Micro800 Expansion I/O Modules

Catalog Numbers 2085-IQ16, 2085-IQ32T, 2085-OV16, 2085-OB16, 2085-IA8, 2085-IM8, 2085-OA8, 2085-OW8, 2085-OW16, 2085-IF4, 2085-IF8, 2085-OF4, 2085-IRT4, 2085-EP24VDC

Allen-Bradley
by ROCKWELL AUTOMATION

User Manual

Original Instructions

Important User Information

Read this document and the documents listed in the additional resources section about installation, configuration, and operation of this equipment before you install, configure, operate, or maintain this product. Users are required to familiarize themselves with installation and wiring instructions in addition to requirements of all applicable codes, laws, and standards.

Activities including installation, adjustments, putting into service, use, assembly, disassembly, and maintenance are required to be carried out by suitably trained personnel in accordance with applicable code of practice.

If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

In no event will Rockwell Automation, Inc. be responsible or liable for indirect or consequential damages resulting from the use or application of this equipment.

The examples and diagrams in this manual are included solely for illustrative purposes. Because of the many variables and requirements associated with any particular installation, Rockwell Automation, Inc. cannot assume responsibility or liability for actual use based on the examples and diagrams.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

WARNING: Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.

ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence.

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

These labels may also be on or inside the equipment to provide specific precautions.

SHOCK HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.

BURN HAZARD: Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.

ARC FLASH HAZARD: Labels may be on or inside the equipment, for example, a motor control center, to alert people to potential Arc Flash. Arc Flash will cause severe injury or death. Wear proper Personal Protective Equipment (PPE). Follow ALL Regulatory requirements for safe work practices and for Personal Protective Equipment (PPE).

The following icon may appear in the text of this document.

Identifies information that is useful and can help to make a process easier to do or easier to understand.

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About This Publication

Use this manual if you are responsible for designing, installing, programming, or troubleshooting control systems that use Micro800™ controllers.

This manual is a reference guide for Micro800 expansion I/O modules. It describes the procedures you use to install, wire, and troubleshoot your expansion I/O. This manual:

- Gives you an overview of expansion I/O features and configuration parameter
- Gives you an overview of the Micro800 controller system

You should have a basic understanding of electrical circuitry and familiarity with relay logic. If you do not, obtain the proper training before using this product.

Rockwell Automation recognizes that some of the terms that are currently used in our industry and in this publication are not in alignment with the movement toward inclusive language in technology. We are proactively collaborating with industry peers to find alternatives to such terms and making changes to our products and content. Please excuse the use of such terms in our content while we implement these changes.

Download Firmware, AOP, EDS, and Other Files

Download firmware, associated files (such as AOP, EDS, and DTM), and access product release notes from the Product Compatibility and Download Center at rok.auto/pcdc.

Summary of Changes

This publication contains the following new or updated information. This list includes substantive updates only and is not intended to reflect all changes.

Topic	Page
Updated template	throughout
Added Inclusive Language Acknowledgment	5
Updated Additional Resources	5
Updated description of field '0x' in table Field Descriptions for 2085-IRT4	45

Additional Resources

These documents contain additional information concerning related products from Rockwell Automation. You can view or download publications at rok.auto/literature.

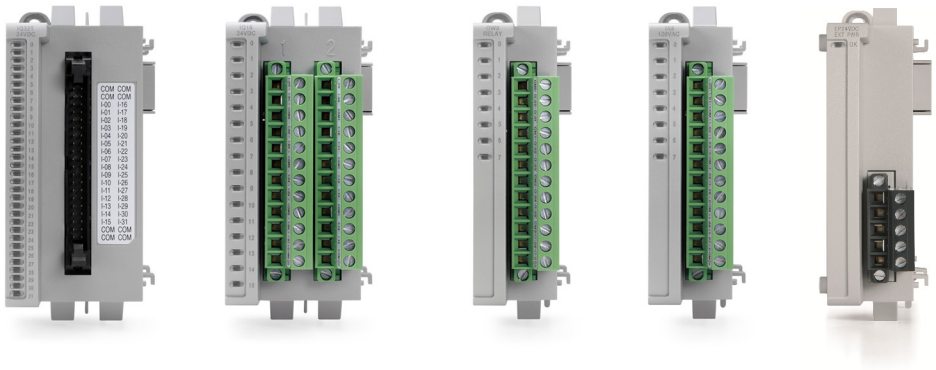
Additional Resources

Resource	Description
Micro800 Programmable Controller Family Selection Guide, publication 2080-SG001	Provides information to help you select the Micro800 controller, plug-ins, expansion I/O, and accessories, based on your requirements.
Micro800 Programmable Controllers Technical Data, publication 2080-TD001	Provides detailed specifications for Micro800 controllers, expansion I/O modules, plug-in modules, and accessories.
Micro830, Micro850, and Micro870 Programmable Controllers User Manual, publication 2080-UM002	Describes how to install, configure, use, and troubleshoot your Micro830®, Micro850®, and Micro870® controllers.
Micro800 16-point and 32-point 12/24V Sink/Source Input Modules Installation Instructions, publication 2085-IN001	Provides information on mounting and wiring the expansion I/O modules (2085-IQ16, 2085-IQ32T).
Micro800 Bus Terminator Module Installation Instructions, publication 2085-IN002	Provides information on mounting and wiring the expansion I/O bus terminator (2085-ECR).
Micro800 16-point Sink and 16-point Source 12/24V DC Output Modules Installation Instructions, publication 2085-IN003	Provides information on mounting and wiring the expansion I/O modules (2085-OV16, 2085-OB16).
Micro800 8-point and 16-point AC/DC Relay Output Modules Installation Instructions, publication 2085-IN004	Provides information on mounting and wiring the expansion I/O modules (2085-OW8, 2085-OW16).
Micro800 8-point Input and 8-point Output AC Modules Installation Instructions, publication 2085-IN005	Provides information on mounting and wiring the expansion I/O modules (2085-IA8, 2085-IM8, 2085-OA8).
Micro800 4-channel and 8-channel Analog Voltage/Current Input and Output Modules Installation Instructions, publication 2085-IN006	Provides information on mounting and wiring the expansion I/O modules (2085-IF4, 2085-IF8, 2085-OF4).
Micro800 4-channel Thermocouple/RTD Input Module Installation Instructions, publication 2085-IN007	Provides information on mounting and wiring the expansion I/O module (2085-IRT4).
Micro870 Programmable Controllers 24V DC Expansion Power Supply Installation Instructions, publication 2085-IN008	Provides information on mounting and wiring the 24V DC expansion power supply (2085-EP24VDC).

Additional Resources (Continued)

Resource	Description
Safety Guidelines for the Application, Installation, and Maintenance of Solid-state Control, publication SGI-1.1	Designed to harmonize with NEMA Standards Publication No. ICS 1.1-1987 and provides general guidelines for the application, installation, and maintenance of solid-state control in the form of individual devices or packaged assemblies incorporating solid-state components.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Selection and Configuration website, rok.auto/systemtools	Helps configure complete, valid catalog numbers and build complete quotes based on detailed product information.
Product Certifications website, rok.auto/certifications	Provides declarations of conformity, certificates, and other certification details.

Hardware Features



Micro800 controllers support a range of expansion I/O modules to extend the functionality of the controller.

Micro800 Expansion I/O Modules

The different types of expansion I/O modules are listed in Table 1.

Table 1 - Micro800 Expansion I/O Modules

Catalog	Type	Description
2085-IA8	Discrete	8-point, 120V AC input
2085-IM8	Discrete	8-point, 240V AC input
2085-OA8	Discrete	8-point, 120/240V AC Triac Output
2085-IQ16	Discrete	16-point, 12/24V Sink/Source Input
2085-IQ32T	Discrete	32-point, 12/24V Sink/Source Input
2085-OV16	Discrete	16-point, 12/24V DC Sink Transistor Output
2085-OB16	Discrete	16-point, 12/24V DC Source Transistor Output
2085-OW8	Discrete	8-point, AC/DC Relay Output
2085-OW16	Discrete	16-point, AC/DC Relay Output
2085-IF4	Analog	4-channel, 14-bit isolated(1) voltage/current input
2085-IF8	Analog	8-channel, 14-bit isolated(1) voltage/current input
2085-OF4	Analog	4-channel, 12-bit isolated(1) voltage/current output
2085-IRT4	Analog	4-channel, 16-bit isolated(1) RTD and Thermocouple input module
2085-EP24VDC	Power supply	Supplies power for up to four expansion I/O modules(2)
2085-ECR	Terminator	2085 bus terminator

(1) Refers to isolation from field side wiring to controller, **not** channel-to-channel isolation.
(2) Use only in a Micro870 system with more than four expansion I/O modules.

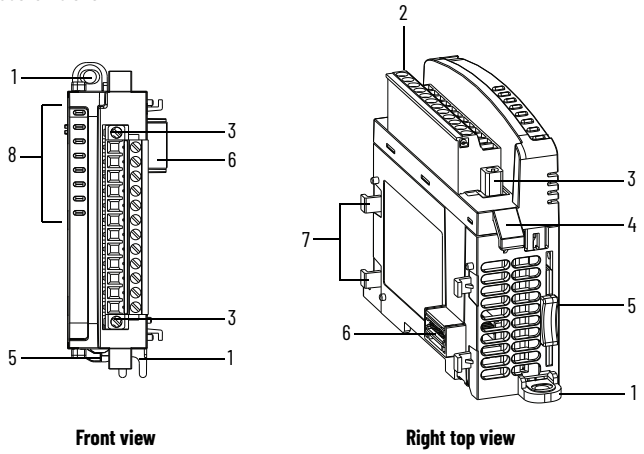
The bus terminator, 2085-ECR, serves as an end cap and terminates the end of the Serial communication bus. It is **required** whenever an expansion I/O module is connected to the controller and should be connected to the last expansion I/O module in the system.

Hardware Features

Micro800 expansion I/O modules come as a single-width (90 x 28 x 87 mm, HxWxD) or double-width (90 x 46 x 87 mm, HxWxD) form factor. See the Micro800 Programmable Controllers Technical Data, publication 2080-TD001 for information on module dimensions and specifications.

Figure 1 - Single-width Expansion I/O

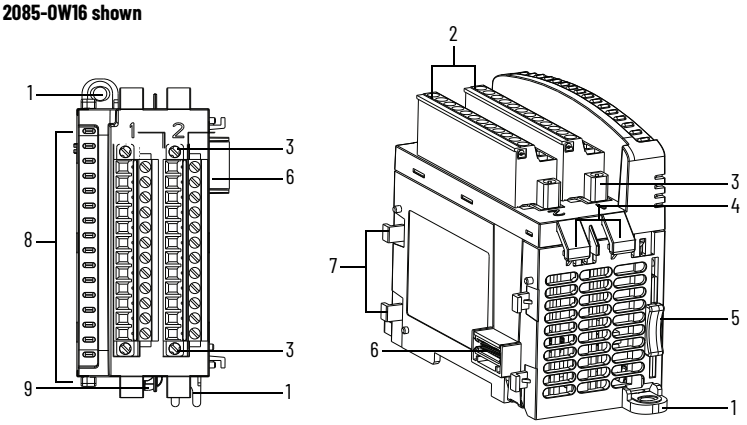
2085-OW8 shown



Front view **Right top view**

Figure 2 - Double-width Expansion I/O

2085-OW16 shown



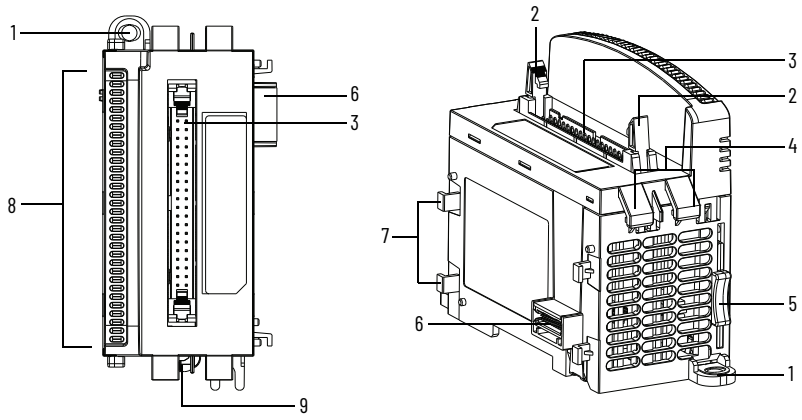
Front view **Right top view**

Table 2 - Module Description

	Description		Description
1	Mounting screw hole/mounting foot	6	Bus connector (male/female)
2	Removable Terminal Block (RTB)(1)	7	Latch hooks
3	RTB hold down screws	8	I/O status LED
4	Cable grip	9	DIN rail mounting latch
5	Module interconnect latch		

(1) The removable terminal block has slots for mechanical keying, to prevent inadvertently making the wrong wire connections to your module. Expansion I/O modules are shipped with keys.

Figure 3 - 2085-IQ32T Hardware Features

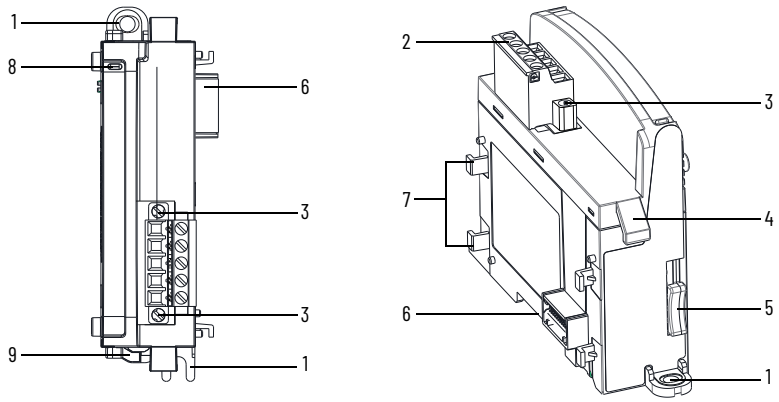


Front view **Right top view**

Table 3 - 2085-IQ32T Hardware Components

	Description		Description
1	Mounting screw hole/mounting foot	6	Bus connector (male/female)
2	Connector	7	Latch hooks
3	Connector retaining arm	8	I/O status LEDs
4	Cable grip	9	DIN rail mounting latch
5	Module interconnecting latch		

Figure 4 - 2085-EP24VDC Hardware Features



Front view **Right top view**

Table 4 - 2085-EP24VDC Hardware Components

	Description		Description
1	Mounting screw hole/mounting foot	6	Bus connector (male/female)
2	Removable Terminal Block (RTB)	7	Latch hooks
3	RTB hold down screws	8	Power status LED
4	Cable grip	9	DIN rail mounting latch
5	Module interconnecting latch		

Notes:

Discrete and Analog Expansion I/O Features

Overview

This section includes a brief description of the different features and configuration parameters for the analog and discrete Micro800 expansion I/O modules.

Discrete Expansion I/O Features

Micro800 discrete expansion I/O modules are input/output modules that provide On/Off detection and actuation.

Module Information

The Connected Components Workbench™ programming software makes it easy to configure the modules as most module features can be enabled or disabled through the device configuration portion of the software. You can also use the software to check any expansion I/O module in the system to retrieve:

- Hardware revision information
- Vendor ID
- Module information

Channel Status Indicator Information

The discrete expansion I/O modules have yellow status indicators for each input/output point which indicates the On/Off state of the point.

Discrete Input

Discrete input modules interface to sensing devices and detect whether they are On or Off. These modules convert AC or DC On/Off signals from user devices to appropriate logic level for use within the processor.

The 2085-IA8, 2085-IM8, 2085-IQ16, and 2085-IQ32T modules update the controller with new data whenever an input point transitions from On to Off and Off to On.

On to Off and Off to On filter times can be adjusted through the Connected Components Workbench software. These filters improve noise immunity within a signal. A larger filter value affects the length of delay times for signals from these modules.

You can select from a series of operational ranges for each channel. The range designates the minimum and maximum signals that are detectable by the module.

Discrete Output

Output modules may be used to drive a variety of output devices. Typical output devices compatible with the outputs include:

- Motor starters
- Solenoids
- Indicators

Follow these guidelines when designing a system.

- Make sure that the outputs can supply the necessary surge and continuous current for proper operation. See the Micro800 Programmable Controllers Technical Data, publication 2080-TD001 for more information.

- Make sure that the surge and continuous current are not exceeded. Damage to the module could result. When sizing output loads, check the documentation that is supplied with the output device for the surge and continuous current needed to operate the device. The Micro800 standard digital outputs are capable of directly driving the Micro800 standard digital inputs.

User-configurable options are not available in Connected Components Workbench software for discrete output modules.

IMPORTANT On controller minor and major fault, all output channels are de-energized.

Analog Expansion I/O Features

This section pertains to the following Micro800 analog expansion I/O modules.

Table 5 - Micro800 Expansion I/O Modules

Catalog	Type	Description
2085-IF4	Analog	4-channel, 14-bit isolated(1) voltage/current input
2085-IF8	Analog	8-channel, 14-bit isolated(1) voltage/current input
2085-OF4	Analog	4-channel, 12-bit isolated(1) voltage/current output
2085-IRT4	Analog	4-channel, 16-bit isolated(1) RTD and Thermocouple input module

(1) Refers to isolation from field side wiring to controller, **not** channel-to-channel isolation.

Analog expansion I/O modules are interface modules that convert analog signals to digital values for inputs and convert digital values to analog signals for outputs. Controllers can then use these signals for control purposes.

Analog Input and Output

Input/Output Types and Ranges

The 2085-IF4 and 2085-IF8 modules support four and eight input channels, respectively, while the 2085-OF4 supports four output channels. Each of the channels can be configured as current or voltage input/output, with current mode as default configuration.

Table 6 - Input/Output Type/Range for 2085-IF4, 2085-IF8, and 2085-OF4

Module	Input/Output Type/Range
2085-IF4	0...20 mA 4...20 mA (default) -10...10 V 0...10 V
2085-IF8	
2085-OF4	

To use an input or output as a current or voltage device, you must:

- Wire the input/output connector for the correct input/output type (see Input/Output Wiring on page 19)
- Configure the input/output as current or voltage through Connected Components Workbench software (see Configure Your Expansion I/O Module on page 29)

Analog Data Formats

This parameter configures each channel to present analog data in any of the following formats:

- Raw/Proportional Data – The value presented to the controller is proportional to the selected input and scaled into the maximum data range allowed by the bit resolution of the A/D converter.

  For example, the data value range for a ±10V DC user input is -32,768...+32,767, which covers the full-scale range of -10.5...+10.5V. See Valid Range of the Data Formats for 2085-IF4, 2085-IF8, and 2085-OF4 on page 13.

- Engineering Units – The module scales the analog input data to the actual current or voltage values for the selected input range. The resolution of the engineering units is 0.001V or 0.001 mA per count.
- Percent Range – The input data is presented as a percentage of the normal operating range.

  For example, 0...10V DC equals 0...100%. The amount over and under the normal operating range (the full-scale range) is also supported.

Valid Range of the Data Formats for 2085-IF4, 2085-IF8, and 2085-OF4

The valid range of each Data Format corresponds to the **full range** of each Type/Range (or normal range). For example, the full range of 0...20 mA is 0...21 mA.

Table 7 - Valid Range of the 2085-IF4 and 2085-IF8 Data Formats

Data Format	Type/Range			
	0...20 mA(1)	4...20 mA(4)	-10...10V(4)	0...10V(4)
Raw/Proportional Data(2)	-32768...+32767			
Engineering Units(3)	0...21000	3200...21000	-10500...+10500	-500...+10500
Percent Range(4)	0...10500	-500...+10625	Not supported	-500...+10500

(1) The full range value of:
a. 0...20 mA is 0...21 mA
b. 4...20 mA is 3.2...21 mA
c. -10...+10V is -10.5...+10.5V
d. 0...10V is -0.5...+10.5V
(2) See Convert Analog Value to Data Format Value on page 13.
(3) The resolution is 0.001V or 0.001 mA per count. For example, 9999 here means 9.999V or 9.999 mA (or 9999 x 0.001).
(4) The resolution is 0.01% per count. For example, 9999 here means 99.99% (or 9999 x 0.01%). See Convert Analog Value to Data Format Value on page 13

Table 8 - Valid Range of the 2085-OF4 Data Formats

Data Format	Type/Range			
	0...20 mA(1)	4...20 mA(4)	-10...10V(4)	0...10V(4)
Raw/Proportional Data(2)	-32768...+32767			
Engineering Units(3)	0...21000	3200...21000	-10500...+10500	0...10500
Percent Range(4)	0...10500	-500...+10625	Not supported	0...10500

(1) The full range value of:
a. 0...20 mA is 0...21 mA
b. 4...20 mA is 3.2...21 mA
c. -10...10V is -10.5...10.5V
d. 0...10V is 0...10.5V
(2) See Convert Analog Value to Data Format Value on page 13.
(3) The resolution is 0.001V or 0.001 mA per count. For example, 9999 here means 9.999V or 9.999 mA (or 9999 x 0.001).
(4) The resolution is 0.01% per count. For example, 9999 here means 99.99% (or 9999 x 0.01%). See Convert Analog Value to Data Format Value on page 13.

Convert Analog Value to Data Format Value

The formula for converting an analog value x to a data format value y (or conversely, deriving data format value y to analog value x) is as follows:

Y = ((X - Minimum Value of X Range) * (Range of Y)/(Range of X)) + (Minimum Value of Y Range)

Example 1:
Find the analog value (Y) of type/range 4...20 mA when the Raw/Proportional Data X is -20000.

Given:
X = -20000
Minimum value of X Range = -32768
Range of X = 32767 - (-32768) = 65535
Range of Y = 21 - 3.2 = 17.8
Minimum value of Y Range = 3.2

Using the conversion formula:
Y = (-20000 - (-32768)) * 17.8/65535 + (3.2) = **6.668 mA**

Example 2:
Find the Raw/Proportional value (Y) of 10 mA (X) for type/range 4...20 mA.

Given:
X = 10 mA
Minimum value of X Range = 3.2 mA (Minimum value of 4...20 mA)
Range of X = 21 - 3.2 = 17.8 mA (Range of 4...20 mA)
Range of Y = 32767 - (-32768) = 65535 (Range of Raw/Proportional Data)
Minimum value of Y Range = -32768 (Minimum value of Raw/Proportional Data)

Using the conversion formula:
Y = **-7732.15** (Decimals are not displayed)

Input Filter

For the input modules, 2085-IF4 and 2085-IF8, the input filter parameter lets you specify the frequency filter type for each channel. Frequency filter type affects noise rejection, as explained below. Select a frequency filter type considering acceptable noise and response time.

Through the Connected Components Workbench software, you can configure input filter as:

- 50/60Hz Rejection (default)
- No Filter
- 2-point Moving Average
- 4-point Moving Average
- 8-point Moving Average

Noise Rejection

The input modules use a digital filter that provides noise rejection for the input signals.

The moving average filter reduces the high frequencies and random white noise while keeping an optimal step response. See the Micro800 Programmable Controllers Technical Data, publication 2080-TD001 for minimum and maximum response times.

Normal Mode Rejection is better than 40 dB, while Common Mode Rejection is better than 60 dB @ 50/60 Hz, with the 50/60 Hz rejection filters selected. The modules perform well in the presence of common mode noise as long as the signals applied to the user plus and minus input terminals do not exceed the common mode voltage rating (±10 V) of the modules. Improper earth ground may be a source of common mode noise.

Process Level Alarms

Process level alarms alert you when the module has exceeded configured high and low limits for each channel (for input modules, it provides additional high-high and low-low alarms). When the channel input or output goes below a low alarm or above a high alarm, a bit is set in the status words. All Alarm Status bits can be read individually or read through the Channel Status Byte.

For the output module, 2085-OF4, it is possible to latch the alarm status bit when the latch configuration is enabled.

You can configure each channel alarm individually.

Clamping Limits and Alarm

For the output module, 2085-OF4, clamping limits the output from the analog module to remain within a range configured by the controller, even when the controller commands an output outside that range. This safety feature sets a high clamp and a low clamp. Once clamps are determined for a module, any data received from the controller that exceeds those clamps transitions the output to that limit but not beyond the clamp value. It also sets the alarm status bit when the alarm is enabled. It is also possible to latch the alarm status bit when the latch configuration is enabled.

For example, an application may set the high clamp on a module for 8V and the low clamp for -8V. If a controller sends a value corresponding to 9V to the module, the module only applies 8V to its screw terminals.

You can configure the clamp limit (high/low clamp), the associated alarm, and its latching configuration on a per channel basis.

The following table shows the default values of the High/Low Clamps (in the order of low clamp value followed by the high clamp value) for the respective type/range when they are first enabled. You can change these values (within their full range) according to your application.

Table 9 - Default Range of High Clamp/Low Clamp Values

Data Format	0...20 mA	4...20 mA	-10...+10V	0...10V
Raw/Proportional Data	-32768, +29647	-29822, +29086	-31207, +31207	-32768, +29647
Engineering Units	0, 20000	4000, 20000	-10000, +10000	0, 10000
Percent Range	0, 10000	0, 10000	Not supported	0, 10000

Channel Status Indicator Information for 2085-IF4 and 2085-IF8

The 2085-IF4 and 2085-IF8 modules use red LEDs to indicate when certain operating conditions occur on the analog input channels. The behavior for the channel status indicators are described in the following table.

Table 10 - Channel Status Indicator Information for 2085-IF4 and 2085-IF8

Operating Condition	Channel Status Indicator	Status Data
Analog input channel is disabled	OFF	Analog input status values can be read from Global Variables IO_Xx_ST_yy. Where "x" represents the expansion slot number 1...4, and "yy" represents the status word number 00...02.
Analog input channel is enabled and: • No data error is present, or • Closed, or • Not underrange or overrange	OFF	
Analog input channel is enabled and data error is present	RED	
Analog input channel is enabled and the connection is open	RED	
Analog input channel is enabled and either of the underrange or overrange alarms configured is triggered: • Low Alarm • Low Low Alarm • High Alarm • High High Alarm	RED	

Specialty Module 2085-IRT4 Temperature Input Module

The 2085-IRT4 module lets you configure a sensor type for each of four input channels that linearizes analog signal into a temperature value.

Sensor Type

The following Thermocouple and RTD sensor types are supported by the 2085-IRT4 expansion I/O module.

Table 11 - Supported Thermocouple Types and mV Range

Sensor Range	Range	
B	300…1800 °C	(572…3272 °F)
C	0…2315 °C	(32…4199 °F)
E	-270…+1000 °C	(-454…+1832 °F)
J	-210…+1200 °C	(-346…+2192 °F)
K	-270…+1372 °C	(-454…+2502 °F)
TXK/XK (L)	-200…+800 °C	(-328…+1472 °F)
N	-270…+1300 °C	(-454…+2372 °F)
R	-50…+1768 °C	(-58…+3214 °F)
S	-50…+1768 °C	(-58…+3214 °F)
T	-270…+400 °C	(-454…+752 °F)
mV	0…100 mV	

Table 12 - Supported RTD Types and Ohms Range

Sensor Range	Range	
100 Ω Pt α = 0.00385 Euro	-200…+870 °C	(-328…+1598 °F)
200 Ω Pt α = 0.00385 Euro	-200…+400 °C	(-328…+752 °F)
100 Ω Pt α = 0.003916 U.S	-200…+630 °C	(-328…+1166 °F)
200 Ω Pt α = 0.003916 U.S.	-200…+400 °C	(-328…+752 °F)
100 Ω Nickel 618	-60…+250 °C	(-76…+482 °F)
200 Ω Nickel 618	-60…+200 °C	(-76…+392 °F)
120 Ω Nickel 672	-80…+260 °C	(-112…+500 °F)
10 Ω Copper 427	-200…+260 °C	(-328…+500 °F)
Ohms	0…500 Ohms	

Data Format

You can configure the following data formats for channels 0…3 through the Connected Components Workbench software.

- Engineering Units x 1 – If you select engineering units x 1 as the data format for a Thermocouple and RTD input, the module scales input data to the actual temperature values for the selected Thermocouple/RTD type per Thermocouple/RTD standard. It expresses temperatures in 0.1 °C/°F units. For resistance inputs, the module expresses resistance in 0.1 ohm per count. For mV inputs, the module expresses it in 0.01 mV per count.
- Engineering Units x 10 – For a Thermocouple or RTD input, the module scales input data to the actual temperature values for the selected Thermocouple/RTD type per Thermocouple/RTD standard. With this format, the module expresses temperatures in 1 °C/°F units. For resistance inputs, the module expresses resistance in 1 ohm per count. For mV inputs, the module expresses it in 0.1 mV per count.
- Raw/Proportional Data Format – The value presented to the controller is proportional to the selected input and scaled into the maximum data range allowed by the bit resolution of the A/D converter.

  For example, the full data value range for a thermocouple type B 300…1800 °C is mapped to -32768…+32767. See Convert Analog Value to Data Format Value on page 17 for the conversion method.
- Percent Range – The input data is presented as a percentage of the normal operating range.

  For example, 0…100 mV equals 0…100% or 300…1800 °C equals 0…100% for thermocouple type B sensor. See Convert Analog Value to Data Format Value on page 17 for the conversion method.

Valid Range of the Data Formats for 2085-IRT4

The following table shows the valid range of the Data Format versus the Data Type/Range for channels 0...3.

Table 13 - Valid Range of the 2085-IRT4 Data Formats

Data Format	Sensor Type – Temperature (10 Thermocouples, 8 RTDs)	Sensor Type 0...100 mV	Sensor Type 0...500 ohms
Raw/Proportional Data(1)	-32768...+32767		
Engineering Units x 1	Temperature Value(2) (°C/°F)	0...10000(3)	0...5000(4)
Engineering Units x 10	Temperature Value(5) (°C/°F)	0...1000(6)	0...500(7)
Percent Range(8)	0...10000		

(1) See Convert Analog Value to Data Format Value on page 17.
(2) The resolution is 0.1 °C/°F per count. For example, 999 here means 99.9 °C/°F (or 999 x 0.1 °C/°F). The range depends on the selected sensor type.
(3) The resolution is 0.01 mV per count. For example, 9999 here means 99.99 mV (or 9999 x 0.01 mV).
(4) The resolution is 0.1 ohm per count. For example, 4999 here means 499.9 ohm (or 4999 x 0.1 ohm).
(5) The resolution is 1 °C/°F per count. For example, 999 here means 999 °C/°F (or 999 x 1 °C/°F). The range depends on the selected sensor type.
(6) The resolution is 0.1 mV per count. For example, 999 here means 99.9 mV (or 999 x 0.1 mV).
(7) The resolution is 1 ohm per count. For example, 499 here means 499 ohm (or 499 x 1 ohm).
(8) The resolution is 0.01% per count. For example, 9999 here means 99.99% (or 9999 x 0.01%). See Convert Analog Value to Data Format Value on page 17 for the conversion method.

Convert Analog Value to Data Format Value

The formula for converting an analog value x to a data format value y, or converting data format value y to analog value x, is as follows:

Y = ((X - Minimum Value of X Range)*(Range of Y)/(Range of X)) + (Minimum Value of Y Range)

Example:
Find the temperature value (Y) of thermocouple type K when the Raw/Proportional Data X is -20000.

Given:
X = -20000 (Raw/Proportional Value)
Minimum value of X Range = -32768 (Minimum value of Raw/Proportional Data)
Range of X = 32767 - (-32768) = 65535 (Range of Raw/Proportional Data)
Range of Y = 1372 - (-270) = 1642 (Range of Thermocouple K in °C)
Minimum value of Y Range = -270 °C (Minimum value of Thermocouple K)

Then:
Y = (-20000 - (-32768)) * 1642/65535 + (-270 °C) = **49.9 °C**

Temperature Units

Temperature value can be set to °C (default) or °F.

Open circuit response

This parameter defines the response to be taken by the module during an open circuit.

- Upscale – Sets input to full upper scale value of channel data word. The full-scale value is determined by the selected input type, data format, and scaling.
- Downscale – Sets input to full lower scale value of channel data word. The low scale value is determined by the selected input type, data format, and scaling.
- Hold Last State – Sets input to last input value.
- Zero – Sets input to 0 to force the channel data word to 0.

Filter Frequency

The 2085-IRT4 module uses a digital filter that provides noise rejection for the input signals. The filter is set by default at 4 Hz. The digital filter provides -3 dB (50% amplitude) attenuation at a filter frequency of 4 Hz.

The -3 dB frequency is the filter cut-off frequency. The cut-off frequency is defined as the point on the frequency response curve where frequency components of the input signal are passed with 3 dB of attenuation. All input frequency components at or below the cut-off frequency are passed by the digital filter with less than 3 dB of attenuation. All frequency components above the cutoff frequency are increasingly attenuated.

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

A lower filter frequency provides a better noise rejection, but it also increases the update time. Conversely, a higher filter frequency provides a faster update time, but it decreases the noise rejection and effective resolution.

For quickstart instructions on how to add, configure, delete and replace your expansion I/O module, see Configure Your Expansion I/O Module on page 29.

Wiring Connections

In solid-state control systems, grounding and wire routing helps limit the effects of noise due to electromagnetic interference (EMI).

ATTENTION: Do not wire more than 2 conductors on any single terminal.

Input/Output Wiring

Basic wiring of devices to the expansion I/O modules are shown as follows.

Figure 5 - 2085-IA8 or 2085-IM8

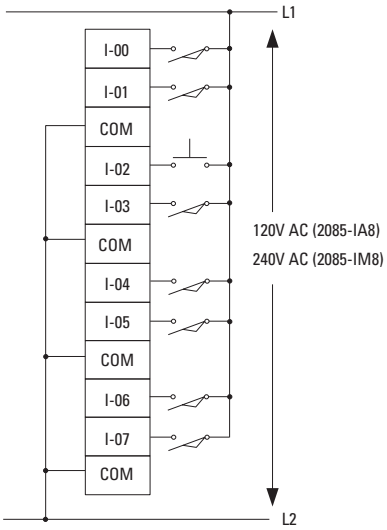


Figure 6 - 2085-IQ16

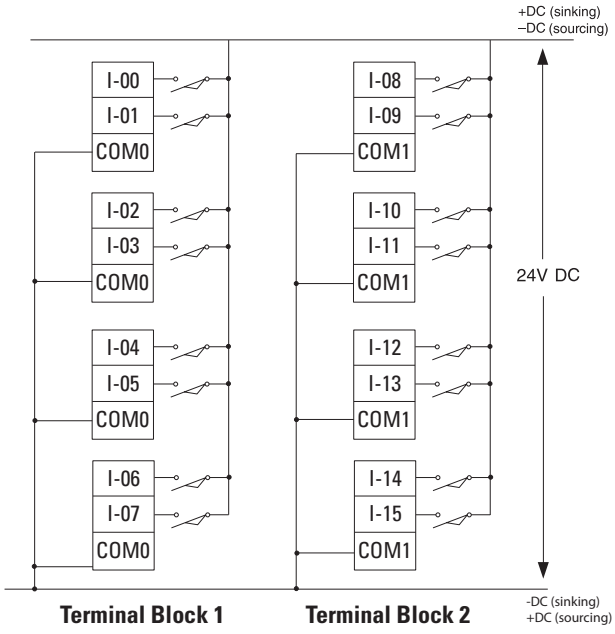


Figure 7 - 2085-OA8

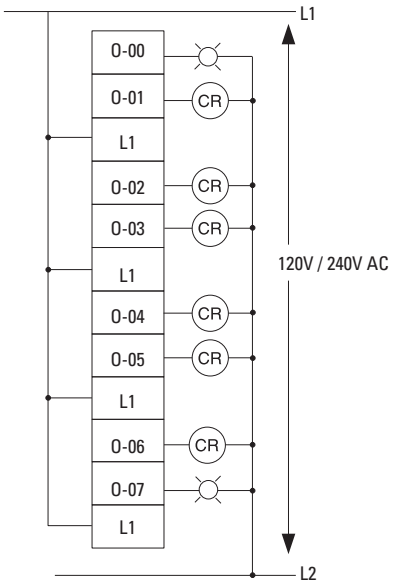
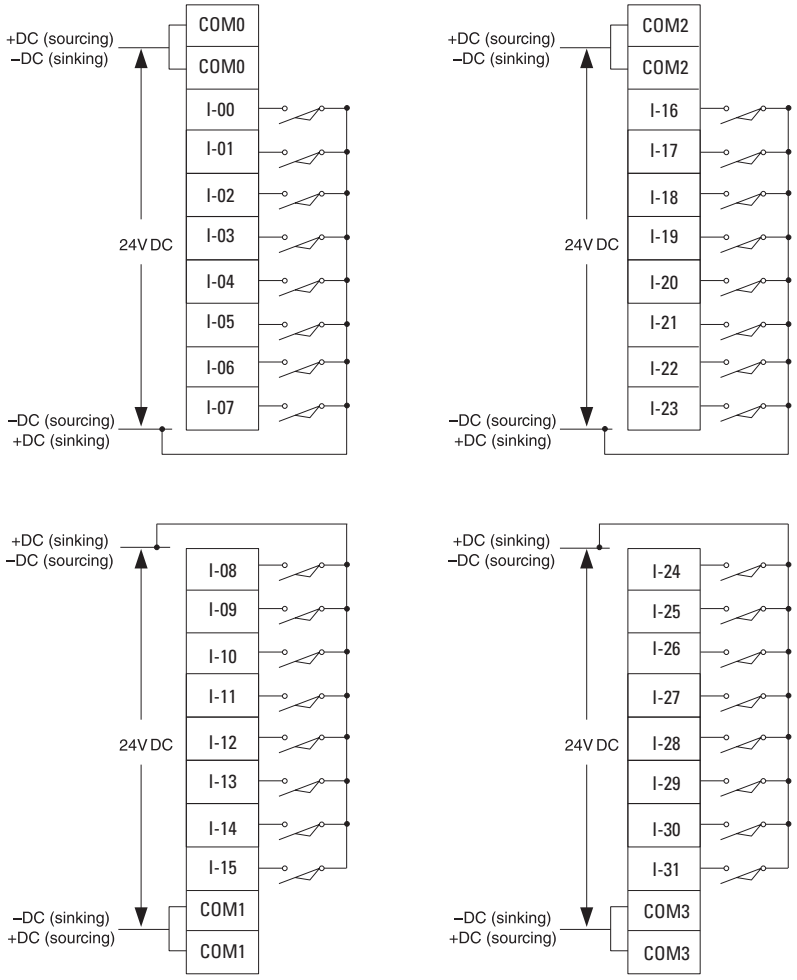


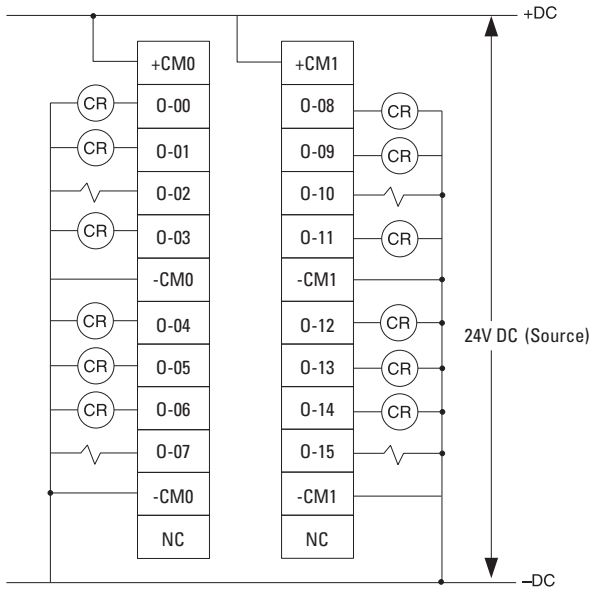
Figure 8 - 2085-IQ32T



See Wiring Options for the 2085-IQ32T Module on page 24.

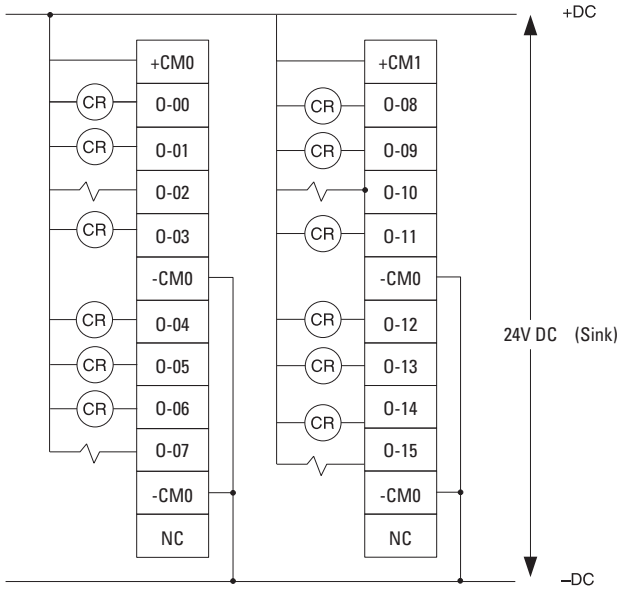
Figure 9 - 2085-OB16 and 2085-OV16

2085-OB16



Terminal Block 1 **Terminal Block 2**

2085-OV16



Terminal Block 1 **Terminal Block 2**

Figure 10 - 2085-OW8

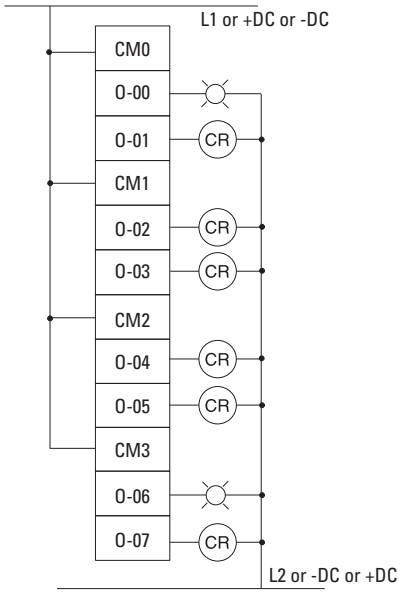


Figure 11 - 2085-OW16

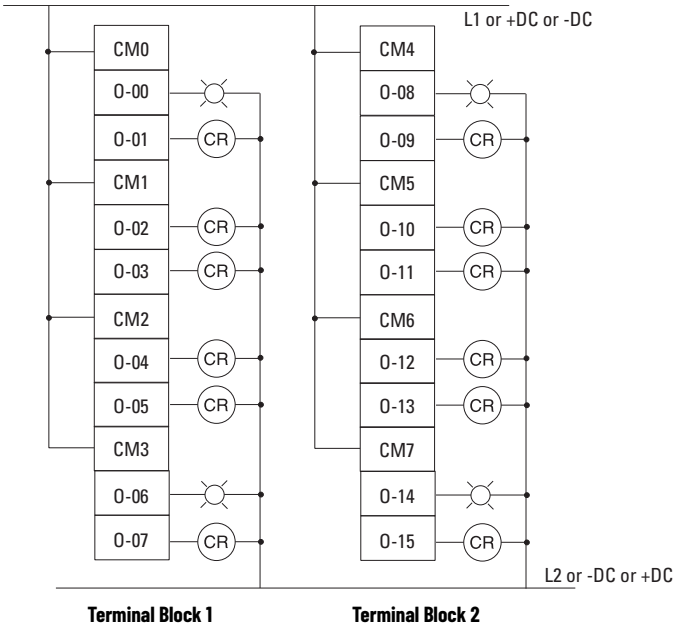


Figure 12 - 2085-IF4

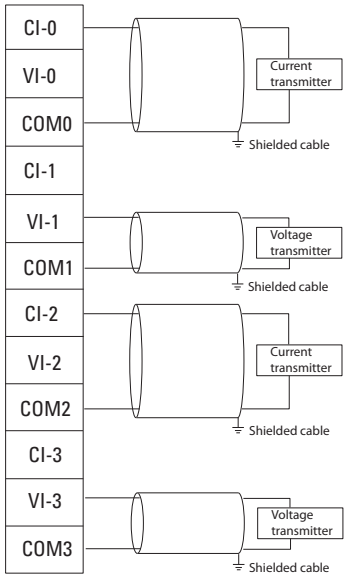


Figure 13 - 2085-IF8

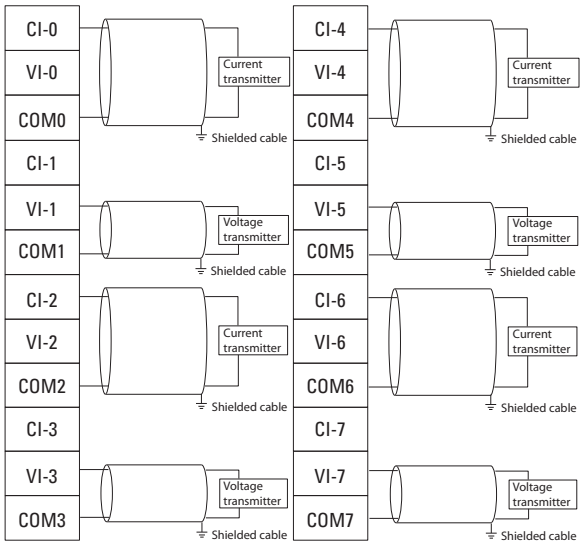


Figure 14 - 2085-OF4

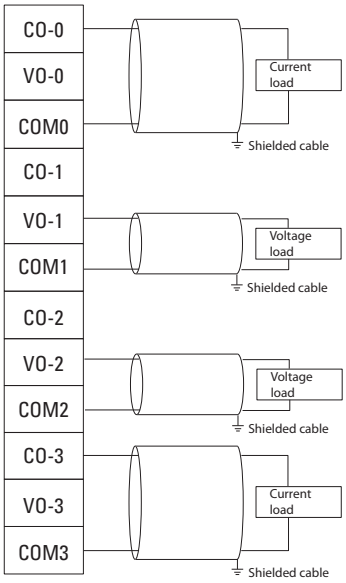
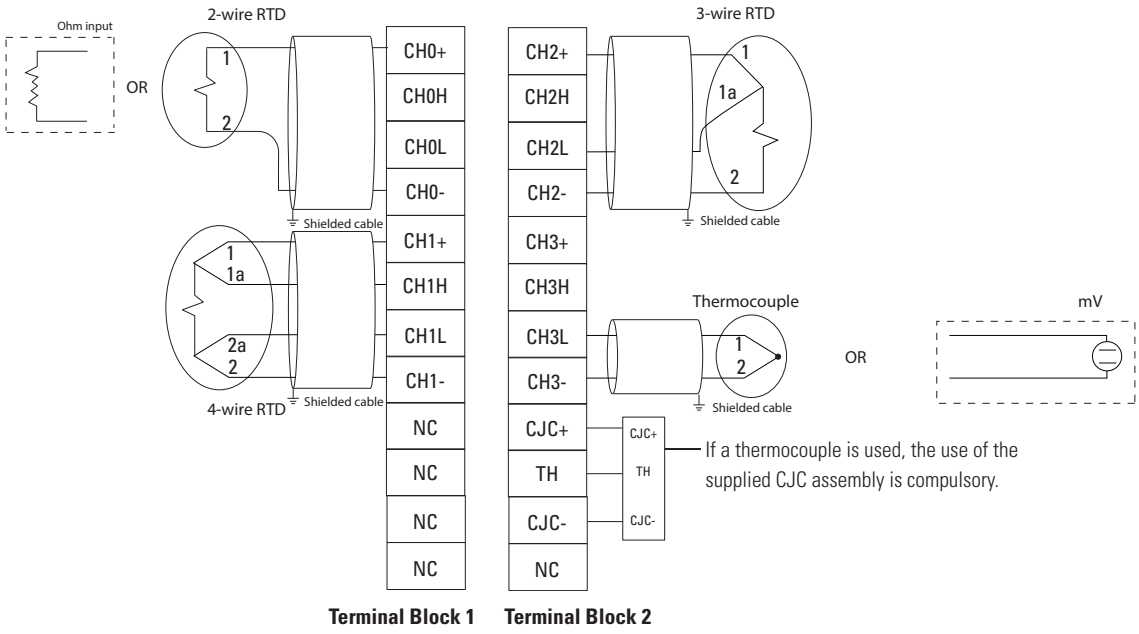
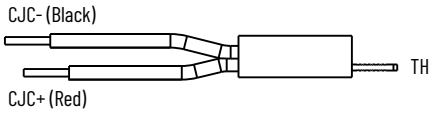


Figure 15 - 2085-IRT4

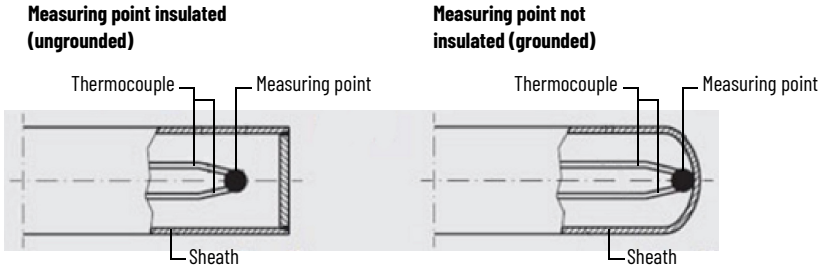


Thermistor



ATTENTION: There is no channel-to-channel isolation for the 2085-IRT4 module. It is recommended to use a non-grounded thermocouple for better noise immunity.

Figure 16 - Tip designs of thermocouple sensors



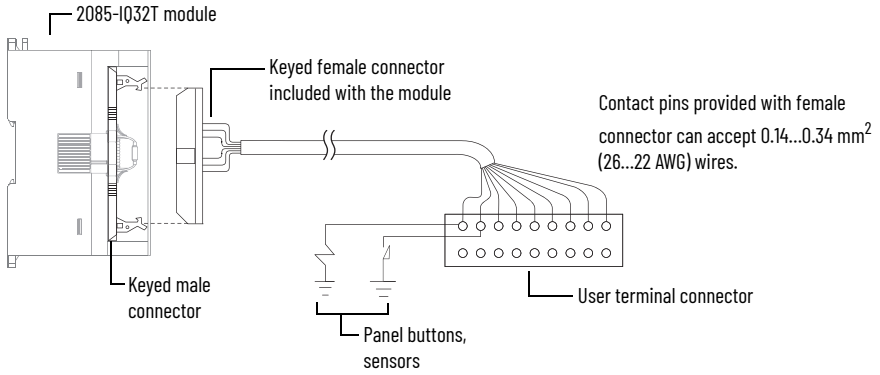
Wiring Options for the 2085-IQ32T Module

Included with your 2085-IQ32T module is a keyed 40-pin female connector and crimp type pins. These components allow you to wire I/O devices to the module using a 40-conductor cable or individual wires.

ATTENTION: To comply with UL restrictions, this equipment must be powered from a source compliant with the following:
Class 2 or Limited Voltage/Current.

When assembled, align the female connector over the module's male header using the keying slot as a guide. Firmly lock them together with the upper and lower retaining arms.

Figure 17 - Option 1 – Wire the Connector with Available 40-pin Connector

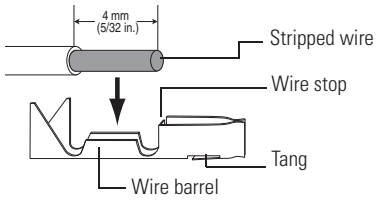


Assemble the Wire Contacts

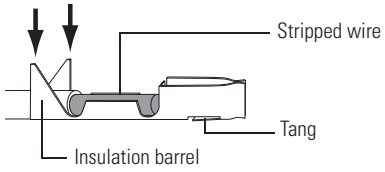
1. Strip the wire insulation to expose 4 mm (5/32 in.) of wire. Crimp pins can accept 0.14...0.34 mm^2 (26...22 AWG) wire.

ATTENTION: Be careful when stripping wires. Wire fragments that fall into the module could cause damage. Once wiring is complete, be sure the module is free of all metal fragments before removing the protective debris strip. Failure to remove the strip before operating can cause overheating.

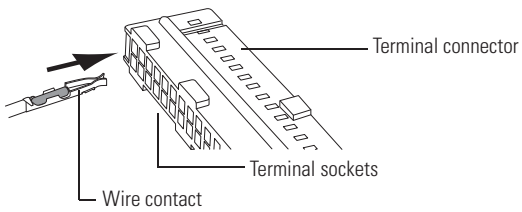
2. Insert the wire into the crimp pin as far as the wire stop.



3. Crimp the wire barrel around the wire using small needle nose pliers.
4. Crimp the insulation barrel around the wire insulation using small needle nose pliers.



5. Solder wire and wire barrel together using lead-free solder and soldering pencil.
6. Insert the assembled wire contact into the terminal socket. Push the wire contact in until the tang latches. Make sure the tang is properly latched by lightly pulling on the wire.



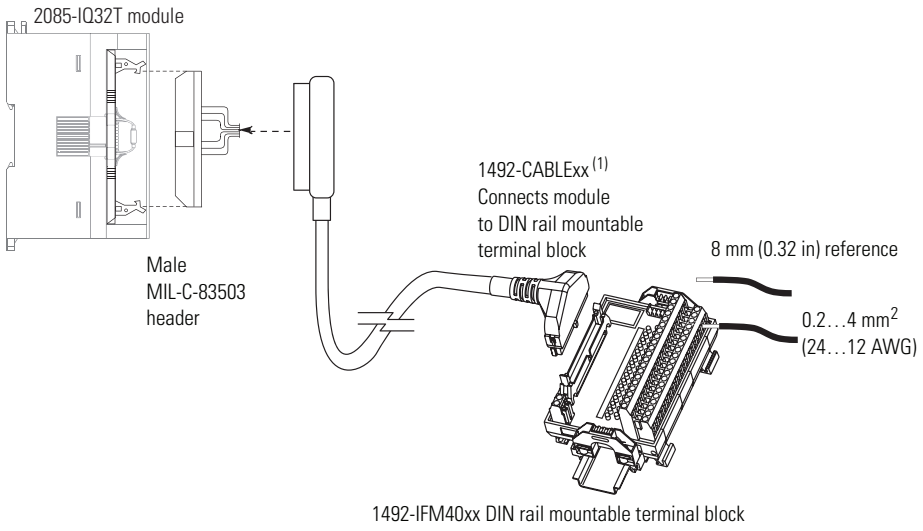
Option 2 – Use Allen-Bradley 1492 Connector Cables with Flying Leads

Preassembled 40-conductor cables with the 40-pin connector on one end and flying leads on the other end are also available from Allen-Bradley. They are available in 1 m (3.3 ft), 2.5 m (8.2 ft), and 5 m (16.4 ft) lengths. The catalog numbers from shortest to longest are:

- 1492-CAB010U62 (or 1492-CAB010P62)
- 1492-CAB025U62 (or 1492-CAB025P62)
- 1492-CAB050U62 (or 1492-CAB050P62)

The "U62" cables route the cable upward when plugged into the module, while "P62" cables route the cable downward when plugged into the module.

Option 3 – Use Allen-Bradley 1492 Cables with Keyed Connectors



(1) Maximum user cable length is dependent on how much voltage drop (current x (ohms/ft.) x (feet)) the user system can tolerate. The user system should take into account the minimum turn-on voltage required by external loads connected to the module, the minimum turn-on voltage required by the module, and all of the voltage drops associated with wiring to and from the load, sensors, terminal blocks, power sources and the module itself. See the table on page 26 for voltage drop values for the 1492 cables shown above.

Allen-Bradley 1492 wiring systems are available for connecting the I/O module to external I/O. These wiring systems include a pre-wired cable available in four lengths: 0.5 m (1.6 ft), 1.0 m (3.3 ft), 2.5 m (8.2 ft), and 5 m (16.4 ft). An interface module for connecting external devices is also available. Cables are equipped with keyed connectors at both ends for proper connections. Interface modules are DIN rail mountable and are available with or without field side status indicating LEDs. Stick-on labels are provided with the interface modules to identify I/O wiring termination points.

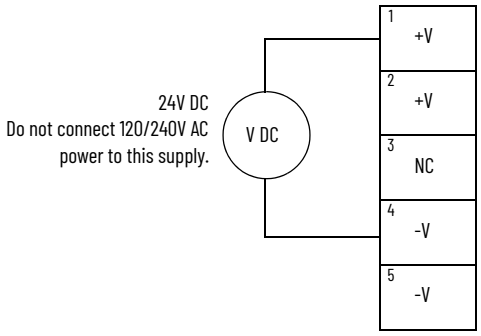
Table 14 - 1492 Cables

Catalog Number	Voltage Drop @ 30 °C (86 °F)		Voltage Drop @ 60 °C (140 °F)	
Series C Cables	**V DC and DC Com Wires(1)**	**Output Channel Wires(2)**	**V DC and DC Com Wires**	**Output Channel Wires**
1492-CABLE005H	127 mv	34 mv	144 mv	38 mv
1492-CABLE010H	173 mv	45 mv	196 mv	51 mv
1492-CABLE025H	334 mv	83 mv	388 mv	95 mv
1492-CABLE050H	574 mv	147 mv	686 mv	169 mv

(1) Voltage drop at maximum rated current of 2 A per conductor.
(2) Voltage drop at maximum rated current of 0.5 A per output channel.

Expansion I/O Power Supply Wiring

One 5-pin removable terminal block (RTB) is included with your 2085-EP24VDC module. Use a single external power supply to power both the module and Micro800 controller.



ATTENTION: To comply with the CE Low Voltage Directive (LVD), this equipment must be powered from a source compliant with the following: Safety Extra Low Voltage (SELV) or Protected Extra Low Voltage (PELV).

Notes:

Configure Your Expansion I/O Module

Overview

The following sample project guides you through the step-by-step process of adding, configuring, deleting, and replacing Micro800 expansion I/O modules in Connected Components Workbench software.

For more information about using the Connected Components Workbench software, you can refer to the Connected Components Workbench Online Help (it comes with your software).

In this sample project, you need to create a Connected Components Workbench project with a 2080-LC50-24QWB controller. Then, configure four expansion I/O devices (2085-IF4, 2085-IQ32T, 2085-OB16, 2085-IRT4) following the instructions below.

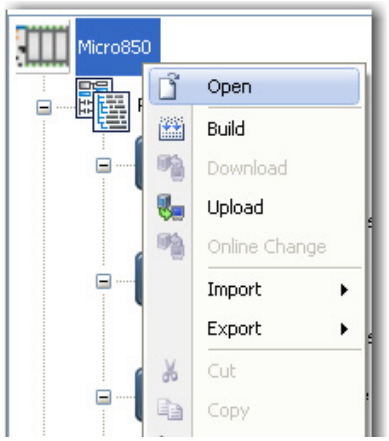
These instructions make use of the drag-and-drop mechanism available in Connected Components Workbench software, which allows the user to easily add, replace, and delete devices through simple drag-and-drop motion.

Add an Expansion I/O

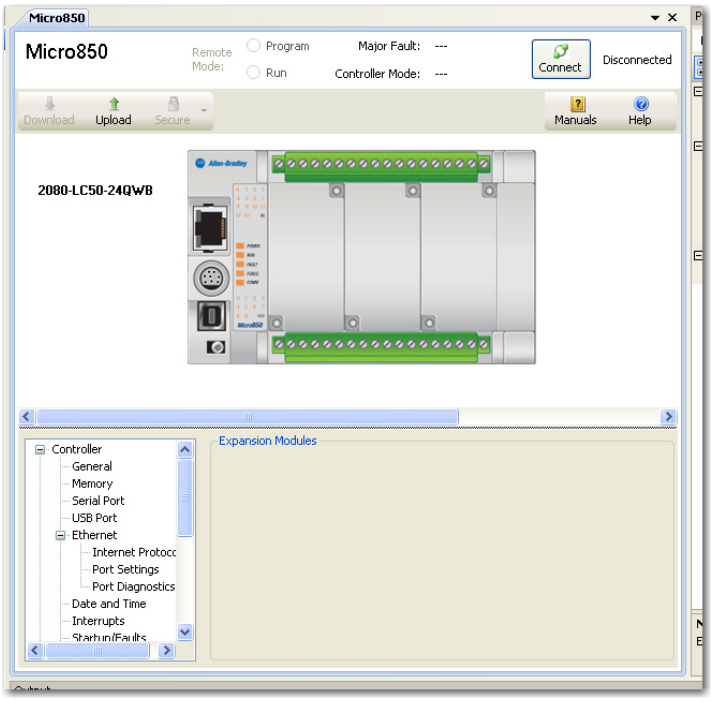
Expansion I/O modules are automatically added to a project when using the "Discover" feature in Connected Components Workbench software.

To add expansion I/O modules to an existing Micro800 controller project, do the following:

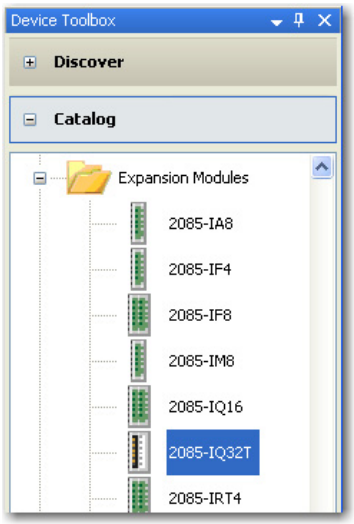
1. On the Project organizer pane, right-click Micro850 and choose Open.



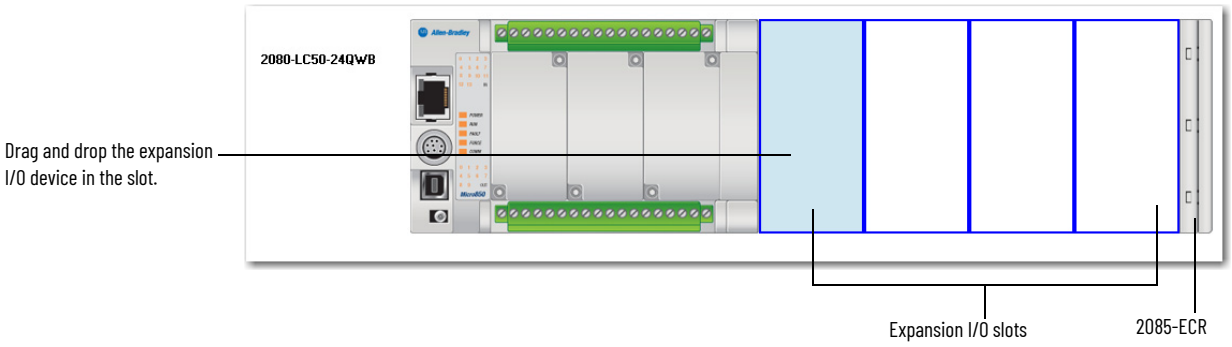
The Micro850 project page opens in the center pane with a graphical replica of the Micro850 controller on the first tier, Controller properties on the second tier, and an Output box on the last tier.

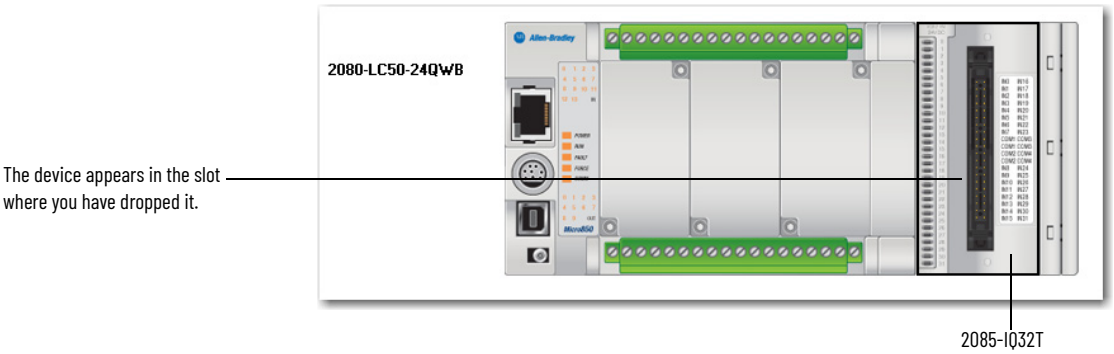


2. On the Device Toolbox pane, found at the rightmost corner of the Connected Components Workbench window, go to the Expansion Modules folder.

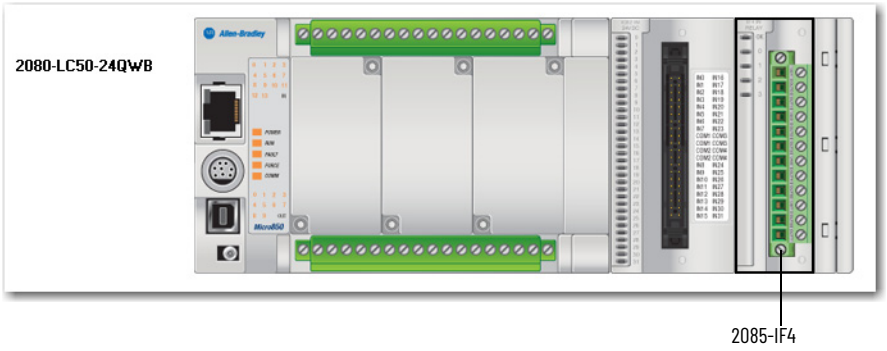


3. Click and drag 2085-IQ32T to the right of the controller graphic at the center pane. Four blue slots appear to indicate available slots for expansion I/O modules. Drop 2085-IQ32T on the first and rightmost slot against the controller.





4. From the Expansion Modules folder on the Device Toolbox pane, drag and drop 2085-IF4 on the second Expansion I/O slot, next to 2085-IQ32T.

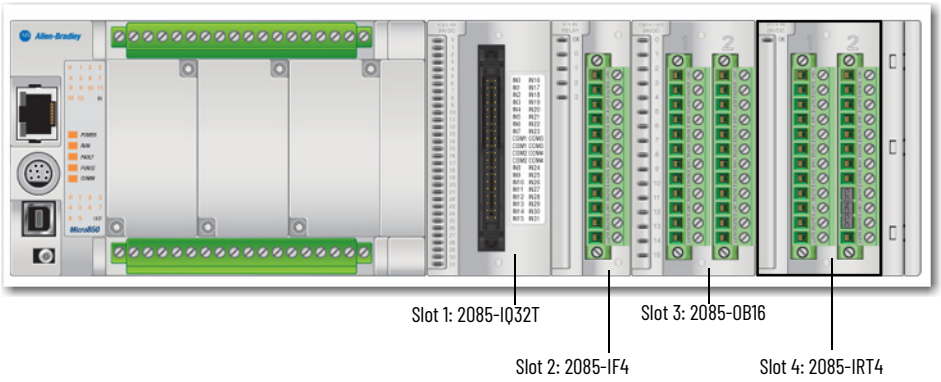


To move an expansion I/O device to another slot, simply drag and drop the device to the preferred slot. For step-by-step instructions on how to delete and replace expansion I/O devices, see Delete and Replace an Expansion I/O Configuration on page 38.

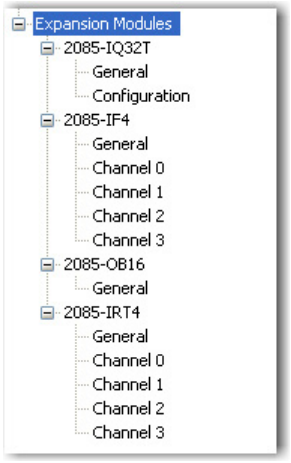
5. From the Expansion Modules folder on the Device Toolbox, drag and drop 2085-OB16 on the third Expansion I/O slot, next to 2085-IF4.
6. From the Expansion Modules folder on the Device Toolbox pane, drag and drop 2085-IRT4 on the fourth Expansion I/O slot, next to 2085-IRT4.

You can edit default configuration by following the procedure provided in the next section, Edit Expansion I/O Configuration on page 32.

After you have added all four expansion I/O modules, your Connected Components Workbench project should look like this:



The Expansion Modules list should appear as shown below. To see device details for each of the expansion I/O you have just added, select General. To see default configuration properties, select Configuration, if available.

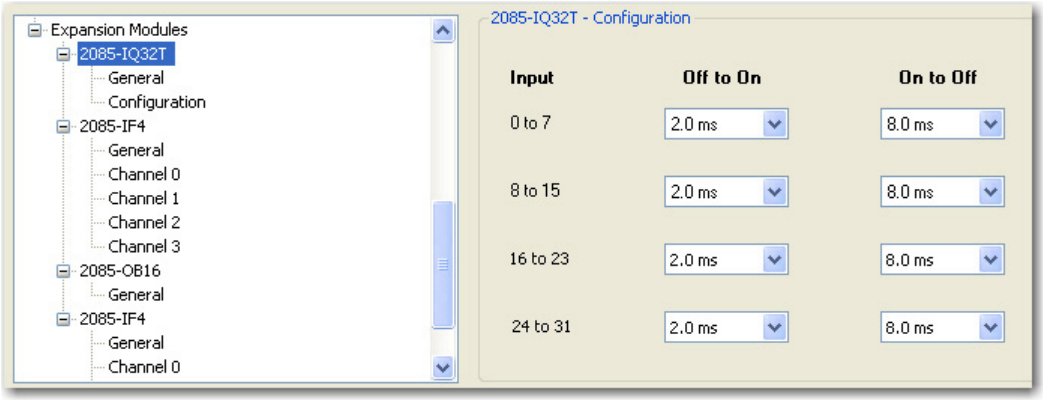


Edit Expansion I/O Configuration

You can edit default I/O configuration through the Expansion Modules Details box located right below the controller graphic.

IMPORTANT To download configuration to your device, see Build, Save, Download a Project with Expansion I/O Configuration on page 40.

1. Select the Expansion I/O device you want to configure.

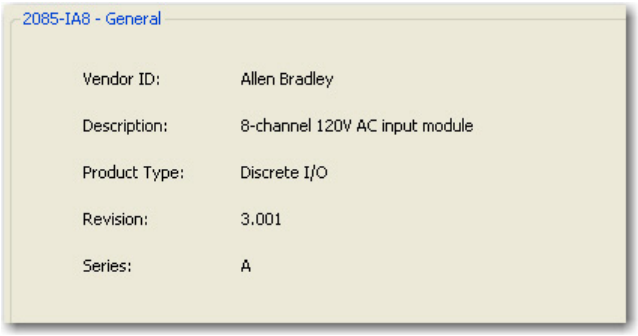


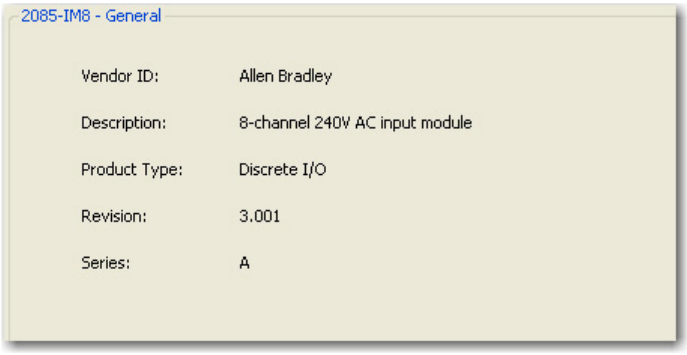
2. Click Configuration. Edit module and channel properties according to your requirements and application.

The next sections show you configuration properties for each of the expansion I/O module.

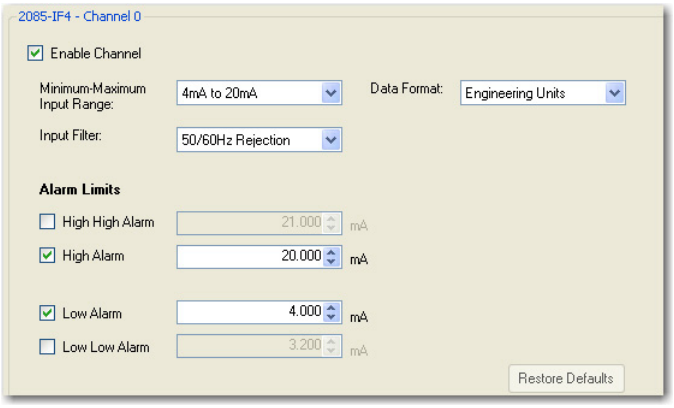
2085-IA8 and 2085-IM8

These two AC input modules only have general device details available for the user in Connected Components Workbench software. No configuration properties are available.



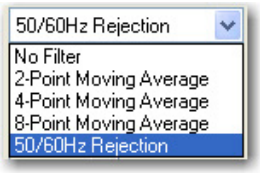


2085-IF4 and 2085-IF8



For the analog input modules, 2085-IF4 and 2085-IF8, you can configure properties such as input range, format, filter and alarm limits for each individual channel.

Table 15 - Configuration Parameters for 2085-IF4 and 2085-IF8

Configuration Property	What to do	Description
Enable channel	Select or deselect the checkbox. The box is selected by default.	Enable or disable a channel through this checkbox. By default, each channel is enabled.
Minimum-maximum input range	Choose from a range of values: • 0...20 mA • 4...20 mA (default) • -10...10 V • 0...10 V	Defines the input mode for the channel as either voltage or current, with current as default mode.
Data format	Select from the following options: • Raw/Proportional Data • Engineering Units (default) • Percent Range	See Analog Data Formats on page 12 for detailed information.
Input filter	Choose from the following values: 	See Input Filter on page 14 for detailed information.
High High alarm High alarm Low alarm Low Low alarm	Check the checkbox to enable an alarm. By default, High High and Low Low alarms are disabled and High and Low alarms are enabled.	Process level alarms alert you when the module has exceeded configured High, High High, Low, and Low Low limits for each channel.

2085-IQ16 and 2085-IQ32T

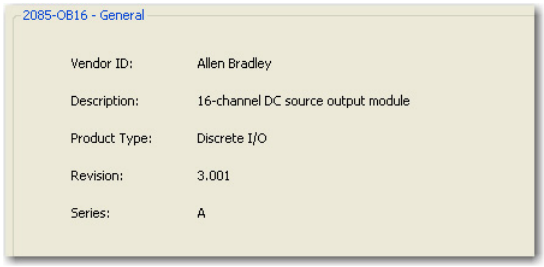
For the 16- and 32-channel DC input modules, 2085-IQ16 and 2085-IQ32T respectively, you can configure OFF to ON and ON to OFF ranges.

Table 16 - Configuration Parameters for 2085-IQ16 and 2085-IQ32T

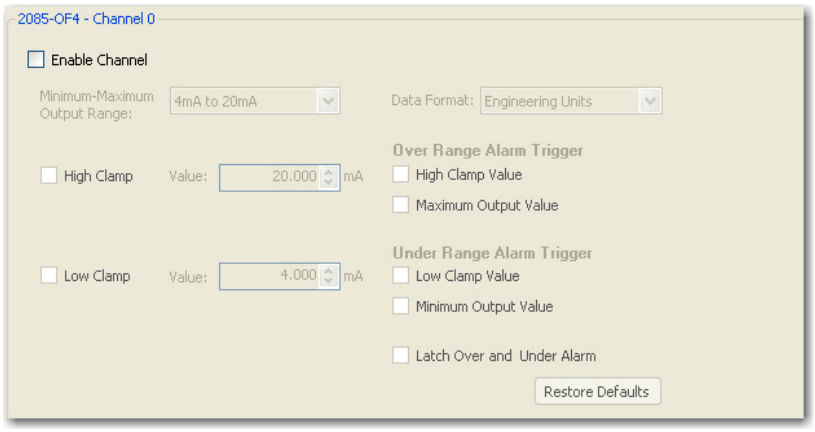
Configuration Property	What to do
Input	–
OFF to ON	Choose from the following values: • 8.0 ms • 4.0 ms • 2.0 ms (default) • 1.0 ms • 0.5 ms • 0.1 ms • 0.0 ms
ON to OFF	Choose from the following values: • 8.0 ms (default) • 4.0 ms • 2.0 ms • 1.0 ms • 0.5 ms • 0.1 ms • 0.0 ms

2085-OV16, 2085-OB16, 2085-OW16, 2085-OA8, 2085-OW8

The output modules, 2085-OV16, 2085-OB16, 2085-OW16, 2085-OA8, and 2085-OW8, only have device details available to the user in Connected Components Workbench software. There are no user configuration pages for these modules in the Connected Components Workbench software.



2085-OF4

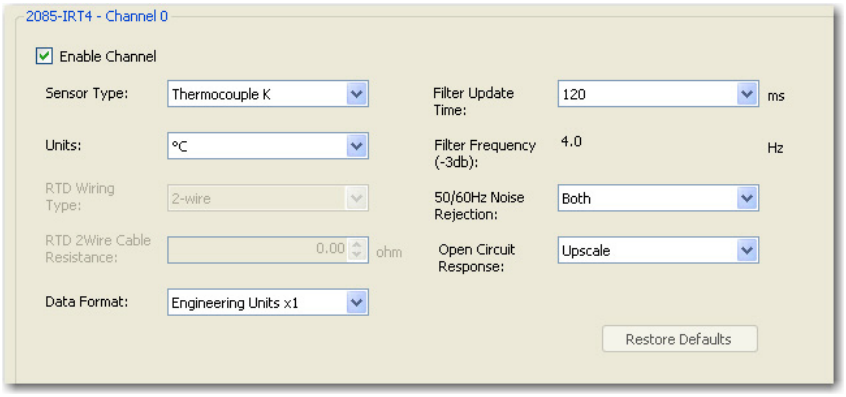


For the analog output module, 2085-OF4, you can configure output unit, minimum to maximum output range, high clamp and low clamp values, and overrange and underrange values.

Table 17 - Configuration Parameters for 2085-OF4

Configuration Property	What to do	Description
Enable channel	Select or deselect the checkbox. Channel is not enabled by default.	Enable or disable a channel through this checkbox. By default, each channel is disabled.
Minimum-maximum output range	Choose from a range of values: • 0...20 mA • 4...20 mA (default) • -10...10 V • 0...10 V	For more information, see: Input/Output Types and Ranges on page 12 Valid Range of the Data Formats for 2085-IF4, 2085-IF8, and 2085-OF4 on page 13
Data format	Select from the following options: • Raw/Proportional Data • Engineering Units (default) • Percentage Data	See Analog Data Formats on page 12 for detailed information.
High clamp value	Select the checkbox to enable and enter a high clamp value.	Sets an appropriate alarm that limits the output from the analog module to remain within a range configured by the controller, even when the controller commands an output outside that range. This safety feature sets a high clamp and a low clamp. Once clamps are determined for a module, any data received from the controller that exceeds those clamps sets an appropriate limit alarm and transitions the output to that limit but not beyond the requested value.
Low clamp value	Select the checkbox to enable and enter a low clamp value.	
Overrange alarm trigger	If you enabled and entered a High Clamp value, you can check High Clamp Value as overrange alarm trigger.  If you did not enable and entered a High Clamp value, you can check Maximum Output Value as your overrange alarm trigger. 	The overrange and underrange feature detects when the output module is operating beyond limits set by the output range. The trigger could be set based on clamp values or minimum/maximum output values.
Underrange alarm trigger	If you enabled and entered a Low Clamp value, you can check Low Clamp Value to set it as underrange alarm trigger.  If you did not enable and entered a Low Clamp value, you can check Minimum Output Value as underrange alarm trigger. 	
Latch over and under alarm	Select to latch.	Check the box to latch an alarm in the set position even if the condition that causes the alarm disappears.
Restore defaults	Select button to restore defaults.	Restores default device properties

2085-IRT4



For the RTD and Thermocouple expansion I/O module, 2085-IRT4, you can configure sensor type, data format, temperature units, and other properties, on each of the four individual channels.

Table 18 - Configuration Parameters for 2085-IRT4

Configuration Property	What to do	Description
Enable channel	Select the box to enable.	This parameter enables the particular channel for operation.
Sensor type	Select from the following sensors: • 100 Ω Platinum 385 • 200 Ω Platinum 385 • 100 Ω Platinum 3916 • 200 Ω Platinum 3916 • 100 Ω Nickel 618 • 200 Ω Nickel 618 • 120 Ω Nickel 672 • 100 Ω Copper 427 • 0…500 Ohm • 0…100 mV • Thermocouple B • Thermocouple C • Thermocouple E • Thermocouple J • Thermocouple K • Thermocouple TXK/XK (L) • Thermocouple N • Thermocouple R • Thermocouple S • Thermocouple T	Defines the RTD or Thermocouple sensor type for the channel
Units	Set as °C or °F	Sets the temperature unit to be used by the channel
RTD wiring type	Set as any of the following: • 2-wire • 3-wire • 4-wire	The wiring type for channel x. This parameter is only available when the Sensor Type for the channel is RTD or (0 to 500 Ohm).
RTD 2-wire cable resistance	Replace value from 0.0…500.00 ohms to 0.0…655.35 ohms.	The specified cable resistance for the 2-wire cable. When the RTD 2-wire cable resistance value is smaller than the input value, it is subtracted from the input value during each read. When the value is greater than the input value, the under-range or open status bit is set (1). To configure the wire resistance, the sensor type must be RTD or (0…500 Ohm) and the RTD Wiring Type must be 2-wire. Otherwise, this parameter is not available.
Data format	Choose from the following options: • Raw/Proportional Data • Engineering Units*1 • Engineering Units*10 • Percent range	For more information, see: Data Format on page 16 Valid Range of the Data Formats for 2085-IRT4 on page 17

Table 18 - Configuration Parameters for 2085-IRT4 (Continued)

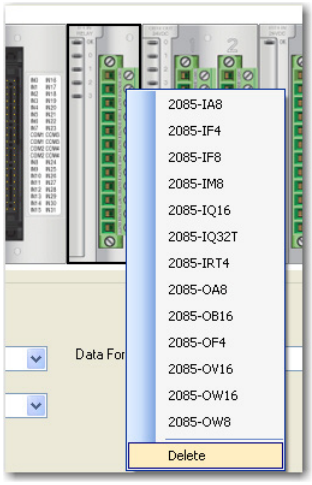
Configuration Property	What to do	Description
Filter update time	Set as the following (in msec): • 4 • 8 • 16 • 32 • 40 • 48 • 60 • 101 • 120 • 160 • 200 • 240 • 320 • 480	See Filter Frequency on page 18. NOTE: Filter update time 4 ms is not available for Thermocouple sensor types B, R, S, E, J, C, K, L, N, or T or 0...10 mV. Filter update time 8 ms is not available for Thermocouple sensor types B, R, S.
Filter frequency (-3dB)	• Set as the following (in Hz): • 114 • 60 • 30 • 14 • 12 • 9.4 • 8.0 • 4.7 • 4.0 • 3.0 • 2.4 • 2.0 • 1.5 • 1.0	
50/60 Hz noise rejection	Set as: • Both (default) • 50 Only • 60 Only • Neither	See Noise Rejection on page 14.
Open circuit response	Choose from the following options: • Upscale • Downscale • Hold Last State • Zero	Defines the response to be taken during an open circuit, whether to upscale, downscale, hold last state, or zero. **Upscale** – Sets input to full upper scale value of channel data word. The full-scale value is determined by the selected input type, data format, and scaling. **Downscale** – Sets input to full lower scale value of channel data word. The low scale value is determined by the selected input type, data format, and scaling. **Hold Last State** – Sets input to last input value. **Zero** – Sets input to 0 to force the channel data word to 0.

Delete and Replace an Expansion I/O Configuration

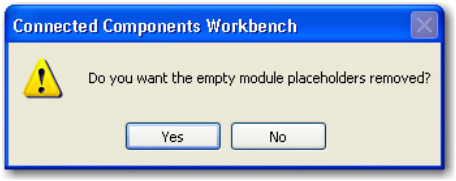
Using our example project, let us try to delete 2085-IF4 in slot 2 and 2085-OB16 in slot 3. Then, let us replace the modules with 2085-OW16 and another 2085-IQ32T module in slots 2 and 3, respectively.

To do this:

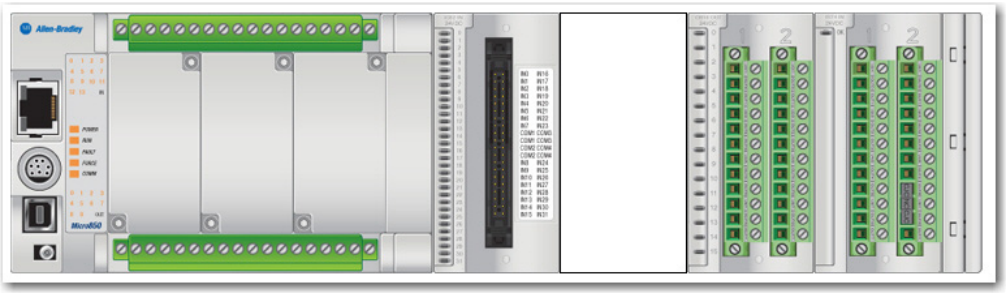
1. On the project graphic in the center pane, right-click 2085-IF4 and select Delete.



2. Another message box appears asking you if you want to empty the placeholders to the left to fill the empty slot. Click No.

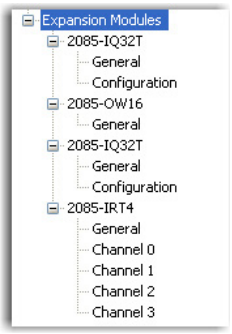


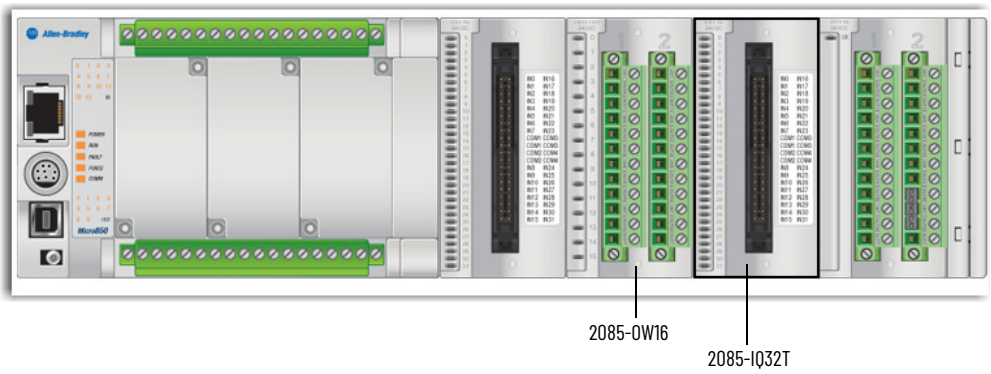
After deleting 2085-IF4 from slot 2, the project graphic should look like as follows:



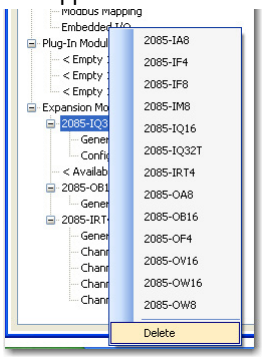
3. On the empty slot (slot 2), right-click and select 2085-OW16.
4. Next, replace 2085-OB16 in slot 3 with a 2085-IQ32T device.
   Right-click 2085-OB16 in slot 3, and choose 2085-IQ32T.

   The project graphic and Expansion Modules list should look as follows after the modules are replaced:





You can also delete and replace an expansion I/O through the Expansion Modules list. To replace, right-click the expansion I/O module you would like to replace, then select the Expansion I/O module you would like to replace it with, from the list that appears. To delete the Expansion I/O, choose Delete.



Build, Save, Download a Project with Expansion I/O Configuration

To learn how to build, save, and download the project to your controller, see the Connected Components Workbench Online Help.

Expansion I/O Data Mapping

This section includes I/O data mapping for the discrete, analog, and specialty expansion I/O modules.

Discrete I/O Data Mapping

Use the Connected Components Workbench software to see Global Variables.

2085-IQ16 and 2085-IQ32T I/O Data Mapping

Discrete input states can be read from Global Variables _IO_Xx_DI_yy, where 'x' represents the expansion slot number 1...4 and 'yy' represents the point number 00...15 for 2085-IQ16 and 00...31 for 2085-IQ32T.

2085-OV16 and 2085-OB16 I/O Data Mapping

Discrete output states can be read from Global Variables _IO_Xx_ST_yy, where 'x' represents the expansion slot number 1...4 and 'yy' represents the point number 00...15.

Discrete output states can be written to Global Variables _IO_Xx_DO_yy, where 'x' represents the expansion slot number 1...4 and 'yy' represents the point number 00...15.

2085-IA8 and 2085-IM8 I/O Data Mapping

Discrete input states can be read from Global Variables _IO_Xx_DI_yy, where 'x' represents the expansion slot number 1...4 and 'yy' represents the point number 00...07.

2085-OA8 I/O Data Mapping

Discrete output states can be read from Global Variables _IO_Xx_ST_yy, where 'x' represents the expansion slot number 1...4 and 'yy' represents the point number 00...07.

Discrete output states can be written to Global Variables _IO_Xx_DO_yy, where 'x' represents the expansion slot number 1...4 and 'yy' represents the point number 00...07.

2085-OW8 and 2085-OW16 I/O Data Mapping

Discrete output states can be read from Global Variables _IO_Xx_ST_yy, where 'x' represents the expansion slot number 1...4 and 'yy' represents the point number 00...07 for 2085-OW8 and 00...15 for 2085-OW16.

Discrete output states can be written to Global Variables _IO_Xx_DO_yy, where 'x' represents the expansion slot number 1...4 and 'yy' represents the point number 00...07 for 2085-OW8 and 00...15 for 2085-OW16.

Analog I/O Data Mapping

The following sections provide I/O and status mapping for the following analog expansion I/O modules:

Catalog Number	Description
2085-IF4	4-channel, 14-bit analog voltage/current input module
2085-IF8	8-channel, 14-bit analog voltage/current input module
2085-OF4	4-channel, 12-bit analog voltage/current output module
2085-IRT4	4-channel, 16-bit RTD and Thermocouple input module

Use the Connected Components Workbench software to see Global Variables.

2085-IF4 I/O Data Mapping

Analog input values are read from Global Variables _IO_Xx_AI_yy, where 'x' represents the expansion slot number 1...4 and 'yy' represents the channel number 00...03.

Analog input status values can be read from Global Variables IO_Xx_ST_yy, where 'x' represents the expansion slot number 1...4 and 'yy' represents the status word number 00...02.

Table 19 - 2085-IF4(1) Status Data Mapping

Word	R/W	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Status 0	R	PU	GF	CRC	Reserved												
Status 1	R	Reserved		HHA1	LLA1	HA1	LA1	DE1	S1	Reserved		HHA0	LLA0	HA0	LA0	DE0	S0
Status 2	R	Reserved		HHA3	LLA3	HA3	LA3	DE3	S3	Reserved		HHA2	LLA2	HA2	LA2	DE2	S2

(1) See Field Descriptions for 2085-IF4 and 2085-IF8 Input Modules on page 42 for definition of each bit.

2085-IF8 I/O Data Mapping

Analog input values are read from Global Variables _IO_Xx_AI_yy, where 'x' represents the expansion slot number 1...4 and 'yy' represents the channel number 00...07.

Analog input status values can be read from Global Variables IO_Xx_ST_yy, where 'x' represents the expansion slot number 1...4 and 'yy' represents the status word number 00...04. Individual bits within a status word can be read by appending '.zz' to the Global Variable name, where 'zz' is the bit number 00...15.

Table 20 - 2085-IF8(1) Status Data Mapping

Word	R/W	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Status 0	R	PU	GF	CRC	Reserved												
Status 1	R	Reserved		HHA1	LLA1	HA1	LA1	DE1	S1	Reserved		HHA0	LLA0	HA0	LA0	DE0	S0
Status 2	R	Reserved		HHA3	LLA3	HA3	LA3	DE3	S3	Reserved		HHA2	LLA2	HA2	LA2	DE2	S2
Status 3	R	Reserved		HHA5	LLA5	HA5	LA5	DE5	S5	Reserved		HHA4	LLA4	HA4	LA4	DE4	S4
Status 4	R	Reserved		HHA7	LLA7	HA7	LA7	DE7	S7	Reserved		HHA6	LLA6	HA6	LA6	DE6	S6

(1) See Field Descriptions for 2085-IF4 and 2085-IF8 Input Modules on page 42 for a detailed definition of each bit.

Table 21 - Field Descriptions for 2085-IF4 and 2085-IF8 Input Modules

Field	Description	
CRC	CRC error	This bit is set (1) when there is a CRC error on the data received. It gets cleared when the next good data is received.
DE#	Data error	These bits are set (1) when the enabled input channels are not getting any reading for the current sampling. The respective returned Input Data value remains the same as the previous sample.
GF	General fault	This bit is set (1) when any of these faults occur: RAM test failure, ROM test failure, EEPROM failure, and reserved bits. All channel fault bits (S#) are set too.
HA#	High Alarm overrange	These bits are set (1) when the input channel exceeds a preset high limit defined by the configuration selected (UL# is set).

Table 21 - Field Descriptions for 2085-IF4 and 2085-IF8 Input Modules (Continued)

Field	Description	
HHA#	High High Alarm overrange	These bits are set (1) when the input channel exceeds a preset high-high limit defined by the configuration selected (UL# is set).
LA#	Low Alarm underrange	These bits are set (1) when the input channel goes below the configured low alarm limit.
LLA#	Low Low Alarm underrange	These bits are set (1) when the input channel goes below the configured low-low alarm limit.
PU	Power up	This bit is set after a power on. It is cleared when good configuration data is accepted by the module. It is set when an unexpected MCU reset occurs in RUN mode. All channel fault bits (S#) are set too. The module stays connected with no configuration after the reset. PU and channel fault bits (S#) are cleared when a good configuration is accepted.
S#	Channel fault	These bits are set(1) if the corresponding channels are open, have data error or under/overrange.

2085-OF4 I/O Data Mapping

Analog output data can be written to Global Variables _IO_Xx_AO_yy, where 'x' represents the expansion slot number 1...4 and 'yy' represents the channel number 00...03.

Control bit states can be written to Global Variable _IO_Xx_CO_00.zz, where 'x' represents the expansion slot number 1...4 and 'zz' represents the bit number 00...12.

Table 22 - 2085-OF4 Control Data Mapping

Word	Bit Position															
	15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Control 0	Reserved				CE3	CE2	CE1	CE0	UU3	UO3	UU2	UO2	UU1	UO1	UU0	UO0

Channel Alarm/Error Unlatch

UU*x* and **UO*x*** are written during run mode to clear any latched underrange and overrange alarms. The alarm is unlatched when the unlatch bit is set (1) and the alarm condition no longer exists. If the alarm condition persists, then the unlatch bit has no effect.

CE*x* are written during run mode to clear any DAC hardware error bits and re-enable the error-disabled channel x.

You need to keep the unlatch bit set until verification from the appropriate input channel status word says that the alarm status bit has cleared (0), then you need to reset (0) the unlatch bit.

Status Data

Analog output status can be read from Global Variables IO_Xx_ST_yy, where 'x' represents the expansion slot number 1...4 and 'yy' represents the status word number 00...06. Individual bits within a status word can be read by appending a '.zz' to the Global Variable name, where 'zz' is the bit number 00...15.

Table 23 - 2085-OF4 Status Data Mapping

Word	Bit Position															
	15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**
Status 0	Channel 0 Data Value															
Status 1	Channel 1 Data Value															
Status 2	Channel 2 Data Value															
Status 3	Channel 3 Data Value															
Status 4	PU	GF	CRC	Reserved	Reserved				E3	E2	E1	E0	S3	S2	S1	S0
Status 5	Reserved		U3	O3	Reserved		U2	O2	Reserved		U1	O1	Reserved		U0	O0
Status 6	Reserved															

Table 24 - Field Descriptions for 2085-OF4 Status Word

Field	Description	
CRC	CRC error	Indicates there is a CRC error on data receive. All channel fault bits (Sx) are also set. The error is cleared when the next good data is received.
Ex	Error	Indicates there is an DAC hardware error, broken wire or high load resistance associated with the channel *x*, an error code may be displayed on the respective input word (0...3) and the corresponding channel is locked (disabled) until user clears the error by writing the CE*x* bit in output data.
GF	General fault	Indicates a fault has occurred, including: RAM test failure, ROM test failure, EEPROM failure, and reserved bits. All channel fault bits (Sx) are also set.
Ox	Overrange flag	Indicates the controller is attempting to drive the analog output above its normal operating range or above the channel's High Clamp level. However the module continues to convert analog output data to a maximum full range value if clamp levels are not set for the channel.
PU	Power up	Indicates an unexpected MCU reset has occurred in RUN mode. All channel error bits (Ex) and fault bits (Sx) are also set. The module stays connected with no configuration after the reset. PU and channel fault bits are cleared when a good configuration is downloaded.
Sx	Channel fault	Indicates there is an error associated with the channel x.
Ux	Underrange flag	Indicates the controller is attempting to drive the analog output below its normal operating range or below the channel's Low Clamp level (if clamp limits are set for the channel).

Specialty I/O Data Mapping

2085-IRT4 I/O Data Mapping

Analog input values can be read from Global Variables _IO_Xx_AI_yy, where 'x' represents the expansion slot number 1...4 and 'yy' represents the channel number 00...03.

Analog input status can be read from Global Variables IO_Xx_ST_yy, where 'x' represents the expansion slot number 1...4 and 'yy' represents the status word number 00...02. Individual bits within a status word can be read by appending a '.zz' to the Global Variable name, where 'zz' is the bit number 00...15.

Table 25 - 2085-IRT4 Status Data Mapping

Word	Bit Position															
	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Status 0	DE3	DE2	DE1	DE0	OC3	OC2	OC1	OC0	R3	R2	R1	R0	S3	S2	S1	S0
Status 1	O3	O2	O1	O0	U3	U2	U1	U0	T3	T2	T1	T0	CJC over	CJC under	CJC OC	CJC DE
Status 2	PU	GF	CRC	Reserved												

Table 26 - Field Descriptions for 2085-IRT4

Field	Description	
CJC OC	CJC open circuit	Indicates that the cold junction sensor is open-circuit. CJC DE bit, when set, indicates the cold junction sensor current readings is not reliable. The previous reading shall be used instead. It indicates internal compensation status if Tx is set.
CJC DE	CJC data error	Indicates that the cold junction sensor current readings is not reliable. The previous reading will be used instead. It indicates internal compensation status if Tx is set.
CJC over	CJC overrange	Indicates cold junction sensor overrange (above 75 °C).
CJC under	CJC underrange	Indicates cold junction sensor is underrange (below -25 °C).
CRC	CRC error	Indicates there is a CRC error on data receive. All channelfault bits (Sx) are also set. The error is cleared when the next good data is received.
DEx	Data error	Indicates that the current input data is not reliable. The previous input data is sent to the controller instead. Diagnostic status bits are for internal use only.

Table 26 - Field Descriptions for 2085-IRT4 (Continued)

Field	Description	
GF	General fault	Indicates a fault has occurred, including: RAM test failure, ROM test failure, EEPROM failure, and reserved bits. All channel fault bits (Sx) are also set.
OCx	Open-circuit flag	Indicates that an open-circuit condition exists on the channel x.
Ox	Overrange flag	Indicates the controller is attempting to drive the analog input above its normal operating range or above the channel's High Clamp level. However the module continues to convert analog input data to a maximum full range value if clamp levels are not set for the channel.
PU	Power up	Indicates an unexpected MCU reset has occurred in RUN mode. All channel error bits (Ex) and fault bits (Sx) are also set. The module stays connected with no configuration after the reset. PU and channel fault bits are cleared when a good configuration is downloaded.
Rx	RTD compensation	Indicates that the RTD compensation of channel x is not working. This is effective for RTD and ohm type only.
Sx	Channel fault	Indicates there is an error associated with the channel x.
Tx	Thermocouple compensation	Indicates that the thermocouple compensation of channel x is not working. This is effective for thermocouple type only.
Ux	Underrange flag	Indicates that the input of channel x is at the minimum end of its normal operating range. The module automatically resets the bit when the under-range condition is cleared and the data value is within the normal operating range.

Calibration of Analog Modules

The analog modules are shipped to you calibrated.

Notes:

Numerics

1492-CAB010P62 26
1492-CAB010U62 26
1492-CAB025P62 26
1492-CAB025U62 26
1492-CAB050P62 26
1492-CAB050U62 26
2085-ECR 7
2085-EP24VDC 7
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2085-IA8 7, 11
  configuration parameters 33
  I/O data mapping 41
  wiring 19
2085-IF4 7, 12, 38
  configuration parameters 33
  I/O data mapping 42
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