Modicon Quantum 140CRA31908

Adapter Module Installation and Configuration Guide

Original instructions

10/2019

NVE75259.04

www.schneider-electric.com

Schneider Electric

The information provided in this documentation contains general descriptions and/or technical characteristics of the performance of the products contained herein. This documentation is not intended as a substitute for and is not to be used for determining suitability or reliability of these products for specific user applications. It is the duty of any such user or integrator to perform the appropriate and complete risk analysis, evaluation and testing of the products with respect to the relevant specific application or use thereof. Neither Schneider Electric nor any of its affiliates or subsidiaries shall be responsible or liable for misuse of the information contained herein. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

You agree not to reproduce, other than for your own personal, noncommercial use, all or part of this document on any medium whatsoever without permission of Schneider Electric, given in writing. You also agree not to establish any hypertext links to this document or its content. Schneider Electric does not grant any right or license for the personal and noncommercial use of the document or its content, except for a non-exclusive license to consult it on an "as is" basis, at your own risk. All other rights are reserved.

All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to help ensure compliance with documented system data, only the manufacturer should perform repairs to components.

When devices are used for applications with technical safety requirements, the relevant instructions must be followed.

Failure to use Schneider Electric software or approved software with our hardware products may result in injury, harm, or improper operating results.

Failure to observe this information can result in injury or equipment damage.

Table of Contents

Safety Information

Important Information

NOTICE

Read these instructions carefully, and look at the equipment to become familiar with the device before trying to install, operate, service, or maintain it. The following special messages may appear throughout this documentation or on the equipment to warn of potential hazards or to call attention to information that clarifies or simplifies a procedure.

The addition of this symbol to a “Danger” or “Warning” safety label indicates that an electrical hazard exists which will result in personal injury if the instructions are not followed.

This is the safety alert symbol. It is used to alert you to potential personal injury hazards. Obey all safety messages that follow this symbol to avoid possible injury or death.

⚠ DANGER

DANGER indicates a hazardous situation which, if not avoided, **will result in** death or serious injury.

⚠ WARNING

WARNING indicates a hazardous situation which, if not avoided, **could result in** death or serious injury.

⚠ CAUTION

CAUTION indicates a hazardous situation which, if not avoided, **could result** in minor or moderate injury.

NOTICE

NOTICE is used to address practices not related to physical injury.

PLEASE NOTE

Electrical equipment should be installed, operated, serviced, and maintained only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material.

A qualified person is one who has skills and knowledge related to the construction and operation of electrical equipment and its installation, and has received safety training to recognize and avoid the hazards involved.

BEFORE YOU BEGIN

Do not use this product on machinery lacking effective point-of-operation guarding. Lack of effective point-of-operation guarding on a machine can result in serious injury to the operator of that machine.

⚠ WARNING

UNGUARDED EQUIPMENT

- Do not use this software and related automation equipment on equipment which does not have point-of-operation protection.
- Do not reach into machinery during operation.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

This automation equipment and related software is used to control a variety of industrial processes. The type or model of automation equipment suitable for each application will vary depending on factors such as the control function required, degree of protection required, production methods, unusual conditions, government regulations, etc. In some applications, more than one processor may be required, as when backup redundancy is needed.

Only you, the user, machine builder or system integrator can be aware of all the conditions and factors present during setup, operation, and maintenance of the machine and, therefore, can determine the automation equipment and the related safeties and interlocks which can be properly used. When selecting automation and control equipment and related software for a particular application, you should refer to the applicable local and national standards and regulations. The National Safety Council's Accident Prevention Manual (nationally recognized in the United States of America) also provides much useful information.

In some applications, such as packaging machinery, additional operator protection such as point-of-operation guarding must be provided. This is necessary if the operator's hands and other parts of the body are free to enter the pinch points or other hazardous areas and serious injury can occur. Software products alone cannot protect an operator from injury. For this reason the software cannot be substituted for or take the place of point-of-operation protection.

Ensure that appropriate safeties and mechanical/electrical interlocks related to point-of-operation protection have been installed and are operational before placing the equipment into service. All interlocks and safeties related to point-of-operation protection must be coordinated with the related automation equipment and software programming.

NOTE: Coordination of safeties and mechanical/electrical interlocks for point-of-operation protection is outside the scope of the Function Block Library, System User Guide, or other implementation referenced in this documentation.

START-UP AND TEST

Before using electrical control and automation equipment for regular operation after installation, the system should be given a start-up test by qualified personnel to verify correct operation of the equipment. It is important that arrangements for such a check be made and that enough time is allowed to perform complete and satisfactory testing.

⚠ WARNING

EQUIPMENT OPERATION HAZARD

- Verify that all installation and set up procedures have been completed.
- Before operational tests are performed, remove all blocks or other temporary holding means used for shipment from all component devices.
- Remove tools, meters, and debris from equipment.

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Follow all start-up tests recommended in the equipment documentation. Store all equipment documentation for future references.

Software testing must be done in both simulated and real environments.

Verify that the completed system is free from all short circuits and temporary grounds that are not installed according to local regulations (according to the National Electrical Code in the U.S.A, for instance). If high-potential voltage testing is necessary, follow recommendations in equipment documentation to prevent accidental equipment damage.

Before energizing equipment:

- Remove tools, meters, and debris from equipment.
- Close the equipment enclosure door.
- Remove all temporary grounds from incoming power lines.
- Perform all start-up tests recommended by the manufacturer.

OPERATION AND ADJUSTMENTS

The following precautions are from the NEMA Standards Publication ICS 7.1-1995 (English version prevails):

- Regardless of the care exercised in the design and manufacture of equipment or in the selection and ratings of components, there are hazards that can be encountered if such equipment is improperly operated.
- It is sometimes possible to misadjust the equipment and thus produce unsatisfactory or unsafe operation. Always use the manufacturer's instructions as a guide for functional adjustments. Personnel who have access to these adjustments should be familiar with the equipment manufacturer's instructions and the machinery used with the electrical equipment.
- Only those operational adjustments actually required by the operator should be accessible to the operator. Access to other controls should be restricted to prevent unauthorized changes in operating characteristics.

About the Book

At a Glance

Document Scope

This guide describes the 140CRA31908 adapter module. Use this module to modernize S908 architectures to M580 systems.

Quantum or 984 CPUs drive S908 non-Ethernet RIO architectures. When you mount and install the 140CRA31908 module in am X80 drop in an M580 system, you can attach S908 architectures to that X80 drop and allow your S908 network to communicate with the M580 network.

NOTE: The 140CRA31908 module is not compatible with Quantum Ethernet I/O architectures; the module cannot be scanned by a Quantum 140CRP31200 communication module.

NOTE: The specific configuration settings contained in this guide are intended to be used for instructional purposes only. The settings required for your specific configuration may differ from the examples presented in this guide.

Validity Note

This document is valid for an M580 system when used with EcoStruxure™ Control Expert 14.1 or later.

For product compliance and environmental information (RoHS, REACH, PEP, EOLI, etc.), go to *www.schneider-electric.com/green-premium*.

The technical characteristics of the devices described in the present document also appear online. To access the information online:

Step	Action
1	Go to the Schneider Electric home page *www.schneider-electric.com*.
2	In the **Search** box type the reference of a product or the name of a product range. ● Do not include blank spaces in the reference or product range. ● To get information on grouping similar modules, use asterisks (*).
3	If you entered a reference, go to the **Product Datasheets** search results and click on the reference that interests you. If you entered the name of a product range, go to the **Product Ranges** search results and click on the product range that interests you.
4	If more than one reference appears in the **Products** search results, click on the reference that interests you.
5	Depending on the size of your screen, you may need to scroll down to see the datasheet.
6	To save or print a datasheet as a .pdf file, click **Download XXX product datasheet**.

The characteristics that are presented in the present document should be the same as those characteristics that appear online. In line with our policy of constant improvement, we may revise content over time to improve clarity and accuracy. If you see a difference between the document and online information, use the online information as your reference.

Related Documents

Title of Documentation	Reference Number
Quantum EIO, Remote I/O Modules, Installation and Configuration Guide	S1A48978 (English), S1A48981 (French), S1A48982 (German), S1A48983 (Italian), S1A48984 (Spanish), S1A48985 (Chinese)
Modicon M580, Hardware, Reference Manual	EIO0000001578 (English), EIO0000001579 (French), EIO0000001580 (German), EIO0000001582 (Italian), EIO0000001581 (Spanish), EIO0000001583 (Chinese)
Quantum using EcoStruxure™ Control Expert, Hardware Reference Manual	35010529 (English), 35010530 (French), 35010531 (German), 35013975 (Italian), 35010532 (Spanish), 35012184 (Chinese)
Modicon M580, M340, and X80 I/O Platforms, Standards and Certifications	EIO0000002726 (English), EIO0000002727 (French), EIO0000002728 (German), EIO0000002730 (Italian), EIO0000002729 (Spanish), EIO0000002731 (Chinese)
EcoStruxure™ Control Expert, M580 Application Converter, User Guide	NVE78183 (English), NVE78184 (French), NVE78185 (German), NVE78186 (Italian), NVE78187 (Spanish), NVE78188 (Chinese)

Title of Documentation	Reference Number
Modicon M580 Standalone, System Planning Guide for Complex Topologies	NHA58892 (English), NHA58893 (French), NHA58894 (German), NHA58895 (Italian), NHA58896 (Spanish), NHA58897 (Chinese)
Modicon M580 Hot Standby, System Planning Guide for Frequently Used Architectures	NHA58880 (English), NHA58881 (French), NHA58882 (German), NHA58883 (Italian), NHA58884 (Spanish), NHA58885 (Chinese)
Modicon M580, RIO Modules, Installation and Configuration Guide	EIO0000001584 (English), EIO0000001585 (French), EIO0000001586 (German), EIO0000001587 (Italian), EIO0000001588 (Spanish), EIO0000001589 (Chinese),
Modicon M580, Change Configuration on the Fly, User Guide	EIO0000001590 (English), EIO0000001591 (French), EIO0000001592 (German), EIO0000001594 (Italian), EIO0000001593 (Spanish), EIO0000001595 (Chinese)
Electrical installation guide	EIGED306001EN (English)
EcoStruxure™ Control Expert, Operating Modes	33003101 (English), 33003102 (French), 33003103 (German), 33003104 (Spanish), 33003696 (Italian), 33003697 (Chinese)

Title of Documentation	Reference Number
EcoStruxure™ Control Expert, Installation Manual	35014792 (English), 35014793 (French), 35014794 (German), 35014795 (Spanish), 35014796 (Italian), 35012191 (Chinese)
Modicon Controllers Platform Cyber Security, Reference Manual	EIO0000001999 (English), EIO0000002001 (French), EIO0000002000 (German), EIO0000002002 (Italian), EIO0000002003 (Spanish), EIO0000002004 (Chinese)

You can download these technical publications and other technical information from our website at https://www.se.com/ww/en/download/ .

Chapter 1
Introducing the 140CRA31908 Adapter Module

What Is in This Chapter?

This chapter contains the following sections:

Section 1.1
Physical Description

Introduction

This section describes the physical attributes of the 140CRA31908 adapter module.

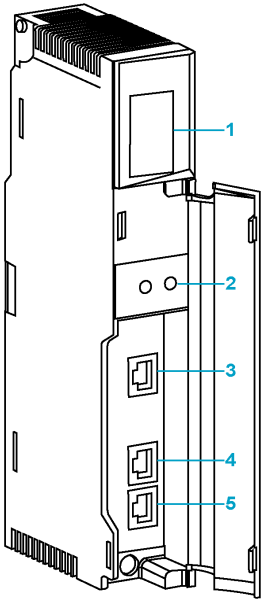
What Is in This Section?

This section contains the following topics:

Module Description

External Features

This illustration shows the external features of the 140CRA31908 module:



1 LED display *(see page 17)*

2 rotary switches *(see page 50)*

3 SERVICE port (ETH 1) *(see page 16)*

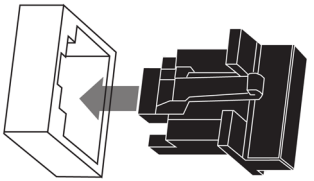
4 DEVICE NETWORK port (ETH 2) *(see page 16)*

5 DEVICE NETWORK port (ETH 3) *(see page 16)*

NOTE: The Ethernet ports are labeled on the front of the module.

Dust Cover

Insert dust covers into the unused Ethernet ports on the module:



External Port Descriptions

Two of the Ethernet ports allow implicit I/O exchanges with an M580 ePAC through the EIO network. (An implicit I/O exchange has a maximum frame size of 1,400 bytes.) You can use both Ethernet ports when you connect the 140CRA31908 module to an Ethernet main ring.

There is a maximum of 31 adapters in a single EIO network. For network topologies, refer to the *Modicon M580 Hot Standby, System Planning Guide for Frequently Used Architectures (see Modicon M580 Hot Standby, System Planning Guide for, Frequently Used Architectures)*.

The 140CRA31908 module has these 10/100 Base-T Ethernet ports:

Port	Description
SERVICE	The SERVICE port allows the diagnosis of Ethernet ports and provides access to external tools and devices (Control Expert, ConneXium Network Manager, HMI, etc.). The port supports these modes: ● access port (default): This mode supports Ethernet communications. ● port mirroring: In this mode, data traffic from one of the three other ports is copied to this port. This allows a connected management tool to monitor and analyze the port traffic. ● disabled **NOTE:** ● You can configure the SERVICE port either on line or off line. ● In port mirroring mode, the SERVICE port acts like a read-only port. That is, you cannot access devices (ping, connection to Control Expert, etc.) through the SERVICE port. Refer to the SERVICE port configuration instructions *(see page 66)*.
DEVICE NETWORK	The DEVICE NETWORK copper port provides: ● connections for remote I/O communications ● cable redundancy (Ethernet ring)

⚠ CAUTION

ETHERNET CONNECTION NON-OPERATIONAL

Do not connect a device with a speed in excess of 100 Mbit/s to any adapter port.

Failure to follow these instructions can result in injury or equipment damage.

If you connect a device with a speed in excess of 100 Mbit/s, the Ethernet link may not be established between the device and the module through its port.

LED Indicators

Display

The LEDs are on the front of the 140CRA31908 module:

Indications

LED conditions:

Description		Run	IO	Mod Status		Net Status	
		green	red	green	red	green	red
power-up sequence	blink (.25 sec on; .25 sec off)	1	2	green/red/green		green/red/off	
not configured	IP address not valid	—	—	flashing	off	off	off
	• valid IP address • invalid configuration	off	off	flashing	off	flashing	off
configured	no external error detected	flashing	off	—	—	flashing	off
	external error detected	flashing	on	—	—	flashing	off
I/O data communication established	stop	flashing	on/off(1)	on	off	on	off
	run	on	on/off(2)	on	off	on	off
detected error states	recoverable error	—	—	off	flashing	—	—
	nonrecoverable error	flashing	on	off	on	—	—
	duplicate IP address	—	—	—	—	off	on
OS firmware update		flashing	off	off	on	off	on

(1) stop (**IO** LED):
- ❍ on: An input or output indicates a detected error that originates in a module or a channel configuration.
- ❍ off: Operations are normal.

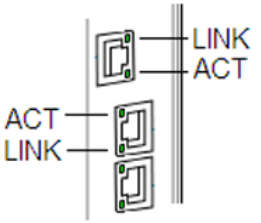
(2) run (**IO** LED):
- ❍ on: An external error is detected.
- ❍ off: No external errors are detected.

Identification of the I/O master of the S908 bus:

- In a configuration with a single 140CRA31908 module, the 140CRA31908 is the I/O master of the S908 bus.
- In configurations that have redundant 140CRA31908 modules the **Com Act** LED on the 140CRP93•00 module identifies the I/O master.

NOTE: In a redundant configuration, IO led is flickering on both 140CRA31908 modules when all S908 drops are off.

Ethernet Port Indications



These LEDs report the status of the Ethernet port:

Name	Color	Status	Description
LINK	green	on	100 Mbps link detected
	yellow	on	10 Mbps link detected
	—	off	no detected link
ACT	green	blinking	active Ethernet link (transmit or receive)
	—	off	inactive Ethernet link

Section 1.2
Functionality

Introduction

This section explains how the 140CRA31908 adapter works in the migration of an S908 architecture to M580.

What Is in This Section?

This section contains the following topics:

Converting an S908 Architecture to M580

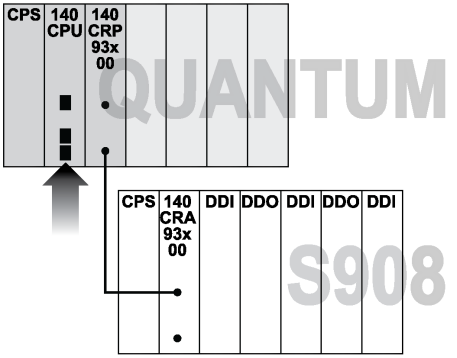
Functional Overview

An S908 network typically connects I/O modules over a long distance for redundancy and includes these Modicon platforms:

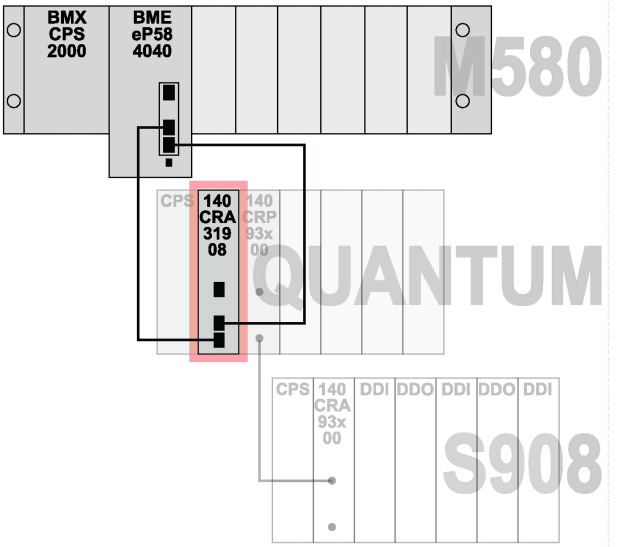
- 800 Series
- SY/MAX
- Quantum

The 140CRA31908 adapter module can be installed and configured on an X80 remote drop in an M580 system to connect an architecture based on S908 to an M580 system.

In a simple Quantum architecture that includes an S908 network, a 140CPU••••• (see the arrow) is the processor. A 140CRP93•00 module on the local rack communicates with the 140CRA93•00 module in the Quantum S908 remote drop:

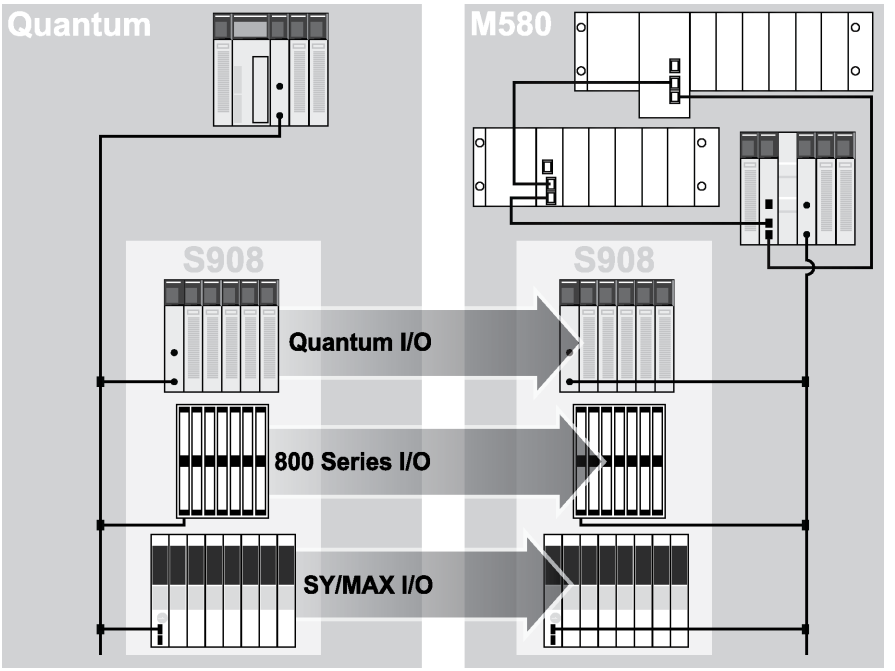


You can replace the 140CPU••••• in the Quantum rack with a 140CRA31908 adapter module to allow the S908 network to communicate with an M580 architecture:



How to migrate S908 redundant architectures *(see page 24)* to an M580 network is discussed in the following pages

With this methodology, the 140CRA31908 adapter module allows other Modicon platforms (like S908, 800 Series, and SY/MAX I/O) to migrate to an M580 architecture:



The 140CRA31908 module exchanges data through the EIO scanner service in the M580 CPU on the main local rack:

- The input data from remote drops is collected and published through the EIO scanner service of the CPU.
- The output modules are updated with the data received from the EIO scanner.
- The EtherNet/IP protocol is used for the data exchange.
- The exchanges are deterministic, which means that remote drops are scanned regularly.

Migration Paths

This table shows the possible migration paths for an S908 user who wants to convert to an M580 architecture. This document discusses the last option only (keep the network and remote drops), which is the solution with the lowest financial cost and has the smallest impact on product or application changes:

Use Case	Description
• Update the network. • Update the remote drops.	The S908 user migrates to M580 by replacing all remote drops with X80 drops. The user is then required to change the logic, operator screens, animation tables, etc. because X80 modules do not use state RAM addressing, which is the mapping strategy that is typically used for RIO modules.
• Update the network. • Keep the remote drops.	The S908 user migrates to M580 but limits the overall investment by keeping much of the existing RIO modules and wiring: • Quantum remote drops are supported by the M580 EIO scanner service. • Quantum remote drops are supported by quick wiring adapter modules that allow RIO modules to connect to existing field wiring. **NOTE:** In this case, the same I/O vision variables are retained.
• Keep the network. • Keep the remote drops.	The S908 user retains the cabling for these reasons: • Customers do not use quick wiring adapter modules in the S908 network. They retain Quantum remote drops that are not Ethernet-compatible. • Customers retain existing Quantum S908 remote drops (including cabling) by adding the Quantum S908 adapter module to the S908 network. **NOTE:** In this case, the same I/O vision variables are retained.

Redundant Networks

Introduction

You can connect Quantum S908 remote drops to redundant Quantum networks. The redundancy is retained when you migrate the Quantum network to an M580 architecture because the 140CRA31908 adapter module assumes the redundancy tasks of the Quantum CPUs.

Process Overview

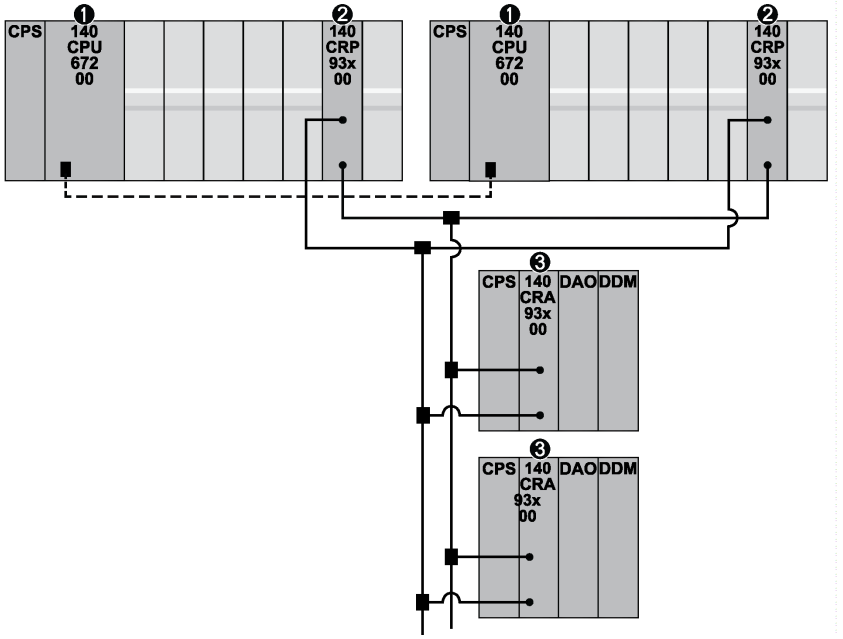
The migration of a redundant Quantum network into a redundant M580 architecture is described in general stages:

Stage	Description
1	**Assemble a Redundant Quantum RIO Network:** Build a redundant Quantum network that includes Quantum S908 remote drops.
2	**Assemble a Redundant Quantum EIO Network:** Build a redundant Quantum network that includes both Quantum S908 remote drops and X80 remote drops.
3	**Complete the Migration:** Replace the Quantum CPUs in the above example networks with 140CRA31908 adapter modules, and add redundant M580 CPUs in local racks.

These stages are described in more detail below.

Assemble a Redundant Quantum RIO Network

This redundant Quantum RIO network is connected to Quantum S908 remote drops. The 140CRP93•00 communications module facilitates S908 communications with modules in the S908, SY/MAX, and 800 Series remote drops:



1 Quantum primary and standby CPUs on local racks with a fiber optic link
2 140CRP93•00 communications modules with redundant connections to the Quantum S908 remote drops
3 140CRA93•00 adapter module on a Quantum S908 remote drop

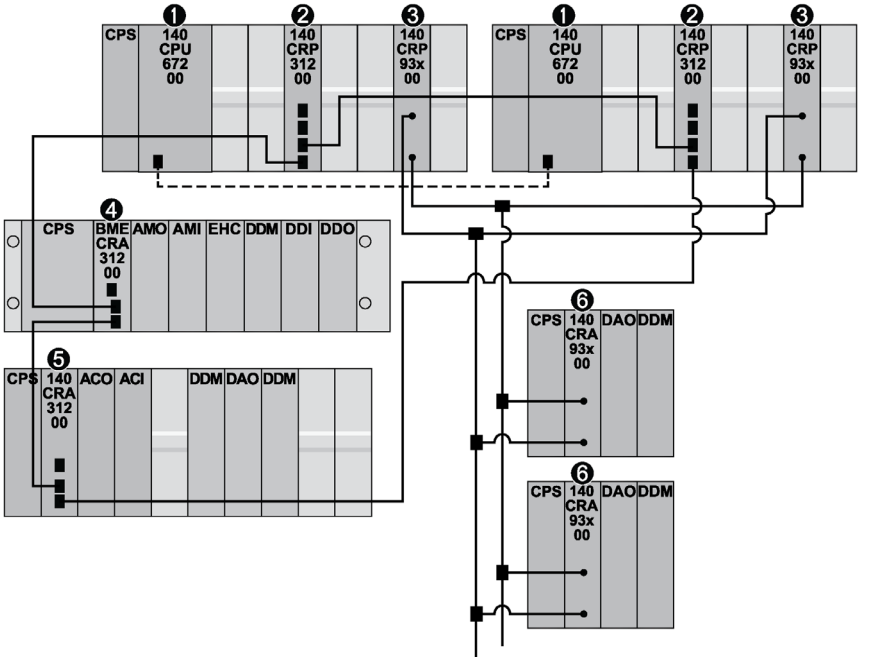
NOTE: The configuration of each Quantum CPU is identical. For information about redundant Quantum networks, refer to the *Modicon Quantum Hot Standby System User Manual*.

Assemble a Redundant Quantum Network

Add X80 remote drops to the redundant network (above):

Step	Action
1	Add a 140CRP31200 communications module to each local rack in the redundant Quantum network.
2	Add an X80 remote drop with a Quantum adapter module to the main ring.
3	Add an X80 remote drop with an M580 adapter module to the main ring.
4	Build the Control Expert application and download it to the Quantum CPUs.

Result: The 140CRP31200 modules (not the CPUs) connect the local rack to the Quantum main ring to facilitate Ethernet communications with the X80 remote drops:



1 Quantum primary and standby CPUs on local racks with a fiber optic link
2 140CRP31200 communications modules
3 140CRP93•00 adapter modules with redundant connections to the Quantum S908 remote drops
4 BMECRA31200 adapter module on an X80 remote drop containing an M580 adapter module
5 140CRA31200 adapter module on an X80 remote drop containing a Quantum adapter module
6 140CRA93•00 adapter module on a Quantum S908 remote drop

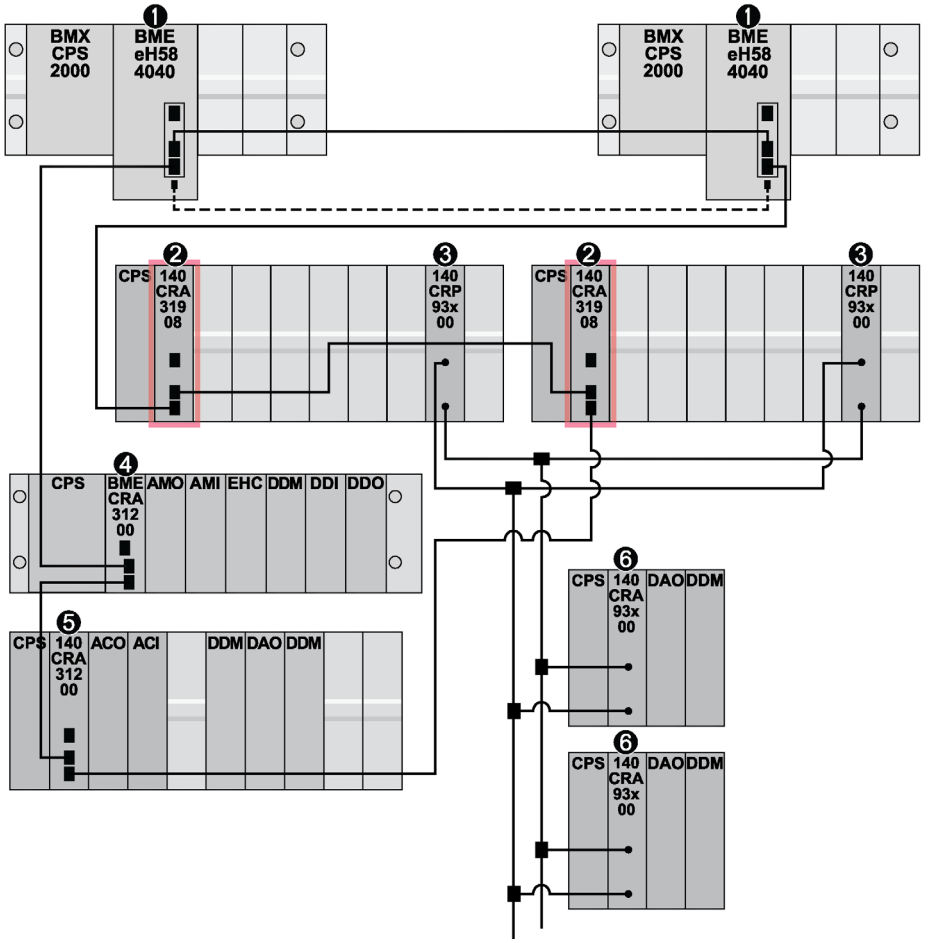
Complete the Migration

Complete the migration of the redundant Quantum network (shown above) to an M580 architecture:

Step	Action
1	Remove the Quantum CPUs from the racks in the order that is opposite to their installation.
2	Place the 140CRA31908 adapter modules in the slots from which you removed the CPUs.
3	Add redundant M580 CPUs in local racks. **NOTE:** The configurations of the redundant M580 CPUs is identical.
4	Connect the main ring to the M580 CPUs.
5	Remove the 140CRP31200 communications modules.
6	Modify your Control Expert application as necessary.
7	Download the Control Expert application to the M580 CPUs.

Refer to the *EcoStruxure™ Control Expert, M580 Application Converter, User Guide*.

Result: A 140CRA31908 adapter module (not a Quantum CPU) connects to the main ring. The M580 CPUs now manage the network and the 140CRA31908 modules:



1 M580 primary and standby CPUs on local racks with a fiber optic link
2 140CRA31908 adapter modules
3 140CRP93•00 communications modules
4 BMECRA31200 adapter module on an X80 remote drop containing an M580 adapter module
5 140CRA31200 adapter module on an X80 remote drop containing a Quantum adapter module
6 140CRA93•00 adapter module on a Quantum S908 remote drop

Primary 140CRA31908 Election

When you migrate a redundant Quantum application to the M580 architecture, replace the Quantum CPU with a 140CRA31908 adapter module. The system assigns the role of I/O master to the first healthy 140CRA31908 module that it detects, but you can manually assign that role with one of these methods:

- Use the QSA CTRL BIT in the CPU scanner DDT. Close the EtherNet/IP connection to the 140CRA31908 module to force the other 140CRA31908 module to be the master.
- Use %S88 to reassign the role of I/O master.

The internal state of the 140CRA31908 module is set to primary when it is the I/O master. In that case, the 140CRA31908 module can perform these tasks:

- Manage the I/O points over the S908 network.
- Manage the I/O points that are configured on its local rack.
- Provide EtherNet/IP statistics.
- Provide the heath bit for all modules that are configured over S908.
- Provide the S908 network diagnostics.

Only one 140CRA31908 module can serve the role of I/O master at any time. The other (not master) 140CRA31908 module performs these tasks:

- Manage the I/Os points that are configured on its local rack.
- Provide EtherNet/IP statistics.
- Monitor the S908 network.

Switchover

A 140CRA31908 module switchover is triggered by loss of communication between the CPU and the master 140CRA31908 module.

The CPU status is added to the input phase of the PLC scan as part of the INPUT assembly. The change of primary is sent to the 140CRA31908 module during the OUTPUT phase of the PLC scan. Therefore, the 140CRA31908 module switchover takes place over a maximum of two CPU scans.

The switchover is driven by the system or the application:

System-driven switchover: In a redundant 140CRA31908 module configuration, the CPU can drive a 140CRA31908 module switchover according to the status of both 140CRA31908 modules. There is a case in which neither 140CRA31908 module can drive the I/O modules. When the master 140CRA31908 module loses communication with all Quantum S908 remote drops, the RIO status from the master 140CRA31908 module is unhealthy. Therefore, the standalone CPU or the primary CPU operates a 140CRA31908 module switchover and assigns the role of I/O master to the other 140CRA31908 module. If the new I/O master 140CRA31908 module cannot properly drive the I/O modules, it reports an unhealthy RIO status to the CPU. In that case, the CPU assigns the role of I/O master to the other 140CRA31908 module. The CPU repeats this loop until one of the two 140CRA31908 modules is able to drive the I/O modules.
Application-driven switchover: You can use system bit %S88 to reassign the master of the I/O points. When %S88 is set, the system triggers a 140CRA31908 switch over and assigns the role of I/O master to the other 140CRA31908. The system then resets %S88. **NOTE:** In redundant 140CRA31908 module configurations, check the status of the redundant 140CRA31908 module before a switchover is triggered. If the redundant 140CRA31908 module is not healthy, the system does not allow the switchover (even if %S88 is set).

NOTE: The impact of the 140CRA31908 module on the redundant operating mode is discussed in the operating modes chapter *(see page 89)*.

Master 140CRA31908 Module Selection

Only one 140CRA31908 module is assigned the I/O master at any time. The master 140CRA31908 module can perform these tasks:

- Manage I/O modules over the S908 network.
- Manage I/O modules that are configured on its local rack.
- Provide EtherNet/IP statistics.
- Provide S908 network diagnostics.

In redundant systems, the 140CRA31908 module that is not the I/O master can perform these tasks:

- Manage I/O modules that are configured on its local rack.
- Provide EtherNet/IP statistics.
- Monitor the S908 network.

EIO Support

In the M580 redundant architecture, the detection of an I/O error can cause a CPU switchover when all of these conditions are true:

- The primary CPU detects that no X80 remote drops are communicating.
- The standby CPU communicates with at least one X80 remote drop.
- The redundant link is OK.

The detection of an I/O error on the S908 network does not cause a CPU switchover, but it can cause a 140CRA31908 module to switch when these conditions are true:

- The master 140CRA31908 module or the primary 140CRP93•00 is unhealthy.
- The primary 140CRP93•00 cannot communicate with any remote drop.

Application Conversion

Introduction

The 140CRA31908 adapter module allows you to migrate a physical S908 architecture to an M580 system.

Conversion

Follow these steps to convert the S908 application to an M580 application:

Stage	Description
1	Convert the S908 application to a Quantum application. **NOTE:** Refer to the general description of the Control Expert Concept Converter in the *Control Expert Concept Application Converter User's Manual*.
2	Convert the Quantum application to an M580 application. **NOTE:** Refer to the *EcoStruxure™ Control Expert, M580 Application Converter, User Guide*.

Chapter 2
Installation

Introduction

This chapter describes the hardware installation of a 140CRA31908 adapter module.

What Is in This Chapter?

This chapter contains the following sections:

Section 2.1
Mounting the Adapter Module

Introduction

Use the instructions in this section to mount the 140CRA31908 adapter module.

What Is in This Section?

This section contains the following topics:

Mounting the Adapter Module

Introduction

Use these instructions to mount a 140CRA31908 adapter module on the backplane of a Quantum X80 remote drop.

Grounding Considerations

Do not apply power to a rack until connections are made at both ends of the Ethernet cable. For example, connect the cable to both the CPU and the communication or adapter module before you turn on the power.

⚠⚠ DANGER

ELECTRICAL SHOCK HAZARD

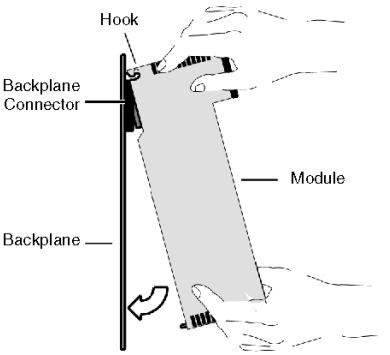
- Switch off the power supply at both ends of the PAC connection, and lock out and tag out both the power sources.
- In case lock out and tag out are not available, ensure that the power sources cannot be inadvertently switched on.
- Use suitable insulation equipment when inserting or removing all or part of this equipment.

Failure to follow these instructions will result in death or serious injury.

Use fiber-optic cable to establish a communications link when it is not possible to master potential between distant grounds.

NOTE: Refer to the ground connections topic to comply with EMC certifications and deliver expected performance.

Mounting a Module

Step	Action
1	Hold the module at an angle and mount it on the 2 hooks near the top of the backplane. The figure shows the correct way to hold the module: 
2	Swing the module down so the connector engages the backplane connector.
3	Use a Phillips-head screw driver to tighten the screw at the bottom of the module from 2 to 4 in-lbs or from .22 through .45 N•m of torque.

Replacing a Module

You can replace a 140CRA31908 module at any time using another module with compatible firmware. The replacement module obtains its operating parameters through Ethernet communications with the CPU. The transfer occurs immediately at the next cycle to the device.

NOTE: To retain the device name, set the rotary switches *(see page 50)* on the replacement module to the same values as the module being replaced.

The operating parameters that the CPU sends to a replacement module do not include any parameter values that were edited in the original module using explicit messaging **SET** commands.

Mounting Considerations

Introduction

Observe the following guidelines when you mount the 140CRA31908 adapter module.

Grounding Considerations

⚠⚠ DANGER

ELECTRICAL SHOCK HAZARD

- Switch off the power supply at both ends of the PAC connection, and lock out and tag out both the power sources.
- In case lock out and tag out are not available, ensure that the power sources cannot be inadvertently switched on.
- Use suitable insulation equipment when inserting or removing all or part of this equipment.

Failure to follow these instructions will result in death or serious injury.

Use fiber-optic cable to establish a communications link when it is not possible to master potential between distant grounds.

NOTE: For more information, refer to the ground connections topic.

Installation

You can apply power to the Quantum X80 remote drop after the 140CRA31908 module is inserted:

- Successful installation:
  - Initialization is finished.
  - Interconnections to other modules are validated (remote drop adapter module only).
- Unsuccessful installation:
  - Initialization does not finish.
  - Interconnections to other modules are not validated (remote adapter modules only).

You can see the status of the installation on the LED display *(see page 17)*.

NOTE: These guidelines pertain to the installation of a single 140CRA31908 module, not the entire network. For network power up guidelines, refer to the *Modicon M580 Standalone, System Planning Guide for Frequently Used Architectures*.

Section 2.2
Installing the Quantum S908 Adapter Module on the X80 Remote Drop

Introduction

This section describes the installation of the 140CRA31908 adapter module in a Quantum remote drop.

What Is in This Section?

This section contains the following topics:

Installing the Adapter Module

Locate a Backplane Slot

Install the 140CRA31908 adapter module in any slot in the Quantum remote drop.

Refer to the directions for installing a module on the backplane *(see page 35)*.

Power Consumption

Power consumption is 1.2 A on a 5 Vdc power rail on the backplane (6 W). The 140CRA31908 module supports other Quantum modules on two racks (main rack and extended rack). (Power consumption has no relation to the number of installed rack modules.)

Select a Power Supply

When configuring the local rack, use a power supply module that can supply power to all rack modules.

Select a power module that suits your unique system requirements. These modules (and their conformally coated versions) are supported:

Power Supply Type	Quantum Module
standalone	140CPS2100 (C)
	140CPS51100 (C)
	140CPS11100 (C)
summable	140CPS21400 (C)
	140CPS41400 (C)
	140CPS11420 (C)
redundant	140CPS22400 (C)
	140CPS42400 (C)
	140CPS52400 (C)
	140CPS12420 (C)

Remote Drop Considerations

Introduction

The guidelines in this topic refer to these remote drops:

- Quantum remote drops that support S908 and include a 140CRA31908 adapter module
- Quantum S908 remote drops

Racks and Extensions

A remote drop that includes a 140CRA31908 module can have two racks (main rack and extended rack). These racks are linked with a 140XBE10000 bus extender module and a 140•CA7170• cable (1-3m).

Maximum Configuration

A Quantum remote drop with a 140CRA31908 module can include two 16-slot racks for a maximum of 32 slots. The table shows the maximum number of modules:

Module Type	Number of Modules	Note
140CRA31908	1	A 140CRA31908 module consumes one slot in the main remote rack of a Quantum remote drop. The extended remote rack does not require a 140CRA31908 module.
power supply	2	A power supply consumes one dedicated slot in each rack.
bus extension	2	A bus extender module is required for each rack. The bus extender consumes one rack slot.
I/O	27	

Supported CPUs

These M580 CPU modules are compatible with the 140CRA31908 module:

CPU	Supports ...	X80 Remote Drops	Quantum S908 Remote Drops
BMEP584040	DIO, X80 remote drops	16	31
BMEP585040	DIO, X80 remote drops	31	31
BMEP586040	DIO, X80 remote drops	31	31
BMEH584040	DIO, X80 remote drops, redundant networks	16	31
BMEH586040	DIO, X80 remote drops, redundant networks	31	31

Supported Adapter Modules

These X80 adapter modules are compatible with the 140CRA31908 module and can be used on the same Ethernet main ring:

Product Range	Module
Quantum	140CRA31200
Modicon X80	BMXCRA31200
	BMXCRA31210
	BMECRA31210

Supported RIO Modules

M580 architectures support the drop-end communication modules in the following tables.

Quantum range support:

Adapter Module	RIO Cable Ports
140CRA93100	1
140CRA93200	2

Control Expert does not support the ACSII read (`READ`) and write (`WRIT`) functions for ACSII. Therefore, the ACSII ports on the P453, P892, and J892 modules are no longer accessible. You can manage ACSII communications as follows:

- In M580 standalone configurations, you can use BMXNOM0200 modules in the M580 local rack.
- In M580 redundant configurations, use a 140ESI06210 module in a Quantum remote drop or a BMXNOM0200 module in an X80 remote drop on the Ethernet main ring.
  NOTE: The BMXNOM0200 is not supported in an M580 local rack.

800 Series I/O range support:

Module	ASCII Ports	RIO Cable Ports
3220	0	1
3240	0	1
410	0	1
J890/P8••	0	1 or 2
J892/P8••	2	1 or 2
P890-••1	0	1
P890-••2	0	2
P890 300	2	2
P892-••1	2	1
P892-••2	2	1

SY/MAX range support:

Module	Type
8030CRM931DG2	RIO adapter module
8030CRM931DG4	
8030CRM931DG8	
8030CRM931DG1	
8030CRM931RG	register RIO adapter module

Supported S908 I/O Modules

M580 architectures support S908 I/O modules in the following tables.

Quantum range support:

I/O Module	Reference
discrete	all
	generic I/O (see note)
analog	all (including intrinsically safe 140AI•33•••)
	generic analog I/O (see note)
communication	140EIA92100 AS-i, 140NRP95400/140NRP95401C fiber optic repeater, 140XBE10000 extender
expert	all (140ERT85410/20 time stamp, 140DCF07700 clock, 140ESI06210 serial line ASCII, two-port RS232C [12 registers bidirectional], 140XCP90000 battery)
motion	single-axis motion (MSX) modules, 140MSB10100 incremental encoder, resolver/encoder
power supply	all

800 Series range support (discrete modules)**:**

I/O Module	Type	Range	Channels	Comment
B802-008	out	80...130 Vac cont.	8	individually isolated
		47...63 Hz		
B803-008	in	80...130 Vac cont.	8	individually isolated
		47...63 Hz		
B804-116	out	80...130 Vac cont.	16	isolated
		47...63 Hz		2 groups, 8 points/group
B804-148	out	40...56 Vac	16	isolated
		47...63 Hz		2 groups, 8 points/group
B805-016	in	80...130 Vac cont.	16	isolated
		47...63 Hz		2 groups, 8 points/group
B806-032	out	80...130 Vac cont.	32	
		47...63 Hz		
B806-124	out	20...28 Vac cont.	32	2 groups, 16 points/group
		47...63 Hz		
		32 Vac RMS max. for 10 sec		
B807-132	in	80...130 Vac cont.	32	4 groups, 8 points/group
		47...63 Hz		
B808-016	out	80...260 Vac cont.	16	2 groups, 8 points/group
		47...63 Hz		
B809-016	in	160...260 Vac cont.	16	2 groups, 8 points/group
		47...63 Hz		
B810-008	out	80...130 Vac cont.	8	isolated
		47...63 Hz		
B814-108	out	0...30 Vdc	8	relay
		0...240 Vac		
		47...63 Hz		
B817-116	in	115 Vac	16	isolated
B817-216	in	230 Vac	16	isolated
B820-008	out	10…60 Vdc	8	true high
B821-108	in	10…60 Vdc	8	true high
B824-016	out	20…28 Vdc	16	true high
B825-016	in	20…28 Vdc	16	true high

I/O Module	Type	Range	Channels	Comment
B827-032	in	18…30 Vdc	32	true high
B828-016	out	5 V TTL	16	
B829-116	in	5 V TTL	16	high-speed TTL
B832-016	out	20…28 Vdc	16	true low
B833-016	in	20…28 Vdc	16	true low
B836-016	out	12…250 Vdc		isolated
B837-016	in	20.3...27 Vac	16	isolated
		47...63 Hz		2 groups, 8 points/group
		19.2…30 Vdc		
B838-032	out	20…30 Vdc	32	true high
B840-108	out	0...300 Vdc	16	relay
		0...230 Vac max.		
		19.2…30 Vdc		
B846-001	in	0...5 V	16	1 word out (BIN)
		1...5 V		
		+/- 10 V		
B846-002	in	4...20 mA	16	1 word out (BIN)
B849-016	in	41...53 Vac	16	true high
		47...63 Hz		
		85...150 Vdc		
B853-016	in	80...130 Vac	16	true high
		47...63 Hz		
		85...150 Vdc		
B855-016	in	11.4...12.6 Vdc	16	isolated
B863-032	in	18...30 Vdc true high	32	
		24 Vdc nominal		
B863-132	in	0...30 Vdc	32	
B864-001	out		8	8-channel reg. mux
B865-001	in	5 V TTL	8	8-channel reg. mux
B881-001	out	20…28 Vdc	16	
B881-508	out	5...140 Vdc max.	8	
B882-032	out	19.2...28 Vdc	32	
B882-116	out	19.2...30 Vdc	16	

800 Series range support (analog modules)**:**

I/O Module	Type	Range	Channels	Comment
B846-001	IN	0...5 V	16	Reed-Relay-Multiplexer for voltage input as front end for B873/875 A/D converter
		1...5 V		
		+/- 10 V		1 word (BIN)
B846-002	in	4...20 mA	16	Reed-Relay-Multiplexer for current input (250 ohm impedance) as front end for B873/875 A/D converter
				1 word (BIN)
B872-100	out	4...20 mA	4	user supply required
B872-200	out	0...5 Vdc	4	operating range selectable per channel
		0...10 Vdc		no user supply required
		+/- 5 Vdc		
		+/- 10 Vdc		
B873-002	in	1...5 Vdc	4	4 words (BIN)
		4...20 mA		
B875-002	in	1...5 Vdc	8	8 words (BIN)
		4...20 mA		
B873-012	in	+/- 10 Vdc	4	4 words out (BIN)
B875-012	in	+/- 10 Vdc	8	8 words out (BIN)
B875-102	in	1...5 Vdc	4 (8)	high speed
		0...5 Vdc		
		0...10 V		
		+/- 5 V		
		+/- 10 V		
		4...20 mA		
		0...20 mA		
		0...40 mA		
		+/- 20 mA		
		+/- 40 mA		

I/O Module	Type	Range	Channels	Comment
B875-111	in	1...5 Vdc	8 differential, 16 single	8 words (BIN) as B877 = 16 words (BIN)
		0...5 Vdc		
		0...10 V		
		+/- 5 V		
		+/- 10 V		
		4...20 mA		
		0...20 mA		
		+/- 20 mA		
B875-114	in	0...2 mA	8 differential	
B875-200	in	4...20 mA	8	A/D converter with pluggable input amplifier modules
		1...5 V		
		0...10 V		
		RTD/TC		
		0...10 V		
		0...20 mA		

800 Series range support (special purpose modules)**:**

I/O Module	Type	Range	Channels	Comment
B882-239	high-speed counter	30 kHz		4 inputs
		350 Hz		3 outputs
B883-001	high-speed counter	50 kHz	2	3 outputs
B883-101	CAM	4	8	24 Vdc out
B883-200	thermocouple in	centigrade	10 in	open circuit detection
		fahrenheit		self-calibration
		millivolts		
B883-201	RTD in	centigrade	8	Europe
		fahrenheit		America
				linear
B884-002	PID loop	n/a	2	open/closed loop
B885-002	ASCII/BASIC	n/a	2	RS2322
			2	

I/O Module	Type	Range	Channels	Comment
B885100/110	motion control			Communications between the CPU and the module are through the Traffic cop registers (3000x and 4000x, like a generic analog I/O module).
B984100	reflex		8 out, 16 in	contains the LL984 program and is running in standalone (exchanges 6 register bi-directional)

NOTE: Specific software packages may be required to complete the setting, programming, and monitoring for some of these modules (B884-002, B885-002, B885-100/110, B984-100).

SY/MAX range support:

Module	Type
8030RIM101	input modules
8030RIM121	
8030RIM123	
8030RIM125	
8030RIM126	
8030RIM127	
8030RIM301	
8030RIM331	
8030RIM361	
8030RIM731	
8030ROM121	output modules
8030ROM122	
8030ROM221	
8030ROM421	
8030ROM431	
8030ROM441	
8030ROM141	multiplex output module
8030RIM144	multiplex input module
8030ROM271	relay output modules
8030ROM871	
8030RIM131	high-speed counter module
8030ROM131	stepper motor controller module
8030SIM116	simulator input module

Quantum CAPP Partner Modules

The following tables show supported modules that are produced by members of Schneider Electric's Collaborative Automation Partner Program (CAPP).

AVG partner (CAPP communication modules):

Module Type	Function	Personality Code	Comment
DeviceNet scanner (obsolete)	140SACQDNET010	313 (8/8 words), 320 (32/32 words)	Configure in Control Expert as a generic analog I/O module.

Niobrara Research & Development partner (CAPP communication modules):

Module Type	Function	Personality Code	Comment
universal communication module (protocol conversion, serial and Ethernet ports)	140QUCMOE, 140QUCMLE, 140QUCMSE	295 (30 input words, 30 output words)	Configure in Control Expert as a generic analog I/O module.
QASI AS-i master V3.0	QASI	356 (27 input words, 27 output words)	Configure in Control Expert as a generic analog I/O module. Can also be configured as an emulation of the 140EIA921 Quantum Asi adapter.
QSPXM Seriplex master (obsolete)	QSPXM	303	Configure as generic analog I/O module with 32 input registers (3x) and 32 output registers (4x), or as an I/O module with 512 discrete inputs (1x) and 512 discrete outputs (0x).

Spectrum Controls partner (CAPP input and output modules):

Module Type	Function	Personality Code	Comment
16 configurable analog input channels (RTD, thermocouple, current, or voltage)	140AUI04000	1060 (20 configuration registers max).	Configure in Control Expert as a generic analog I/O module mapped on 32 input registers (3x) and 32 output registers (4x).

Monaghan Engineering partner (CAPP modules):

Module Type	Function	Personality Code	Comment
GPS receiver	140GPS10000	307	Configure in Control Expert as a generic analog I/O module. NB: Add MEI library from Monaghan to the Control Expert environment to get the GPS function block.
sequence event recording	140SER85300	302	Configure in Control Expert as a generic discrete I/O module mapped as 64 input bits (1x) and 64 output bits (0x), or as four input words (3x) and 4 output bits (4x).

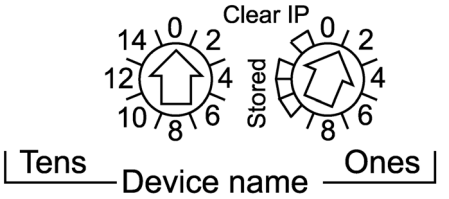
AMCI partner (CAPP modules):

Module Type	Function	Personality Code	Comment
convert resolver signals to digital position	AMCI 1831Q 6I/10O	323	6 input bytes, 10 output bytes
	AMCI 1832Q 12I/10O	323	12 input bytes, 10 output bytes
	AMCI 1833Q 18I/10O	324	18 input bytes, 10 output bytes
	AMCI 1834Q 24I/10O	324	24 input bytes, 10 output bytes
	AMCI 1841Q 6I/10O	323	6 input bytes, 10 output bytes
	AMCI 1842Q 12I/10O	323	12 input bytes, 10 output bytes
	AMCI 1843Q 18I/10O	324	18 input bytes, 10 output bytes
	AMCI 1844Q 24I/10O	324	24 input bytes, 10 output bytes
	AMCI 1861Q 8I/20O	326	8 input bytes, 20 output bytes
	AMCI 1862Q 16I/20O	326	16 input bytes, 20 output bytes

Setting the Location of the X80 Remote Drop

Setting Rotary Switches

Set the location of an X80 remote drop (not a Quantum S908 remote drop) on the network with the rotary switches on the front of the 140CRA31908 adapter module before you apply power to the module and before you download the application:



The values you set are applied during a power cycle. If you change the switch settings after the module has powered up, the Mod Status LED is activated and a mismatch message is logged in the module diagnostic.

Because new values on the rotary switches are implemented only at the next power cycle, we recommend that you set a valid value (01 ... 159) before you start the module.

The values on the rotary switches combine with the device prefix (for example, 140QSA_*xxx*) to create the device name (where *xxx* represents the value of the rotary switches). The preceding figure shows the **Tens** switch set to 0 and the **Ones** switch set to 01, for a device name of 140QSA_001.

NOTE:

- Adjust the rotary switch values with a small flat-tipped screwdriver.
- No software is required to configure or enable the rotary switches.
- Do not use the **Stored** and **Clear IP** settings on the **Ones** rotary switch. (The functionality of these settings does not apply to remote I/O installations.)

Section 2.3
X80 Infrastructure Cables

What Is in This Section?

This section contains the following topics:

Cable Installation

Introduction

Observe these guidelines when making cable connections in an M580 system that uses a 140CRA31908 adapter module to attach S908 architectures. Using the 140CRA31908 module does not introduce constraints or limitations in terms of the architecture length and capacity.

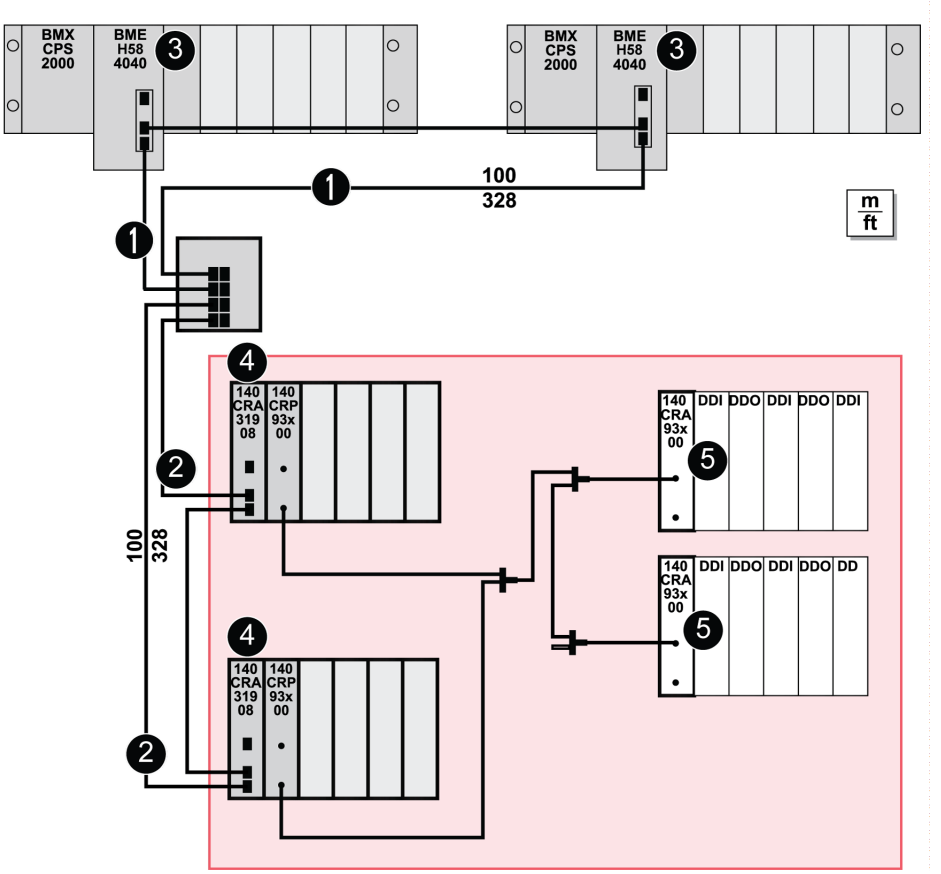
Cables

The sample system in the illustration below uses these cable types:

Type	Description	Maximum Distance
X80 remote (copper)	The 140CRA31908 module connects the X80 remote drop to the M580 network with standard Quantum X80 cables. We recommend the use of shielded twisted pair CAT5e (10/100 Mbps) cables, ideally ConneXium 490NT•000••.	100 m
S908 remote (coaxial)	The 140CRP93•00 S908 RIO adapter module connects the Quantum S908 remote drop to the X80 remote drop with the standard coaxial S908 cables. There is no requirement to change the hardware or cable connections to the Quantum S908 remote drop. **NOTE:** The S908 cabling system consists of a linear trunk cable with line taps and drop cables that connect to each Quantum S908 remote drop.	4572 m at 1.544 Mbps (CATV)
fiber	You can use fiber cables between two remote devices. (You can also use 140NRP95400/140NRP95401C fiber converter modules for this purpose.)	**single mode:** 15 km **multi-mode:** 2.5 km

Connections Between Devices

This sample network architecture uses both copper and fiber optic connections on the main ring to show the distances between devices in an M580 network that communicates with the S908 network via an X80 remote drop, which includes a 140CRA31908 adapter module:



The shaded red area represents the conversion of Quantum S908 remote drops to X80 remote drops that are attached to an M580 EIO network.

1 dual-ring switch (DRS) connection to the main ring
2 dual-ring switch (DRS) connection to a sub-ring
3 BMEH584040 redundant CPUs on the local racks
4 140CRA31908 adapter module on an X80 remote drop
5 140CRA93•00 adapter module on a Quantum S908 remote drop

Duplicate IP Address Checking

Introduction

Each Quantum module has a single IP address. The address conflict detection algorithm (also called duplicate IP checking) is performed based on the status (link up, link down) of the ports.

Link Down

These conditions apply when links are lost:

Link Status	Description
A transition has occurred from one connected link to all links down.	When no module port is connected to a cable (all links are down), all services are reset. For example, I/O connections, Modbus connections, and explicit EtherNet/IP connections close, but low-level network services (like RSTP or switches) are not affected. The updated Net Status LED indicates the status.
There is one link down and at least one connected link.	There is no impact on services that are running in the module.

Link Up

These conditions apply when links are added:

Link Status	Description
A transition occurred from an unconnected link to a connected link.	A duplicate IP check is performed: ● *no duplicate*: All services start. ● *duplicate*: I/O services stop. The 140CRA31908 module gets new configuration and downloads the IP configuration again. The system goes to default IP and I/O modules are set to fallback mode.
A transition has occurred from at least one connected link to an additional connected link.	A duplicate IP check is performed: ● no duplicated: All services continue. ● duplicate: All services stop.

NOTE: The updated Net Status LED indicates the status.

Chapter 3
Configuration and Programming with Control Expert

Introduction

This chapter tells you how to use Control Expert to configure an M580 local rack that communicates with an S908 network via an X80 drop, which includes a 140CRA31908 adapter module.

What Is in This Chapter?

This chapter contains the following sections:

Section 3.1
Creating a Control Expert Project

Introduction

Use these instructions to create a Control Expert project that includes a 140CRA31908 adapter module.

NOTE: These instructions assume that you have a working knowledge of Control Expert.

What Is in This Section?

This section contains the following topics:

Compatibility and Interoperability

Windows Compatibility

Configure the 140CRA31908 adapter module in Unity Pro v12.0 (or later), which is compatible with these operating systems:

- Windows 7 (32-bit, 64-bit)
- Windows 10 (32-bit, 64-bit)
- Windows Server 2012 R2

Assembling Local and Remote Racks

Introduction

A Control Expert project that includes the 140CRA31908 adapter module requires the assembly of these local and remote racks:

Rack Type		Description
local	M580 rack	The M580 CPU on this rack is the processor for the network.
remote	X80 remote rack	This rack includes a 140CRA31908 module and a 140CRP93•00 communications module.
	Quantum S908 remote rack	This rack includes a drop-end communicator that corresponds to the drop type (S908, 800 Series, SY/MAX).

The following tables describe the configuration of these racks in a Control Expert project.

NOTE: Create a Control Expert project that corresponds to the hardware and cabling considerations *(see page 53)* of your physical M580 network architecture.

Assemble an M580 Local Rack

Create an M580 local rack in Control Expert:

Step	Action
1	Create a new project in Control Expert (**File → New**).
2	In the **New Project** window, expand (+) the **Modicon M580** menu.
3	Select an M580 PLC for your project. For this example, select a BMEP584040 PLC. **NOTE:** Refer to the list of supported PLCs *(see page 40)*.
4	Press **OK** to create a **Project Browser** view of the new project. **NOTE:** Because the selected CPU (BMEP584040) uses the EIO scanner service, a **PLC bus** and an **EIO Bus** are automatically added to the **Configuration** in the **Project Browser**.
5	Add more modules to the **PLC Bus**. (For this example, this step is optional. Select modules that conform to your network design and application.)
6	Save the project (**File → Save**).

Assemble an X80 Remote Drop

An X80 remote drop in an M580 network has these components:

- 140CRA31908: This is the adapter module that connects an S908 network to an M580 network.
- 140CRP93•00: This communications module uses coaxial cables to connect a remote drop in an S908 network to an M580 network.

Add an X80 remote drop supporting S908 to the configuration:

Step	Action
1	Double-click **EIO Bus** in the **Configuration** in the **Project Browser**.
2	In the **EIO Bus** window, double-click the square link connector to access a list of available racks.
3	For this example, expand (+) these menus in the **New Device** window: • **Quantum S908 remote drop** • **Rack**
4	For this example, double-click **140XBP00400** to see a four-slot rack for the Quantum S908 remote drop. **NOTE:** Control Expert automatically adds a 140CRA31908 adapter module in first slot of the rack. (You can move this module to a different slot if you wish.)
5	Save the project (**File → Save**).

Add a remote head module to the Quantum remote drop supporting S908:

Step	Action
1	In the **EIO Bus** window, double-click an empty slot.
2	For this example, expand (+) these items in the **Part Number** column of the **New Device** window: • **Quantum S908 remote drop** • **Communication**
3	Select **140 CRP 93X 00** and press **OK** to install the 140CRP93•00 communication module on the X80 remote drop. **NOTE:** Because the selected 140CRP93•00 module manages communications with a Quantum S908 remote drop, Control Expert automatically adds an **RIO Bus** to the **Configuration** in the **Project Browser**.
4	Double-click any empty slot to add modules to the **EIO Bus**. (For this example, this step is optional.)
5	Save the project (**File → Save**).

Assemble a Quantum S908 Remote Drop

Add a Quantum S908 remote drop to the **RIO Bus**:

Step	Action
1	Double-click **RIO Bus** in the **Configuration** in the **Project Browser**.
2	In the **RIO Bus** window, double-click the square link connector to access the available racks.
3	Expand (+) these items in the **Part Number** column of the **New Device** window to see the available drop types: ● **800IO Drop** ● **Remote IO Quantum Drop** ● **SY/MAX Drop**
4	For this example, expand **Remote IO Quantum Drop**.
5	Double-click **140 XBP 004 00**. **NOTE:** Because the selected rack accommodates S908 I/O modules, Control Expert automatically adds a 140CRA93X00 drop end communicator to slot 1. (You can move the module to a different slot if you wish.)
6	Double-click any empty slot to add modules to the **RIO Bus**. (For this example, this step is optional.)
7	Save the project (**File → Save**).

You can now double-click the 140CRA31908 module in the Quantum S908 remote drop to access its configuration tabs.

Rack Considerations

- You can insert two racks on an X80 remote drop supporting S908 in an M580 architecture with a 140CRA31908 module.
- You can move some communication modules to different slots in their respective racks within the same device editor. You cannot, however, move objects from the local rack to the X80 remote drop or vice-versa.

Download the Application

Introduction

After you create a Control Expert project *(see page 59)* that includes a 140CRA31908 adapter module, use these instructions to download the application to the M580 PLC.

Connection

Download the Control Expert application to the PLC through one of the ports on the M580 CPU or through a connection to an Ethernet communication module:

Method	Connection
USB port	If the PLC and the PC that is running Control Expert both have USB ports, you can download the application to the PLC directly through the USB ports.
Ethernet port	If the PLC and the PC that is running Control Expert both have Ethernet ports, you can download the application to the PLC directly through the Ethernet ports.
communication module	You can download the application to the PLC by connecting Control Expert to the IP address of the communication module.

Download the Application to the PLC

Download the Control Expert application to the M580 PLC:

Step	Action
1	Open the Control Expert project.
2	Double-click **PLC bus** in the **Project Browser**.
3	Double-click the ports on the M580 CPU in the **PLC bus** rack.
4	Select the **Security** tab.
5	Click the **Unlock Security** button to set the communication protocol services to **Enabled**.
6	Build the project (**Build → Rebuild All Project**).
7	Open the **Set Address** window (**PLC → Set Address**).
8	In the **Address** pull-down menu, select the IP address of the CPU.
9	In the **Media** pull-down menu, select the media type used to connect to the CPU (**USB** or **Ethernet**). **NOTE:** Select the **Test Connection** button to execute a connection test.
10	Press **OK** to apply the selections.
11	Connect the PLC to the project (**PLC → Connect**).
12	Open the **Transfer Project to PLC** window (**PLC → Transfer Project to PLC**).
13	Click **OK** to confirm a stop on the project while the application downloads.

NOTE: To confirm the download, check **PLC Run after Transfer** and press the **Transfer** button.

Section 3.2
Control Expert Configuration for Ethernet RIO Modules

Introduction

This section describes the module configuration tabs in Control Expert. Use the parameters on these tabs to configure 140CRA31908 adapter module on the X80 remote drop.

NOTE: These directions assume that you have already used Control Expert to assemble an X80 remote drop *(see page 59)* in an M580 network.

What Is in This Section?

This section contains the following topics:

RSTP Bridge Configuration

About RSTP

Use RSTP to design a network with redundant cabling so that Ethernet communication automatically finds an alternate path if a communication disruption occurs (for example, a cable breaks or a device becomes inoperable). This method does not require you to manually enable or disable communication paths.

Changing these parameters can affect sub-ring diagnostics, I/O determinism, and network recovery times.

Access the RSTP Tab

You can access the **RSTP** parameters in Control Expert by double-clicking the 140CRA31908 adapter module in the Control Expert rack view.

Parameters

This table shows the **Bridge priority** parameters for the **RSTP Operational State** on the **RSTP** tab:

Bridge Priority	Value	CPU	140CRA31908
Root	0	default	—
Backup Root	4096	for redundant configurations *(see page 24)* (automatic)	—
Participant	32768	—	default
NOTE: In redundant systems, the RSTP bridge priority is applied to the CPU module in rack A.			

Cable Redundancy

Use a daisy chain loop configuration that implements the RSTP service to establish redundant communications between the 140CRA31908 module and an EIO scanner. The module operates normally when at least one of the two physical paths to the 140CRA31908 is valid.

SNMP Agent Configuration

About SNMP

An SNMP v1 agent is a software component of the SNMP service that runs on these modules to allow access to diagnostic and management information for the modules. You can use SNMP browsers, network management software, and other tools to access this data. In addition, the SNMP agent can be configured with the IP addresses of one or two devices (typically PCs that run network management software) to be the targets of event-driven trap messages. Such messages inform the management device of events like cold starts and the inability of the software to authenticate a device.

Access the SNMP Tab

Double-click the 140CRA31908 adapter module in the Control Expert configuration to access the **SNMP** tab.

The SNMP agent can connect to and communicate with one or two SNMP managers as part of an SNMP service. This service includes:

- authentication checking, by the Ethernet communication module, of any SNMP manager that sends SNMP requests
- management of events or traps

SNMP Parameters

These parameters are found on the **SNMP** tab:

Field	Parameter	Description	Value
IP Address managers	IP Address manager 1	address of the first SNMP manager to which the SNMP agent sends notices of traps	0.0.0.0 ... 255.255.255.255
	IP Address manager 2	address of the second SNMP manager to which the SNMP agent sends notices of traps	
Agent	Location (SysLocation)	device location	31 characters (maximum)
	Contact (SysContact)	description of the person to contact for device maintenance	
	Enable SNMP manager	*de-selected* (default): You can edit the **Location** and **Contact** parameters. *selected*: You cannot edit the **Location** and **Contact** parameters.	checked/unchecked
Community names	Set	password that the SNMP agent requires to read commands from an SNMP manager (default = **Public**)	15 characters (maximum)
	Get		
	Trap		
Security	Enable “Authentication failure” trap	*de-selected* (default): not enabled. *selected* (enabled): The SNMP agent sends a trap notice to the SNMP manager if an unauthorized manager sends a **Get** or **Set** command to the agent.	checked/unchecked

Online Behavior

Tests are done to verify that the IP addresses of the managers are not:

- multicast
- loopback
- broadcast

Service Port Configuration

Access the Service Port Tab

Double-click the 140CRA31908 adapter module in the Control Expert project to view the **Service Port** tab.

Service Port Parameters

These parameters are on the Control Expert **Service Port** tab:

Field	Parameter	Value	Comment
Service Port	**Enabled**	—	Enable the port and edit port parameters.
	Disabled	—	Disable port parameters.
Service Port Mode	**Access** (default)	—	This mode supports Ethernet communications.
	Mirroring	—	In port mirroring mode, data traffic from one or more of the other ports is copied to this port. A connected tool can monitor and analyze port traffic. **NOTE:** In this case, the SERVICE port acts like a read-only port. That is, you cannot access devices (ping, connection to Control Expert, etc.) through the SERVICE port.
Access Port Configuration	**Service Port Number**	ETH1	You cannot edit the value in the **Service Port Number** field.
Port Mirroring Configuration	**Source Port(s)**	**Internal Port**	all Ethernet traffic for the module
		ETH2	CPU: all INTERLINK port traffic
			adapter modules: Ethernet traffic through the first port
		ETH3	CPU: Ethernet traffic through the first port
			adapter modules: Ethernet traffic through the second port

Online Behavior

The **Service Port** parameters are stored in the application, but you can reconfigure (change) the parameters in connected mode. The values that you reconfigure in connected mode are sent to the 140CRA31908 module on the X80 remote drop or the CPU with EIO scanner service in explicit messages. (The changed values are not stored, so a mismatch can exist between the parameters that are being used and those that are in the stored application.) A message appears when the module does not respond to the explicit messages.

Limitations

The SERVICE port on the CPU and the adapter modules have the same limitations as the cloud port of the dual-ring switch (DRS). Therefore, the module's cloud port and the DRS's cloud port can be connected to the same equipment.

The maximum load the module can process from distributed equipment:

- 5 Mbps: per SERVICE port
- 20 Mbps: total distributed device traffic on the main ring

For considerations that apply to the use of DIO ports, refer to the *Predefined Configuration Files topic* in the *Modicon M580 Standalone, System Planning Guide for Complex Topologies*.

Section 3.3
Control Expert Configuration for X80 Remote Drops

Introduction

This section discusses the use of Control Expert to configure the 140CRA31908 adapter module on the X80 remote drop. It includes descriptions of the parameters on the Control Expert tabs.

NOTE: These instructions assume that you have already added an X80 remote drop *(see page 59)* to your Control Expert project .

What Is in This Section?

This section contains the following topics:

Device DDT Parameters

Introduction

This topic describes the Control Expert **Device DDT** tab for a X80 remote drop that includes a 140CRA31908 adapter module.

A derived data type (DDT) is a set of elements with the same type (`ARRAY`) or with different types (structure).

This is the I/O structure type when an X80 remote drop with a 140CRA31908 module is installed in an M580 system (where *QSA* represents the 140CRA31908 module): `T_Q_QSA_DROP_EXT_IN`

In the default DDT name, the drop number is represented by **d#**. For example, the second drop has the default DDT name EIO2_d2_DROP.

Access the Device DDT Tab

Access the **Device DDT** parameters in Control Expert:

Step	Action
1	Expand (+) **EIO Bus** in Control Expert (**Project Browser → EIO Bus → Quantum S908 remote Drop**). **NOTE:** *QSA* represents the 140CRA31908 module.
2	Double-click **Quantum S908 remote drop** to view the parameter tabs for the drop.
3	Select the **Device DDT** tab to see the DDDT parameters for the Quantum S908 remote drop.

Implicit Device DDT

On the **Device DDT** tab you can view the default **Name** and **Type** of the implicit device DDT instance for the Quantum S908 remote drop

Parameter	Name	Comment
Name	`EIO2_d1_DROP`	You can edit this name for the first drop (`d1`) on the **EIO Bus**.
Type	`T_Q_QSA_DROP_EXT_IN`	This is the name for the Quantum S908 remote drop that contains a 140CRA31908 module. (You cannot edit this name.)

Diagnostic Parameters

Click the **Goto details** button on the **Device DDT** tab to see the list of diagnostic parameters of the T_Q_QSA_DROP_EXT_IN DDT for the Quantum S908 remote drop:

Name	Type	Description
IO_HEALTH_RACK1	WORD	Health bits of rack 1: slot 1 (rightmost) to 16 (leftmost)
IO_HEALTH_RACK2	WORD	Health bits of rack 2: slot 1 (rightmost) to 16 (leftmost)
DEVICE_NAME	string[16]	device name of the remote drop *(see page 75)*
VERSION	WORD	firmware version (Maj, Min) (4 digits coded in BCD)
ROTARY_SWITCHES	BYTE	rotary switch value at power up
CRA_STATE	BYTE	1: CRA module is idle.
		2: CRA module is stopped.
		3: CRA module is running.

Name		Type	Description
CRA_DIAGNOSTIC (WORD)	bit 0: GLOBAL_IO_HEALTH	BOOL	0: At least one I/O module in the remote drop reports bad health.
	bit 1: CCOTF_IN_PROGRESS	BOOL	CCOTF is in progress.
	bit 2:CCOTF_INVALID_CONF	BOOL	CCOTF configuration is not valid.
	bit 3: IOPL_MISMATCH	BOOL	There is an output data mismatch. The modules in the rack are not the same as the modules configured in the PLC.
	bit 4: SWITCH_CHANGE	BOOL	The rotary switches settings have changed since the last power up.
	bit 5: DROP_COM_HEALTH	BOOL	This bit shows the remote drop communication health (set to 1 in the remote drop).
	bits 6...7		(reserved)
	bit 8: REMOTE_IO_ERROR	BOOL	1 = One of these conditions is met: • The 140CRP93•00 is missing. • The 140CRP93•00 has a detected error. • Communications with one or more remote drops lost. **NOTE:** Refer to RIO_ERROR_CODE values for details on the detected IO error (see below).
			0 = The 140CRP93•00 is operating normally and it sees Quantum S908 remote drops.
	bit 9: MASTER_STATE	BOOL	1 = 140CRP93•00 is the S908 bus master of the remote drop.
			0 = 140CRP93•00 is not the S908 bus master.
	bit 10: INPUT_READY	BOOL	1 = S908 inputs are ready.
			0 = S908 inputs are not ready.
	bit 11: CCOTF_ALLOWED	BOOL	1 = CCOTF is allowed on the RIO bus.
			0 = CCOTF is not allowed on the RIO bus.
	bits 12...15		(reserved)

Name	Type	Description
CYCLE_CURR_TIME	UINT	This word indicates the execution time of the last CRA cycle. Its values (0...65535) have a resolution of 0.01 ms. Therefore, the last cycle time is between 0 and 655 ms.
CYCLE_MAX_TIME	UINT	This word indicates the longest CRA cycle execution time since the last start. Its values (0...65535) have a resolution of 0.01 ms. Therefore, the last cycle time is between 0 and 655 ms.
CYCLE_MIN_TIME	UINT	This word indicates the shortest CRA cycle execution time since the last start. Its values (0...65535) have a resolution of 0.01 ms. Therefore, the last cycle time is between 0 and 655 ms.
TIME_STAMP_RECORDS	UINT	number of time stamp records available in the remote drop local buffer
CRP_VERSION	WORD	firmware version of the 140CRP93•00
RIO_ERROR_CODE	WORD	Error code values (Hex): • 10: Incorrect CRP initialization • 20: The CRP is hot swapped or connected in a wrong slot • 30: Incorrect CRP diagnostic sequence • 40: Quantum S908 Adapter internal state error • 50: The CRP version is not compliant with CCOTF • 60: Incorrect CRP configuration • 70: Communication interruption with CRP • 80: CRP in Kernel mode

Name		Type	Description
ETH_STATUS (BYTE)	PORT1_LINK	BOOL	0 = Port 1 link is down.
			1 = Port 1 link is up.
	PORT2_LINK	BOOL	0 = Port 2 link is down.
			1 = Port 2 link is up.
	PORT3_LINK	BOOL	0 = Port 3 link is down.
			1 = Port 3 link is up.
	RPI_CHANGE	BOOL	RPI change: EtherNet/IP RPI change is in progress (during CCOTF).
	REDUNDANCY_OWNER	BOOL	0 = Redundant owner is not present.
			1 = Redundant owner is present.
	GLOBAL_STATUS	BOOL	0 = At least one service is not operating normally.
			1 = All services are operating normally.
SERVICE_STATUS (BYTE)	RSTP_SERVICE	BOOL	0 = RSTP service is not operating normally.
			1 = RSTP service is operating normally or disabled.
	SNTP_SERVICE (reserved)	BOOL	0 = SNTP service is not operating normally.
			1 = SNTP service is operating normally or disabled.
	PORT502_SERVICE	BOOL	0 = Port 502 service is not operating normally.
			1 = Port 502 service is operating normally or disabled.
	SNMP_SERVICE	BOOL	0 = SNMP service is not operating normally.
			1 = SNMP service is operating normally or disabled.

Name		Type	Description
ETH_PORT_STATUS (WORD)	These combined two-bit values indicate the port conditions.	bits: 0, 1	Ethernet port 1 function
		bits: 2, 3	Ethernet port 1 RSTP role
		bits: 4, 5	Ethernet port 2 function
		bits: 6, 7	Ethernet port 2 RSTP role
		bits: 8, 9	Ethernet port 3 function
		bits: 10, 11	Ethernet port 3 RSTP role
		bits: 12, 13	Ethernet port 4 function
		bits: 14, 15	Ethernet port 4 RSTP role
	Ethernet port function (binary value)	00	disabled
		01	access port
		10	port mirror
		11	RIO network port
	Ethernet port RSTP role	00	alternate
		01	backup
		10	designated
		11	root
NTP_UPDATE		UINT	elapsed time (100 ms) since last update from NTP server
MAX_PACKET_INTERVAL		UINT	maximum packet interval (ms) for output packets
IN_BYTES		UINT	number of bytes (octets) received on interface
IN_ERRORS		UINT	number of inbound packets that contain detected errors (In Errors)
OUT_BYTES		UINT	number of bytes (octets) sent on interface
OUT_ERRORS		UINT	number of outbound packets that contain detected errors (In Errors)

Configuring the Parameters

Parameter Tab (X80 Remote Drop)

This topic describes the Control Expert **Parameter** tab for an X80 remote drop that includes a 140CRA31908 adapter module.

Access the Parameter Tab

Access the **Parameter** tab in Control Expert:

Step	Action	Comment
1	Expand (+) **EIO Bus** in the Control Expert **Project Browser**.	Path: **Project Browser → EIO Bus → Quantum S908 remote drop**.
2	In the **EIO Bus**, double-click the **Quantum S908 remote drop**.	The Quantum S908 remote drop window appears. It contains the parameter tabs for the drop.140CRA31908
3	Select the **Parameter** tab.	–

Parameter Descriptions

Use the Control Expert **Parameter** tab to configure these parameters for the X80 remote drop.

Address information parameters:

Parameter	Comment
Device Name	The device name of the device includes a fixed device prefix and a number provided by the rotary switch. Valid device names conform to this structure (where *QSA* represents the 140CRA31908 module): 140QSA_*xxx* Remember that *xxx* equals the three-digit value selected on the rotary switches, so the device name includes the device prefix (`140QSA`) plus that value. When the device is placed on the X80 remote drop, the number is set to the device number. The device number does not change when the device moves to a new location. Valid device numbers are unique within the application. A message like this appears when analysis reveals redundant device numbers: `{EIO Bus (2)140CRA31908): Device name is not unique` **NOTE:** The device number does not change if you move the remote drop, but you can modify the number. However, if you modify the number, the link breaks between the device name and the remote drop number. Schneider Electric recommends that you allow the remote drop number to equal the device name, even if it can be modified.
IP Address	The IP address of the 140CRA31908 module can be changed only from the Ethernet **Network Manager**. (In the **Project Browser** of your Control Expert application, double-click your Ethernet network to open the manager, or right-click **Ethernet Network → Open**.
Sub Network	
Update IP/DHCP configuration	Click this link to view the **Ethernet Network** window.

Hold up time parameter:

Parameter	Comment
Hold up time	Valid values for the **Hold up time** are 50...65530 (ms). This value represents the time that device outputs are maintained in their current states after a communication disruption and before taking their fallback values.

The minimum holdup time differs for standalone and redundant systems. If you assign a holdup time value that is less than the recommended minimum value, you can send an I/O module to the fallback state. When communications are restored, the I/O module restarts and may not operate as anticipated.

⚠ WARNING

UNINTENDED EQUIPMENT OPERATION

Do not configure a holdup time value that is less than the recommended minimum value for standalone or redundant systems *(see page 24)*:

- standalone systems:
  - periodic application: 4.4 x PLC scan time
  - cyclic application: configured watchdog value
- redundant systems: configured watchdog value + PLC scan time

Failure to follow these instructions can result in death, serious injury, or equipment damage.

Connection parameter:

Parameter	Comment
Custom RPI	Select this check box to configure the **CRA->CRP RPI** value.
CRA->CPU RPI (inputs)	The RPI is the input refresh rate at which the 140CRA31908 module sends inputs to the CPU EIO scanner service. The RPI is set in the subscribe field for the 140CRA31908 module on the X80 remote drop. ● *periodic mode*: default value = 1/2 MAST period ● *cyclic mode*: default value = 1/4 MAST watchdog timeout period ● *valid values*: 5 ...1500 (ms) **NOTE:** ● You can configure this value only when the **Custom RPI** check box is selected. ● The minimum **CRA->CRP RPI** value is 5 ms.
CPU->CRA RPI (outputs) (See note below.)	Outputs are passed from the CPU with EIO scanner service to the 140CRA31908 module. Set the output refresh rate with the **Application Trigger** value (**CPU->CRA RPI**) at the end of the CPU MAST task: ● *periodic mode*: default value = 1.1 * MAST period. The output value is sent at the end of the actual MAST period. ● *cyclic mode*: default value = 1/4 * watchdog timeout period. The output value is sent at the end of the actual MAST period. You cannot edit this value. All outputs are published synchronously or at the execution of the MAST task: ● synchronously: Outputs are published immediately at the end of the MAST task ● execution of IU_ERIO: You can only generate outputs when you use the IU_ERIO function block *(see Quantum EIO, Remote I/O Modules, Installation and Configuration Guide)*.

NOTE:

- *periodic mode*: When this mode is selected for the MAST task and configured to function, the **Period** value allows the complete execution of the logic. (The MAST can overrun when its execution time exceeds this value.) Valid values: 1...255 ms (increment: 1 ms).
- *cyclic mode*: When this mode is selected for the MAST task, the outputs are sent upon the completion of the task. Use a **Watch Dog** value that is greater than the execution time. Valid values: 10...1500 ms (increment: 10 ms).
- The default value for the watchdog timer is 250 ms. If the MAST task does not finish within the watchdog period, the process times out. If the watchdog is greater than 4 times the MAST period, the remote drops could switch to fallback while the CPU is running. For example, MAST period = 20 ms, logic execution = 90 ms, watchdog time = 100 ms.

Configuring the Size and Location of Data

Introduction

Use the Control Expert **Configuration** tab to configure the size and location of data for an X80 remote drop that includes a 140CRA31908 adapter module.

NOTE: These instructions assume that you have already added a remote drop to your Control Expert project

Access the Configuration Tab

Access the **Configuration** parameters in Control Expert:

Step	Action	Comment
1	Expand (+) the **EIO Bus** in the Control Expert **Project Browser**.	Path: **Project Browser → EIO Bus → Quantum S908 remote drop**
2	Double-click **Quantum S908 remote drop**.	The drop window shows the parameter tabs for the **Quantum S908 remote drop**.
3	Select the **Configuration** tab.	The **Configuration** tab is available for the Quantum S908 remote drop only.

Configuration Parameters

On the Control Expert **Configuration** tab, configure these parameters:

Parameter Name	Value
Starting address status table	the first register in the status table (configured)
Ending address status table	the starting address + the maximum number of addresses for the configured rack size
In Bytes	the total number of bytes for input modules in the X80 remote drop
Out Bytes	the total number of bytes for output modules in the X80 remote drop

Section 3.4
Control Expert Libraries

What Is in This Section?

This section contains the following topics:

Control Expert Libraries

I/O Management Libraries

Use the elementary functions (EFs) and elementary function blocks (EFBs) in the following tables when you use X80 remote drops that manage an S908 network.

Analog I/O Configuration Blocks

Analog I/O configuring: This table shows the EFs and EFBs for the Quantum S908 analog I/O configuration:

Function Block	Block Type	Quantum Family
I_FILTER	EF	linearization for analog inputs
I_SET	EFB	set information for analog input channels
O_FILTER	EF	linearization for analog outputs
O_SET	EFB	set information for analog output channels

NOTE: Refer to the detailed descriptions of the analog I/O configuration blocks *(see EcoStruxure™ Control Expert, I/O Management, Block Library)*.

Analog I/O Scaling Blocks

Analog I/O scaling: This table shows the EFBs for scaling the Quantum S908 analog inputs and outputs:

Function Block	Block Type	Quantum Family
I_NORM7	EF	standardized analog input
I_NORM_WARN	EFB	standardized analog input with warning status
I_PHYS	EF	physical analog input
I_PHYS_WARN	EFB	physical analog input with warning status
I_RAW	EF	raw value analog input
I_RAWSIM	EF	simulated raw value analog input
I_SCALE	EF	scaled analog input
I_SCALE_WARN	EFB	scaled analog input with warning status
O_NORM	EF	standardized analog output
O_NORM_WARN	EFB	standardized analog output with warning status
O_PHYS	EF	physical analog output
O_PHYS_WARN	EFB	physical analog output with warning status
O_RAW	EF	raw value analog output

Function Block	Block Type	Quantum Family
O_SCALE	EF	scaled analog output
O_SCALE_WARN	EFB	scaled analog output with warning status

NOTE: Refer to the *Control Expert I/O Management Block Library* for detailed descriptions of the analog I/O scaling blocks *(see EcoStruxure™ Control Expert, I/O Management, Block Library)*.

Quantum I/O Configuration Blocks

Use these parameters to configure Quantum inputs and outputs:

Name	Block Type	Description
ACI030	EFB	configure ACI03000 module
ACI040	EFB	configure ACI04000 module
ACO020	EFB	configure ACO02000 module
ACO130	EFB	configure ACO13000 module
AII330	EFB	configure AII33000 module
AII33010	EFB	configure AII3301000 module
AIO330	EFB	configure AIO33000 module
AMM090	EFB	configure AMM09000 module
ARI030	EFB	configure ARI03000 module
AVI030	EFB	configure AVI03000 module
AVI030	EFB	configure AVI03000 module
AVO020	EFB	configure AVO02000 module
DROP	EFB	configure remote drop
ERT_854_10	EFB	data transfer
ERT_854_20	EFB	data transfer
ERT_854_30	EFB	data transfer
XDROP	EFB	configure extended remote drop

NOTE: Refer to the *Control Expert I/O Management Block Library* for detailed descriptions of the Quantum I/O configuration blocks *(see EcoStruxure™ Control Expert, I/O Management, Block Library)*.

Simulation Blocks

Use these parameters to simulate (write) a value:

Name	Block Type	Description
WRITE_INPUT_AREBOOL_16	EF	simulate INT value at %I array input
WRITE_INPUT_DINT	EF	simulate DINT value at %ID input
WRITE_INPUT_EBOOL	EF	simulate value at %I input
WRITE_INPUT_INT	EF	simulate INT value at %IW input
WRITE_INPUT_REAL	EF	simulate REAL value at %IF input
WRITE_INPUT_UDINT	EF	simulate UDINT value at %ID input
WRITE_INPUT_UINT	EF	simulate UINT value at %IW input

NOTE: Refer to the *Control Expert I/O Management Block Library* for detailed descriptions of the simulation configuration blocks *(see EcoStruxure™ Control Expert, I/O Management, Block Library)*.

Control Expert LL984 Library Blocks

Control Expert supports these LL984 functions for S908:

Name	Block Type	Description
L9_STAT	EFB	PLC status
L9_MRTM	EFB	multi-register transfer module

NOTE: Refer to the *Control Expert Original LL984 Block Library* for detailed descriptions of the L9_STAT *(see EcoStruxure™ Control Expert, UnityLL984, Block Library)* and L9_MRTM *(see EcoStruxure™ Control Expert, UnityLL984, Block Library)* EFBs.

DROP and XDROP Function Blocks

Introduction

Use the DROP and XDROP function blocks to address Quantum S908 remote drops and X80 remote drops.

Inputs

The SLOT and DROP inputs on the DROP and XDROP blocks have the same functionality:

Input	Description
SLOT	This input indicates the slot number of the module that manages the remote drop.
NUMBER	This input indicates the drop number of the Quantum S908 remote drop.

Remote Drop Targeting

The DROP and XDROP function blocks can manage both the X80 remote drops and Quantum S908 remote drops. Assign values to the inputs that address the appropriate drop:

Target	Input	Value
X80 remote drop	SLOT	Assign the slot number of the CPU in the main rack.
	DROP	Assign the X80 remote drop number.
Quantum S908 remote drop	SLOT	Assign the slot number of the 140CRP93•00 module in the remote drop.
	DROP	Assign the Quantum S908 remote drop number.

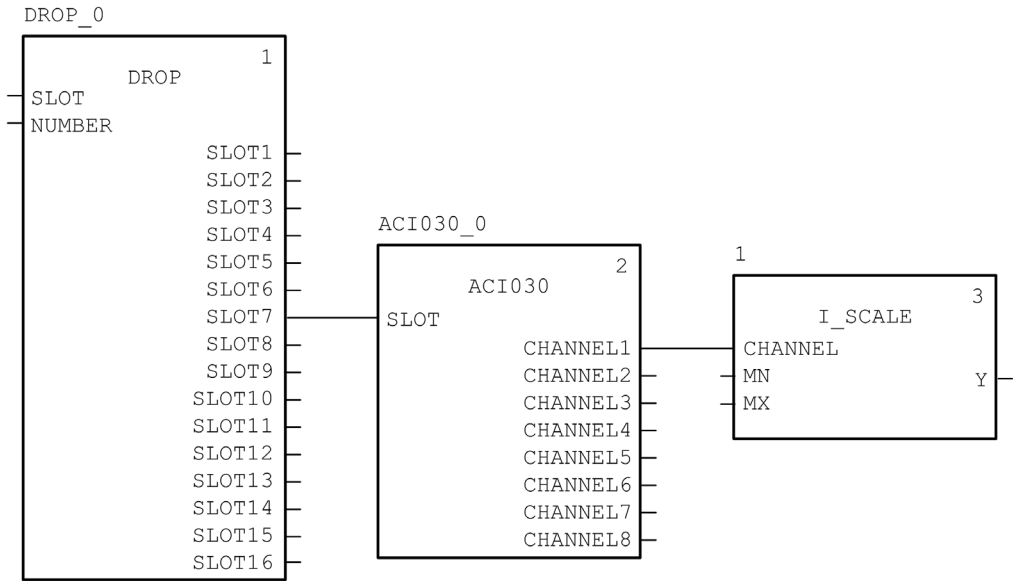
Use case examples:

- The M580 CPU controls a Quantum S908 remote drop through an X80 remote drop that includes a 140CRA31908 adapter module.
  In this case, a 140CRP93•00 module in slot 4 of remote drop 15 is indicated by these input values:
  - SLOT: 4
  - DROP: 15
- The embedded port of the M580 CPU controls an X80 remote drop.
  In this case, the Ethernet port in the CPU (in slot 0) on the main rack controls an X80 drop 15, as indicated by these input values:
  - SLOT: 0
  - DROP: 15

- The embedded port of the M580 CPU controls an X80 remote drop that includes a 140CRA31908 adapter module.
  In this case, the Ethernet port in the CPU (in slot 0) on the main rack controls X80 remote drop 5, as indicated by these input values:
  - `SLOT`: 0
  - `DROP`: 5

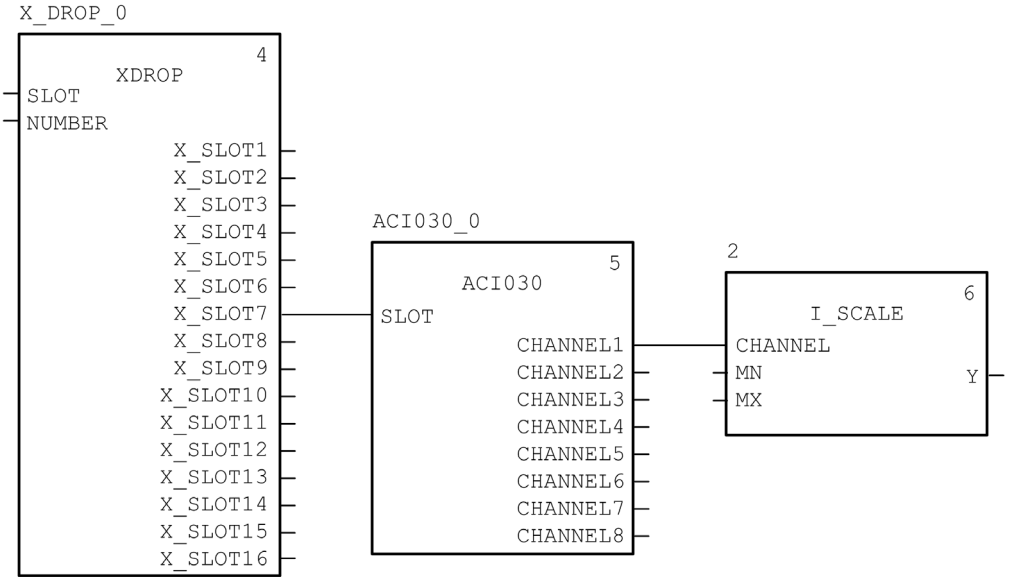
DROP Function Block

The `DROP` function block applies to the main rack in the remote drop:



XDROP Function Block

The XDROP function block applies to the extended rack in the remote drop:



Chapter 4
Operating Modes

What Is in This Chapter?

This chapter contains the following topics:

Operating Modes

Single Access Port

The PLC and the I/O modules on the S908 network are programmed and maintained through Control Expert. You can perform all operations (configuration, tuning, diagnostics, etc.) on the 140CRA31908 module, 140CRP93•00, or Quantum S908 remote drops from the PC on which the Control Expert application is downloaded.

Application Download

Use the Control Expert application to download the 140CRA31908 module and 140CRP93•00 module configurations together.

Fast Device Replacement

You can replace these modules with identical modules. In each case, the replacement module gets the previous configuration and parameters automatically during the initialization of the CPU:

- 140CRA31908 module
- Quantum S908 140CRA93•00 module in a Quantum S908 remote drop
- I/O modules in the Quantum S908 remote drops

I/O Management

The S908 I/O network characteristics are the same as those for Quantum 140CRP93•00 modules:

- You can manage a maximum of 31 SY/MAX, Quantum, and 800 Series I/O remote drops.
- Each remote drop supports up to 64 words IN and 64 words OUT.
- Use only the state RAM mode to program the I/O modules over the S908 network. (The Device DDT programming mode is not supported; topological I/O addressing is supported.)
- I/O data is exchanged only when the CPU is running.
- You can configure only one S908 network. It can be a redundant network *(see page 27)* if you configure two 140CRA31908 adapter modules and a 140CRP93•00 that corresponds to each.
- I/O data over S908 is processed only on the MAST task to create a deterministic network. The 140CRA31908 module, therefore, supports only the MAST task (even for modules that are configured on its local rack).

NOTE: LL984 section and segment schedulers are not supported for the 140CRA31908 module.

Impact of the S908 Network on the Redundant Operating Mode

The support of a redundant S908 network has no impact on redundant M580 architectures *(see page 24)*. The management of the I/O redundancy over the S908 network is independent of redundant operating modes. Therefore, a loss of communications on the S908 network does not drive a M580 CPU switchover.

The redundant system performs a CPU switchover only when these conditions are all met:

- The user configures only two redundant 140CRA31908 modules in the EIO network.
- The primary PLC loses the EtherNet/IP connections to both 140CRA31908 modules.

In a mixed configuration that includes two 140CRA31908 modules and at least one Ethernet CRA module, the CPU switchover is performed only if the primary CPU loses its EtherNet/IP connection to all Ethernet CRA modules and both 140CRA31908 modules.

The user can force a CPU switchover with the swap bit in the redundant DDT (where QSA represents the 140CRA31908 module):

```
IF (Remote IO Health for QSA1 == 0) AND (Remote IO Health for QSA2 == 0)
THEN HSBY_DDT.swap = 1
```

NOTE: The RIO health is part of the 140CRA31908 module diagnostics *(see page 95)* provided by the 140CRA31908 DDT.

Impact of the Redundant Operating Mode on the 140CRA31908

During a CPU switchover, the 140CRA31908 module behaves like the 140CRA31200 module. Within the remote drop hold up time *(see page 75)*, the 140CRA31908 keeps communicating with the modules on its local rack. The values are read from the input modules and copied to the memory of the 140CRA31908 module. The last output values received by the 140CRA31908 from the CPU are sent to the output modules that are configured on its local rack or on the S908 network. This mechanism maintains the current values of the outputs during the CPU switchover.

Impact of Power Cycle on the 140CRA31908 Module Redundancy

After switchover triggered by power cycle on the 140CRA31908 module, the redundancy is effective 40 s after the power up.

PLC Switchover

Switchover considerations:

- The 140CRA31908 module is the master of the I/O points during the switchover. The switchover is bumpless on the S908 RIO.
- The S908 RIOs are not refreshed during two PLC scans when the switchover follows a command, stop, halt, or loss of communications to the primary PLC.
- The S908 RIOs are not refreshed during four PLC scans when the switchover follows a loss of communications to all Ethernet CRA modules.

Fallback Strategy

Quantum S908 Adapter Module Fallback

In some instances, the 140CRA31908 adapter module can lose I/O connections for a period longer than the configured hold up time. During the hold up, the module tries to get IP and configuration parameters from the CPU. If the module does not obtain those parameters, it gets these results:

- *inputs*: retain last known values
- *outputs*: set to fallback

Configure both hold up times:

- One for the Quantum S908 remote drop on the **EIO Bus** (drop with 140CRA31908 adapter module). Set the hold up time value on the Control Expert **Parameter** tab *(see page 75)*.
- One for the Remote IO Quantum drop on the **RIO Bus** (drop with 140CRA93•00 adapter module). Set the hold up time value (multiple of 100 ms) on the Control Expert **Configuration** tab *(see Quantum using EcoStruxure™ Control Expert, Hot Standby System, User Manual)*. Default values are 300 ms for standalone Quantum S908 configuration and 1200 ms for redundant Quantum S908 configuration.

NOTE: The hold up time for the Remote IO Quantum drop starts only after the hold up time for the Quantum S908 remote drop has expired. As a consequence, the IOs over the S908 network follow the fallback strategy after the time equal to Quantum S908 remote drop hold up time + Remote IO Quantum Drop hold up time.

Fallback Strategy

Adopt a fallback strategy:

- **outputs:** Configure a value for each channel in the output modules or accept the fallback values.
- **inputs:** You cannot configure fallback values for input modules.

Behavior	Description
PLC in STOP	• **inputs:** When the M580 PLC is in STOP, the S908 inputs are inhibited. When the PLC returns to RUN, it reads the remote drop inputs before it solves the logic. • **outputs:** When the M580 PLC is in STOP, the S908 outputs retain the last values or the fallback values (according to the configuration).
The RIO master is not healthy.	If the RIO master is not healthy when a single 140CRA31908 module is configured and the CPU is running, these items are true: • **inputs:** All inputs that are configured over the S908 network are set to 0. • **outputs:** All outputs are set to fallback values.
The remote drop is not healthy.	For both single and redundant S908 networks, the loss of communication between a remote drop and its master 140CRP93•00 module has these results: • **inputs:** All inputs are reset. • **outputs:** All outputs are set to fallback values.
The 140CRA31908 module is not connected.	**standalone:** These events occur when the 140CRA31908 module loses its EtherNet/IP connection in a standalone configuration: • **inputs:** All inputs that are configured over the S908 network are set to 0. • **outputs:** All outputs are set to fallback values. **redundant:** These events occur when the 140CRA31908 module loses its EtherNet/IP connection in a redundant configuration: • No CPU switchover occurs.
The CPU is running.	EtherNet/IP or S908 networks: • When the CPU is running, you cannot use system words %SW8 or %SW9 to inhibit the input or output over these networks. • When the CPU is running, you cannot apply fallback values in these networks.

NOTE: When an I/O error is detected over the S908 network, %S10 and %S117 are set to 0. The IO LEDs on the CPU and 140CRA31908 are on.

CCOTF S908

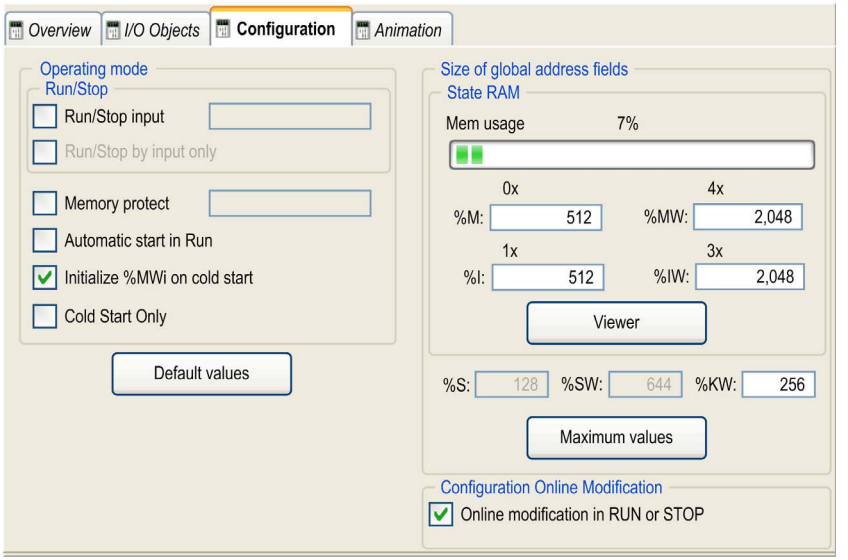
Overview

The CCOTF feature allows to execute the following operations:

- Adding a module in a Quantum drop
- Deleting a module in a Quantum drop
- Modifying a parameter of a module configured in a Quantum drop

CPU Configuration

To allow CCOTF operation over the S908 network, access the CPU configuration screen in Control Expert, and select the **Online modification in RUN or STOP** check box:



NOTE: Only Quantum I/O drops are CCOTF compliant (up to 31 RIO drops).
SY/MAX and 800 series product lines are not supported but they do not prevent CCOTF operation on EIO and S908 bus.

Control Expert Requirements

The minimum software versions required to use CCOTF is Unity Pro XL 12.0 with Hotfix UnityPro_V120_HF_M580_S980_CCOTF installed.

NOTE: Unity Pro 13.0 does not support CCOTF over S908 bus.

Firmware Requirements

The following table gives the required firmware versions to perform CCOTF operations:

Module Type	Part Number	Minimum Firmware Version
M580 CPU	BMEP584040	SV 2.41
	BMEP585040	SV 2.41
	BMEP586040	SV 2.41
M580 Hot Standby CPU	BMEH584040	SV 2.41
	BMEH586040	SV 2.41
S908 Eth S908 gateway	140CRA31908	SV 2.30
S908 RIO communicators	140CRP93•00	SV 2.10
	140CRA93•00	SV 2.03

Chapter 5
Diagnostics

Diagnostics

Introduction

You can get diagnostic information about the 140CRA31908 adapter module from these sources:

- Control Expert application, for example via the L9_STAT *(see page 82)* block
- web pages *(see page 102)*
- LED indicators *(see page 17)*
- Device DDT Parameters *(see page 69)*

NOTE: In a redundant configuration, IO led is flickering on both 140CRA31908 modules when all S908 drops are off.

Control Expert Diagnostics Viewer

Control Expert includes a diagnostics viewer, which logs the following S908 events :

- 140CRA31908 module switchover
- S908 I/O detected error

To open the diagnostic viewer, in the Control Expert main menu select (**Tools → Diagnostic Viewer**).

Rack Viewer Web Page

The 140CRA31908 module web pages include a rack viewer. Access the rack viewer from the **Diagnostics** tab (**Menu → System → Rack Viewer**). In the rack viewer, you can view the following diagnostic data:

- 140CRA31908 module switchover
- S908 I/O detected error

S908 Diagnostics Information (%SW)

Word	Description
IOHEALTH	32 remote drops, 5 racks per drop, 16 modules per rack, 1 health bit per module
RIOERRSTAT	RIO error detected on start-up (1 word)
CAERRCNT	communication status on cable A (3 words)
CBERRCNT	communication status on cable B (3 words)
GLOBERRCNT	global communication status (3 words)
Drops, error counters	Three status words used per remote drop (32 * 3 = 96 words)

System Words %SW185 to %SW764

The RIO master provides a large amount of data to diagnose the S908 network, which is copied into the system words.

The 140CRA31908 module (not the 140CRP93•00 module) updates the M580 CPU with S908 network diagnostic and health information. The 140CRP93•00 module communicates with the Quantum S908 remote drops but does not provide diagnostic data to the M580 CPU.

The words %SW185 to %SW339 are associated with Quantum S908 remote drops 2 to 32. Each remote drop has up to five words, and each word is assigned to a configured rack.

NOTE: You can install a maximum of two Quantum S908 remote racks. The 800 Series can support up to five racks.

This table describes the applicable system words:

Word	Description		Relevance
%SW185	module health bits		Quantum S908 remote drop 2, rack 1
%SW186	module health bits		Quantum S908 remote drop 2, rack 2
%SW335	module health bits		Quantum S908 remote drop 32, rack 1
%SW336	module health bits		Quantum S908 remote drop 32, rack 2
%SW535	CRP start error detection		S908 communication diagnostic
%SW536	least significant byte	dma overrun count (detected error counter)	CABLE A COM STATUS
	most significant byte	frame size (detected error counter)	
%SW537	least significant byte	remote drop receive (detected error counter)	CABLE A COM STATUS
	most significant byte	frame not OK (detected error counter)	
%SW538	least significant byte	bit 0: short frame	CABLE A COM STATUS
		bit 1: detected CRC error	
		bit 2: overrun	
		bit 3: not affected	
		bit 4: abort	
		bits 5 ... 7: residual character length	
	most significant byte	always 0	

Word	Description		Relevance
%SW539	least significant byte	dma overrun count (detected error counter)	CABLE B COM STATUS
	most significant byte	frame size (detected error counter)	
%SW540	least significant byte	remote drop receive (detected error counter)	CABLE B COM STATUS
	most significant byte	frame not OK (detected error counter)	
%SW541	least significant byte	bit 0: short frame	CABLE B COM STATUS
		bit 1: detected CRC error	
		bit 2: overrun	
		bit 3: not affected	
		bit 4: abort	
		bits 5 ... 7: residual character length	
	most significant byte	always 0	
%SW542	least significant byte	cumulative retry counter	GLOBAL COM STATUS
	most significant byte (remote drop health bits)	bit 15: remote drop comm healthy bit	
		bit 14: cable A healthy bit	
		bit 13: cable B healthy bit	
		bit 12	
		bit 11 ... 8: lost communication counter	
%SW543	least significant byte	no response counter (cable A)	GLOBAL COM STATUS
	most significant byte	frame (detected error counter), cable A	
%SW544	least significant byte	no response counter, cable B	GLOBAL COM STATUS
	most significant byte	frame (detected error counter), cable AB	

Word	Description		Relevance
%SW548	least significant byte	cumulative retry counter	DROP 2 COM STATUS
	most significant byte (remote drop health bits)	bit 15: remote drop comm healthy bit	
		bit 14: cable A healthy bit	
		bit 13: cable B healthy bit	
		bit 12	
		bit 11 ... 8: lost communication counter	
%SW549	least significant byte	no response counter (cable A)	DROP 2 COM STATUS
	most significant byte	frame (detected error counter), cable A	
%SW550	least significant byte	no response counter, cable B	DROP 2 COM STATUS
	most significant byte	frame (detected error counter), cable B	
%SW638			DROP 32 COM STATUS
%SW639			
%SW640			

NOTE: System words %SW180 ... %SW184 are reserved for the Quantum local rack.

This table describes the Quantum-specific system words %SW185 to %SW547:

Word **Symbol**		
%SW185 to **%SW339** IOHEALTHij i=1...32, j=1...5	Function	health bits of the PLC modules (Including redundant CPUs)
	Initial State	0
	Words %SW185 to %SW339 are associated with remote drops 2 to 32. Each remote drop has five available words, but only the first two are used: ● %SW185: module health bits of the Quantum S908 remote drop 2 (main rack) ● %SW186: module health bits of the Quantum S908 remote drop 2 (extension rack) ● %SW187: reserved ● %SW188: reserved ● %SW189: reserved ● ... ● %SW335: module health bits of Quantum S908 remote drop 32 (main rack) ● %SW336: module health bits of Quantum S908 remote drop 32 (extension rack) ● %SW337: reserved ● %SW338: reserved ● %SW339: reserved Bits 0 to 15 of each of these words are associated with the modules located in positions 16 to 1 of these racks. The bit equals 0 if the module is inoperative and equals 1 if the module is operating correctly. **Example:** %SW185.5 = 0: the module located in remote drop 2, main rack, slot 11 is inoperative. **NOTE:** Modules 140XBE10000 *(see Quantum using EcoStruxure™ Control Expert, Hardware, Reference Manual)* require a special management. **NOTE:** Extension racks are not used in Safety PLCs. Only the PLC's main rack system words %SW185, %SW190...%SW335) are available in Safety PLCs.	

Word **Symbol**		
%SW535 RIOERRSTAT	Function	RIO error detected on start-up
	Initial State	–
	This word stores the code for the detected start-up error. This word is always set to 0 when the system is running; in the event of an error detection, the PLC does not start up, but generates a stop status code. 01: I/O assignment length 02: Remote I/O link number 03: Number of remote drops in the I/O assignment 04: I/O assignment checksum 10: Length of the remote drop descriptor 11: Remote drop number 12: Remote drop autonomy time 13: ASCII port number 14: Number of remote drop modules 15: Remote drop already configured 16: Port already configured 17: More than 1024 output points 18: More than 1024 input points 20: Module slot address 21: Module rack address 22: Number of output bytes 23: Number of input bytes 25: First reference number 26: Second reference number 28: Internal bits outside the 16 bit range 30: Unpaired odd output module 31: Unpaired odd input module 32: Unpaired odd module reference 33: Reference 1x after register 3x 34: Reference of dummy module already used 35: Module 3x is not a dummy module 36: Module 4x is not a dummy module	

Word Symbol		
%SW536 CAERRCNT1 %SW537 CAERRCNT2 %SW538 CAERRCNT3	Function	Communication status on cable A
	Initial State	–
	These words are the detected communication error words on cable A: ● %SW536: ❍ most significant byte: counts framing (detected errors) ❍ least significant byte: counts overruns of the DMA receiver ● %SW537: ❍ most significant byte: counts receiver (detected errors) ❍ least significant byte: counts incorrect remote drop receptions ● %SW538: ❍ %SW538.15 = 1, short frame ❍ %SW538.14 = 1, no end-of-frame ❍ %SW538.3 = 1, detected CRC error ❍ %SW538.2 = 1, detected alignment error ❍ %SW538.1 = 1, detected overrun error ❍ %SW538.13 to %SW538.4 and %SW538.0 are unused	
%SW539 CBERRCNT1 %SW540 CBERRCNT2 %SW541 CBERRCNT3	Function	Communication status on cable B
	Initial State	–
	These words are the detected communication error words on cable B: ● %SW539: ❍ most significant byte: counts framing (detected errors) ❍ least significant byte: counts overruns of the DMA receiver ● %SW540: ❍ most significant byte: counts receiver (detected errors) ❍ least significant byte: counts incorrect remote drop receptions ● %SW541: ❍ %SW541.15 = 1, short frame ❍ %SW541.14 = 1, no end-of-frame ❍ %SW541.3 = 1, detected CRC error ❍ %SW541.2 = 1, detected alignment error ❍ %SW541.1 = 1, detected overrun error ❍ %SW541.13 to %SW541.4 and %SW541.0 are unused	

Word Symbol		
%SW542 GLOBERRCNT0 %SW543 GLOBERRCNT1 %SW544 GLOBERRCNT2	Function	Global communication status
	Initial State	–
	These words are the detected global communication error words: ● %SW542: displays the global communication status: ❍ %SW542.15 = 1, communication operating correctly ❍ %SW542.14 = 1, communication on cable A operating correctly ❍ %SW542.13 = 1, communication on cable B operating correctly ❍ %SW542.11 to %SW542.8 = lost communications counter ❍ %SW542.7 to %SW542.0 = retry totalizer counter **NOTE:** If cable A is disconnected from the standby PLC, standby status remains active. The primary PLC takes into account the standby PLC, but instead of showing %SW542.14 = 0, the primary %SW542.14 toggles between 0 and 1. ● %SW543: is the total detected global error counter for cable A: ❍ most significant byte: counts the errors detected ❍ least significant byte: counts "non-responses" ● %SW544: is the total detected global error counter for cable B: ❍ most significant byte: counts the errors detected ❍ least significant byte: counts "non-responses"	
%SW545 MODUNHEALTH1 %SW546 IOERRCNT1 %SW547 IORETRY1	Function	Status of the local rack
	Initial State	–
	For the PLCs where drop 1 is reserved for local input/outputs, these status words are used in the following way: ● %SW545: status of the local rack: ❍ %SW545.15 = 1, all modules are operating correctly ❍ %SW545.14 to %SW545.8 = unused, always set to 0 ❍ %SW545.7 to %SW545.0 = number of times the module appears to be inoperable; the counter loops back at 255 ● %SW546: counts detected 16-bit input/output bus errors ● %SW547: counts detected 16-bit input/output bus repetitions	

Web

You can get additional diagnostics information through web pages:

- **rack viewer:** The rack viewer *(see Modicon M580, Hardware, Reference Manual)* page for M580 CPUs displays information about the S908 bus. The page shows each rack and the status of each module. The rack viewer for the Ethernet modules displays information about the S908 bus. The page shows each rack and the status of each module.
- **diagnostics viewer:** The diagnostics viewer displays the status of the 140CRA31908 module relative to its redundant configuration.

Chapter 6
Limitations

What Is in This Chapter?

This chapter contains the following topics:

S908 Network Limitations in an M580 System

Introduction

M580 architectures with X80 remote drops that include a 140CRA31908 adapter module observe the limitations described below.

Limitations

Observe these limitations:

Function	Support	Comment
CCOTF	none	There is no support to add or delete X80 remote drops that contain a 140CRA31908 adapter module.
I/O Sniffing	none	I/O sniffing is not supported by M580 architectures.
I/O vision	state RAM	The state RAM and topological I/O vision are supported to program the I/O over the S908 network. The device DDT is not supported.
Quantum Safety modules	none	Quantum Safety modules can be configured in the M580 network only when they are managed by a Quantum Safety PLC.
section scheduler	none	The 140CRA31908 module does not support the section scheduler mechanism.
segment scheduler	none	The 140CRA31908 module does not support the segment scheduler mechanism.
used task	MAST only	Only the MAST task can process the I/Os over S908. The 140CRA31908 module, therefore, supports the MAST task for only the I/O modules configured in its local rack.
200 Series	with adapter	M580 architectures support 200 Series I/O when the P451 or P453 interface is adapted with a J290 or J291 S908 I/O adapter.

NOTE: In the M580 configuration, assign at least one Quantum S908 remote drop with address 2, 3, 4, 5, 6, 7, 8 or 9.

Application Response Time

Introduction

In a Quantum system, the CPU schedules the CRP directly over the backplane.

In an M580 system, the CRP communicates with the 140CRA31908 module that is scheduled by the CPU over Ethernet/IP.

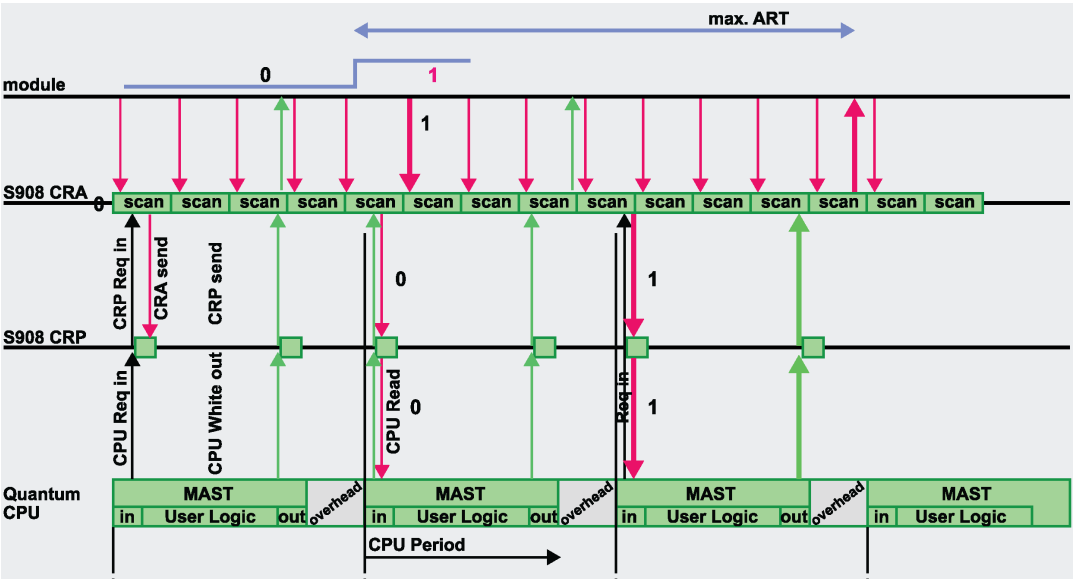
Quantum and M580 systems, therefore, use different methods to manage I/O points and the application response time:

- Quantum: Communication exchanges between an S908 CRP module and a Quantum CPU are done periodically within the cycle time and sequentially remote drop by remote drop. That means the Quantum CPU does not scan the next Quantum S908 remote drop until data for the current remote drop are available. It also means the CPU does not execute the application until all remote drops are refreshed.
- M580: In an M580 system, the input data are sent at a predetermined time interval based on the request packet interval (RPI). The RPI is set (by default) to one-half of the cycle time (if periodic) to synchronize the data with the task.

NOTE:

- For more information, refer to the description of application response time in the *Modicon M580 Hot Standby, System Planning Guide for Frequently Used Architectures*.
- When you import a Quantum application that includes section schedulers and segment schedulers, the order of the logic may not conform to the MAST task. Contact Schneider Electric for more information.
- The local I/O modules are managed in the Quantum S908 remote drop, but the worst-case ART can be increased by 40ms when the 140CRA31908 module is not the I/O master in an S908 remote redundancy configuration.

Quantum S908 ART



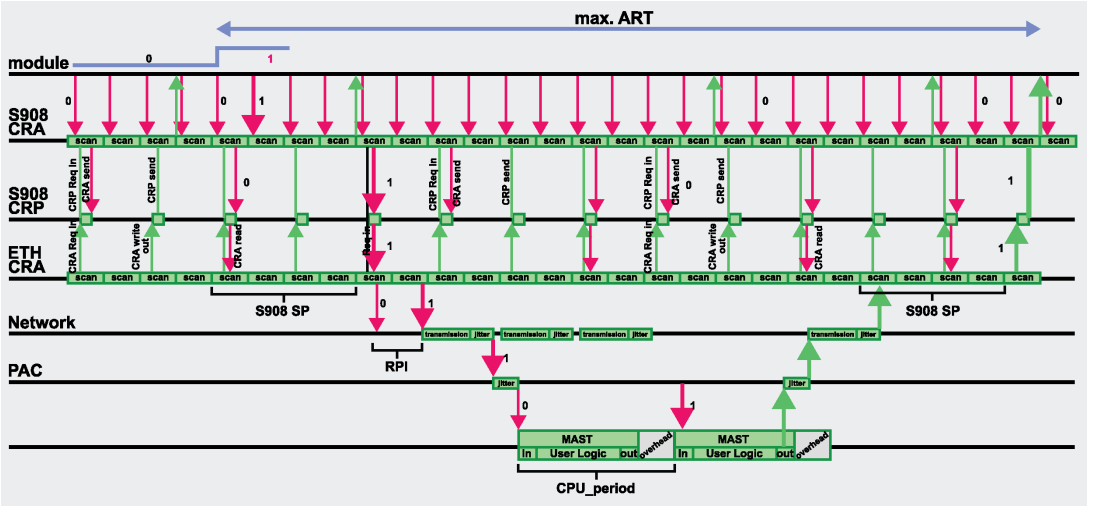
From this illustration of the S908 Quantum ART, we can deduce a simple formula to quickly estimate the maximum ART in a Quantum S908 system:

Mode	Formula
cyclic	`Max ART (ms)= (2*CPU_cycle) + 8.8ms`
periodic	`Max ART (ms)= CPU_period + CPU_cycle + 8.8ms`

Values:

- 8.8ms: This constant value represents the maximum CRA processing time.
- CPU_cycle: CPU_cycle is composed of the real time that is required to execute the application and the S908 scan period, a maximum of 4ms per remote drop in the worst case (an extended remote drop with high number of words).
- CPU_period: CPU_period is composed of the CPU_cycle completed by an overhead to reach the period time configured by the user. Usual recommendation is to have a max CPU_cycle equal to 80% of the configured period.

M580 S908 ART



From this illustration of the S908 M580 ART, we can deduce a simple formula to quickly estimate the maximum ART in an M580 system:

Mode	Formula
cyclic	`Max ART (ms)= CRA->Scanner RPI + 2*CPU_cycle + 8.8ms + 2*S908_scan`
periodic	`Max ART (ms)= CRA->Scanner RPI + (CPU_cycle + CPU_period) + 8.8ms + (2*S908_scan)`

Values:

- 8.8ms: This constant value represents the maximum CRA processing time.
- S908_scan: S908_scan can reach up to 4ms per remote drop (worst case of an extended remote drop with high number of words).
- CPU_cycle: CPU_cycle is the real time required to execute the application and does not include S908_scan time.
- CPU_period: CPU_period is composed of the CPU_cycle completed by an overhead to reach the period time configured by the user. It is recommended to use a maximum CPU_cycle equal to 80 percent of the configured period.

Thanks to M580 additional processing power, we estimate that the cycle execution can be reduced from three to five times compared to Quantum and then compensate in most realistic use cases the Ethernet/IP additional network layer compared to pure S908 network performance. Indeed, in a periodic execution mode, the user will be able in most case to set a period at least three times shorter on an M580 CPU compared to Quantum CPU for the same application. Some exceptions could yet exist for complex systems (especially redundant systems) and could require finer analysis of the application to get the expected performance factor between M580 and Quantum.

Examples

The following tables show sample ART calculation formulas.

Periodic mode example:

System	Characteristics	Maximum ART Formula
Quantum	• remote drops: 16 normal remote drops (periodic mode) • CPU_scan: 150ms max. (including the S908_scan) • CPU_cycle: 120ms	`CPU_period + CPU_cycle + 8.8 = 150 + 120 + 8.8 = 278.8ms`
M580	Same as above, using an M580 CPU in optimized periodic mode (period = 1/3 of Quantum period, with the worst case being 50ms and the cycle time value being 80 percent of the period, which is the recommended cycle time)	`CRA->Scanner RPI + CPU_period + CPU_cycle + 8.8ms + 2*S908_scan = 25 + 50 + 40 + 8.8 + 2*(16*3) = 219.8ms`

Cyclic mode example:

System	Characteristics	Formula
Quantum	• remote drops: 6 normal remote drops (cyclic mode) • CPU_cycle: 93ms max. (75 + 3*6 =93ms due to the S908 scan time)	`2*CPU_cycle + 8.8ms = 2*93 + 8.8 = 194.8ms`
M580	Same as above, using an M580 CPU in cyclic mode, the cycle time becomes 25ms (75 = 25ms), with a watchdog time of 40ms (=> RPI = WDT/4 = 10ms).	`CRA->Scanner RPI + 2*CPU_cycle + 8.8ms + 2*S908_scan = 10 + 2*25 + 8.8 + 2*(6*3) = 104.8ms`

NOTE: In the case of a CPU or 140CRA31908/CRP switchover *(see page 30)*, the ART can increase by two PLC scans.

Chapter 7
Firmware Upgrade

Firmware Update

New Firmware

To update the firmware of the 140CRA31908 adapter module, follow the instructions in the *Ethernet RIO Adapter Firmware Update (see Modicon M580, RIO Modules, Installation and Configuration Guide)* topic.

NOTE: To update the firmware of the 140CRA93•00 and 140CRP93•00 modules, contact a Schneider Electric field service organization.

Redundant Configuration

To update the firmware of both 140CRA31908 adapter modules in a redundant configuration, proceed as follows:

Step	Action
1	Identify the roles of the adapter modules in the redundant configuration: • **I/O master** role • **Not master** role
2	Update the firmware of the **not master** adapter module first.
3	Assign the role of **I/O master** to the adapter module you have updated the firmware. The second adapter module inherit the **not master** role.
4	Update the firmware of the **not master** adapter module.

Chapter 8
Standards, Certifications, and Conformity Tests

What Is in This Chapter?

This chapter contains the following topics:

Standards and Certifications

Download

Click the link that corresponds to your preferred language to download standards and certifications (PDF format) that apply to the modules in this product line:

Title	Languages
Modicon M580, M340, and X80 I/O Platforms, Standards and Certifications	• English: *EIO0000002726* • French: *EIO0000002727* • German: *EIO0000002728* • Italian: *EIO0000002730* • Spanish: *EIO0000002729* • Chinese: *EIO0000002731*

References

For agency certifications, environmental conditions, and mechanical characteristics of the 140CRA31908 adapter module, refer to these topics:

- Agency Approvals and Conformal Coating *(see Quantum using EcoStruxure™ Control Expert, Hardware, Reference Manual)*
- System Specifications *(see Quantum using EcoStruxure™ Control Expert, Hardware, Reference Manual)*
- *Quantum with Control Expert Hardware Reference Guide (see Quantum using EcoStruxure™ Control Expert, Hardware, Reference Manual)*

Glossary

!

%I

According to the CEI standard, %I indicates a language object of type discrete IN.

%IW

According to the CEI standard, %IW indicates a language object of type analog IN.

%M

According to the CEI standard, %M indicates a language object of type memory bit.

%MW

According to the CEI standard, %MW indicates a language object of type memory word.

%Q

According to the CEI standard, %Q indicates a language object of type discrete OUT.

%QW

According to the CEI standard, %QW indicates a language object of type analog OUT.

%SW

According to the CEI standard, %SW indicates a language object of type system word.

A

adapter

An adapter is the target of real-time I/O data connection requests from scanners. It cannot send or receive real-time I/O data unless it is configured to do so by a scanner, and it does not store or originate the data communications parameters necessary to establish the connection. An adapter accepts explicit message requests (connected and unconnected) from other devices.

advanced mode

In Control Expert, advanced mode is a selection that displays expert-level configuration properties that help define Ethernet connections. Because these properties should be edited only by people with a good understanding of EtherNet/IP communication protocols, they can be hidden or displayed, depending upon the qualifications of the specific user.

applicative time stamping

Use the applicative time stamping solution to access time stamp event buffers with a SCADA system that does not support the OPC DA interface. In this case, function blocks in the Control Expert PLC application read events in the buffer and formats them to be sent to the SCADA system.

architecture

Architecture describes a framework for the specification of a network that is constructed of these components:

- physical components and their functional organization and configuration
- operational principles and procedures
- data formats used in its operation

ARRAY

An `ARRAY` is a table containing elements of a single type. This is the syntax: `ARRAY [<limits>] OF <Type>`

Example: `ARRAY [1..2] OF BOOL` is a one-dimensional table with two elements of type `BOOL`.

`ARRAY [1..10, 1..20] OF INT` is a two-dimensional table with 10x20 elements of type `INT`.

ART

(*application response time*) The time a CPU application takes to react to a given input. ART is measured from the time a physical signal in the CPU turns on and triggers a write command until the remote output turns on to signify that the data has been received.

AUX

An (AUX) task is an optional, periodic processor task that is run through its programming software. The AUX task is used to execute a part of the application requiring a low priority. This task is executed only if the MAST and FAST tasks have nothing to execute. The AUX task has two sections:

- IN: Inputs are copied to the IN section before execution of the AUX task.
- OUT: Outputs are copied to the OUT section after execution of the AUX task.

B

BCD

(*binary-coded decimal*) Binary encoding of decimal numbers.

BOOL

(*boolean type*) This is the basic data type in computing. A `BOOL` variable can have either of these values: 0 (`FALSE`) or 1 (`TRUE`).

A bit extracted from a word is of type `BOOL`, for example: `%MW10.4`.

BOOTP

(*bootstrap protocol*) A UDP network protocol that can be used by a network client to automatically obtain an IP address from a server. The client identifies itself to the server using its MAC address. The server, which maintains a pre-configured table of client device MAC addresses and associated IP addresses, sends the client its defined IP address. The BOOTP service utilizes UDP ports 67 and 68.

broadcast

A message sent to all devices in a broadcast domain.

C

CCOTF

(*change configuration on the fly*) A feature of Control Expert that allows a module hardware change in the system configuration while the system is operating. This change does not impact active operations.

CIP™

(*common industrial protocol*) A comprehensive suite of messages and services for the collection of manufacturing automation applications (control, safety, synchronization, motion, configuration and information). CIP allows users to integrate these manufacturing applications with enterprise-level Ethernet networks and the internet. CIP is the core protocol of EtherNet/IP.

class 1 connection

A CIP transport class 1 connection used for I/O data transmission via implicit messaging between EtherNet/IP devices.

class 3 connection

A CIP transport class 3 connection used for explicit messaging between EtherNet/IP devices.

connected messaging

In EtherNet/IP, connected messaging uses a CIP connection for communication. A connected message is a logical relationship between two or more application objects on different nodes. The connection establishes a virtual circuit in advance for a particular purpose, such as frequent explicit messages or real-time I/O data transfers.

connection

A virtual circuit between two or more network devices, created prior to the transmission of data. After a connection is established, a series of data is transmitted over the same communication path, without the need to include routing information, including source and destination address, with each piece of data.

connection originator

The EtherNet/IP network node that initiates a connection request for I/O data transfer or explicit messaging.

connectionless

Describes communication between two network devices, whereby data is sent without prior arrangement between the two devices. Each piece of transmitted data also includes routing information, including source and destination address.

control network

An Ethernet-based network containing PACs, SCADA systems, an NTP server, PCs, AMS, switches, etc. Two kinds of topologies are supported:

- flat: All modules and devices in this network belong to same subnet.
- 2 levels: The network is split into an operation network and an inter-controller network. These two networks can be physically independent, but are generally linked by a routing device.

CPU

(*central processing unit*) The CPU, also known as the processor or controller, is the brain of an industrial manufacturing process. It automates a process as opposed to relay control systems. CPUs are computers suited to survive the harsh conditions of an industrial environment.

D

DDT

(*derived data type*) A derived data type is a set of elements with the same type (`ARRAY`) or with different types (structure).

determinism

For a defined application and architecture, you can predict that the delay between an event (change of value of an input) and the corresponding change of a controller output is a finite time *t*, smaller than the deadline required by your process.

Device DDT (DDDT)

A Device DDT is a DDT predefined by the manufacturer and not modifiable by user. It contains the I/O language elements of an I/O module.

device network

An Ethernet-based network within a remote I/O network that contains both remote I/O and distributed I/O devices. Devices connected on this network follow specific rules to allow remote I/O determinism.

device network

An Ethernet-based network within an RIO network that contains both RIO and distributed equipment. Devices connected on this network follow specific rules to allow RIO determinism.

DFB

(*derived function block*) DFB types are function blocks that can be defined by the user in ST, IL, LD or FBD language.

Using these DFB types in an application makes it possible to:

- simplify the design and entry of the program
- make the program easier to read
- make it easier to debug
- reduce the amount of code generated

DHCP

(*dynamic host configuration protocol*) An extension of the BOOTP communications protocol that provides for the automatic assignment of IP addressing settings, including IP address, subnet mask, gateway IP address, and DNS server names. DHCP does not require the maintenance of a table identifying each network device. The client identifies itself to the DHCP server using either its MAC address, or a uniquely assigned device identifier. The DHCP service utilizes UDP ports 67 and 68.

DIO

(*distributed I/O*) Also known as distributed equipment. DRSs use DIO ports to connect distributed equipment.

DIO cloud

A group of distributed equipment that is not required to support RSTP. DIO clouds require only a single (non-ring) copper wire connection. They can be connected to some of the copper ports on DRSs, or they can be connected directly to the CPU or Ethernet communications modules in the *local rack*. DIO clouds **cannot** be connected to *sub-rings*.

DIO network

A network containing distributed equipment, in which I/O scanning is performed by a CPU with DIO scanner service on the local rack. DIO network traffic is delivered after RIO traffic, which takes priority in an RIO network.

distributed equipment

Any Ethernet device (Schneider Electric device, PC, servers, or third-party devices) that supports exchange with a CPU or other Ethernet I/O scanner service.

DNS

(*domain name server/service*) A service that translates an alpha-numeric domain name into an IP address, the unique identifier of a device on the network.

domain name

An alpha-numeric string that identifies a device on the internet, and which appears as the primary component of a web site's uniform resource locator (URL). For example, the domain name *schneider-electric.com* is the primary component of the URL *www.schneider-electric.com*.

Each domain name is assigned as part of the domain name system, and is associated with an IP address.

Also called a host name.

DRS

(*dual-ring switch*) A ConneXium extended managed switch that has been configured to operate on an Ethernet network. Predefined configuration files are provided by Schneider Electric to downloaded to a DRS to support the special features of the main ring / sub-ring architecture.

DSCP

(*differentiated service code points*) This 6-bit field is in the header of an IP packet to classify and prioritize traffic.

DST

(*daylight saving time*) DST is also called *summer time* and is a practice consisting of adjusting forward the clock near the start of spring and adjusting it backward near the start of autumn.

DT

(*date and time*) The `DT` type, encoded in BCD in a 64-bit format, contains this information:

- the year encoded in a 16-bit field
- the month encoded in an 8-bit field
- the day encoded in an 8-bit field
- the time encoded in an 8-bit field
- the minutes encoded in an 8-bit field
- the seconds encoded in an 8-bit field

NOTE: The eight least significant bits are not used.

The `DT` type is entered in this format:

`DT#<Year>-<Month>-<Day>-<Hour>:<Minutes>:<Seconds>`

This table shows the upper/lower limits of each field:

Field	Limits	Comment
Year	[1990,2099]	Year
Month	[01,12]	The leading 0 is displayed; it can be omitted during data entry.
Day	[01,31]	For months 01/03/05/07/08/10/12
	[01,30]	For months 04/06/09/11
	[01,29]	For month 02 (leap years)
	[01,28]	For month 02 (non-leap years)
Hour	[00,23]	The leading 0 is displayed; it can be omitted during data entry.
Minute	[00,59]	The leading 0 is displayed; it can be omitted during data entry.
Second	[00,59]	The leading 0 is displayed; it can be omitted during data entry.

DTM

(*device type manager*) A DTM is a device driver running on the host PC. It provides a unified structure for accessing device parameters, configuring and operating the devices, and troubleshooting devices. DTMs can range from a simple graphical user interface (GUI) for setting device parameters to a highly sophisticated application capable of performing complex real-time calculations for diagnosis and maintenance purposes. In the context of a DTM, a device can be a communications module or a remote device on the network.

See FDT.

E

EDS

(*electronic data sheet*) EDS are simple text files that describe the configuration capabilities of a device. EDS files are generated and maintained by the manufacturer of the device.

EF

(*elementary function*) This is a block used in a program which performs a predefined logical function.

A function does not have any information on the internal state. Several calls to the same function using the same input parameters will return the same output values. You will find information on the graphic form of the function call in the [*functional block (instance)*]. Unlike a call to a function block, function calls include only an output which is not named and whose name is identical to that of the function. In FBD, each call is indicated by a unique [number] via the graphic block. This number is managed automatically and cannot be modified.

Position and configure these functions in your program to execute your application.

You can also develop other functions using the SDKC development kit.

EFB

(*elementary function block*) This is a block used in a program which performs a predefined logical function.

EFBs have states and internal parameters. Even if the inputs are identical, the output values may differ. For example, a counter has an output indicating that the preselection value has been reached. This output is set to 1 when the current value is equal to the preselection value.

EIO network

(Ethernet I/O) An Ethernet-based network that contains three types of devices:

- local rack
- X80 remote drop (using a BM•CRA312•0 adapter module), or a BMENOS0300 network option switch module
- ConneXium extended dual-ring switch (DRS)

NOTE: Distributed equipment may also participate in an Ethernet I/O network via connection to DRSs or the service port of X80 remote modules.

EN

`EN` stands for **EN**able; it is an optional block input. When the `EN` input is enabled, an `ENO` output is set automatically.

If `EN` = 0, the block is not enabled; its internal program is not executed, and `ENO` is set to 0.

If `EN` = 1, the block's internal program is run and `ENO` is set to 1. If a runtime error is detected, `ENO` is set to 0.

If the `EN` input is not connected, it is set automatically to 1.

ENO

`ENO` stands for **E**rror **NO**tification; this is the output associated with the optional input `EN`.

If `ENO` is set to 0 (either because `EN` = 0 or if a runtime error is detected):

- The status of the function block outputs remains the same as it was during the previous scanning cycle that executed correctly.
- The output(s) of the function, as well as the procedures, are set to 0.

Ethernet

A 10 Mb/s, 100 Mb/s, or 1 Gb/s, CSMA/CD, frame-based LAN that can run over copper twisted pair or fiber optic cable, or wireless. The IEEE standard 802.3 defines the rules for configuring a wired Ethernet network; the IEEE standard 802.11 defines the rules for configuring a wireless Ethernet network. Common forms include 10BASE-T, 100BASE-TX, and 1000BASE-T, which can utilize category 5e copper twisted pair cables and RJ45 modular connectors.

Ethernet DIO scanner service

This embedded DIO scanner service of M580 CPUs manages distributed equipment on an M580 device network.

Ethernet I/O scanner service

This embedded Ethernet I/O scanner service of M580 CPUs manages distributed equipment **and** RIO drops on an M580 device network.

EtherNet/IP™

A network communication protocol for industrial automation applications that combines the standard internet transmission protocols of TCP/IP and UDP with the application layer common industrial protocol (CIP) to support both high speed data exchange and industrial control. EtherNet/IP employs electronic data sheets (EDS) to classify each network device and its functionality.

explicit messaging

TCP/IP-based messaging for Modbus TCP and EtherNet/IP. It is used for point-to-point, client/server messages that include both data, typically unscheduled information between a client and a server, and routing information. In EtherNet/IP, explicit messaging is considered class 3 type messaging, and can be connection-based or connectionless.

explicit messaging client

(*explicit messaging client class*) The device class defined by the ODVA for EtherNet/IP nodes that only support explicit messaging as a client. HMI and SCADA systems are common examples of this device class.

F

FAST

A FAST task is an optional, periodic processor task that identifies high priority, multiple scan requests, which is run through its programming software. A FAST task can schedule selected I/O modules to have their logic solved more than once per scan. The FAST task has two sections:

- IN: Inputs are copied to the IN section before execution of the FAST task.
- OUT: Outputs are copied to the OUT section after execution of the FAST task.

FBD

(*function block diagram*) An IEC 61131-3 graphical programming language that works like a flowchart. By adding simple logical blocks (`AND`, `OR`, etc.), each function or function block in the program is represented in this graphical format. For each block, the inputs are on the left and the outputs on the right. Block outputs can be linked to inputs of other blocks to create complex expressions.

FDR

(*fast device replacement*) A service that uses configuration software to replace an inoperable product.

FDT

(*field device tool*) The technology that harmonizes communication between field devices and the system host.

FTP

(*file transfer protocol*) A protocol that copies a file from one host to another over a TCP/IP-based network, such as the internet. FTP uses a client-server architecture as well as separate control and data connections between the client and server.

full duplex

The ability of two networked devices to independently and simultaneously communicate with each other in both directions.

function block diagram

See FBD.

G

gateway

A gateway device interconnects two different networks, sometimes through different network protocols. When it connects networks based on different protocols, a gateway converts a datagram from one protocol stack into the other. When used to connect two IP-based networks, a gateway (also called a router) has two separate IP addresses, one on each network.

GPS

(*global positioning system*) The GPS standard consists of a space-based positioning, navigation, and timing signals delivered worldwide for civil and military use. Standard positioning service performance depends on satellite broadcast signal parameters, GPS constellation design, the number of satellites in sight, and various environmental parameters.

H

harsh environment

Resistance to hydrocarbons, industrial oils, detergents and solder chips. Relative humidity up to 100%, saline atmosphere, significant temperature variations, operating temperature between -10°C and + 70°C, or in mobile installations. For hardened (H) devices, the relative humidity is up to 95% and the operating temperature is between -25°C and + 70°C.

HART

(*highway addressable remote transducer*) A bi-directional communication protocol for sending and receiving digital information across analog wires between a control or monitoring system and smart devices.

HART is the global standard for providing data access between host systems and intelligent field instruments. A host can be any software application from a technician's hand-held device or laptop to a plant's process control, asset management, or other system using any control platform.

high-capacity daisy chain loop

Often referred to as HCDL, a high-capacity daisy chain loop uses dual-ring switches (DRSs) to connect device sub-rings (containing RIO drops or distributed equipment) and/or DIO clouds to the Ethernet RIO network.

HMI

(*human machine interface*) System that allows interaction between a human and a machine.

Hot Standby

A Hot Standby system uses a primary PAC (PLC) and a standby PAC. The two PAC racks have identical hardware and software configurations. The standby PAC monitors the current system status of the primary PAC. If the primary PAC becomes inoperable, high-availability control is maintained when the standby PAC takes control of the system.

HTTP

(*hypertext transfer protocol*) A networking protocol for distributed and collaborative information systems. HTTP is the basis of data communication for the web.

I

I/O scanner

An Ethernet service that continuously polls I/O modules to collect data, status, event, and diagnostics information. This process monitors inputs and controls outputs. This service supports both RIO and DIO logic scanning.

IEC 61131-3

International standard: programmable logic controllers

Part 3: programming languages

IGMP

(internet group management protocol) This internet standard for multicasting allows a host to subscribe to a particular multicast group.

IL

(*instruction list*) An IEC 61131-3 programming language that contains a series of basic instructions. It is very close to assembly language used to program processors. Each instruction is made up of an instruction code and an operand.

implicit messaging

UDP/IP-based class 1 connected messaging for EtherNet/IP. Implicit messaging maintains an open connection for the scheduled transfer of control data between a producer and consumer. Because an open connection is maintained, each message contains primarily data, without the overhead of object information, plus a connection identifier.

INT

(*INTeger*) (encoded in 16 bits) The upper/lower limits are as follows: -(2 to the power of 15) to (2 to the power of 15) - 1.

Example: `-32768`, `32767`, `2#1111110001001001`, `16#9FA4`.

inter-controller network

An Ethernet-based network that is part of the control network, and provides data exchange between controllers and engineering tools (programming, asset management system (AMS)).

IODDT

(*input/output derived data type*) A structured data type representing a module, or a channel of a CPU. Each application expert module possesses its own IODDTs.

IP address

The 32-bit identifier, consisting of both a network address and a host address assigned to a device connected to a TCP/IP network.

IPsec

(*internet protocol security*) An open set of protocol standards that make IP communication sessions private and secure for traffic between modules using IPsec, developed by the internet engineering task force (IETF). The IPsec authentication and encryption algorithms require user-defined cryptographic keys that process each communications packet in an IPsec session.

isolated DIO network

An Ethernet-based network containing distributed equipment that does not participate in an RIO network.

L

LD

(*ladder diagram*) An IEC 61131-3 programming language that represents instructions to be executed as graphical diagrams very similar to electrical diagrams (contacts, coils, etc.).

literal value of an integer

A literal value of an integer is used to enter integer values in the decimal system. Values may be preceded by the "+" and "-" signs. Underscore signs (_) separating numbers are not significant.

Example:

```
-12, 0, 123_456, +986
```

local rack

An M580 rack containing the CPU and a power supply. A local rack consists of one or two racks: the main rack and the extended rack, which belongs to the same family as the main rack. The extended rack is optional.

local slave

The functionality offered by Schneider Electric EtherNet/IP communication modules that allows a scanner to take the role of an adapter. The local slave enables the module to publish data via implicit messaging connections. Local slave is typically used in peer-to-peer exchanges between PACs.

M

M580 Ethernet I/O device

An Ethernet device that provides automatic network recovery and deterministic RIO performance. The time it takes to resolve an RIO logic scan can be calculated, and the system can recover quickly from a communication disruption. M580 Ethernet I/O devices include:

- local rack (including a CPU with Ethernet I/O scanner service)
- RIO drop (including an X80 adapter module)
- DRS switch with a predefined configuraton

main ring

The main ring of an Ethernet RIO network. The ring contains RIO modules and a local rack (containing a CPU with Ethernet I/O scanner service) and a power supply module.

MAST

A master (MAST) task is a deterministic processor task that is run through its programming software. The MAST task schedules the RIO module logic to be solved in every I/O scan. The MAST task has two sections:

- IN: Inputs are copied to the IN section before execution of the MAST task.
- OUT: Outputs are copied to the OUT section after execution of the MAST task.

MB/TCP

(*Modbus over TCP protocol*) This is a Modbus variant used for communications over TCP/IP networks.

MIB

(*management information base*) A virtual database used for managing the objects in a communications network. See SNMP.

Modbus

Modbus is an application layer messaging protocol. Modbus provides client and server communications between devices connected on different types of buses or networks. Modbus offers many services specified by function codes.

multicast

A special form of broadcast where copies of the packet are delivered to only a specified subset of network destinations. Implicit messaging typically uses multicast format for communications in an EtherNet/IP network.

N

network

There are two meanings:

- In a ladder diagram:
  A network is a set of interconnected graphic elements. The scope of a network is local, concerning the organizational unit (section) of the program containing the network.
- With expert communication modules:
  A network is a set of stations that intercommunicate. The term *network* is also used to define a group interconnected graphic elements. This group then makes up part of a program that may comprise a group of networks.

network time service

Use this service to synchronize computer clocks over the Internet to record events (sequence events), synchronize events (trigger simultaneous events), or synchronize alarms and I/O (time stamp alarms).

NIM

(*network interface module*) A NIM resides in the first position on an STB island (leftmost on the physical setup). The NIM provides the interface between the I/O modules and the fieldbus master. It is the only module on the island that is fieldbus-dependent — a different NIM is available for each fieldbus.

NTP

(*network time protocol*) Protocol for synchronizing computer system clocks. The protocol uses a jitter buffer to resist the effects of variable latency.

O

O->T

(*originator to target*) See originator and target.

ODVA

(*Open DeviceNet Vendors Association*) The ODVA supports network technologies that are based on CIP.

OFS

(*OPC Factory Server*) OFS enables real-time SCADA communications with the Control Expert family of PLCs. OFS utilizes the standard OPC data access protocol.

OPC DA

(*OLE for Process Control Data Access*) The Data Access Specification is the most commonly implemented of the OPC standards that provide specifications for real-time data communications between clients and servers.

operation network

An Ethernet-based network containing operator tools (SCADA, client PC, printers, batch tools, EMS, etc.). Controllers are connected directly or through routing of the inter-controller network. This network is part of the control network.

originator

In EtherNet/IP, a device is considered the originator when it initiates a CIP connection for implicit or explicit messaging communications or when it initiates a message request for un-connected explicit messaging.

P

PAC

programmable automation controller. The PAC is the brain of an industrial manufacturing process. It automates a process as opposed to relay control systems. PACs are computers suited to survive the harsh conditions of an industrial environment.

port 502

Port 502 of the TCP/IP stack is the well-known port that is reserved for Modbus TCP communications.

port mirroring

In this mode, data traffic that is related to the source port on a network switch is copied to another destination port. This allows a connected management tool to monitor and analyze the traffic.

PTP

(*precision time protocol*) Use this protocol to synchronize clocks throughout a computer network. On a local area network, PDP achieves clock accuracy in the sub-microsecond range, making it suitable for measurement and control systems.

Q

QoS

(*quality of service*) The practice of assigning different priorities to traffic types for the purpose of regulating data flow on the network. In an industrial network, QoS is used to provide a predictable level of network performance.

R

rack optimized connection

Data from multiple I/O modules are consolidated in a single data packet to be presented to the scanner in an implicit message in an EtherNet/IP network.

ready device

Ethernet ready device that provides additional services to the EtherNet/IP or Modbus module, such as: single parameter entry, bus editor declaration, system transfer, deterministic scanning capacity, alert message for modifications, and shared user rights between Control Expert and the device DTM.

RIO drop

One of the three types of RIO modules in an Ethernet RIO network. An RIO drop is an M580 rack of I/O modules that are connected to an Ethernet RIO network and managed by an Ethernet RIO adapter module. A drop can be a single rack or a main rack with an extended rack.

RIO network

An Ethernet-based network that contains 3 types of RIO devices: a local rack, an RIO drop, and a ConneXium extended dual-ring switch (DRS). Distributed equipment may also participate in an RIO network via connection to DRSs or BMENOS0300 network option switch modules.

RPI

(requested packet interval) The time period between cyclic data transmissions requested by the scanner. EtherNet/IP devices publish data at the rate specified by the RPI assigned to them by the scanner, and they receive message requests from the scanner at each RPI.

RSTP

(*rapid spanning tree protocol*) Allows a network design to include spare (redundant) links to provide automatic backup paths if an active link stops working, without the need for loops or manual enabling/disabling of backup links.

S

S908 RIO

A Quantum RIO system using coaxial cabling and terminators.

SCADA

(*supervisory control and data acquisition*) SCADA systems are computer systems that control and monitor industrial, infrastructure, or facility-based processes (examples: transmitting electricity, transporting gas and oil in pipelines, and distributing water).

scanner

A scanner acts as the originator of I/O connection requests for implicit messaging in EtherNet/IP, and message requests for Modbus TCP.

scanner class device

A scanner class device is defined by the ODVA as an EtherNet/IP node capable of originating exchanges of I/O with other nodes in the network.

service port

A dedicated Ethernet port on the M580 RIO modules. The port may support these major functions (depending on the module type):

- port mirroring: for diagnostic use
- access: for connecting HMI/Control Expert/ConneXview to the CPU
- extended: to extend the device network to another subnet
- disabled: disables the port, no traffic is forwarded in this mode

SFC

(*sequential function chart*) An IEC 61131-3 programming language that is used to graphically represent in a structured manner the operation of a sequential CPU. This graphical description of the CPU's sequential behavior and of the various resulting situations is created using simple graphic symbols.

SFP

(*small form-factor pluggable*). The SFP transceiver acts as an interface between a module and fiber optic cables.

simple daisy chain loop

Often referred to as SDCL, a simple daisy chain loop contains RIO modules only (no distributed equipment). This topology consists of a local rack (containing a CPU with Ethernet I/O scanner service), and one or more RIO drops (each drop containing an RIO adapter module).

SMTP

(*simple mail transfer protocol*) An email notification service that allows controller-based projects to report alarms or events. The controller monitors the system and can automatically create an email message alert with data, alarms, and/or events. Mail recipients can be either local or remote.

SNMP

(*simple network management protocol*) Protocol used in network management systems to monitor network-attached devices. The protocol is part of the internet protocol suite (IP) as defined by the internet engineering task force (IETF), which consists of network management guidelines, including an application layer protocol, a database schema, and a set of data objects.

SNTP

(*simple network time protocol*) See NTP.

SOE

(*sequence of events*) The process of determining the order of events in an industrial system and correlating those events to a real-time clock.

ST

(*structured text*) An IEC 61131-3 programming language that presents structured literal language and is a developed language similar to computer programming languages. It can be used to organize a series of instructions.

sub-ring

An Ethernet-based network with a loop attached to the main ring, via a dual-ring switch (DRS) or BMENOS0300 network option switch module on the main ring. This network contains RIO or distributed equipment.

subnet mask

The 32-bit value used to hide (or mask) the network portion of the IP address and thereby reveal the host address of a device on a network using the IP protocol.

switch

A multi-port device used to segment the network and limit the likelihood of collisions. Packets are filtered or forwarded based upon their source and destination addresses. Switches are capable of full-duplex operation and provide full network bandwidth to each port. A switch can have different input/output speeds (for example, 10, 100 or 1000Mbps). Switches are considered OSI layer 2 (data link layer) devices.

system time stamping

xx

T

T->O

(*target to originator*) See target and originator.

target

In EtherNet/IP, a device is considered the target when it is the recipient of a connection request for implicit or explicit messaging communications, or when it is the recipient of a message request for un-connected explicit messaging.

TCP

(*transmission control protocol*) A key protocol of the internet protocol suite that supports connection-oriented communications, by establishing the connection necessary to transmit an ordered sequence of data over the same communication path.

TCP/IP

Also known as *internet protocol suite*, TCP/IP is a collection of protocols used to conduct transactions on a network. The suite takes its name from two commonly used protocols: transmission control protocol and internet protocol. TCP/IP is a connection-oriented protocol that is used by Modbus TCP and EtherNet/IP for explicit messaging.

TFTP

(*trivial file transfer protocol*) A simplified version of *file transfer protocol* (FTP), TFTP uses a client-server architecture to make connections between two devices. From a TFTP client, individual files can be uploaded to or downloaded from the server, using the user datagram protocol (UDP) for transporting data.

TIME_OF_DAY

See `TOD`.

TOD

(*time of day*) The `TOD` type, encoded in BCD in a 32-bit format, contains this information:

- the hour encoded in an 8-bit field
- the minutes encoded in an 8-bit field
- the seconds encoded in an 8-bit field

NOTE: The eight least significant bits are not used.

The TOD type is entered in this format: xxxxxxxx: **`TOD#`**`<Hour>:<Minutes>:<Seconds>`

This table shows the upper/lower limits of each field:

Field	Limits	Comment
Hour	[00,23]	The leading 0 is displayed; it can be omitted during data entry.
Minute	[00,59]	The leading 0 is displayed; it can be omitted during data entry.
Second	[00,59]	The leading 0 is displayed; it can be omitted during data entry.

Example: `TOD#23:59:45`.

TR

(*transparent ready*) Web-enabled power distribution equipment, including medium- and low-voltage switch gear, switchboards, panel boards, motor control centers, and unit substations. Transparent Ready equipment allows you to access metering and equipment status from any PC on the network, using a standard web browser.

trap

A trap is an event directed by an SNMP agent that indicates one of these events:

- A change has occurred in the status of an agent.
- An unauthorized SNMP manager device has attempted to get data from (or change data on) an SNMP agent.

U

UDP

(*user datagram protocol*) A transport layer protocol that supports connectionless communications. Applications running on networked nodes can use UDP to send datagrams to one another. Unlike TCP, UDP does not include preliminary communication to establish data paths or provide data ordering and checking. However, by avoiding the overhead required to provide these features, UDP is faster than TCP. UDP may be the preferred protocol for time-sensitive applications, where dropped datagrams are preferable to delayed datagrams. UDP is the primary transport for implicit messaging in EtherNet/IP.

UMAS

(*Unified Messaging Application Services*) UMAS is a proprietary system protocol that manages communications between Control Expert and a controller.

UTC

(*coordinated universal time*) Primary time standard used to regulate clocks and time worldwide (close to former GMT time standard).

V

variable

Memory entity of type `BOOL`, `WORD`, `DWORD`, etc., whose contents can be modified by the program currently running.

VLAN

(*virtual local area network*) A local area network (LAN) that extends beyond a single LAN to a group of LAN segments. A VLAN is a logical entity that is created and configured uniquely using applicable software.

Index

E

F

G

I

L

Q

R

S

T