems that require an analog output voltage varying independently from -10 to +10 volts.
- The current output is designed for control systems that require an analog output current varying from 0 to 20 mA.

Section 1.1 General Description



The 2085-IF4XOF4-SC Expansion I/O module measures up to 4 channels of current and/or voltage inputs, and 4 channels of current and/or voltage outputs. The module supports:

- Four input channels:
 - The module measures either voltage or current input signal for each channel.
 - Five input range types.
 - Four data formats.
 - Four filter frequency setup.
 - Over or under range detection.
 - Open wire detection except for 0 to 20 mA current range.
 - Option to disable open-wire detection for voltage measurement.
- Four output channels:
 - Current or voltage output. When the module receives a new command value from the output control variable, the module converts the digital value to an analog current or voltage signal using a DAC (Digital to Analog Converter).
 - Five output range types.
 - Four data formats.
 - Over and under range detection (from user-defined values).
 - Circuit detection: Open circuit detection available in current mode; Short circuit detection available in voltage mode.
 - User-customizable range alarms and clamp values.
 - Alarm Latches for over range, under range and load error conditions.

All channels have fault tolerance and ESD protection to avoid damage to circuitry on the board. The modules use 50 VAC working Reinforced Insulation between channels and the backplane. Individual channels are not isolated from each other.

The 2085-IF4XOF4-SC module uses a 20-bit analog-to-digital converter to

achieve a 16-bit resolution with ± 10 V full-scale ranges on input channels. The modules digitally convert and store analog data from either the current or voltage input type.

The module also uses a 16-bit digital-to-analog converter, and 4 separate output drivers to provide for either current or voltage output signals on each channel.

Each input and output 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. During power startup, all outputs and inputs are disabled and off until a valid configuration has been received.

- The default configuration for input is for all channels enabled in the 0 to 20 mA range with the 17 Hz filter in Engineering $\times 1$ units.
- The default configuration for output is for all channels enabled in the 0 to 20 mA range in Engineering $\times 1$ units with latch alarm feature disabled.

Section 1.2 Performance Specifications

The 2085-IF4XOF4-SC module has the following performance specifications:

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

Parameter	Specification
Operating Temperature	-20 °C to 65 °C (-4 °F to 149 °F)
Storage/Non-Operating Temperature	-40 °C to 85 °C (-40 °F to 203 °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 \pm 1 ms pulse, half sine
Storage/Non-Operating Shock	25 g peak acceleration, 11 \pm 1 ms pulse, half sine
Pollution Level	Meets Pollution Degree 2 requirements ¹ .
ESD	Meets CE requirements for operating ESD category B at 6 kV indirect (coupling plate).

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

Parameter	Specification
Radiated Immunity	10 V/m with 1 kHz sine-wave 80% AM from 80...2000 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 10 V/m with 1 kHz sine-wave 80% AM from 1000...2000 MHz 10 V/m with 1 kHz sine-wave 80% AM from 2000...2700 MHz
Outputs per module	4 current/voltage output channels
Inputs per module	4 current/voltage input channels
Power Consumption	Maximum 110 mA at 5 V (4.5 V to 5.5 V) from backplane; (0.55 W) Maximum 125 mA at 24 V (19.9 V to 26.4 V) from backplane Nominal 24V; (3 W)
Power Dissipation (within module) (current mode)	Less than 4 W at 50 Ohm resistance load on all output channels Less than 3.6 W at 250 Ohm resistance load on all output channels Less than 3.2 W at 500 Ohm resistance load on all output channels
Peak Inrush Current	Less than 150 mA for +5 V from backplane and rail Less than 500 mA for +24 V from backplane
Module Scan Time for all analog channels	Less than 3 seconds. For the normal case, no communication error occurs between channels and backplane.
Isolation	
Between channels and backplane	50 VAC working Reinforced isolation tested at 2 kVDC for 1 minute.
Between Channels and chassis ground	50 VAC working Reinforced isolation tested at 2 kVDC for 1 minute.
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.

Section 1.3 Output Specifications

The 2085-IF4XOF4-SC module has the following output specifications:

Table 1-2. Output/Performance/Environmental Requirements

Output Description	Value			
Outputs per module	4 current or voltage outputs. Each channel can only output either current or voltage at one time.			
Hardware output ranges ²	Current: 0-20 mA (0-20.4 mA hardware support range) 4-20 mA (3.92-20.4 mA hardware support range) Voltage: 0-5 (Over range is 0 V to 5.25 V) 0-10 V (Over range is 0 V to 10.5 V) ±10 V (Over range is -10.5 V to +10.5 V)			
Current output impedance	More than 1 Mohm			
Voltage output impedance	Less than 1 ohm			
Output Overvoltage Protection	±24 VDC			
Output Short Circuit Protection in current mode	Current outputs are electronically current limited to 20.4 mA or less with no damage			
Output short circuit protection in voltage mode	Output current will be limited at 15 mA			
Resolution in current mode	735 nA/bit ³			
Resolution in voltage mode	±10 V: 735 uV/bit; 0-5 V and 0-10 V: 368 uV/bit			
Peak Inrush Current	Less than 150 mA at 5 V (backplane) ⁴ Less than 500 mA at 24 V (backplane) ⁵			
Current accuracy (calibrated)	Error at 25 °C, Max	Error over -20 °C to 65 °C, Max		
	0-20 mA	±50 µA	±75 µA	
	4-20 mA	±50 µA	±75 µA	
Voltage accuracy (calibrated)	Error at 25 °C, Max	Error over -20 °C to 65 °C, Max		
	0-5 V	±5 mV	±12.5 mV	
	0-10 V	±20 mV	±50 mV	
	±10 V	±20 mV	±50 mV	
Output Current Repeatability	At 25 °C			
0-20 mA	Better than ±5 µA			

² The load on each channel must be within the range of 50-500 Ohm in current mode and greater than 1 Kohm in voltage mode.

³ Output driver to 0-24 mA (2085sc-OF8 is 0-24.5 mA)

⁴ Output driver to set ±12 V

⁵ Output driver set to ±6 V for 0-5 V range and 0-12 V for 0-10 V range

Output Description	Value
4-20 mA	Better than $\pm 5 \mu\text{A}$
Output Voltage Repeatability	At 25 °C
0-5 V	Better than $\pm 0.5 \text{ mV}$
0-10 V	Better than $\pm 2 \text{ mV}$
$\pm 10 \text{ V}$	Better than $\pm 2 \text{ mV}$
Output Drive Capability	50 to 500 Ohm with short-circuit survival in current mode Greater than or equal to 1 Kohm in voltage mode
Load Reactance	100 μH max in current mode Less than 1 μF in voltage mode
Output Settling Time: Current Output	Less than 1 ms to 63% of full scale with resistive loads
Output Settling Time: Voltage Output	Less than 1 ms to 63% of full scale with resistive loads
Output Ripple	Less than 30 μA in current mode Less than 15 mV in voltage mode
Fault detection	Over temperature detection is supported in both current and voltage modes (over 150 °C). Open Circuit current loop detection is supported on each channel in 4 to 20 mA range. A load resistance greater than 500 Ohm might trigger this fault. A short on an output pin in voltage mode will be detected, and output current will be limited to less than 15 mA. A load less than 1 Kohm resistance also triggers this fault.

Section 1.4 Input Specifications

The 2085-IF4XOF4-SC module has the following input specifications:

Table 1-3. Input/Performance/Environmental Requirements

Input Description	Specification	
Number of Inputs	4 current or voltage inputs. Each channel measures either voltage or current.	
Input ranges	Current: 0 to 20 mA, 4 to 20 mA Voltage: 0 to 5 V, 0 to 10 V, ± 10 V DC	
Input over voltage protection	± 17 V DC continuous	
Protection in current mode	Current: 32 mA continuous (approximately 8 V)	
Input current resolution	424 nA	
Input voltage resolution	Better than 678 uV/bit (with typical resolution of 339.1 uV/bit) for ranges of 0 to 5 V, 0 to 10 V, ± 10 VDC	
Current accuracy (4 and 17 Hz filters)	Error at 25 °C, Max	Error over -20 °C to 65 °C, Max
0-20 mA	± 20 μ A	± 60 μ A
4-20 mA	± 20 μ A	± 60 μ A
Repeatability	At 25 °C	
0-20 mA	± 2 μ A	
Voltage accuracy (4 and 17 Hz filters)	Error at 25 °C, Max	Error over -20 °C to 65 °C, Max
0-5 V	± 5 mV	± 15 mV
0-10 V	± 20 mV	± 60 mV
± 10 V	± 20 mV	± 60 mV
Repeatability	At 25 °C	
0-5 V	± 500 μ V	
0-10 V	± 2 mV	
± 10 V	± 2 mV	
Common mode voltage range	± 10 V maximum per channel	
Common mode rejection	Greater than 84 dB at 50 Hz and 60 Hz	
Normal mode Rejection	4 Hz filter	72 dB (minimum) at 50 Hz and 60 Hz
	17 Hz filter	62 dB (minimum) at 50 Hz and 60 Hz
Crosstalk	-70 dB maximum	

Input Description	Specification
Input Bias Currents and Impedance	
Open Wire Detection Current (Voltage range only)	Approximately 100 μ A during open wire checks for a duration of one channel scan time, with a 470 Hz filter.
Current input impedance	250 (\pm 10%) ohms
Voltage input impedance	15 Mohms except during open circuit detection

Section 1.5 Environmental Specifications

The 2085-IF4XOF4-SC module has the following environmental specifications:

Table 1-4. EMC Specification Table

Environmental Tests	Industry Standards
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...2000 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 10 V/M with 1 kHz sine-wave 80% AM from 1400...2000 MHz 10 V/M with 1 kHz sine-wave 80% AM from 2000...2700 MHz
EFT/B immunity (Performance Criteria B)	Signal Ports: \pm 2 kV at 5 kHz for 5 minutes, Criteria B Power Ports: \pm 2 kV at 5 kHz for 5 minutes, Criteria B
Surge transient immunity (Performance Criteria B)	Signal Ports: \pm 2 kV line-earth {CM} at 2 Ω on shielded ports Power Ports \pm 2 kV CM at 12 Ω \pm 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

Environmental Tests	Industry Standards
AC Mains Voltage Dips, Interruptions and Variations	Follow the IEC 61000-4-11

Section 1.6 Safety Test Specifications

The 2085-IF4XOF4-SC module has the following safety test specifications:

Table 1-5. 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 1.7 Hardware Features

1.7.1 Circuit Protections

Channels are wired as inputs and outputs. For channel outputs, this module can detect an open circuit current loop on each channel in 4 to 20 mA range, current mode, a short on an output pin in voltage mode, and over temperature conditions in both current and voltage modes. For input measurement, open wire detection is available in the form of open circuit inputs going over-range for the voltage and current ranges.

All 4 input channels are protected at the maximum input voltage of ± 24 V in voltage mode and limit the input current between 30 mA and 60 mA at fault over current condition in current mode.

Outputs are protected from electrostatic discharge up to 6 kV for indirect and contact discharge, 8 kV for air discharge. A load resistance greater than 500 Ohm also triggers this fault.

A short on an output pin in voltage mode is also detected, and output current is then limited to less than 15 mA. A load less than 1 Kohm resistance also triggers this fault.

1.7.2 LED Indicators

The 2085-IF4XOF4-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. 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 1-6 LED Blink Code Table

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.
4	Calibration invalid or corrupted The module memory may be corrupted.	Factory calibration must be performed. Please return the module back for reprogramming.
5	Serial Number Invalid or Corrupted The module memory may be corrupted.	Serial number must be programmed. Please return the module for reprogramming.
6	Analog Communications Error A communications error took place between the processor and DAC circuitry.	Power-cycle to try and clear the error condition. If unsuccessful, the module must be replaced.

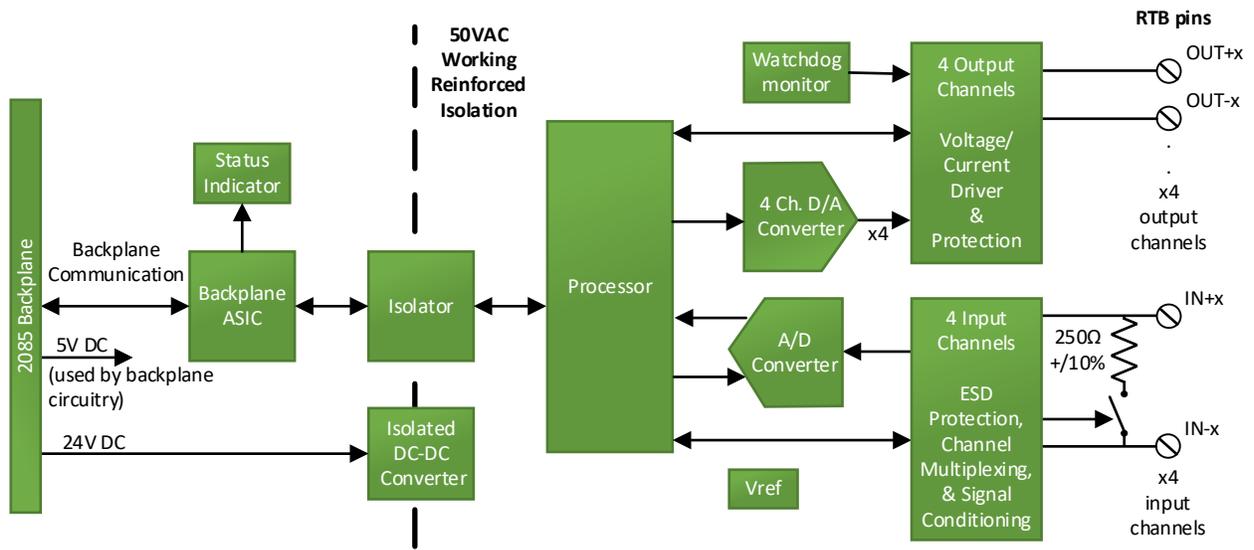
Blink Code	Name and Description	Resolution
7	Power Supply to DAC Driver Error The module 15 V power supply to output drivers is not available.	Check the power transformer on the main board. Power-cycle to try and clear the error condition. If unsuccessful, the module must be replaced.
8	Over Temperature One or more output drivers is overheating. All outputs are disabled for this condition.	Be sure the module is in an appropriate operating environment. Power-cycle to try and clear the error after it has been given time to cool down.
9	Analog Communications Error – Input A communications error or connection error took place between the processor and ADC or PGA circuitry.	Power-cycle to try and clear the error condition. If unsuccessful, the module must be replaced.

Section 1.8 System Overview and Module Operation

The 2085-IF4XOF4-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.

<p>WARNING</p> 	<p>HAZARD OF DAMAGE TO MODULE</p> <p>When multiple channels are configured in voltage mode, and an external 24 V power source is applied to the channels via the terminal block, there is the possibility that the module will be damaged if multiple channels simultaneously experience over voltage conditions.</p> <p>This is because the heating caused by the overvoltage condition will apply to a very small area and may result in damage to that area.</p>
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Block diagram:



Chapter 2

Installation and Wiring

This chapter covers the following subjects:

- Compliance to European Union Directives
- Power Requirements
- General Considerations
- Mounting

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

The backplane power and the analog inputs of the device are only to be supplied by an Isolated Secondary Limited Energy Low Voltage source.

The module receives power through the bus interface from the +5 VDC (4.75 to 5.4 V)/+24 VDC (19.9 to 26.4 V) system power supply. Current rating is for +5 V is 110 mA maximum; for +24 V it is 125 mA maximum. Power rating is 3 Watts maximum:

5 VDC	24 VDC
110 mA	125 mA

Section 2.3

General Considerations

The 2085-IF4XOF4-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 2⁶.

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.

<p>WARNING</p> 	<p>EXPLOSION HAZARD</p> <ul style="list-style-type: none"> • 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. <p>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.</p>
---	--

2.3.2 Prevent Electrostatic Discharge

<p>WARNING</p> 	<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"> • 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.
---	--

⁶ 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>WARNING</p> 	<p>Remove power before removing or inserting this module.</p> <p>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"> • Sending an erroneous signal to your system's field devices, causing unintended machine motion. • Causing an explosion in a hazardous environment. <p>Electrical arcing causes excessive wear to contacts on both the module and its mating connector and may lead to premature failure.</p>
---	---

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.

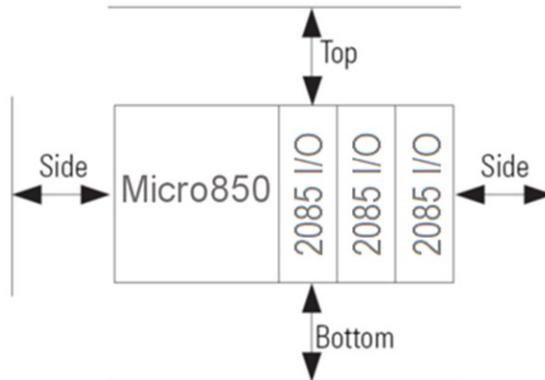
In addition, route shielded, twisted-pair analog input wiring away from any high voltage I/O wiring.

Section 2.4 Mounting

<p>WARNING</p> 	<p>Keeping module free of debris and avoiding overheating:</p> <ul style="list-style-type: none"> • 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. <p>Failure to remove strip before operating can cause overheating.</p>
---	--

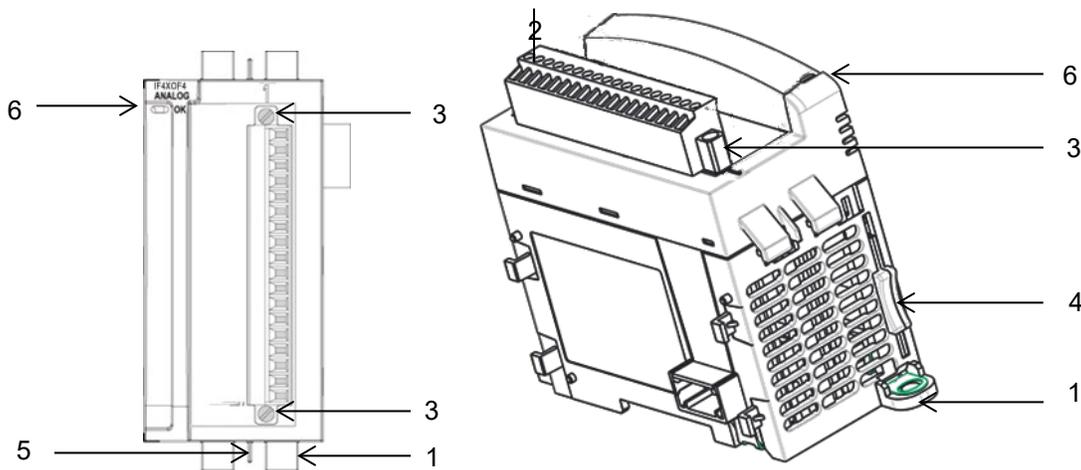
2.4.1 Minimum Spacing

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 2085-IF4XOF4-SC (Analog Input and Output) Expansion I/O Module and one Quick Start Guide.



	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>NOTE</p> 	<ul style="list-style-type: none"> • 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.
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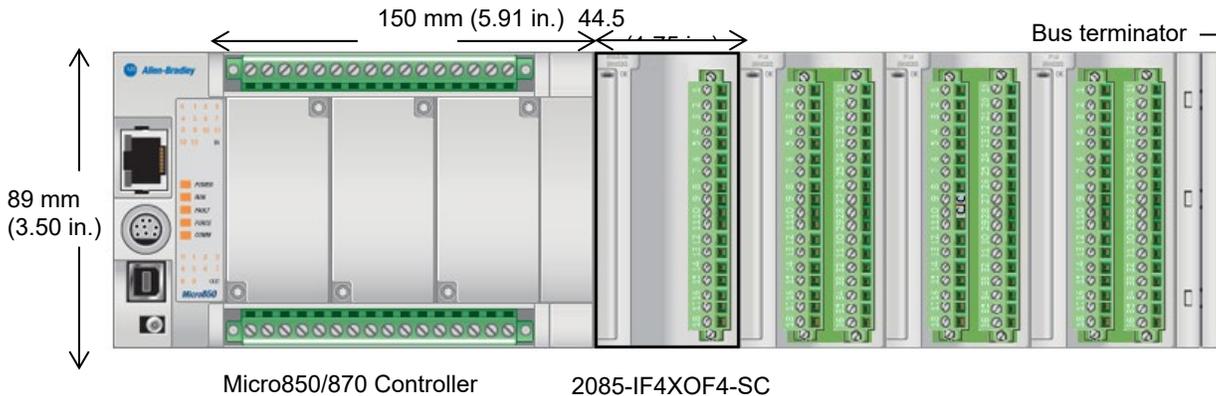
2.4.3 Insert Module next to the Controller

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

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

<p>NOTE</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.

<p>WARNING</p> 	<p>Hazard of intermittent grounding.</p> <p>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.</p> <p>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.</p>
---	--

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.

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.

<p>WARNING</p> 	<p>Hazard of damage to equipment.</p> <p>The Spectrum Controls RTB hold down and terminal screws must be tightened by hand using the guidelines in Step 5. They must <u>not</u> be tightened using a power tool.</p> <p>Use a slot screwdriver of 0.8 × 2.0 mm and carefully tighten to no more than 2.2 lb-in torque (0.25 Nm).</p> <p>Failure to follow these guidelines may result in damage to your connector.</p>
---	---

To install:

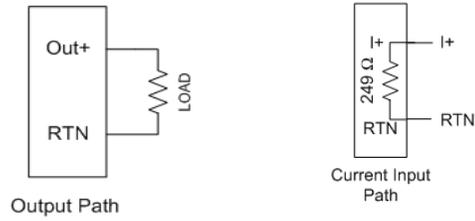
1. Place the module next to the controller against the panel where you are mounting the module.
2. Mark drilling holes through the mounting screw holes and mounting feet, and then remove the module.
3. Drill the holes at the markings.
4. Replace the module and mount it. Leave the protective debris strip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

Wiring Diagram

Wire the module using the following table and image: OUT+3

RTB	Name
1	OUT+0
2	RTN0
3	OUT+1
4	RTN1
5	OUT+2
6	RTN2
7	OUT+3
8	RTN3
9	NC
10	NC
11	IN+4
12	RTN4
13	IN+5
14	RTN5
15	IN+6
16	RTN6
17	IN+7
18	RTN7





Terminal Block signal descriptions are as follows:

RTB	Name	Description
1	OUT+0	Channel 0 voltage or current output
2	RTN0	Channel 0 return
3	OUT+1	Channel 1 voltage or current output
4	RTN1	Channel 1 return
5	OUT+2	Channel 2 voltage or current output
6	RTN2	Channel 2 return
7	OUT+3	Channel 3 voltage or current output
8	RTN3	Channel 3 return
9	NC	No connection
10	NC	No connection
11	IN+4	Channel 4 voltage or current input
12	RTN4	Channel 4 return
13	IN+5	Channel 5 voltage or current input
14	RTN5	Channel 5 return
15	IN+6	Channel 6 voltage or current input
16	RTN6	Channel 6 return
17	IN+7	Channel 7 voltage or current input
18	RTN7	Channel 7 return

Chapter 3

Configuring the 2085-IF4XOF4-SC Using CCW

This chapter covers the following subjects:

- System introduction
- 2085-IF4XOF4-SC AOP
- CCW configuration tab
- Setting configuration parameters using MCC
- Software information
- PLC interfaces
- Product features
- Product performance
- Product safety
- Module-specific errors

Section 3.1 System Introduction

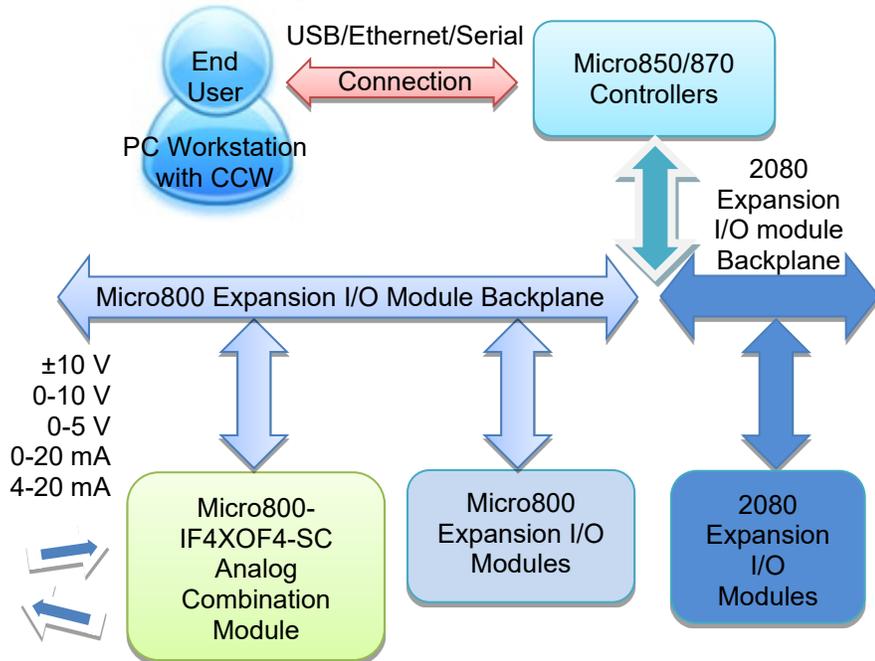
You use CCW software (v 9.00.00 and above) to configure the 2085-IF4XOF4-SC Expansion I/O Module. Your controller firmware must be at v. 9.011 and above as well. You then send the configuration setup to the module. Starting from CCW version 11.00.00 and later, the software provides a module-specific 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.



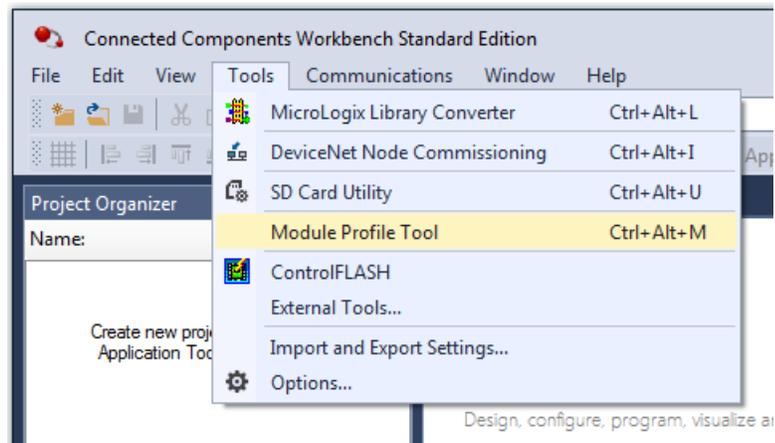
Spectrum Controls, Inc. also provides a custom configuration software utility, MCC, that you may use to send module configuration settings to CCW easier.

Section 3.2 2085-IF4XOF4-SC 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.

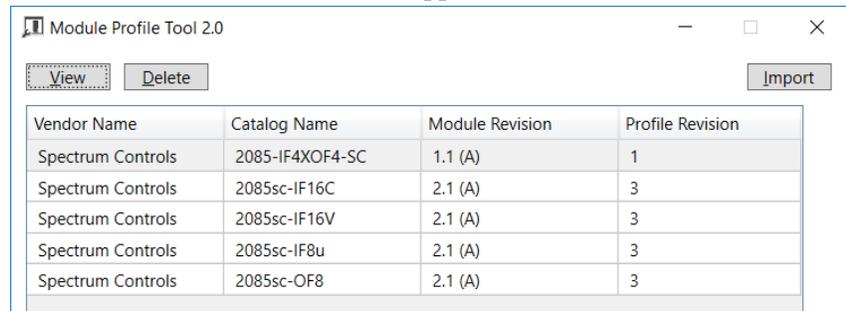
To view information about the AOP:

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:



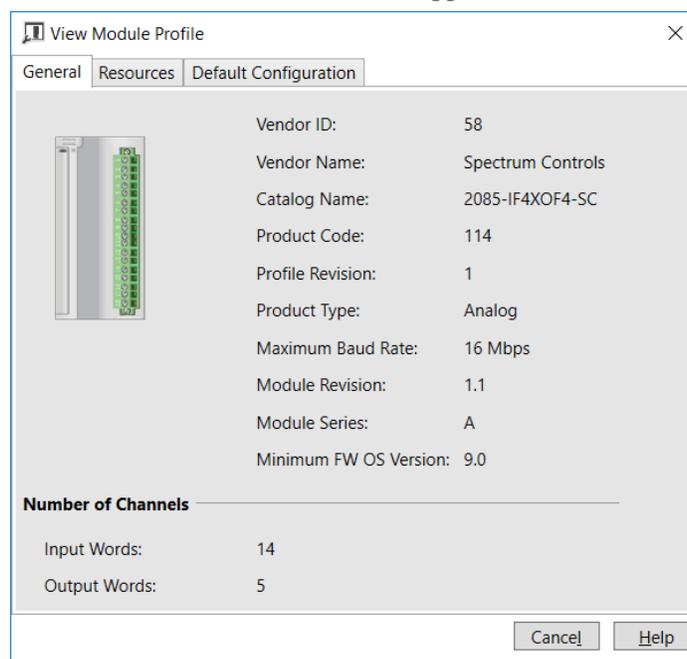
2. When prompted by Windows User Account Control, to confirm that you wish to run the program, click **Yes** button.

The Module Profile Tool window appears:



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

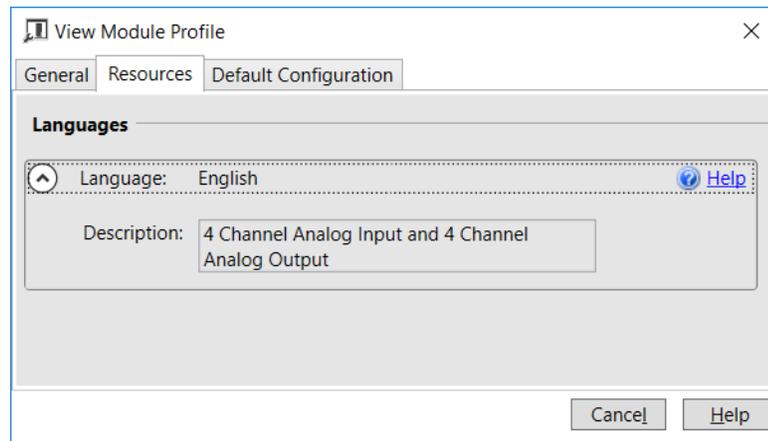
The View Module Profile window appears:



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.

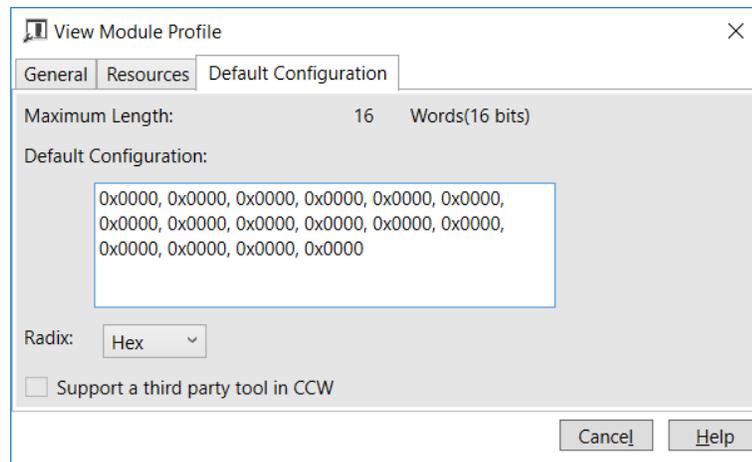
4. To view software language availability, module description, and a help file for the module, click the **Resources** tab.

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.

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



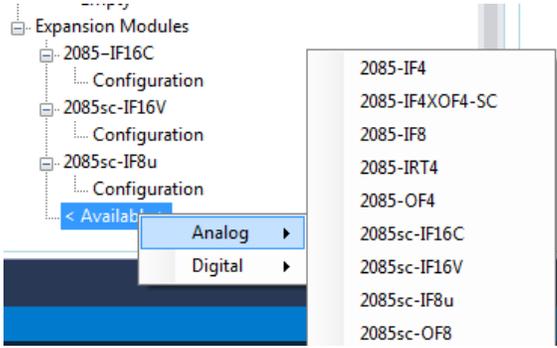
The enabled checkbox shown on the bottom of the tab indicates that the module AOP provides the service for launching the MCC utility to help you configure your module. More information is described in Setting Configuration Parameters Using MCC, later in this section.

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.

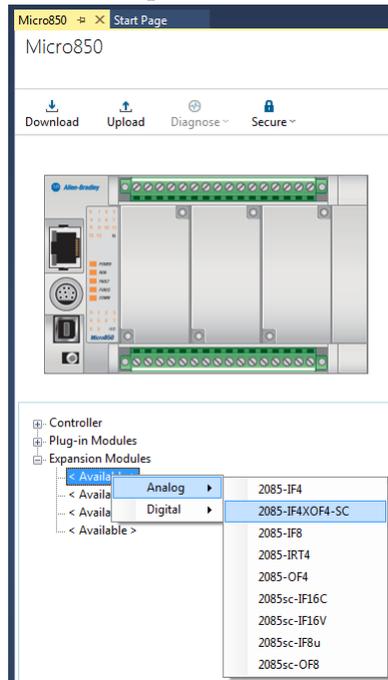
NOTE

Using the Module Profile Tool to import the 2085-IF4XOF4-SC 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:

The screenshot shows the 'Expansion Modules - 2085-IF4XOF4-SC' configuration window. On the left, a tree view shows the navigation path: Controller > Plug-in Modules > Expansion Modules > 2085-IF4XOF4-SC > Configuration. The main area displays the following information:

- Vendor Name: Spectrum Controls
- Description: 4 Channel Analog Input and 4 Channel Analog Output
- Product Type: Multi-Channel Analog
- Revision: 1

Below this information is a table with two columns: 'Input' and 'Output'.

Input	Output
Input 0: IO_X1_AI_00	Output 0: IO_X1_AO_00
Input 1: IO_X1_AI_01	Output 1: IO_X1_AO_01
Input 2: IO_X1_AI_02	Output 2: IO_X1_AO_02
Input 3: IO_X1_AI_03	Output 3: IO_X1_AO_03
Input 4: IO_X1_AI_04	Output 4: IO_X1_AO_04
Input 5: IO_X1_AI_05	
Input 6: IO_X1_AI_06	
Input 7: IO_X1_AI_07	
Input 8: IO_X1_AI_08	
Input 9: IO_X1_AI_09	
Input 10: IO_X1_AI_10	

3. To view the configuration tab, click the **Configuration** option:

The screenshot shows the '2085-IF4XOF4-SC - Configuration' window. On the left, a tree view shows the navigation path: Controller > Plug-in Modules > Expansion Modules > 2085-IF4XOF4-SC > Configuration. The main area displays the following configuration options:

- Maximum Length: 16 Words (16 bit)
- Configuration: `0x0000, 0x0000, 0x0000`
- Radix: Hex
- Launch the configuration tool:

- **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: `0x7FFF` as `32767` in decimal format.
 - ASCII: Characters represented as ASCII. Example: `\7FFF`
 - Binary: Characters represented as 0 and 1. Example: `0111111111111111`

- Decimal. Characters represented as decimals. Example: 32767⁷
- **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 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. Navigate to the CCW Configuration Tab and click in the file path textbox below the **Launch** button.

Launch the configuration tool:



The **Browse** button appears.

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:

⁷ 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.

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

2085-IF4XOF4-SC - Configuration

Maximum Length: 16 Words (16 bit)

Configuration:

```
0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000,
0x0000, 0x0000, 0x0000, 0x0000, 0x0000, 0x0000,
0x0000, 0x0000, 0x0000, 0x0000
```

Radix: Hex

Launch the configuration tool:

Launch

n\CCW\SpectrumTool\ModuleConfigConverter.exe

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

Module Config Converter

Select Module to Configure:

2085sc-IF8u

OK Cancel

4. Select the 2085-IF4XOF4-SC module from the drop-down menu, and click **OK**:

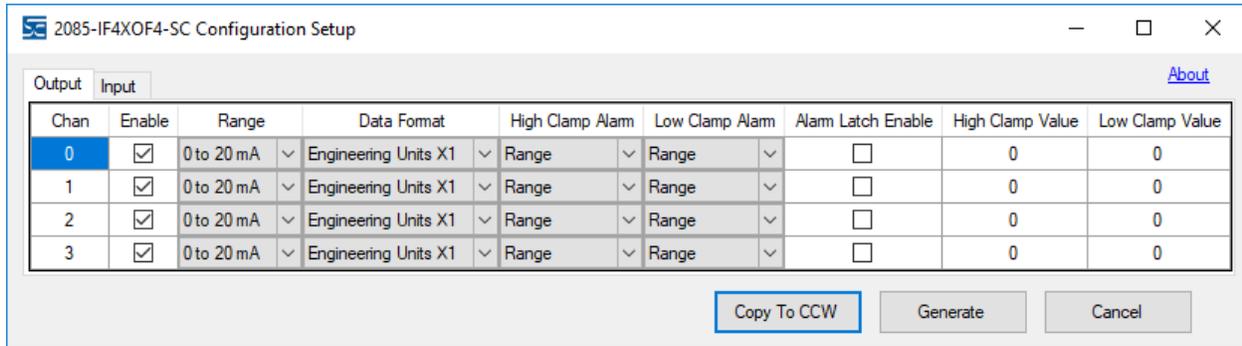
Module Config Converter

Select Module to Configure:

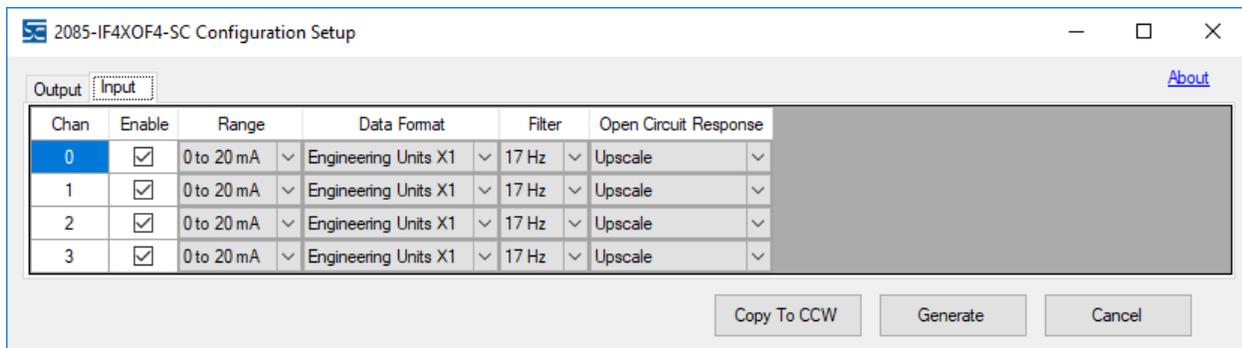
2085-IF4XOF4-SC

OK Cancel

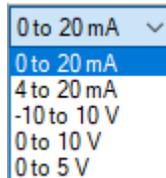
The 2085-IF4XOF4-SC Configuration Setup window appears:



- Click the **Input** tab, and view and specify the following options as needed. See Configuration Assembly for details on the settings for every configuration bit:

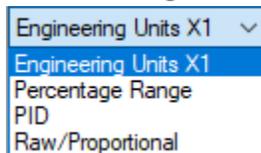


- Chan.** Lists number of input channels from **0** to **3**.
- Enable.** Specifies whether to disable use of this channel. **Enabled** by default (checkbox enabled).
- Range.** Specifies which **Range** type (voltage or current) to use. Select type from drop-down list. Default is **0 to 20 mA**:

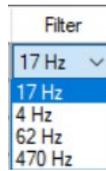


- Data Format.** Specifies which data format to use for reporting input values.

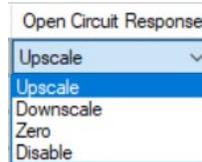
Default is **Engineering Units X1**:



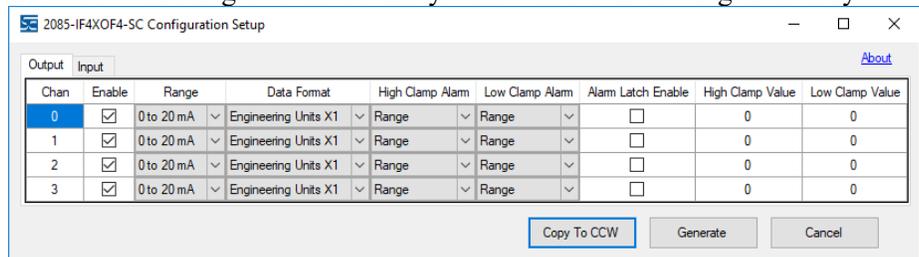
- **Filter.** Specifies which filter to use. Default is **17 Hz**:



- **Open Circuit Response.** Specifies how to respond to an open circuit condition. Default is **Upscale**⁸:

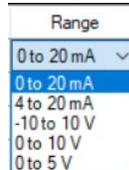


6. Click the **Output** tab, and view and specify the following options as needed. See Configuration Assembly for details on the settings for every

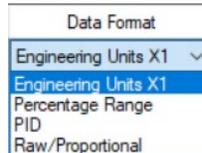


configuration bit:

- **Channel.** Lists number of input channel from **0** to **3**. Click to select.
- **Enable.** Specifies whether to disable use of this channel. **Enabled** by default (checkbox enabled).
- **Range.** Specifies which **Range** type (voltage or current) to use. Select type from drop-down list. Default is **0 to 20 mA**:



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



⁸ The **Disable** option is only available for voltage measurement.

- **High Clamp Alarm.** Specifies whether to clamp the maximum output as defined by **Range**, **Limit**, or **User** setting. Default is **Range**:

High Clamp Alarm
Range ▾
Range
Limit
User

- **Low Clamp Alarm.** Specifies whether to clamp the minimum output as defined by **Range**, **Limit**, or **User** setting. Default is **Range**:

Low Clamp Alarm
Range ▾
Range
Limit
User

- **Alarm Latch Enable.** If the checkbox is enabled, the channel Over Range, Under Range, or Load Error bit in Output Channel Status (AI_02:01) will remain set even after the channel output is normal. To clear the bits, you must set the channel Unlatch Alarm Bits (AO_04) to clear the bits:

Alarm Latch Enable
<input type="checkbox"/>

- **High Clamp Value.** Specifies high value at which output is clamped if the channel **High Clamp Alarm** is set to **User** option:

High Clamp Value
0

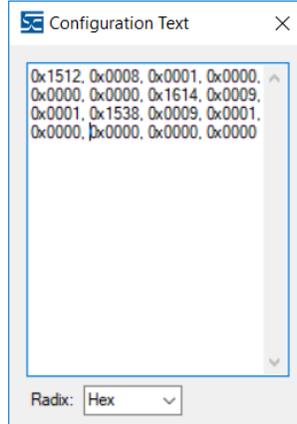
- **Low Clamp Value.** Specifies low value at which output is clamped if the channel **Low Clamp Alarm** is set to **User** option:

Low Clamp Value
0

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

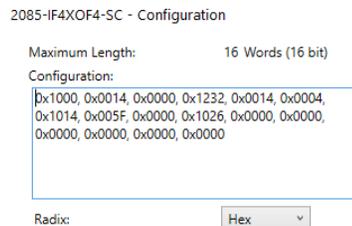
The Configuration Text dialog appears with your configuration settings for all the channels.

8. You can manually copy the settings and paste it to the textbox of the CCW Configuration tab⁹.



9. 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** button⁹.

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.

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.

⁹ 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.

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 initial configuration assumes a default configuration of 0 to 20 mA for current settings and ± 10 V for all voltage settings for both input measurement and channel outputting.

Section 3.6 PLC Interfaces

3.6.1 Module Identity

Parameter	Description
Vendor ID	58 (Spectrum Controls)
Product Type	10 (Analog)
Product Code	114
Series Rev	50208 (First release revision is 1.1)
Module Catalog String	2085-IF4XOF4-SC

3.6.2 Connection Types and Assembly Sizes

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

Assembly Table	Size (words)
Configuration	16
Input	14
Output	5

3.6.3 Configuration Assembly

The first twelve words are for configuring output channels and the next four words are for configuring input channels.

Feature	Config. Word Index	High Byte						Low Byte							
		Bits													
		15	14	13	12	15	14	9	8	7	6	5	4	3	2
Output Channels															
Ch0 Config. Bits	C_00	--	--	--	ALE	Low Clamp & Alarm	High Clamp & Alarm	Not Used	Output Data Format	Output Range Type	Output Chan. Enable				
Ch0 High Clamp Value	C_01	Signed 16-bit INT Must be less or equal to High Limit value of the selected output range type.													
Ch0 Low Clamp Value	C_02	Signed 16-bit INT Must be greater or equal to Low Limit value of the selected output range type.													
Ch1 Config.	C_05:03	(See Output Ch0 Config struct)													
Ch2 Config.	C_08:06	(See Output Ch0 Config struct)													
Ch3 Config.	C_11:09	(See Output Ch0 Config struct)													
Input Channels															
Ch0 Config. Bits	C_12	--	--	--	--	--	--	Open Circuit Detection	Input Filter Freq.	Input Data Format	Input Range Type	Ch0 Config. Bits			
Ch1 Config.	C_13	(See Input Ch0 Config struct)													
Ch2 Config.	C_14	(See Input Ch0 Config struct)													
Ch3 Config.	C_15	(See Input Ch0 Config struct)													

Output Channel Configuration (C_00)

Configuration parameters for each output channel are grouped together in a set of 3 words.

The bit locations details and detailed feature descriptions for the first word are listed below:

Bit		12	11	10	9	8		5	4	3	2	1	0		
Feature		ALE	Low Clamp and Alarm	High Clamp and Alarm				Data Format	Range Type			Chan. Enable			
On	Bit 15: 13 Not Used						Bit 7: 6 Not Used						0		
Off														1	
0-20 mA											0	0	0		
4-20 mA											0	0	1		
±10 V											0	1	0		
0-10 V											0	1	1		
0-5 V											1	0	0		
EU										0	0				
Percent										0	1				
PID										1	0				
Raw/Prop										1	1				
At Range						0		0							
At Limit						0		1							
At User						1		0							
At Range				0	0										
At Limit				0	1										
At User				1	0										
Off			0												
On			1												

The following table contains Bit Definitions for Output Channels:

Bit	Name	Description
0	Enable	Set to 1 to disable the output channel.
3:1	Output Range Type	0 = 0-20 mA 1 = 4-20 mA 2 = ±10 V 3 = 0-10 V 4 = 0-5 V
5:4	Output Data Format	0 = EU ×1 1 = Percent of range 2 = Scaled for PID 3 = Raw/Proportional
7:6	Not Used	Bits marked as Not Used are set to 0.

Bit	Name	Description
9:8	Output High Clamp & Alarm	Clamp channel output and set Over Range Alarm status bit when the channel output is greater or equal to the clamp value based on the configured option. Clamp and trigger Over Range Alarm Status bit at: 0 = High Range value of the selected range type. 1 = High Limit value of the selected range type. Validation on the User-defined High Clamp value is ignored on above two options. 2 = User-defined High Clamp value.
11:10	Output Low Clamp & Alarm	Clamp channel output and set Under Range Alarm status bit when the channel output is less or equal to the clamp value based on the configured option. Clamp and trigger Under Range Alarm Status bit at: 0 = Low Range value of the selected range type. 1 = Low Limit value of the selected range type. Validation on the User-defined Low Clamp value is ignored on above two options. 2 = User-defined Low Clamp value.
12	ALE	Alarm Latch Enable When this bit is set, the channel Over Range, Under Range or Load Error Alarm bit on the Output Channel Status (AI_02:01) will remain set even when any of the alarm conditions is cleared. Set the Unlatch Alarm Bits (AO_04) to clear the corresponding alarm.
15:13	Not Used	Bits marked as Not Used are set to 0.

Output Channel Values (C_02:01)

The second and third words are used for user to specify the high and low clamp values if the corresponding clamp alarm features are set to the User option.

The maximum ranges are from -32768 to 32767. The valid range is based on the configured Data Format and Range Type selections.

Input Channel Configuration (C:12)

Configuration parameters for each input channel are grouped in 1 word.

The bit location details and detailed feature descriptions for the word are listed below:

Bit		9	8	7	6	5	4	3	2	1	0
Feature		Open Circuit Detection		Input Filter Frequency		Input Data Format		Input Range Type			Input Chan. Enable
On											0
Off											1
0-20 mA								0	0	0	
4-20 mA								0	0	1	
±10 V								0	1	0	
0-10 V								0	1	1	
0-5 V								1	0	0	
EU	Bit 15:10 Not Used					0	0				
Percent						0	1				
PID						1	0				
Raw/Prop						1	1				
17 Hz				0	0						
4 Hz				0	1						
62 Hz				1	0						
470 Hz				1	1						
Upscale			0	0							
Downscale			0	1							
Zero			1	0							
Disable ¹⁰			1	1							

The following table contains Bit Definitions for Input Channels:

Bit	Name	Description
0	Disable	Set to 1 to disable channel.
1:3	Input Range Type	0 = 0-20 mA 1 = 4-20 mA 2 = ±10 V 3 = 0-10 V 4 = 0-5 V
4:5	Input Data Format	0 = EU ×1 1 = Percent of range 2 = Scaled for PID 3 = Raw/Proportional

Bit	Name	Description
6:7	Input Filter Frequency	0 = 17 Hz 1 = 4 Hz 2 = 62 Hz 3 = 470 Hz
8:9	Input Open Circuit Detection	0 = Upscale 1 = Downscale 2 = Zero 3 = Disabled ¹⁰
15:10	Unused	Bits marked as Not Used have no configuration functionality.

3.6.4 Input Assembly

The table below provides the information of module status, channel status, channel data and firmware revision. One byte (8-bits) is allocated for indicating each channel status.

Module & Channel	Word Index	High Byte								Low Byte							
		Bits															
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Module Status	AI_00	MF	-	-	-	-	DRV	SN	CAL	I3	I2	I1	I0	O3	O2	O1	O0
Output Status Ch 1 & 0	AI_01	-	-	-	OT1	DAC 1	LD 1	OR 1	UR 1	-	-	-	OT 0	DAC 0	LD 0	OR 0	UR 0
Output Status Ch 3 & 2	AI_02	-	-	-	OT3	DAC 3	LD 3	OR 3	UR 3	-	-	-	OT 2	DAC 2	LD 2	OR 2	UR 2
Input Status Ch 1 & 0	AI_03	-	-	-	-	ADC 1	OC 1	OR 1	UR 1	-	-	-	-	ADC 0	OC 0	OR 0	UR 0
Input Status Ch 3 & 2	AI_04	-	-	-	-	ADC 3	OC 3	OR 3	UR 3	-	-	-	-	ADC 0	OC 2	OR 2	UR 2
Output Data Ch0	AI_05	Signed 16-bit INT															
Output Data Ch1	AI_06	Signed 16-bit INT															
Output Data Ch2	AI_07	Signed 16-bit INT															
Output Data Ch3	AI_08	Signed 16-bit INT															

¹⁰ The Disabled option is only available for voltage measurement.

Module & Channel	Word Index	High Byte								Low Byte							
		Bits															
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Input Data Ch0	AI_09	Signed 16-bit INT															
Input Data Ch1	AI_10	Signed 16-bit INT															
Input Data Ch2	AI_11	Signed 16-bit INT															
Input Data Ch3	AI_12	Signed 16-bit INT															
FW Revision	AI_13	Major								Minor							

Module Status (AI_00)

If any of the following bits are set in this word, the most significant bit (Module Fault) will also be set as a global indication. If any hardware fault is set by the module or channels, the fault is permanent until the module is power-cycled.

Bit definitions for Module Status are provided in the table below:

Bit	Name	Description
3:0	O<n>	General Status Output <Channel> General status bit. If a bit is set (1) then there is an error associated with that Output channel (check Output Status bits for the indicated channel). Bit 0 = Output Channel 0, Bit 1 = Channel 1, etc.
7:4	I<n>	General Status Input <Channel> General status bit. If a bit is set (1) then there is an error associated with that input channel (check Input Status bits for the indicated channel). Bit 4 = Input Channel 0, Bit 5 = Input Channel 1, etc.
8	CAL	Internal use only
9	SN	Internal use only
10	DRV	Invalid Power Supply Hardware fault that indicates the module 15 V power supply to output drivers is not available.
14:11	Not Used	Bits marked as Not Used are set to 0.
15	MF	Module Fault Set as global fault if any hardware or channel has fault.

Output Channel Status (AI_02:01)

Each word holds output status bits for two channels output. The high byte is for odd channel and the low byte is for even channel.

Bit definitions for Output Channel Status are provided in the following table:

Bit	Name	Description
8, 0	UR<n>	Under Range <Channel> ¹¹ When set to 1, indicates the channel output value set by the end user on the Output Ch<x> (AO_03:00) is less than or equal to the defined Under Range Alarm value. The Under Range value is determined by the Low Clamp & Alarm Configuration bit settings (Low Range/Limit/User-defined bit and its Low Clamp value based on the Data Format and Range Type selections) ¹² .
9, 1	OR<n>	Over Range <Channel> ¹¹ When set to 1, indicates the channel output value set by the user on the Output Ch<x> (AO_03:00) is greater than or equal to the defined Over Range Alarm value. The Over Range value is determined by the High Clamp & Alarm Configuration bit settings (High Range/Limit/User-defined bit and its High Clamp value based on the Data Format and Range Type selections) ¹² .
10, 2	LD<n>	Load Error <Channel> ¹¹ If the channel is set to voltage mode, this bit indicates a short circuit. If the channel is set to current mode, open circuit is indicated.
11, 3	DAC<n>	DAC Communication Failure <Channel> When set to 1, indicates there is a channel communication failure over the module DAC. This is a hardware fault.
12, 4	OT<n>	Output Driver Over Temperature <Channel> When set to 1, indicates the channel output driver is overheating. This is a hardware fault.
7:5 and 15:13	Not Used	Bits marked as Not Used are set to 0. For even channels, bits 7:5 in the word are unused. For odd channels, bits 15:13 in the word are unused.

Input Channel Status (AI_04:03)

Each word holds input status bits for two channels. The high byte is for odd channel and the low byte is for even channel.

¹¹ If ALE configuration bit is not set, the error bit is automatically cleared (0) at the same time that the condition is cleared.

If ALE configuration bit is is set, this alarm will remain set (1) until the condition clears and the end user sets the appropriate unlatch bit on the Unlatch Alarm Bits (AO_04).

¹² The Low or High Range/Limit value is noted on the User Scaling Table.

Bit Definitions for Input Channel Status are provided in the following table:

Bit	Name	Description
8, 0	UR<n>	Under Range <Channel> When set to 1, indicates the measured value is less than or equal to the defined Under Range value based on the Data Format and Range Type selections.
9, 1	OR<n>	Over Range <Channel> When set to 1, indicates the measured value is greater than or equal to the defined Over Range value based on the Data Format and Range Type selections.
10, 2	OC<n>	Open Circuit <Channel> ¹³ When set to 1, indicates the connection on the remote terminal block is open.
11, 3	ADC<n>	ADC Communication Failure or PGA Connection Failure <Channel> When set to 1, indicates there is a channel ADC communication failure or PGA connection error. This is a hardware fault.
7:4 and 15:12	Not Used	Bits marked as Not Used are set to 0. For even channels, bits 7:4 in the word are unused. For odd channels, bits 15:12 in the word are unused.

Output Data Ch<x> (AI_08:05)

Each word reflects the current channel output value in the corresponding engineering unit based on the user configuration. It is not necessarily identical to the value set on the Output Ch<x> (AO_03:00). It depends on the operating mode (Run/Program/Fault).

Input Data Ch<x> (AI_12:09)

Each word reflects the measured channel input value in corresponding engineering unit based on the user configuration.

Firmware Revision (AI_13)

The lower byte of the word indicates the minor revision of the module firmware. The upper byte of the word indicates the major revision.

3.6.5 Output Assembly

The table below is for output channel control only. It is not applicable for input channel control.

Channel	Word	Usage
Output Ch0	AO_00	Signed 16-bit INT
Output Ch1	AO_01	Signed 16-bit INT

¹³ The open circuit detection is not applicable to 0-20 mA measurement.

Channel	Word	Usage															
Output Ch2	AO_02	Signed 16-bit INT															
Output Ch3	AO_03	Signed 16-bit INT															
Unlatch Bits	Word Index	High Byte							Low Byte								
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Unlatch Alarm Ch3 – Ch0	AO_04	-	ULD3	UOR3	UUR3	-	ULD2	UOR2	UUR2	-	ULD1	UOR1	UUR1	-	ULD0	UOR0	UUR0

Output Ch<x> (AO_03:00)

This word is read by the module and scaled to the appropriate analog output level based on the Data Format and Range Type selections. It is considered a signed 16-bit integer with maximum values ranging from -32768 to +32767.

Unlatch Alarm Bits (AO_04)

When the Alarm Latch Enable bit is configured as enabled through the Output Channel Configuration (C_00), the Under Range, Over Range, or LD alarm status bit on the Output Channel Status (AI_02:01) remain set even when the corresponding condition is cleared.

The only way to clear the alarm is to set the appropriate Unlatch bit on this word. Once it has been set, and the alarm condition has been cleared, the Unlatch bit should be cleared manually as well to allow subsequent latching. If the Alarm Latch Enable bit is not enabled, these bits are ignored by the module.

Bit definitions for Unlatch Alarm Bits are provided in the following table:

Bit	Name	Description
12, 8, 4, 0	UUR<n>	Unlatch Under Range <channel> Set this bit to clear the channel under range alarm.
13, 9, 5, 1	UOR<n>	Unlatch Over Range <channel> Set this bit to clear the channel over range alarm.
14, 10, 6, 2	ULD<n>	Unlatch Load Error <channel> Set this bit to clear the channel load error alarm. The LD status bit on the Output Channel Status (AI_02:01) is always active and may be latched and unlatched any time if the Alarm Latch Enable bit is set to enabled.
15, 11, 7, 3	Not Used	Bits marked as Not Used have no output control functionality.

Section 3.7 Product Features

The following sections provide information on user-configurable parameters.

3.7.1 Range Type and its limits for Output and Input Channels

Range Types

For module outputs, this module has one 4-channel DAC equipped with 4 programmable output drivers. For module inputs, multiplexed ADC and PGA are used. Both are configured and set based on user-configurable parameters.

There are five pre-defined Range Type Format settings used for Output and Input Channels. Range types for output and input channels are:

Index	Range Type	Note
0	0 to 20 mA	Default
1	4 to 20 mA	
2	-10 to 10 V	
3	0 to 10 V	
4	0 to 5 V	

The final current or voltage output signal and input signal are determined by:

- Range.
- Data Format (fixed or user-defined).
- Output Word (Output channel only).
- ADC Filter (Input channel only).
- Operational state of the module:
 - Run
 - Program
 - Fault

Range Limits by Software Controls

Regardless of the final scaled value, the output and input signals clipped to a High and Low Limit by software are based on the following table:

- The High and Low Range values indicate the intended use of the Range.
- The Current Ranges allow for a 2% overhead at each Range endpoint.
- The Voltage Ranges allow for a 5% overhead at each Range endpoint.
- Ranges with a 0 mA or 0 V Low Range are clipped at 0 mA or 0 V and do not go negative.

The following table provides range limits for input and output channels:

Range Type	Low Limit	Low Range	High Range	High Limit
0 to 20 mA	0.0 mA	0.0 mA	+20.0 mA	+20.4 mA
4 to 20 mA	+3.92 mA	+4.0 mA	+20.0 mA	+20.4 mA
-10 to 10 V	-10.5 V	-10.0 V	+10.0 V	+10.5 V
0 to 10 V	0.0 V	0.0 V	+10.0 V	+10.5 V
0 to 5 V	0.0 V	0.0 V	+5.0 V	+5.25 V

3.7.2 Data Format and User Scaling for Output and Input Channels

Data Format

There are four pre-defined Data Format settings used for Output and Input Channels.

Index	Data Format	Note
0	Engineering Unit $\times 1$	Default
1	Percent Range	
2	PID	
3	Raw/Proportional Count	

User Scaling

The Data Format and Range parameters in the channel configuration bits determine scaling. To convert the user value to analog output signal and input signal, use the following formula:

$$\text{Analog Output or Input} = \text{User Value} * M + B$$

The following table shows the pre-defined scaling values and how they match with the output and input channels. Also see corresponding M and B values listed in the table below.

Range Type	Condition	Analog Signal	Engineering Unit $\times 1$	Percentage Range	PID	Raw/Prop Count	
0 to 20 mA	High Limit	20.40 mA	20400	10200	16711	32767	
	High Range	20.00 mA	20000	10000	16383	31482	
	Low Range	0.00 mA	0	0	0	-32768	
	Low Limit	0.00 mA	0	0	0	-32768	
	Scaling	M		0.001	0.002	0.001220753	0.00031128
		B		0	0	0	10.20015564
4 to 20 mA	High Limit	20.40 mA	20400	10250	16793	32767	
	High Range	20.00 mA	20000	10000	16383	31176	
	Low Range	4.00 mA	4000	0	0	-32450	
	Low Limit	3.92 mA	3920	-50	-82	-32768	
	Scaling	M		0.001	0.0016	0.000976593	0.00025147
		B		0	4	4.000080593	12.16012573
-10 to 10 V	High Limit	10.50 VDC	10500	10500	16798	32767	
	High Range	10.00 VDC	10000	10000	16383	31207	
	Low Range	-10.00 VDC	-10000	-10000	0	-31208	
	Low Limit	-10.50 VDC	-10500	-10500	-410	-32768	

Range Type	Condition	Analog Signal	Engineering Unit $\times 1$	Percentage Range	PID	Raw/Prop Count	
	Scaling	M	0.001	0.001	0.001220717	0.00032044	
		B	0	0	-9.9995059	0.00016022	
0 to 10 V	High Limit	10.50 VDC	10500	10500	17202	32767	
	High Range	10.00 VDC	10000	10000	16383	29646	
	Low Range	0.00 VDC	0	0	0	-32768	
	Low Limit	0.00 VDC	0	0	0	-32768	
	Scaling	M	0.001	0.001	0.001	0.000610389	0.00016022
		B	0	0	0	0	5.25008011
0 to 5 V	High Limit	5.25 VDC	5250	10500	17202	32767	
	High Range	5.00 VDC	5000	10000	16383	29646	
	Low Range	0.00 VDC	0	0	0	-32768	
	Low Limit	0.00 VDC	0	0	0	-32768	
	Scaling	M	0.001	0.0005	0.0005	0.000305197	8.011E-05
		B	0	0	0	0	2.625040055

3.7.3 Under/Over Range Alarms for Output and Input Channels

An Under Range or Over Range status indication bit is set on the Input Assembly if the Output or Input Channel reading reaches or exceeds the defined or customizable operating range¹⁴.

- If the channel reading is equal to or less than the Low Range based on the configured Data Format and Range Type selections, the Under Range status, the Channel Fault, and the module fault bits are set. Its reading is also clamped at the Low Range value.
 - For Input Channel measurement, if the channel reading is continuously going less than the Low limit, its reading will be clamped at the Low Limit value.
- If the channel reading is equal to or greater than the High Range, its Over Range status, the Channel Fault and module fault bits are set. Its reading is also clamped at the High Range value.
 - For Input Channel measurement, if the channel reading is continuously going over the High limit, its reading will be clamped at the High Limit value.

¹⁴ The customizable operating range is only available for Output Channel control. See Customizable Clamp Ranges and Alarms for Output Channels.

- The channel Under Range status bit is automatically cleared when the channel reading is greater than the Low Range¹⁵.
- The channel Over Range status bit is automatically cleared when the channel reading is less than the High Range¹⁵.

3.7.4 Customizable Clamp Ranges and Alarms for Output Channels

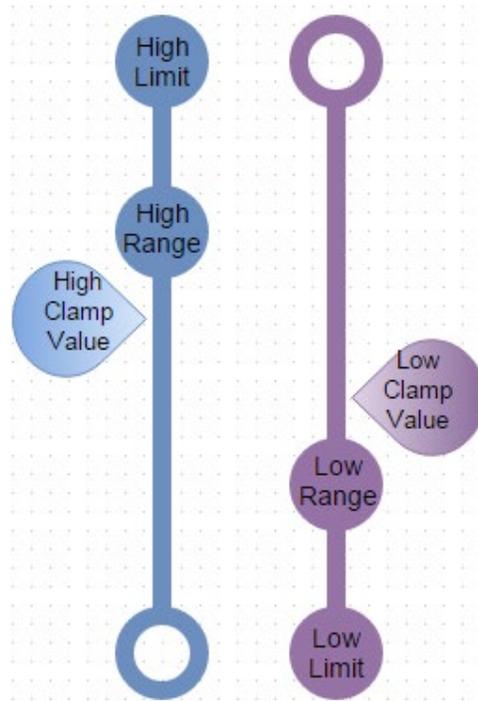
In addition to using the basic Under/Over Range Alarm feature on monitoring channel status based on the Low & High Ranges of the configured Data Format and Range Type selections, for Output Channel control, you can set different indications other than default ranges such as limits or user-defined clamp values. Each Output Channel can control the Low and High Clamp options separately. Low/High Clamp options for Output Channels are listed in the following table:

Index	Clamp Option	Note
0	At Range	Default
1	At Limit	
2	At User-defined Clamp value	

- If Option 0 is selected, the channel status indication is the same as previous Under/Over Range Alarm feature. The Channel Under/Over Range status, the Channel Fault and module fault bits on the Output Channel Status (AI_02:01) are set if the Output Channel reading is less/equal or greater/equal to the Low/High Range.
- If Option 1 is selected, the same bits from above are set if the Output Channel reading is less/equal or greater/equal to the Low/High Limit.
- If Option 2 is selected, the same bits from above are set if the Output Channel reading is less/equal or greater/equal to the user-defined Clamp value.

¹⁵ For monitoring Output Channel status, this bit can also be latched as an alarm. See Alarm Latches for Output Channels.

The following figure shows the relationship between Low and High Clamp values.



The value validation on the configured Low/High Clamp value is ignored if the Low/High Clamp & Alarm option is not set to User option. Otherwise, if the option is in use, violation of the following conditions triggers a module-specific configuration error:

- The High Clamp value configured from the user-defined value or based on the selected option from the High Clamp Alarm settings has to be greater than the Low Clamp value coming from any Low Clamp Alarm option settings.
- The same requirement above applies to the configured Low Clamp value. It must be less than the High Clamp value coming from any High Alarm Option settings.
- The user-definable Low/High clamp value cannot be set beyond the Limits based on the Data Format and Range Type selections.

3.7.5 Alarm Latches for Output Channels

Alarm latch allows you to latch the Under Range, Over Range, or LD alarm status bit on the Output Channel Status (AI_02:01) if any corresponding conditions occurred and then cleared on the Output Channel circuitry. You can clear these status bits through the Unlatch Alarm Bits (AO_04).

Alarm Latch Enable (ALE) options for Output Channels are listed in the following table:

Index	Alarm Latch Enable	Note
0	Off	Default
1	On	

3.7.6 ADC Filters for Input Channels

This configuration parameter allows you to select a filter setting that attenuates the input signal beginning at the specified frequency. The actual filtering is performed via module ADC:

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

3.7.7 Open Circuit Detection for Input Channels

The Open Circuit setting options determine what value could indicate on the Input Channel Status (AI_04:03) when a channel open circuit condition is detected. There are four value reporting options for indication. Open Circuit Detection options for input channels are provided in the following table:

Index	Open Circuit Detection	Note
0	Upscale	Default
1	Downscale	
2	Zero	
3	Disable ¹⁶	

With a 3-second MCU timer periodically running to detect channel open circuit condition, if the input channel circuit is open on the terminal block, the Upscale option refers to indicate the High Limit based on the configured Data Format and Range Type selections, the Downscale option refers to indicate the Low Limit, and the Zero option would report a zero.

If a sensitive low-impedance sensor is connected to the input channel circuitry, applying open circuit detection circuitry may affect the accuracy on channel measurement. By selecting the Disable option to disable the open circuit detection, the channel measurement can avoid the detection impact, and the channel open circuit status bit on the Input Channel Status (AI_04:03) is not updated¹⁶.

Open Circuit conditions may display transitional data until an open circuit value is reached. The channel reading may transition toward one of the Full Range values until the open circuit value is detected. Once detected, the Upscale, Downscale or Zero value is immediately set. Open circuit may also be triggered by applying an input value well beyond the Low or High Limit values. The values beyond the Low and High Limits are not specified since the function of the Open Circuit Detection only applies to a disconnected input.

Open circuit detection for the Current measurement only applies to 4 to 20 mA range type. If the signal wire to the channel terminal block is open or lower than

¹⁶ Applicable for voltage measurement only

2 mA, the module reports open circuit condition within 5 seconds.

For the 0 to 20 mA range type, open circuit condition results in a measured value of 0 mA which is no difference from a measured value of 0 mA when a circuit is present. The appropriate Under Range bit will be floating but the channel open circuit condition will not be reported. To protect the module circuit, if the input current is negative, it will be clamped to 0 mA that the appropriate Under Range bit will also be floating.

3.7.8 Fault Mode/Program Mode Operation

During operation, the module may detect a hardware fault or that the system has changed the run mode (run/program).

- If a hardware fault is detected or controller Program Mode is detected
 - All Outputs are turned off.
 - All Inputs stop reporting input data to controller.
- If the hardware fault clears, the Outputs and Inputs resume the previous setting if no configuration content change has occurred. Both Outputs and Inputs resume normal operation when Run Mode is detected.

Section 3.8 Product Performance

3.8.1 Update Rate for Output Channels

The Output Ch<x> (AO_03:00) is continuously scanned by the module and outputs are scaled as data arrives. The rate at which the data arrives is determined by the connected system. The 2085-IF4XOF4-SC is expected to process output data and status within 10 ms.

3.8.2 Update Rate for Input Channels

The input channel scan time will be 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.

When the timer option like detecting open circuit condition is enabled, each channel performs two measurements to achieve user-defined requirements. By enabling that time, the channel scan rate may vary. Below is the approximate input update rate based on different input ADC filter selections.

ADC Filter Selection	Total Channel Scan Time
17 Hz	131
4 Hz	491
62 Hz	43
470 Hz	15

Keep in mind:

- All timing unit is in ms.

- When the module is powering up for running voltage measurement with the open circuit detection option enabled, the open circuit condition will be checked first, and every 3 seconds thereafter, using the 470 Hz filter. It will take an additional 15 ms to perform the detection.

Section 3.9 Product Safety

3.9.1 Watchdog

There are multiple watchdogs at work in the module. Any one of them can cause a fault condition and disable outputs. A power reset is required to clear the condition if possible.

Controller Watchdog

After a power cycle, and the controller is initialized, it has a 30 ms command timeout interval. When the timeout expires, the controller enters the idle state and waits for up to 130 ms. If no valid communication is received, the controller communication watchdog will fire. Once the watchdog is executed, the controller no longer communicates with the module MCU and holds its reset line.

Hardware Watchdog

The module also uses a hardware watchdog IC that will reset the module MCU if it does not assert it within at least 900 ms. The backplane reset line is also tied to the Hardware Watchdog. The MCU is required to distinguish between a reset caused by a watchdog timeout vs. a normal bus reset to avoid a false positive.

3.9.2 Glitch Requirements

The module is required to predictably control outputs under various conditions. The Micro850 or Micro870 controller has two operation modes, Program and Run, that can be controlled via a physical switch or the CCW software. The following table describes these conditions and expected behavior:

Condition/Transition	Expected Behavior of Outputs
Controller and Module Power-up	No Channel outputs and inputs until valid configuration is downloaded to the controller.
To Run Mode	Once the controller receives valid configuration and switches from Program Mode to Run Mode, <ul style="list-style-type: none"> • Output channels can output current or voltage based on the value user entered in the Output Ch<x> (AO_03:00). • Input channels start to scan.
To Program Mode	All outputs are OFF and all inputs are running but stop reporting input data to the controller.

3.9.3 Peripheral Device Communications

During normal operation, the module MCU communicates with:

- One four-channel DAC and four individually addressed Output Drivers.
- Multiplexed of PGA and ADC for input measurement.

If any following communication fault happens from either the Outputs or the Inputs, a global fault is triggered to the controller level, and all outputs will be disabled, and all inputs will stop reporting input data to the controller.

Output DAC Communications

It is not possible to detect communications errors with the DAC since there is no transmit line coming from the device for feedback. In cases where communications are lost with the DAC, there can be three possible outcomes:

- Outputs may remain in their previous state.
- Outputs may be full-scale.
- Outputs may be minimum scale (depending on range).

Output Driver Communications

Since the module MCU can read from the Output Drivers, communications errors can be detected, and a hardware fault can be set.

Input ADC and PGA Communications

Communications errors can be detected, and a hardware fault can be set. The approaches to ensure valid communications available:

- For PGA: Read the GPIO register of the hardware pre-soldered GPIO pin connection for indexing. This should return constant address number.
- ADC reads the data register for getting ADC counts. After settling input ADC, if the ADC stays in data-not-ready status for 1.5 seconds, stale data will be reported. After the timeout, the channel fault will be set as hardware communication fault.

Section 3.10 Module Error

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:

3.10.1 Module Specific Hardware Errors

If you attempt to trigger or cause a hardware error, the CCW software generates a high-level hardware fault with an extended code for details. The connection status is faulted and disconnected. The follow table contains some examples of module-specific hardware faults that can be detected and shown in CCW:

Fault Code	Extended Fault Code	Error Description
$0 \times F29z^{17}$	0×301	Not used
	0×302	Not used
	0×303	Output driver over temperature

¹⁷ 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
	0×304	ADC or PGA communications error
	0×305	DAC communications error
	0×306	Not used
	0×307	15 V power supply to output drivers not available.

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.

3.10.2 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

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

Fault Code	Extended Fault Code	Error Description
0×F2Bz ¹⁸	Output Configuration Error	
	0×410-413	Invalid Output Range The Range setting is not within the valid selectable range. See Configuration Table for possible values.
	0×420-423	Invalid Clamp Setup The High or Low Clamp bit setup is out of range.
	0×430-433	Invalid Clamp Value The High Clamp value is less than or equal to the Low Clamp value. The High Clamp value is greater than the High Limit value of the selected range type. The Low Clamp value is less than the Low Limit value of the selected range type.
	Input Configuration Error	
0×440-443	Invalid Input Range The Range setting is not within the valid selectable range. See Configuration Table for possible values.	

¹⁸ 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
	0×520-453	Invalid Open Circuit Detection The selected option is not applicable for current measurement. See Configuration Assembly for possible values.

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.

Section 3.11 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 3.12 Declaration of Conformity

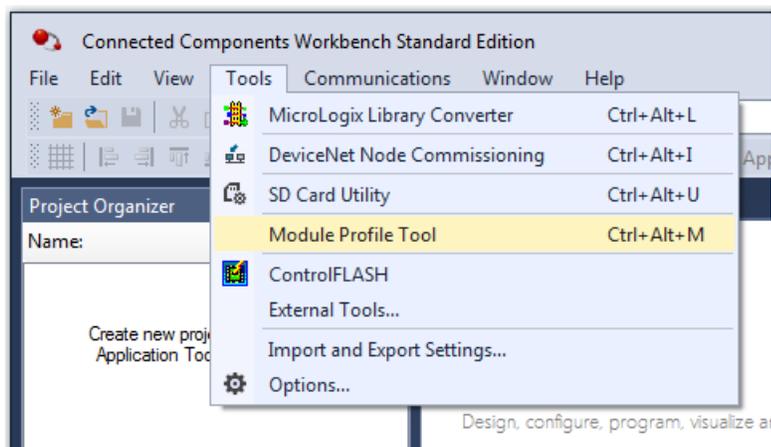
Available upon request

Appendix A

Manually Importing an AOP

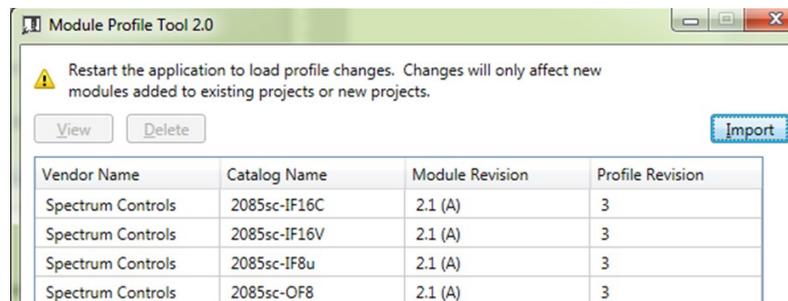
This appendix explains how to manually import an AOP .rampp file into CCW software.

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:



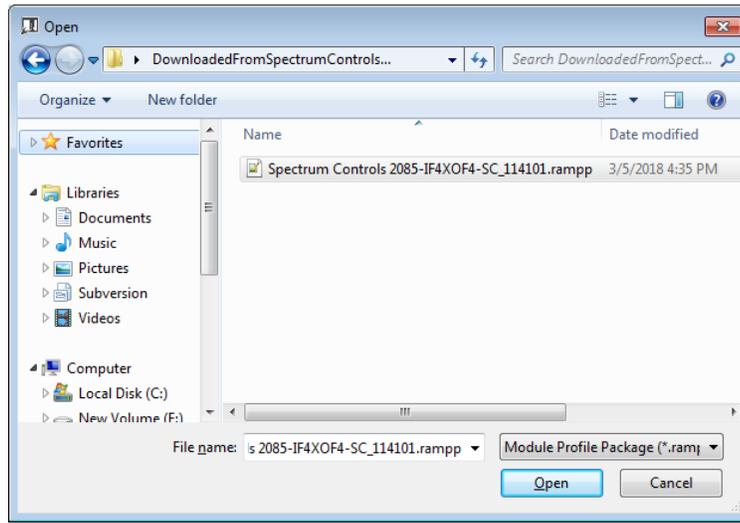
4. When prompted by Windows User Account Control, to confirm that you wish to run the program, click **Yes** button.

The Module Profile Tool 2.0 window appears:

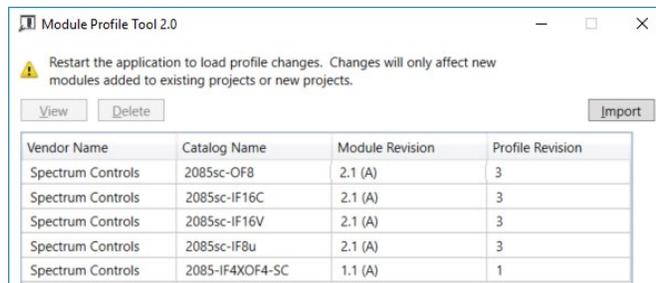


5. Click the **Import** button.
6. An Open dialog appears.

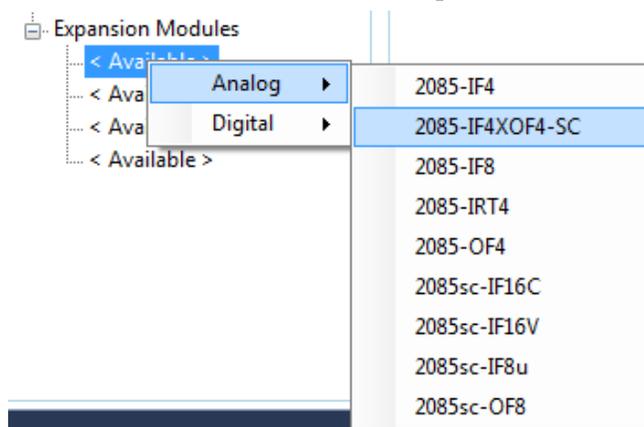
- Navigate to the provided .rampp file location, and click the file you downloaded:



- Click **Open** to import the file.
- The program loads the .rampp file and informs you that you need to restart the CCW program.



- 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.

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