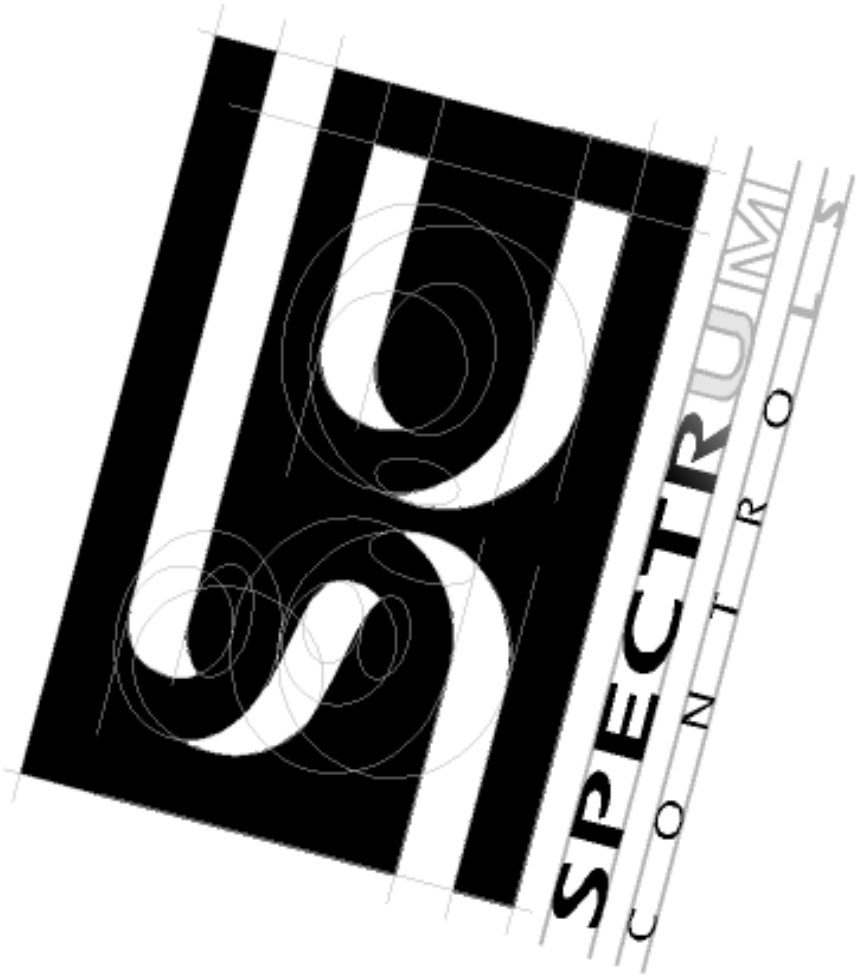
User's Manual Pub. 0300308-01 Rev. A

Micro850™
8-Channel Analog Output Module

Catalog Number: 2085sc-OF8



SPECTRUM
CONTROLS

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 publications
- Conventions used in this manual
- Technical support

Who Should Use This Manual

Use this manual if you are responsible for designing, installing, programming, or troubleshooting control systems that use the Micro850™ 8-Channel Analog Output Module.

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

How to Use This Manual

As much as possible, we organized this manual to explain, in a task-by-task manner, how to install, configure, program, operate and troubleshoot a control system using the Micro850™ 8-Channel Analog Output Module.

Related Documentation

The table below provides a listing of publications that contain important information about Allen-Bradley MicroLogix 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
Installing 24-point PLC	Micro850 24-Point Programmable Controllers Installation Instructions	2080-IN007

For	*Refer to this Document*	*Allen-Bradley Pub. No.*
Installing 48-point PLC	Micro850 48-Point Programmable Controllers Installation Instructions	2080-IN008
User manual information	Micro830 and Micro850 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 60259
Declarations of conformity, certificates, and other certification details.	Product Certification website: http://spectrumcontrols.com	

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  Used to identify critical information for you and the installation.

NOTE  Used to identify useful tips and hints.

Chapter 1
Module Overview

The Micro850™ 8-Channel Analog Output Module is an 8-point analog output module designed to expand the local I/O capability of a Rockwell Automation Micro850 System. The minimum configuration in which an expansion module can be installed is a Micro850 Controller and a power supply.

Section 1.1 General Description

SPECTRUM CONTROLS Enabled™ By Rockwell Automation TECHNOLOGIES
P.O. BOX 6489 Bellevue, WA 98008 USA
CAT. NO.
2085sc–OF8
8 CHANNEL
ANALOG OUTPUT MODULE
P/N: 9060143–03 P/R: A F/W REV: 1.1
F/N: 2050429–01
S/N: 00000001 SERIES: A M/D: 1623 Fac. 1G
MANUALS ONLINE AT:
http://spectrumcontrols.com
PRODUCT OF USA SEE INSTALL GUIDE FOR INSTAL. INFO.

CAT. NO.
2085sc–OF8
BACKPLANE:
85mA @ 5VDC
10mA @ 24VDC
OUTPUT:
0–20mA
4–20mA
0–5VDC
0–10VDC
+/–10VDC
FIELD POWER:
195mA @ 24VDC
c UL us LISTED 1P98
IND. CONT. EQ.
FOR HAZ. LOC.
CLASS I DIV. 2
GROUPS ABCD
TEMP CODE T4A
–20 C < Ta < +65 C
CE

The 2085sc-OF8 Expansion I/O module measures current and/or voltage outputs. The module supports:

- Eight output channels.
- Current output. When the module receives a new command value from the output image, the module converts the digital value to an analog current signal using a DAC (Digital to Analog Converter).
- Voltage output. When the module receives a new command value from the output image, the module's circuitry converts the digital value to an analog voltage signal using a DAC (Digital to Analog Converter).
- Output fault detection.
- Range scaling of output data.
- Over or under voltage detection (from user-defined values).
- Four data formats.
- Four filter frequency setup.

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

The 2085sc-OF8 module uses a 16-bit digital-to-analog converter to achieve a 16-bit resolution with ±10 V full scale ranges. The module also uses 8 separate output drivers to provide for either current or voltage output signals on each channel. Each output channel is individually configured via Rockwell-provided Connected Component Workbench (CCW) software for the Micro850 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. During startup, all outputs are disabled and off until a valid configuration has been received. Default configuration is 4 to 20 mA.

Section 1.2
Output Specifications

The 2085sc-OF8 module has the following output specifications:

Table 1-1. Output/Performance/Environmental Requirements

Output 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
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

Output Description	Value
Storage/Non-Operating Shock	25 g peak acceleration, (35 g for panel mount), 11±1 ms pulse, half sine
Pollution Level	Meets Pollution Degree 2 requirements.
ESD	Meets CE requirements for operating ESD category B at 6 kV indirect (coupling plate).
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 9 10 V/m with 1 kHz sine-wave 80% AM from 2000…6000 MHz
Outputs per module	8 current or voltage outputs.
Output ranges[1]	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 V (Over range is 0 V to 6 V) 0-10 V (Over range is 0 V to 12 V) ±10 V (Over range is -12 V to +12 V)
Current output impedance	Less 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 µV/bit
Resolution in voltage mode	735 µV/bit at range of ±10 V and 0-10 V
	370 µV/bit at range of 0-5 V
Field Power Input Voltage Range	20.4 V to 26.4 V
Peak Inrush Current	Less than 150 mA at 5 V (backplane) Less than 400 mA at 24 V (backplane) Less than 900 mA at 24 V (field power)

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

Output Description	**Value**	
Current accuracy (calibrated)	**Error at 25 °C, Max**	**Error over -20 °C to 65 °C, Max**
0-20 mA	±50.0 µA	±75.0 µA
4-20 mA	±50.0 µA	±75.0 µA
Voltage accuracy (calibrated)	**Error at 25 °C, Max**	**Error over -20 °C to 65 °C, Max**
0-5 V	±5.0 mV	±15.0 mV
0-10 V	±20.0 mV	±50.0 mV
±10 V	±20.0 mV	±50.0 mV
Output Current Repeatability	**At 25 °C**	
0-20 mA	Better than ±5.0 µA	
4-20 mA	Better than ±5.0 µA	
Output Voltage Repeatability	**At 25 °C**	
0-5 V	Better than ±0.5 mV	
0-10 V	Better than ±2.0 mV	
±10 V	Better than ±2.0 mV	
Module Scan Time (for all analog channels)	Less than 10 ms	
Drive Capability	50 to 500 Ohm with short-circuit survival in current mode	
	Better 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 2.5 ms to 63% of full scale with resistive loads	
Output Settling Time: Voltage Output	Less than 2.5 ms to 63% of full scale with resistive loads	
Output Ripple	Less than 15 mV in voltage mode	
	Less than 30 µA in current mode	
Isolation		
Input to backplane isolation	50 VAC working Reinforced isolation tested at 2 kVDC for 1 minute.	
Input to Chassis GND isolation	50 VAC working Reinforced isolation tested at 2 kVDC for 1 minute.	

Output Description	Value
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 current mode. A load resistance greater than 500 Ohm also triggers 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.
Power Requirements	
Bus +5 VDC (4.75 V to 5.4 V)	110 mA max (0.55 W) at 50 Ohm resistance load on all channels.
Bus +24 VDC (19.9 V to 26.4 V)	20 mA max (24 V from backplane, [0.48 W]).
Bus +5 VDC (4.75 V to 5.4 V)	110 mA max (0.55 W) at 50 Ohm resistance load on all channels.
Power Dissipation (Current mode)	Less than 4.3 W at 500 Ohm Less than 5 W at 250 Ohm Less than 5.5 W at 50 Ohm
Wire size	#16 to #28 AWG
RoHS	Meets European RoHS component standards (January 2015 and earlier).
Wire Strip Length	0.25 in.
Recommended Tightening Torque:	0.25 N-m (2.2 lb-in)
REACH	Meets European REACH 7 requirements.
Dimensions	110 mm × 87 mm × 51 mm (plastics) 110 mm × 89 mm × 51 mm (with RTBs installed.)

Table 1-2. Environmental Specification Table

Environmental Tests	Industry Standards
Temperature (Operating) (Performance Criteria A)	IEC60068-2-1: (Test Ad, Operating Cold), IEC60068-2-2: (Test Bd, Operating Dry Heat), IEC60068-2-14: (Test Nb, Operating Thermal Shock)
Temperature (Non-operating) (Performance Criteria B)	IEC60068-2-1: (Test Ab, Unpackaged Non-operating Cold), IEC60068-2-2: (Test Bb, Unpackaged Non-operating Dry Heat), IEC60068-2-14: (Test Nb, Unpackaged Non-operating Thermal Shock)
Operating Altitude	2000 meters (6561 feet)
Humidity (Operating) (Performance Criteria A)	IEC 60068-2-30: (Test Db, Unpackaged Damp Heat):

Environmental Tests	Industry Standards
Vibration (Operating) (Performance Criteria A)	IEC 60068-2-6: (Test Fc, Operating)
Shock (Operating) (Performance Criteria A)	IEC 60068-2-27: (Test Ea, Unpackaged Shock)
Shock (Non-operating) (Performance Criteria B)	IEC 60068-2-27: (Test Ea, Unpackaged Shock)
Radiated Emissions	IEC 61000-6-4:2007
Conducted Emissions	IEC 61000-6-4:2007
ESD immunity (Performance Criteria B)	IEC 61000-4-2
Radiated RF immunity (Performance Criteria A)	IEC 61000-4-3: Level 3
EFT/B immunity (Performance Criteria B)	IEC 61000-4-4*
Surge transient immunity (Performance Criteria B)	IEC 61000-4-5
Conducted RF immunity (Performance Criteria A)	IEC 61000-4-6
Magnetic Field (Performance Criteria A)	IEC 61000-4-8
AC Mains Voltage Dips, Interruptions and Variations	IEC 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) cUL 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	ULH ANSI/ISA–12.12.01–2007 Nonincendive Electrical Equipment for Use in Class I, Division 2 Hazardous (Classified) Locations (NRAG) cULH 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, and d.

Safety Tests	Industry Standards
CE EMC Directive	IEC 61131-2 Programmable Controllers: Third Edition 2007-02, Clause 8 IEC 61000-6-2: Generic Industrial Immunity IEC 61000-6-4: Generic Industrial Emissions

Section 1.3 Data Formats

The data format and range parameters in the channel configuration bits determine the scaling. There are four pre-defined settings:

- Engineering units
- Scaled-for-PID
- Raw/proportional data
- Percent of full range

Section 1.4 Hardware Features

Channels are wired as outputs. This module can detect open circuit current loop on each channel in current mode, short on an output pin in voltage mode, and over temperature conditions in both current and voltage modes. 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.

1.4.1 LED Indicators

The 2085sc-OF8 module uses a single, green **OK** LED to show power or module operational status:

- When startup is completed, and all internal tests have passed, the LED is solid GREEN.
- If the LED remains off, there is an error with the module: it may not have power, or failed to pass the self-test.
- Any time the system is not in Run mode (and showing no faults), the LED blinks rapidly. All 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 Table 1-4.

Table 1-4 LED Status Indicators

Blink Code	Name 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	Module In Run Mode Module operating without error	Normal operation. No further action needed.
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 ASIC. 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	Factory Calibration Mode This code is only seen during the manufacturing process. Not seen by end-user.	This is not an error condition. Complete the calibration process.
4	Calibration invalid or corrupted This code will be seen for newly manufactured boards that have yet to be calibrated. It is also possible for the end user to see this in very rare cases where flash memory may be corrupted.	Factory calibration must be performed. The end-user cannot perform this action.
5	Serial Number Invalid or Corrupted This code will only be seen if calibration is valid and serial number is corrupt.	Serial number must be programmed. The end-user cannot perform this action.
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.
7	Watchdog Reset The module experienced a watchdog reset.	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.

Section 1.5 System Overview and Module Operation

The 2085sc-OF8 module is expected to operate indefinitely. It does not require periodic maintenance or calibration. The 24 VDC field power supply must be present to allow for outputs from the module channels.

WARNING

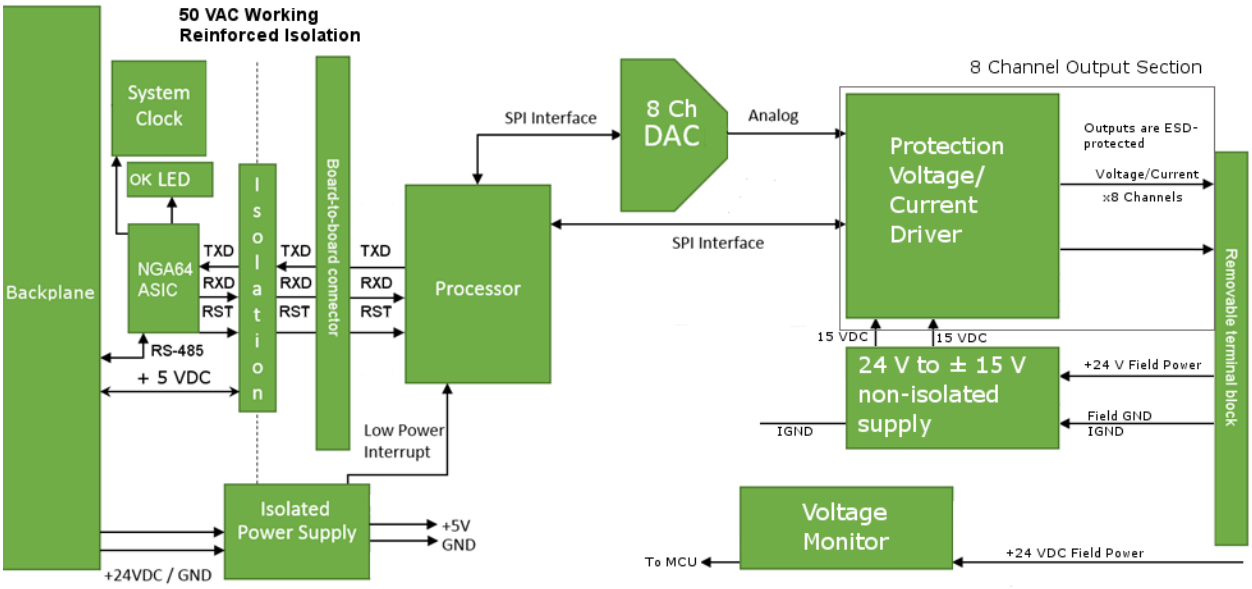
Hazard of damage to module.

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.

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.

The module communicates to the controller through the bus interface. The module also receives 5 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

The 2085sc-OF8 modules are tested to meet Council Directive 89/336/EEC Electromagnetic Compatibility (EMC) and the following standards, in whole or in part, documented in a technical construction file:

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

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 V to 5.4 V)/+24 VDC (19.9 V to 26.4 V) system power supply, and a 24 VDC field power supply. Both must be present for the module to operate.

Current rating is for + 5 V is 110 mA maximum; for +24 V it is 20 mA maximum. Power rating is 3 Watts maximum:

5 VDC	24 VDC
110 mA	20 mA

Section 2.3 General Considerations

The 2085sc-OF8 module is suitable for use in an industrial environment when installed in accordance with these instructions. Specifically, this equipment is intended for use in clean, dry environments Pollution degree 2[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. 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.

2.3.2 Prevent Electrostatic Discharge

WARNING

Electrostatic discharge can damage integrated circuits or semiconductors if you touch analog module card bus connector pins or the terminal block on the output 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 bus connector or connector pins.
- Do not touch circuit components inside the module.
- If available, use a static-safe work station.
- When it is not in use, keep the module in its static-shield bag.

[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.

2.3.3 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 outputs are highly susceptible to electrical noise. Electrical noise coupled to the analog outputs 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

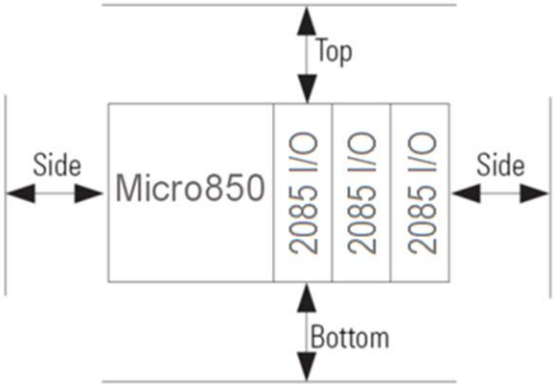
WARNING

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

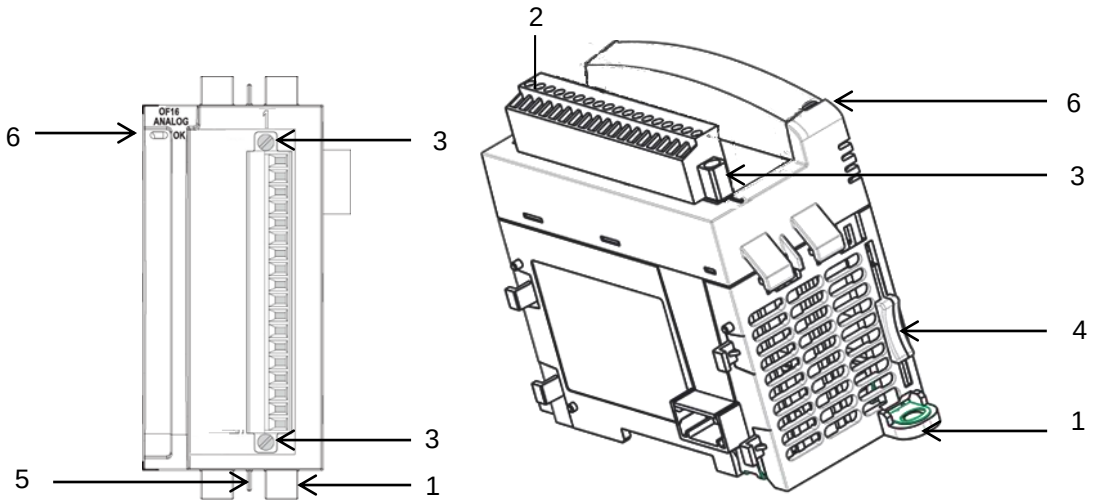
Maintain spacing from enclosure walls, wire ways, adjacent equipment, etc. Allow 50.8 mm (2 in.) of space on all sides for adequate ventilation, as shown:



2.4.2 Parts List

Your package contains one Micro850 2085sc-OF8 (Analog Output) 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

2.4.4 Insert Module into the Controller

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

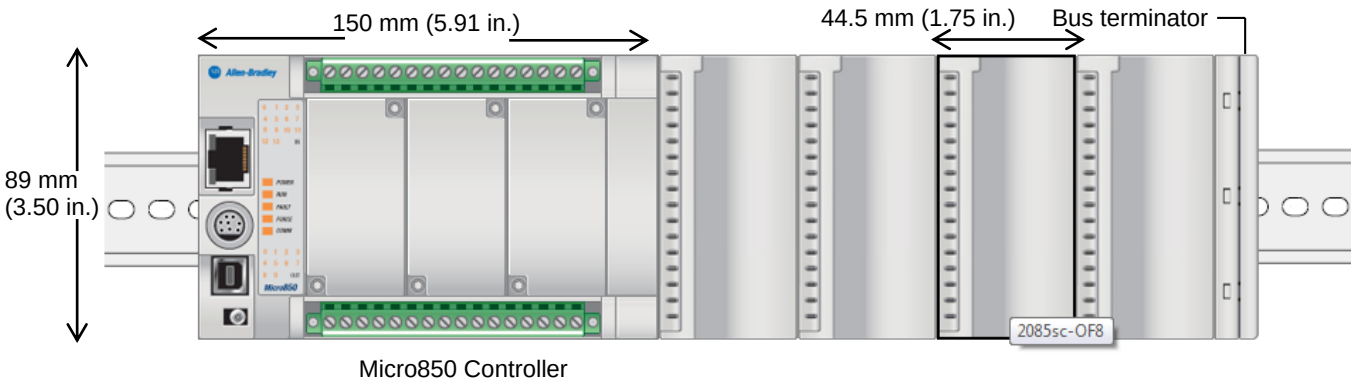
NOTE

- 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 plug-in 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.
- Do not insert or remove the plug-in module while power is applied, otherwise, permanent damage to equipment may occur.

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

NOTE The module expansion may only be mounted horizontally.

Mounting Dimensions and DIN Rail Mounting



Micro850 Controller

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 and Micro850 Programmable Controller User Manual 2080-UM002. To install:

1. Place the module next to the controller against the panel where you are mounting the module.
2. Marking 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 images, which explain the layout of the single-row, 18-pin terminal block, and the associated wiring diagram for the output signals, and the two, 24 VDC field power terminal input pins for the 2085sc-OF8 module:

RTB	Name
1	V/I OUT0
2	RTN0
3	V/I OUT1
4	RTN1
5	V/I OUT2
6	RTN2
7	V/I OUT3
8	RTN3
9	V/I OUT4
10	RTN4
11	V/I OUT5
12	RTN5
13	V/I OUT6
14	RTN6
15	V/I OUT7
16	RTN7
17	+24V DC
18	COM DC

Terminal Block signal descriptions are as follows:

RTB	Name	Description
1	V/I OUT0	Channel 0 voltage or current output
2	RTN0	Channel 0 return
3	V/I OUT1	Channel 1 voltage or current output
4	RTN1	Channel 1 return
5	V/I OUT2	Channel 2 voltage or current output
6	RTN2	Channel 2 return
7	V/I OUT3	Channel 3 voltage or current output
8	RTN3	Channel 3 return
9	V/I OUT4	Channel 4 voltage or current output
10	RTN4	Channel 4 return
11	V/I OUT5	Channel 5 voltage or current output
12	RTN5	Channel 5 return
13	V/I OUT6	Channel 6 voltage or current output
14	RTN6	Channel 6 return
15	V/I OUT7	Channel 7 voltage or current output
16	RTN7	Channel 7 return
17	+24V DC	24V DC power from field
18	COM DC	Field common ground

Chapter 3
Configuring the 2085sc-OF8 Using CCW

This chapter covers the following subjects:

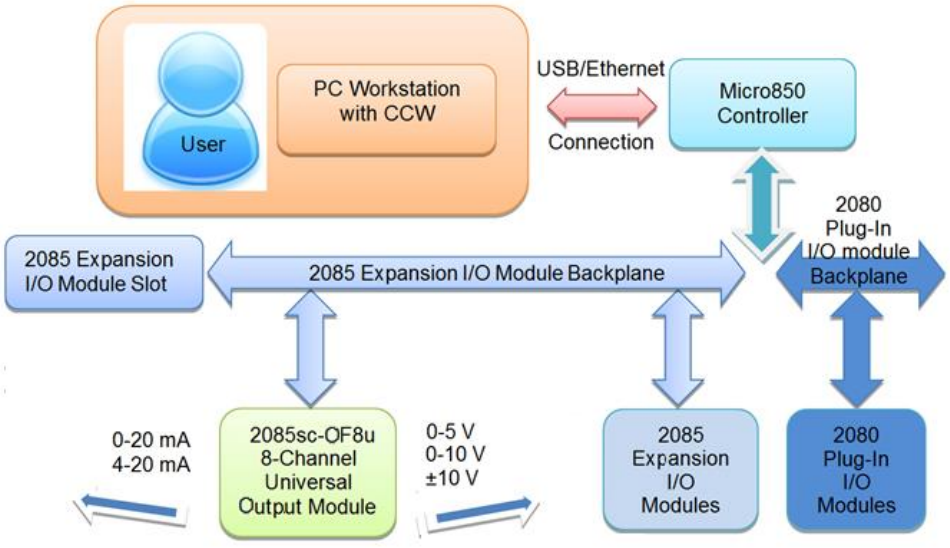
- How to use Connected Components Workbench (CCW) and, optionally, ModuleConfigConverter.exe software to configure the Module.
- Analog Data and Status settings.
- Data Links settings.
- Setting configuration parameters and associated values.

Section 3.1 Introduction

You use Connected Components Workbench programming software to configure the 2085sc-OF8. You may import and download a module profile to the controller. You then send the configuration setup to the module. Rockwell Automation provides a customized, module-specific add-on profile to configure the 2085sc-OF8.

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

- Micro850 Power Supply (separate module or built-in the main controller).
- Micro850 Controller
- Plug-in Modules

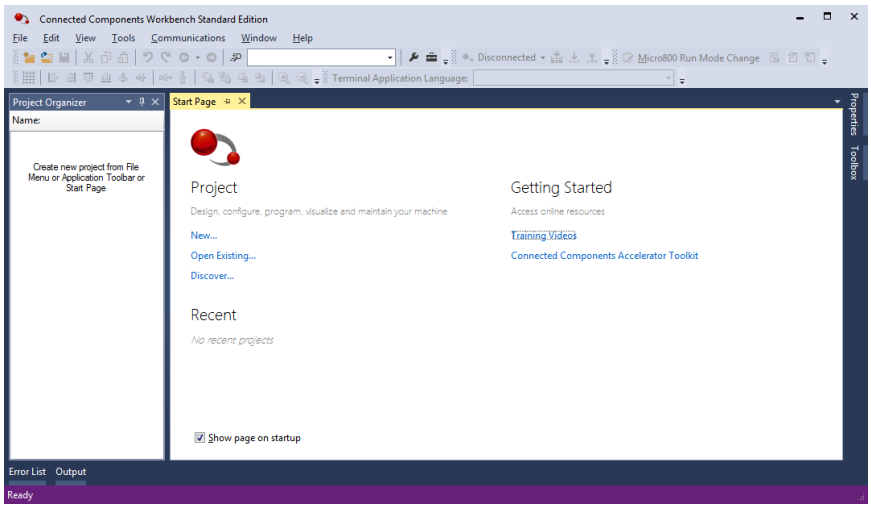


Spectrum Controls, Inc. also provides a custom configuration software utility that you may use to provide configuration settings to the profile.

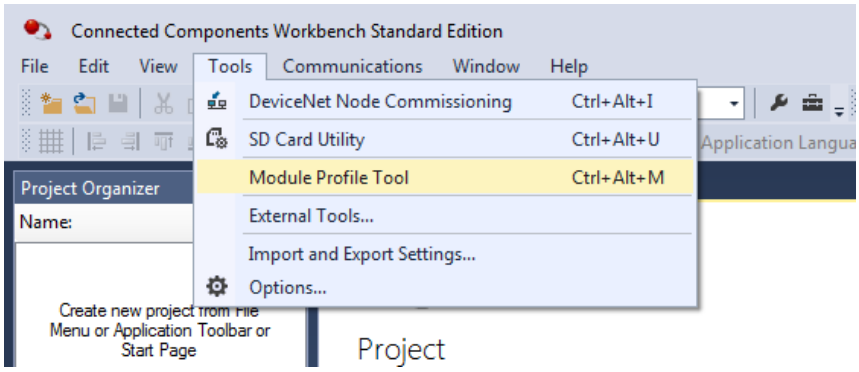
Section 3.2 Importing a Profile into CCW Software

Rockwell Automation provides an add-on profile for the 2085sc-OF8. You import this profile into the CCW software as follows:

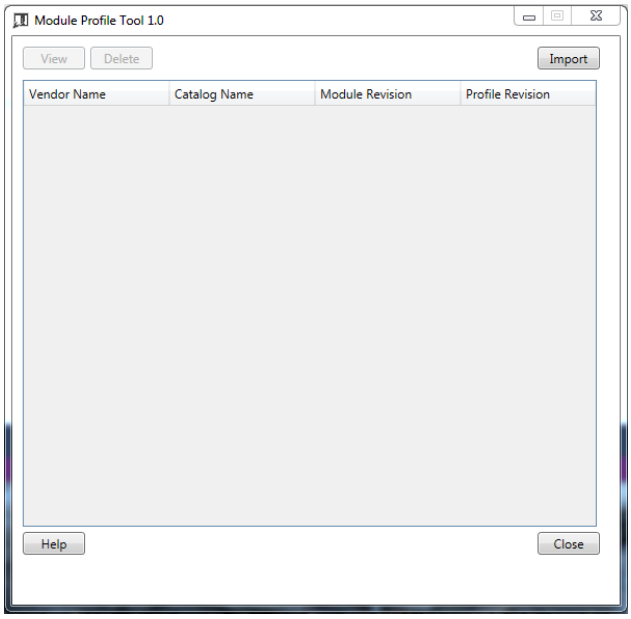
1. Start the CCW software on your personal computer. The following dialog appears:



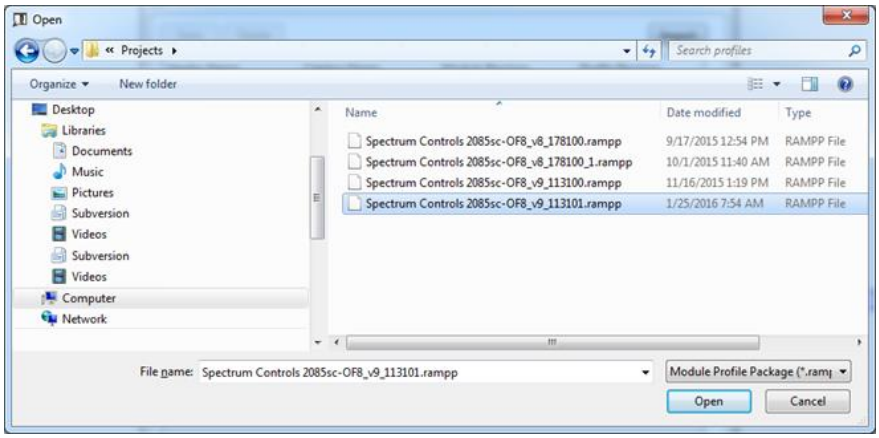
2. From the Tools menu, select the **Module Profile Tool** option:



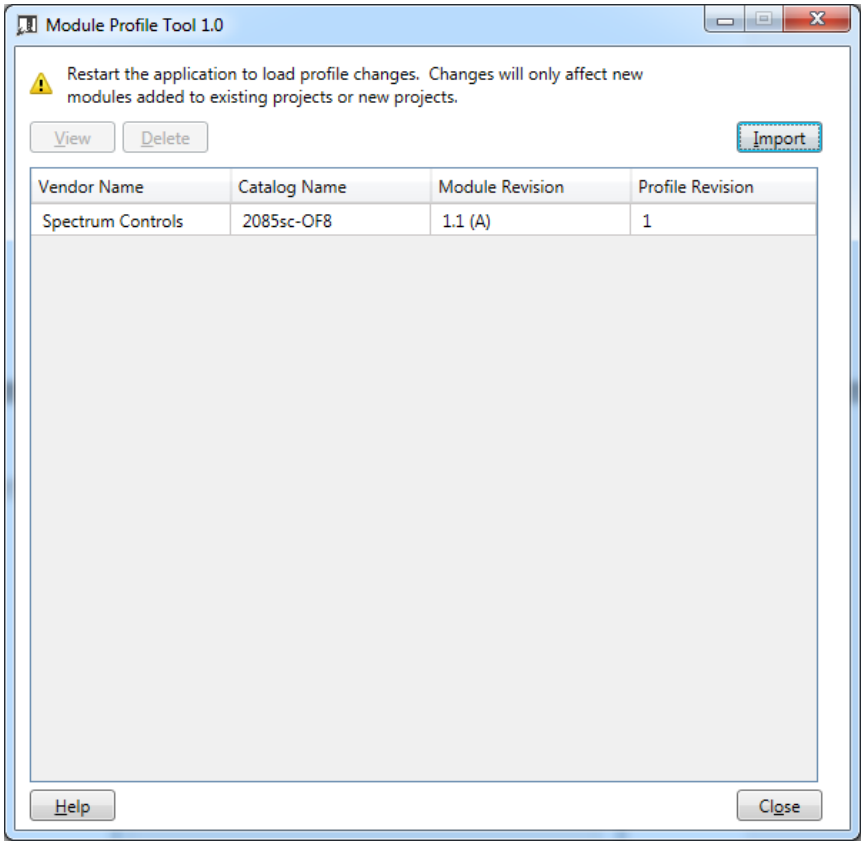
If necessary, confirm with the Windows operating system that you wish to run the software. The Module Profile Tool dialog appears.



3. Click the **Import** button:
4. From the Open File dialog that appears, navigate to the directory containing the **2085sc-OF8.rampp** file and open it:



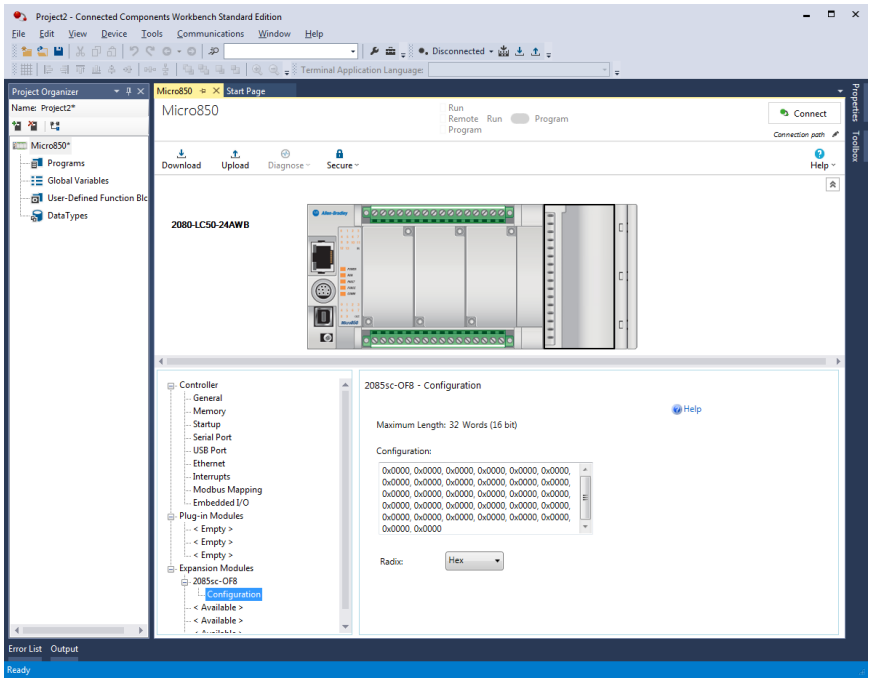
The profile appears in the Module Profile Tool dialog:



5. Click **Close** to exit and re-open the CCW software so that the software recognizes the imported Add-On profile.
6. Navigate to the Micro850 project of interest, and from **Expansion Module**, select **Available:Specialty:2085sc-OF8**:

7. The 2085sc-OF8 Configuration dialog appears associated with the selection. You may either manually enter the configuration for your system, or use the ModuleConfigConverter.exe utility provided by

Spectrum Controls, Inc. Once you have your configuration, you then copy and paste the data into the **Configuration:** field:



8. To create your configuration using ModuleConfigConverter.exe, refer to the section below.

Section 3.3 Setting Configuration Parameters Using ModuleConfigConverter.exe

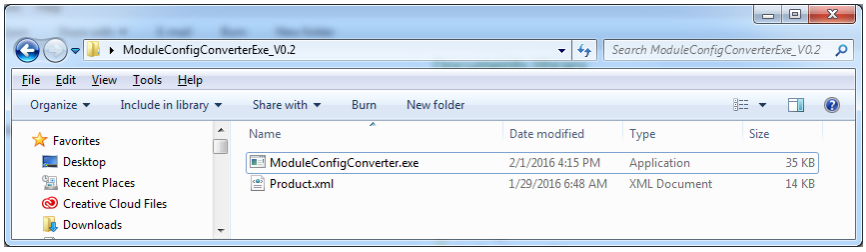
You may create the configuration for each channel using the utility provided by Spectrum Controls, Inc. You download the utility from the Spectrum Controls website at www.spectrumcontrols.com.

NOTE

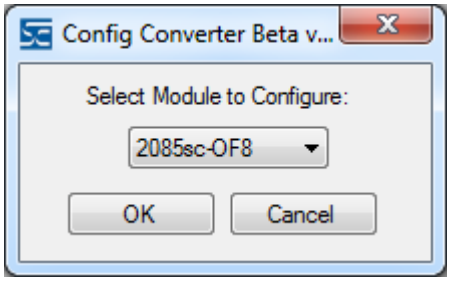
It is recommended that when you generate your configuration, that you use the **Binary Radix** selection. If you choose the **Decimal Radix**, the utility is unable to work with negative values.

To start the configuration converter:

1. Navigate to where you placed the downloaded the Module Configuration Converter executable folder, open the folder, and run the following executable file: **ModuleConfigConverter.exe**:

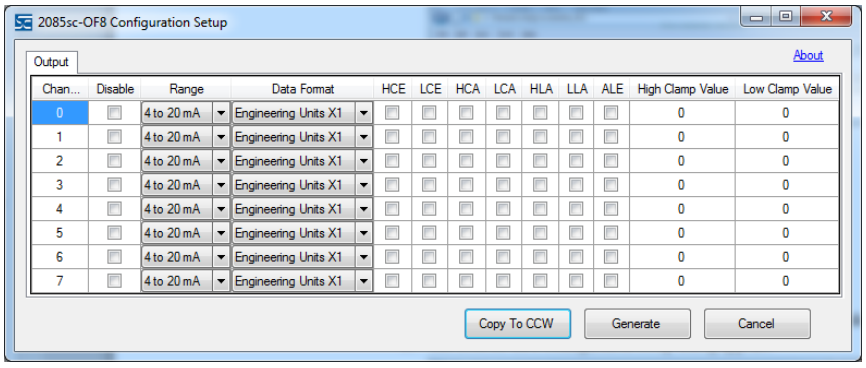


The Config Converter dialog appears:

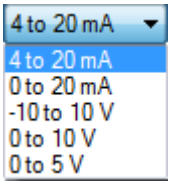


2. From the drop-down menu, select the **2085sc-OF8** option and click **OK**.

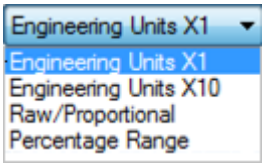
The 2085sc-OF8 Configuration Setup dialog appears:



3. View and specify the following options as needed. See Channel Configuration Bit locations listed later in this section for details on the settings for every configuration bit:
   - **Channel**. Lists number of input channel from **0** to **7**. Click to select.
   - **Disable**. Specifies whether to disable use of this channel. **Enabled** by default (checkmark not selected).
   - **Range**. Specifies which Range (voltage or current) to use. Select type from drop-down list. **4 to 20 mA** input is default:



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

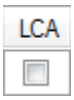


- **HCE**. Specifies whether to clamp the maximum output defined in **High Clamp Value**. Default is **Disabled**:

- **LCE**. Specifies whether to clamp the minimum output defined in **Low Clamp Value**. Default is **Disabled**:

- **HCA**. Specifies whether to enable **High Clamp Alarm**. To function, HCE must be enabled and set. Default is **Disabled**:

- **LCA**. Specifies whether to enable **Low Clamp Alarm**. To function, LCE must be enabled and set. Default is **Disabled**:

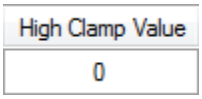


- **HLA**. Specifies whether **High Limit Alarm** is enabled. To function, the HCE bit must be cleared. Default is **Disabled**:

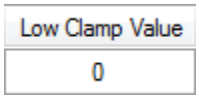
- **LLA**. Specifies whether **Low Limit Alarm** is enabled. To function, the LCE bit must be cleared. Default is **Disabled**:

- **ALE**. Specifies whether to keep **Over Range**, **Under Range**, and **LD Alarm** bits set, even when the Alarm condition is cleared.

- **High Clamp Value**. Specifies high value at which output is clamped:

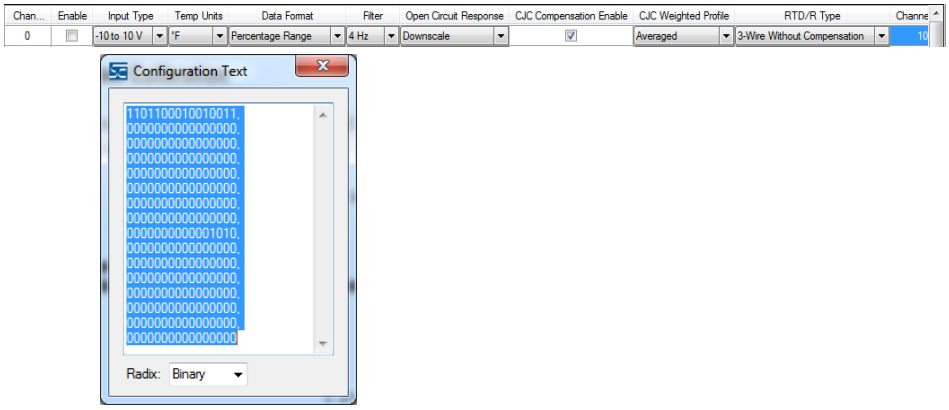


- **Low Clamp Value**. Specifies low value at which output is clamped:

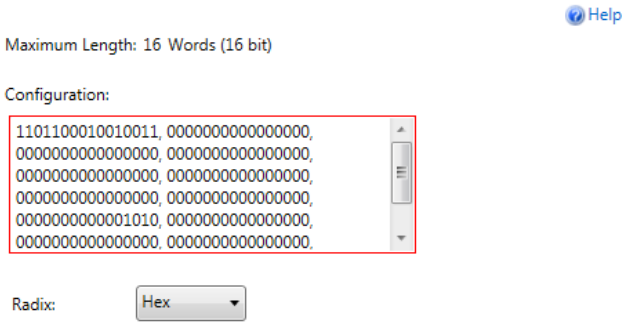


4. When finished making selections, click **Generate**.

   The Configuration Text dialog appears, with your configuration settings for each enabled channel. The example below shows example channel 0 selections in the utility, and the associated channel 0 configuration text generated from those selections:



5. To copy the generated values into the CCW **Configuration:** field, click **Copy to CCW**. The software copies the configuration and shows it in the CCW **Configuration** field:



6. Download and run.

The following description of columns is copied from CCW Help.

Column	Description
	Currently selected parameter. As a device is monitored and updated, an asterisk (*) appears in this column.
#	Parameter number. Click the column header to list the data in the column in ascending (default) or descending order.
Name	Short name of the parameter. Click the column header to list the data in the column in ascending (default) or descending order.
Value	The current value of the parameter. Writable parameter values are shown with a white background and can be changed directly in this field.
Units	The measurement units used for this parameter (examples: Volts and Amps).
Internal Value	The unscaled value used internally in the device and by AC drives that communicate with the device. The information in this field provides the scaling information to calculate Internal Value from a scaled value.
Default	The initial value of a parameter as defined at the factory.
Min	The minimum value is the lowest possible value for this parameter.
Max	The maximum value is the highest possible value for this parameter.

3.3.1 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.

3.3.2 Software Updates

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

3.3.3 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 PLC Interfaces. The initial configuration assumes a default configuration of 4 mA to 20 mA for current settings and ±10 V for all voltage settings.

3.3.4 PLC Interfaces

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

Module Identity

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

Parameter	Hex	OF8
Vendor ID	0×3A (58)	58 (Spectrum Controls)
Product Type	0×0A	10 (Analog)
Product Code	0×71	(113)
Series Rev	0×C420	50208 (First release revision is 1.1)
Module Catalog Number		2085sc-OF8
Module Feature Code	0 [0×00]	0
Interrupts		Not Supported
Distance Rating	0×08	8
Number of Input Words	0×0E	14
Number of Output Words	0×0A	10
Number of Configuration Words	0×20	32

3.3.5 Connection Types and Assembly Sizes

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

Table	Size (words)
Configuration Assembly	32
Input Assembly	30
Output Assembly	10

3.3.6 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**
Range Type	4 to 20 mA													**0**	**0**	**0**	
	0 to 20 mA													**0**	**0**	**1**	
	±10 V													**0**	**1**	**0**	
	0-10 V													**0**	**1**	**1**	
	0-5 V													**1**	**0**	**0**	
Data Format	Engineering Unit										**0**	**0**	**0**				
	PID										**0**	**0**	**1**				
	Percentage										**0**	**1**	**0**				
	Raw/ Proportional Data										**0**	**1**	**1**				
HCE	Enable									**1**							
	Disable									**0**							
LCE	Enable								**1**								
	Disable								**0**								
HCA	Enable							**1**									
	Disable							**0**									
LCA	Enable						**1**										
	Disable						**0**										
HLA	Enable					**1**											
	Disable					**0**											
LLA	Enable				**1**												
	Disable				**0**												
ALE	Enable			**1**													
	Disable			**0**													
Unused		**x**	**x**														

The Input Table provides status bits for the module and individual channels. One byte (8-bits) is allocated for each channel. The Input Table also indicates the currently applied output value for each channel.

Input Channel Configuration Bit location details are listed below:

	WORD	High Byte								Low Byte							
		Bits															
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Module Status Word 0	I:0	-	-	-	-	-	-	CAL	FP	S7	S6	S5	S4	S3	S2	S1	S0
Output Status Word 1	I:1	-	-	-	-	-	LD1	UR1	OR1	-	-	-	-	-	LD0	UR0	OR0
Output Status Word 2	I:2	-	-	-	-	-	LD3	UR3	OR3	-	-	-	-	-	LD2	UR2	OR2
Output Status Word 3	I:3	-	-	-	-	-	LD5	UR5	OR5	-	-	-	-	-	LD4	UR4	OR4
Output Status Word 4	I:4	-	-	-	-	-	LD7	UR7	OR7	-	-	-	-	-	LD6	UR6	OR6
Output Data Ch0	I:5	Signed INT															
Output Data Ch1	I:6	Signed INT															
Output Data Ch2	I:7	Signed INT															
Output Data Ch3	I:8	Signed INT															
Output Data Ch4	I:9	Signed INT															
Output Data Ch5	I:10	Signed INT															
Output Data Ch6	I:11	Signed INT															
Output Data Ch7	I:12	Signed INT															
Version	I:13	Major Revision									Minor Revision						

Below is the 2085sc-OF8 module status word list:

Bit	Name	Description
15:10	Not Used	Bits marked as Not Used are set to 0.
9	CAL	Invalid Cal Data The stored calibration data is corrupt or invalid. The module must be factory calibrated before it will operate normally.
8	FP	Field Power Fault When set, 24 VDC field power is over voltage or under voltage. The user-specified voltage range is 20.4 V-26.4 V. The module can operate outside of this range but will disable outputs when the voltage is outside of maximum and minimum values. There is no guarantee that outputs will perform as specified when outside your specified range. When the Field Power voltage is detected as being too high, the outputs are turned off. When the Field Power drops from normal operating range to a value below 18.7 volts, outputs are disabled and this flag set. There is no guarantee which voltage level below 18.7 V will set this bit. When Field Power is applied, the FP bit shall be cleared and outputs enabled when the voltage is greater than 19.9 V (±0 V) and less than 27.8 V (±1 V). The FP bit is set and outputs disabled when Field Power is greater than 28.1 V (±1 V).
7:0	S<*n*>	General Status <*channel*> General status bit. If a bit is set (1) then there is an error associated with that channel (check Status bits for the indicated channel). Bit 0=Channel 0, Bit 1=Channel 1…Bit 7=Channel 7.

Status Word <*x*>

Word 1 holds status bits for channels 0, 1.

Word 2 holds status bits for channels 2, 3.

Word 3 holds status bits for channels 4, 5.

Word 4 holds status bits for channels 6, 7.

Bit	Name	Description
3:7 and 11:15	Not Used	Bits marked as Not Used are set to 0. For even channels, bits 3:7 in the word are unused. For odd channels, bits 11:15 in the word are unused.

<table>
<tr><th>Bit</th><th>Name</th><th>Description</th></tr>
<tr><td>0, 8</td><td>OR<<i>x</i>></td><td>Over Range
When set to 1, indicates the output word value you set is greater than or equal to the defined Over Range Alarm value. The Over Range value is determined by the High Clamp Enable (HCE) and High Limit Alarm (HLA) configuration bit settings:
<table>
<tr><th>HCE</th><th>HLA</th><th>HCA</th><th>Over Range Value</th></tr>
<tr><td>0</td><td>0</td><td>X</td><td>High Range (High Clamp Alarm [HCA] ignored)</td></tr>
<tr><td>0</td><td>1</td><td>X</td><td>High Limit (HCA ignored)</td></tr>
<tr><td>1</td><td>X</td><td>0</td><td>High Range (HLA ignored)</td></tr>
<tr><td>1</td><td>X</td><td>1</td><td>High Clamp (HLA ignored)</td></tr>
</table>
High Range and Limit values are noted in the Data Format Table in section 3.3.8.[3]</td></tr>
<tr><td>1, 9</td><td>UR<<i>x</i>></td><td>Under Range
When set to 1, indicates the output word value you set is less than or equal to the defined Under Range Alarm value. The Under Range value is determined by the Low Clamp Enable (LCE) and Low Limit Alarm (LLA) configuration bit settings:
<table>
<tr><th>LCE</th><th>LLA</th><th>LCA</th><th>Under Range Value</th></tr>
<tr><td>0</td><td>0</td><td>X</td><td>Low Range (Low Clamp Alarm [LCA] ignored)</td></tr>
<tr><td>0</td><td>1</td><td>X</td><td>Low Limit (LCA ignored)</td></tr>
<tr><td>1</td><td>X</td><td>0</td><td>Low Range (LLA ignored)</td></tr>
<tr><td>1</td><td>X</td><td>1</td><td>Low Clamp (LLA ignored)</td></tr>
</table>
Low Range and Limit values are noted in the Data Format Table in section 3.3.8.[4]</td></tr>
</table>

[3] If ALE configuration bit is not set the error bit is cleared (0) at the time the condition is cleared. If ALE configuration bit is set, this alarm will remain set (1) until the condition clears and you set the appropriate unlatch bit in the Output Table.

Bit	Name	Description
2, 10	LD<*x*>	Load Error 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.

Data Ch<*x*>

This word reflects the current output value in Engineering Units. It is not necessarily the same value in your Output Word. It depends on the operating mode (Run/Program/Fault).

Version

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

3.3.7 Output Table

The Output Table consists of 9 INTs (signed 16-bit integer). The meaning of the values depends on the individual channel's scaling configuration.

	WORD	High Byte											Low Byte				
		Bits															
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Output Ch0	O:0	Signed INT															
Output Ch1	O:1	Signed INT															
Output Ch2	O:2	Signed INT															
Output Ch3	O:3	Signed INT															
Output Ch4	O:4	Signed INT															
Output Ch5	O:5	Signed INT															
Output Ch6	O:6	Signed INT															
Output Ch7	O:7	Signed INT															
Unlatch Bits	-	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

[4] If ALE configuration bit is not set the error bit is cleared (0) at the time the condition is cleared. If ALE configuration bit is set, this alarm will remain set (1) until the condition clears and you set the appropriate unlatch bit in the Output Table.

	WORD	High Byte											Low Byte				
		Bits															
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Unlatch Alarm Ch0–Ch3	O:8	-	ULD3	UUR 3	UOR3	-	ULD2	UUR 2	UOR2	-	ULD1	UUR 1	UOR1	-	ULD0	UUR 0	UOR0
Unlatch Alarm Ch4–Ch7	O:9	-	ULD7	UUR 7	UOR7	-	ULD6	UUR 6	UOR6	-	ULD5	UUR 5	UOR5	-	ULD4	UUR 4	UOR4

Output Ch<*x*>

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

Unlatch Alarm Bits

When the Alarm Latch configuration setting is enabled for a channel, the Over Range, Under Range and LD status alarm bits remain set even when the condition is cleared. The only way to clear the alarm is to set the appropriate unlatch bit for that channel. Once it has been set, and the alarm condition has been cleared, the Unlatch bit should be cleared as well to allow subsequent latching. If the Alarm Latch channel setting is not enabled, these bits are ignored by the module.

The LD status bit is always active, and may be latched and unlatched any time the Alarm Latch Enable configuration setting is set.

3.3.8 Data Format and Range

The following table shows the pre-defined scaling values and how they match with the output Analog Signal.

Output Range	Condition	Analog Signal	Raw/Prop	EU	PID	% FS
4 to 20 mA	High Limit	20.40 mA	32767	20400	16793	10250
	High Range	20.00 mA	31176	20000	16383	10000
	Low Range	4.00 mA	-32450	4000	0	0
	Low Limit	3.92 mA	-32768	3920	-82	-50
0 to 20 mA	High Limit	20.40 mA	32767	20400	16711	10200
	High Range	20.00 mA	31482	20000	16383	10000
	Low Range	0.00 mA	-32768	0	0	0
	Low Limit	0.00 mA	-32768	0	0	0
±10 V	High Limit	10.50 VDC	32767	10500	16793	10500
	High Range	10.00 VDC	31207	10000	16383	10000
	Low Range	-10.00 VDC	-31208	-10000	0	-10000
	Low Limit	-10.50 VDC	-32768	-10500	-410	-10500
0 to 5 V	High Limit	5.25 VDC	32767	5500	17202	10500
	High Range	5.00 VDC	29646	5000	16383	10000
	Low Range	0.00 VDC	-32768	0	0	0
	Low Limit	0.00 VDC	-32768	0	0	0
0 to 10 V	High Limit	10.50 VDC	32767	10500	17202	10500
	High Range	10.00 VDC	29646	10000	16383	10000
	Low Range	0.00 VDC	-32768	0	0	0
	Low Limit	0.00 VDC	-32768	0	0	0

Regardless of the final scaled value, the output is clipped to a High and Low Limit 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.

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

Range	Low Limit	Low Range	High Range	High Limit
-10 V ~ +10 V	-10.5 V	-10.0 V	+10.0 V	+10.5 V

3.3.9 Configuration Table

Configuration parameters for each channel are grouped together in a set of 5 words. Detailed descriptions follow.

	WORD	High Byte								Low Byte							
		Bits															
		15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
CH0 Config. Bits	C:0	--	--	ALE	LLA	HLA	LCA	HCA	LCE	HCE	Data Format			Range			Chan Disable
CH0 High Clamp Value	C:1	Signed INT															
CH0 Low Clamp Value	C:2	Signed INT															
Unused	C:3	Unused															
CH1 Config.	C:4-7	(See CH0 Config struct)															
CH2 Config.	C:8-11	(See CH0 Config struct)															
CH3Config.	C:12-15	(See CH0 Config struct)															
CH4 Config.	C:16-19	(See CH0 Config struct)															
CH5 Config.	C:20-23	(See CH0 Config struct)															
CH6 Config.	C:24-27	(See CH0 Config struct)															
CH7 Config.	C:28-31	(See CH0 Config struct)															

3.3.10 Configuration Bits

	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	-	-	ALE	LLA	HLA	LCA	HCA	LCE	HCE	Data Format			Range			Chan. Disable
Enable																0
Disable																1
4-20 mA													0	0	0	
0-20 mA													0	0	1	
±10 V													0	1	0	
0-10 V													0	1	1	
0-5 V													1	0	0	
EU										0	0	0				
PID										0	0	1				
Percent										0	1	0				
Raw/Prop										0	1	1				
Enable			1	1	1	1	1	1	1							
Disable			0	0	0	0	0	0	0							
Unused	x	x														

Bit Definitions		
Bit	**Name**	**Description**
0	Disable	Set to 1 to disable channel.
1:3	Range	0 = 4-20 mA 1 = 0-20 mA 2 = ±10 V 3 = 0-10 V 4 = 0-5 V
4:6	Format	0 = EU ×1 1 = Raw/Proportional 2 = Scaled for PID 3 = Percent of range See Section 3.3.8 for details.
7	HCE	High Clamp Enable The High Clamp configuration value is used to clamp the maximum output. The High Clamp configuration value is ignored when this bit is cleared.
8	LCE	Low Clamp Enable The Low Clamp configuration value is used to clamp the minimum output. The Low Clamp configuration value is ignored when this bit is cleared.

Bit Definitions		
Bit	**Name**	**Description**
9	HCA	High Clamp Alarm Enable This bit is only valid when HCE bit is set. It is ignored when HCE is cleared. When HCE and HCA are both set, the Over Range Alarm status bit is only set when the user Output is greater than or equal to the High Clamp value. When HCE is set and HCA is cleared, the Over Range Alarm is determined by the High Range value indicated in the Output Range Table in section 3.3.8. In this case the Over Range alarm may not be set if the High Clamp value is less than the High Range value since the final output cannot reach that value due to clamping.
10	LCA	Low Clamp Alarm Enable This bit is only valid when LCE bit is set. It is ignored when LCE is cleared. When LCE and LCA are both set, the Under Range Alarm status bit is only set when the Output is less than or equal to the Low Clamp value When LCE is set and LCA is cleared, the Under Range Alarm is determined by the Low Range value indicated in the Output Range Table in section 3.3.8. In this case the Under Range alarm may not be set if the Low Clamp value is less than the Low Range value since the final output cannot reach that value due to clamping.
11	HLA	High Limit Alarm Enable This bit is only valid when the HCE bit is cleared. It is ignored when HCE is set. When HCE is cleared and HLA set, the Over Range status bit is set when the Output is set to a value greater than or equal to the High Limit value indicated in the Output Range Table in section 3.3.8. When HCE is cleared and HLA cleared, the Over Range Alarm status bit is set when the Output is set to a value greater than or equal to the High Range value indicated in the Output Range Table in section 3.3.8.
12	LLA	Low Limit Alarm Enable This bit is only valid when the LCE bit is cleared. It is ignored when LCE is set. When LCE is cleared and LLA is set, the Under Range Alarm status bit is set when the Output is set to a value less than or equal to the Low Limit value indicated in the Output Range Table in section 3.3.8. When LCE is cleared and LLA is cleared, the Under Range Alarm status bit is set when the Output is set to a value less than or equal to the Low Range value indicated in the Output Range Table in section 3.3.8.
13	ALE	Alarm Latch Enable When this bit is set, the Over Range, Under Range and LD Alarm bits will remain set even when the Alarm condition is cleared. The Unlatch Alarm bits for this channel in the Output Table must be set to clear the alarms.

High Clamp, Low Clamp Value

- The High Clamp value will be ignored if HCE is not set.
- The Low Clamp value will be ignored if LCE is not set.

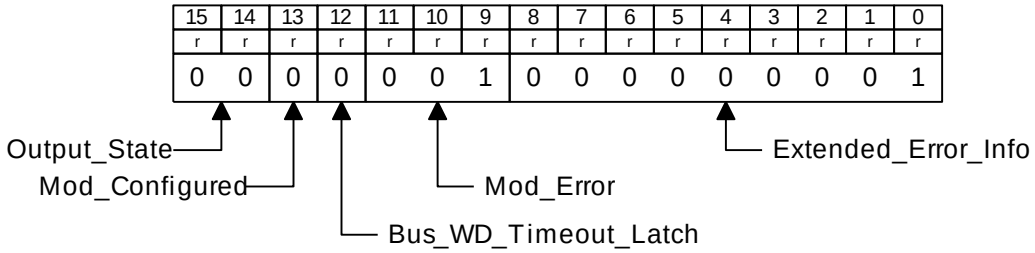
If you set the High or Low Clamp beyond the Limit for the specific

Range/Format setting, the output is internally adjusted to the Limit values. In this case, the Limit value determines the Over or Under Range Alarm trigger if HCA or LCA is set respectively (assuming HCE or LCE is set).

3.3.11 Module Error

The 2085 analog I/O modules notify the host of critical and non-critical module errors. The Mod_Condition Array Word 0 located in the ASIC communication command contains the error codes that are generated by the modules for indication. 2085 module errors are expressed as two fields: Mod_Error (3 bits) and Extended_Error_Info (9 bits).

Mod_Condition Arry Word 0



Mod_Condition Array Word 0 bit fields

Mod_Error Field (Bits 11:9)

The purpose of the Mod_Error field is to classify module errors into three distinct groups:

- No Errors (Mod_Error = 0×0): When Mod_Error field = 0×0, there is no error present in the module, and there is no need to check the Extended_Error_Info field.
- Hardware Errors (Mod_Error = 0×1): General and specific error codes may be specified by the Extended_Error_Info field.
- Configuration Errors (Mod_Error = 0×2): Module-specific error codes specified in the Extended_Error_Info field. These error codes correlate to options that you can change directly; Example: **Input Range** or **Input Filter** Selection.

Extended_Error_Info Field (Bits 8:0)

The Extended_Error_Info field is checked when a non-zero value is present in the Mod_Error field. Depending on the value of Mod_Error, the Extended_Error_Info contains error codes that are module-specific.

Error Type	Mod_Error (11:9)	Extended_Error_Info(8:0)
No Error	00b	Always 0×000
Hardware Error	01b	0×000=no additional information 0×100–0×1FF=module-specific errors
Configuration Error	10b	0×000=no additional information 0×001–0×1FF=module-specific errors

3.3.12 Hardware Errors

The following table lists the hardware errors reported by the module.

Mod_Error (11:9)	Extended_Error_Info(8:0)	Combined (11:0)	Error Description
001b	0×000	0×000	No Errors.
001b	0×001	0×201	Reset Module (detected by ASIC).
001b	0×100	0×300	ASIC detected a communication failure to the MCU. The ASIC, not the module firmware, sets this code.
001b	0×101	0×301	Watchdog reset detected. This can only be set if the MCU detects its own reset. If ASIC communications timeout the MCU will not be able to communicate status.
001b	0×102	0×302	Not used.
001b	0×103	0×303	Output driver over temperature.
001b	0×104	0×304	Not used.
001b	0×105	0×305	DAC communications error
001b	0×106	0×306	Not used.

3.3.13 Module Specific Hardware Errors

Mod_Error (11:9)	Extended_Error_Info(8:0)	Combined	Error Description
001b	0×103	0×303	DAC Communication Error. This hardware error is set if the module detects the output driver is not functioning properly.

3.3.14 Module Specific Configuration Errors

If you attempt to set the fields in the configuration file to invalid (unsupported) values, the module:

- Ignores the invalid configuration.
- Generates a non-critical error.
- Keeps operating with the previous configuration. This section lists the possible module specific configuration error codes defined for the 2085sc-OF8.

Extended Error Info Format

The nine bits of Extended Error Info are separated into channel and error bits as follows:

- Bits 0-3 are used to indicate which channel has the configuration error. If multiple channels have an error, the module stops on the first channel that has the error.
- Bits 4-7 are used to indicate the configuration error.
- Bit 8 is reserved and always zero.

Bits 11:9 Mod_Error	Extended_Error_Info			Combined Value	Error Description
	Bit 8 Reserved	Bits 7:4 Error	Bits 3:0 Channel		
010b	0	0001b	0000b–0111b	0×410–0×417	Invalid Range The Range setting is not within the valid selectable range. See Configuration Table for possible values.
010b	0	0010b	0000b–0111b	0×420–0×427	Invalid Data Format The Data Format setting is not within the valid selectable range. See Configuration Table for possible values.
010b	0	0011b	0000b–0111b	0×430–0×437	Invalid Clamp Value If LCE and HCE configuration bits are set, the High Clamp value is less than or equal to the Low Clamp value. OR If LCE set and HCE not set, the Low Clamp Value is greater than or equal to the High Limit Value. OR If HCE set and LCE not set, the High Clamp Value is less than or equal to the Low Limit Value.

3.3.15 Glitch Requirements

The module is required to predictably control outputs under various conditions. The following table describes these conditions and expected behavior:

Condition/Transition	Expected Behavior of Outputs
Power-up	All outputs OFF until valid configuration received and Run Mode is active. Once valid configuration and Run Mode is detected, the outputs are set per your configuration and Output Words.
Run Mode transition to Program Mode	All outputs OFF
Program Mode transition to Run Mode	Immediately set outputs from OFF to value set by Output Words based on your configuration.
Configuration change	Once a new/valid configuration is received, all outputs shall be set to OFF during the re-configuration sequence. The outputs will then change from OFF to the value set in the Output Words.

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	440-646-6900
United Kingdom	01908 635230
Australia	1800-809-929
Mexico	001-888-365-8677
Brazil	(55) 11 3618 8800
Europe	+49 211 41553 630

Declaration of Conformity

Available upon request

Index

Corporate Headquarters
Spectrum Controls Inc.
P.O. Box 6489
Bellevue, WA 98008 USA
Fax: 425-641-9473
Tel: 425-746-9481

Web Site: www.spectrumcontrols.com
E-mail: spectrum@spectrumcontrols.com

User's Manual Pub. 0300308-01 Rev. A