Momentum M1 Processor Adapter and Option Adapter User Guide

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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, 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 an imminently hazardous situation, which, if not avoided, **will result** in death, serious injury, or equipment damage.

WARNING

WARNING indicates a potentially hazardous situation, which, if not avoided, **can result** in death, serious injury, or equipment damage.

CAUTION

CAUTION indicates a potentially hazardous situation, which, if not avoided, **can result** in injury or equipment damage.

PLEASE NOTE

Electrical equipment should be serviced only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material. This document is not intended as an instruction manual for untrained persons.

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About the Book

At a Glance

Document Scope

This manual contains complete information about the Momentum M1 processor adapters, option adapters and Ethernet adapters. It does not contain information about Momentum I/O bases or communication adapters.

Validity Note

The data and illustrations found in this book are not binding. We reserve the right to modify our products in line with our policy of continuous product development. The information in this document is subject to change without notice and should not be construed as a commitment by Schneider Electric.

Related Documents

Title of Documentation	Reference Number
Momentum I/O Bases User Guide	870 USE 002 00
170 PNT Series Modbus Plus Communication Adapters for Momentum User Guide	870 USE 103 00
170 NEF Series Modbus Plus Communication Adapters for TSX Momentum User Guide	870 USE 111 00

Product Related Warnings

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All pertinent state, regional, and local safety regulations must be observed when installing and using this product. For reasons of safety and to ensure compliance with documented system data, only the manufacturer should perform repairs to components.
When controllers are used for applications with technical safety requirements, please follow the relevant instructions.
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 product related warning can result in injury or equipment damage.

User Comments

We welcome your comments about this document. You can reach us by e-mail at techpub@schneider-electric.com

Getting Started with Momentum Components

I

At a Glance

Purpose

This part describes the M1 processor adapters and option adapters and explains how to assemble them.

What's in this Part?

This part contains the following chapters:

Overview of Momentum M1 Processor Adapters

1

At a Glance

Purpose

A Momentum M1 processor adapter can be snapped onto a Momentum I/O base to create a central processing unit (CPU) that provides programmable logic control to local and distributed I/O.
This chapter describes the eight M1 processor adapters.

What's in this Chapter?

This chapter contains the following sections:

1.1 Introducing the M1 Processor Adapters

Overview

Purpose

A Momentum M1 processor adapter stores and executes the application program, controlling the local I/O points of its host I/O base and distributed I/O devices on a common communication bus.
This section describes the front panel components, memory and performance characteristics of M1 processor adapters.

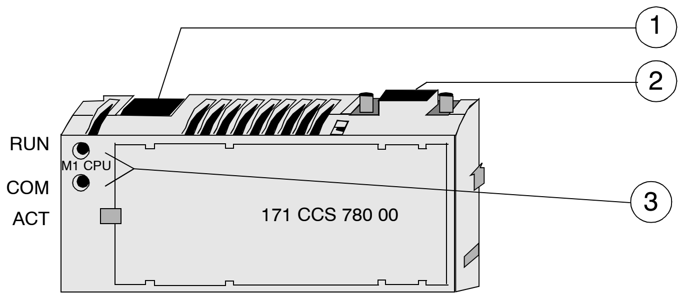
What's in this Section?

This section contains the following topics:

Front Panel illustration (M1 Processor Adapters)

Introduction

A typical processor adapter is shown in the following illustration.



Label	Description
1	Standard port connector
2	Optional second port connector
3	LED indicators

Overview of Ports (M1 Processor Adapters)

Introduction

Each processor adapter is equipped with at least one Modbus or Ethernet port. Some models also have a second port. The ports allow the processor adapter to communicate with:

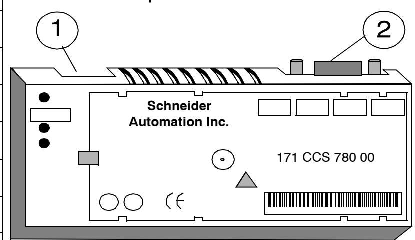
- programming panels
- network I/O points under its control
- network supervisory computers

Adapter Ports

The following table indicates which ports are available with each processor adapter:

	Standard		Optional	
Processor Adapter	**Ethernet Port**	**Modbus RS-232**	**Modbus RS-485**	**I/O Bus Port**
171 CCS 700 00		x		
171 CCS 700 10		x		
171 CCS 760 00		x		x
171 CCC 760 10		x		x
171 CCS 780 00		x	x	
171 CCC 780 10		x	x	
171 CCC 960 20	x			x
171 CCC 960 30	x			x
171 CCC 980 20	x		x	
171 CCC 980 30	x		x	

This is the adapter.



1 Port 1
2 Port 2

Ethernet Port

The Ethernet port is a standard, twisted pair, Ethernet 10BASE-T port which can communicate with programming panels, other M1 processor adapters with Ethernet ports, and with other Ethernet products. This port has an RJ45 connector, with an industry standard pinout.

Modbus Port 1

Modbus port 1 is a general-purpose asynchronous serial port with dedicated RS232 slave functionality. This port has an RJ45 connector.

Modbus Port 2

Modbus port 2 is a general-purpose asynchronous serial port with dedicated RS485 slave functionality. This port has a 9-pin D connector.

I/OBus Port

The I/O bus port is used to control and communicate with other network (non-local) I/O modules under the control of the CPU. This port has a 9-pin D connector.

Memory and Performance Characteristics of M1 Processor Adapters

Introduction

Processor adapters are equipped with internal memory and flash RAM. This section explains those two types of memory and describes the memory size and performance characteristics of each processor adapter.

Internal Memory

Internal memory includes user memory and state RAM:
- User memory contains the control logic program and such system overhead as the processor adapter configuration, I/O mapping, checksum and system diagnostics.
- State RAM is the area in memory where all the input and output references for program and control operations are defined and returned.

The user may change the way internal memory is allocated by adjusting parameters for user memory and state RAM.

Flash RAM

Flash RAM contains the executive firmware, which is the operating system for the PLC. It also contains a firmware kernel, which cannot be changed. The kernel is a small portion of memory that recognizes acceptable executive firmware packages and allows them to be downloaded to the processor adapter.

Space is also provided in flash so that a copy of the user program and state RAM values can be stored. This back-up capability is particularly useful in configurations where no battery is used (i.e., a processor adapter without an option adapter).

When the module is successfully communicating with other devices, if a ring adapter with battery back up is not present, it is recommended that you stop the processor and save the user program to flash. This will save the processor’s ARP cache and enable it to remember this information if power is lost or removed.

This procedure should also be followed whenever:
- a new or substitute device is installed on the network
- the IP address of a network device has been changed

Note: Some processors run both IEC and Ladder Logic and some run only IEC.

Memory Size and Clock Speed

The memory size and clock speed of each processor are described in the table below:

Processor Adapter	984LL	Flash RAM	Clock Speed	984LL Program Memory	IEC Program Memory
171 CCS 700 00	64K bytes	256K bytes	20MHz	2.4k	-
171 CCS 700 10	64K bytes	256K bytes	32MHz	2.4k	-
171 CCS 760 00	256K bytes	256K bytes	20MHz	12k	160k
171 CCC 760 10	512K bytes	512K bytes	32MHz	18k	240k
171 CCS 780 00	64K bytes	256K bytes	20MHz	2.4k	-
171 CCC 780 10	512K bytes	512K bytes	32MHz	18k	240k
171 CCC 960 20	544K bytes	512K bytes	50 MHz	18k	-
171 CCC 960 30	544K bytes	1 megabyte	50 MHz	18k	200k
171 CCC 980 20	544K bytes	512K bytes	50 MHz	18k	-
171 VVV 980 30	544K bytes	1 megabyte	50 MHz	18k	200j
* In a default configuration. User memory may be increased or decreased by adjusting other parameters.					

Input and Output References

The number of registers (for 3x and 4x references) and discretes (for 0x and 1x references) supported by each processor are described in the table below:

Processor Adapter	984LL Executive		IEC Executive	
	Registers	**Discretes**	**Registers**	**Discretes**
171 CCS 700 00	2048	2048*		-
171 CCS 700 10	2048	2048*		-
171 CCS 760 00	4096	2048*	4096	2048 0x references 2048 1x references
171 CCC 760 10	26032	8192 0x references 8192 1x references	26048	8192 0X references 8192 1x references
171 CCS 780 00	2048	2048*	-	-
171 CCC 780 10	26048	8192 0x references 8192 1x references	26048	8192 0X references 8192 1x references
171 CCC 960 20	26032	8192 0x references 8192 1x references	-	-
171 CCC 960 30	26048	8192 0x references 8192 1x references	11,200	4096 0x references 4096 1x references
171 CCC 980 20	26048	8192 0x references 8192 1x references	-	-
171 CCC 980 30	26048	8192 0x references 8192 1x references	11,200	4096 0x references 4096 1x references
*This total may include any combination of 0x and 1x references.				

Power Supply for M1 Processor Adapters

Supplied by Base

A processor adapter requires 5 V, which is supplied by its I/O base.

> **Note:** For information about the 171 CPS 111 00 TIO power supply module, refer to 870 Use 101 00 V. 3 Momentum I/O Base User Guide.

1.2 Features of Each M1 Processor Adapter

Overview

Purpose

This section provides a description of key features, LEDs and specifications for each processor adapter.

What's in this Section?

This section contains the following topics:

171 CCS 700 00 (M1 Processor Adapter)

Key Features

The key features of this processor adapter are:
- Modbus port 1
- 64K bytes of internal memory
- 20 MHz clock speed

Note: The Modbus port connector looks like an Ethernet port connector. Do not attempt to use a Modbus adapter as an Ethernet unit. Do not attempt to place an Ethernet connector in a Modbus connector.

Illustration

The connector and LED indicators are shown in the following illustration:

Legend:

Label	Description
1	Modbus Port 1 connector
2	LED indicators

LED Indicators

This processor adapter has two LED indicators, RUN and COM ACT. Their functions are described in the table below:

LED	Status	Function
Start up	Both	Single flash. Indicates good health.
RUN	Green	On continuously when the CPU has received power and is solving logic.
		Flashes an error pattern if the CPU is in kernel mode (see *p. 367*)
	Off	CPU is not powered up or is not solving logic.
COM ACT	Green	May be on continuously or blinking. Indicates activity on Modbus port 1.
	Off	No activity on Modbus port 1.

Specifications

The following table contains specifications for the 171 CCS 700 00 Momentum M1 processor adapter:

Memory	
Internal Memory	64K bytes
User Memory	2.4K words
Flash RAM	256K bytes
Clock Speed	20 MHz
Input and Output References	
Registers	2048
Discretes	2048 (any combination of 0x and 1x references)
I/O Servicing	
Local I/O	Services all the points on any host Momentum I/O base
Watchdog Timeout	419 ms
Logic Solve Time	0.25 ms/k ladder logic instructions
Mechanical	
Weight	42.5 g (1.5 oz)
Dimensions (HxDxW)	25.9x61.02x125 mm (1.01 x 2.37 x 4.86 in)
Material (Enclosures/ Bezels)	Lexan
Operating Conditions	
Temperature	0 ... 60 degrees C
Humidity	5 ... 95% (noncondensing)
Chemical Interactions	Enclosures and bezels are made of Lexan, a polycarbonate that can be damaged by strong alkaline solutions

Altitude, Full Operation	2000 m (6500 ft)
Vibration	10 ... 57 Hz @ 0.075 mm displacement amplitude 57...150 Hz @ 1 g Ref. IEC 68-2-6 FC
Shock	+/-15 g peak, 11 ms, half sine wave Ref. IEC 68-2-27 EA
RFI Susceptibility/ Immunity	Meets CE mark requirements for open equipment. Open equipment should be installed in an industry-standard enclosure, with access restricted to qualified service personnel.
Storage Conditions	
Temperature	-40 ... +85 degrees C
Humidity	5 ... 95% (noncondensing)
Safety Parameters	
Degree of Protection	Unintentional access (UL 508 Type 1, NEMA250 Type 1, IP20 conforming to IEC529)
Di-electric Strength	RS232 and I/OBus are non-isolated from logic common
Ground Continuity	30 A test on the exposed metal connector
Agency Approvals	UL 508, CSA, CUL, CE; FM class1, div2

171 CCS 700 10 (M1 Processor Adapter)

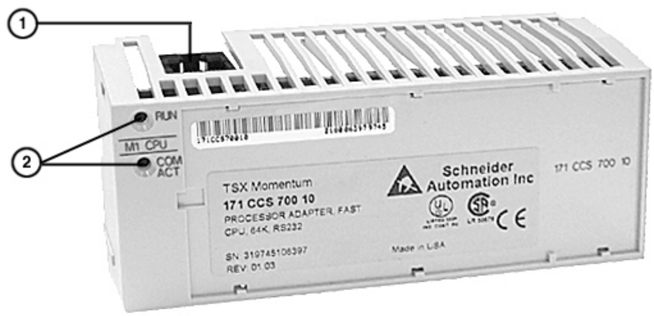
Key Features

The key features of this processor adapter are:
- Modbus port 1
- 64K bytes of internal memory
- 32 MHz clock speed

Note: The Modbus port connector looks like an Ethernet port connector. Do not attempt to use a Modbus adapter as an Ethernet unit. Do not attempt to place an Ethernet connector in a Modbus connector.

Illustration

The connector and LED indicators are shown in the following illustration:



Legend:

Label	Description
1	Modbus Port 1 connector
2	LED indicators

LED Indicators

This processor adapter has two LED indicators, RUN and COM ACT. Their functions are described in the table below:

LED	Status	Function
Start up	Both	Single flash. Indicates good health.
RUN	Green	On continuously when the CPU has received power and is solving logic.
		Flashes an error pattern if the CPU is in kernel mode (see *p. 367*)
	Off	CPU is not powered up or is not solving logic.
COM ACT	Green	May be on continuously or blinking. Indicates activity on Modbus port 1.
	Off	No activity on Modbus port 1.

Specifications

The following table contains specifications for the 171 CCS 700 10 Momentum M1 processor adapter:

Memory	
Internal Memory	64K bytes
User Memory	2.4K words
Flash RAM	256K bytes
Clock Speed	32 MHz
Input and Output References	
Registers	2048
Discretes	2048 (any combination of 0x and 1x references)
I/O Servicing	
Local I/O	Services all the points on any host Momentum I/O base
Watchdog Timeout	262 ms
Logic Solve Time	0.16 ms/k ladder logic instructions
Mechanical	
Weight	42.5 g (1.5 oz)
Dimensions (HxDxW)	25.9x61.02x125 mm (1.01 x 2.37 x 4.86 in)
Material (Enclosures/ Bezels)	Lexan
Operating Conditions	
Temperature	0 ... 60 degrees C
Humidity	5 ... 95% (noncondensing)

Chemical Interactions	Enclosures and bezels are made of Lexan, a polycarbonate that can be damaged by strong alkaline solutions
Altitude, Full Operation	2000 m (6500 ft)
Vibration	10 ... 57 Hz @ 0.075 mm displacement amplitude 57...150 Hz @ 1 g Ref. IEC 68-2-6 FC
Shock	+/-15 g peak, 11 ms, half sine wave Ref. IEC 68-2-27 EA
RFI Susceptibility/ Immunity	Meets CE mark requirements for open equipment. Open equipment should be installed in an industry-standard enclosure, with access restricted to qualified service personnel.
Storage Conditions	
Temperature	-40 ... +85 degrees C
Humidity	5 ... 95% (noncondensing)
Safety Parameters	
Degree of Protection	Unintentional access (UL 508 Type 1, NEMA250 Type 1, IP20 conforming to IEC529)
Di-electric Strength	RS232 and I/OBus are non-isolated from logic common
Ground Continuity	30 A test on the exposed metal connector
Agency Approvals	UL 508, CSA, CUL, CE; FM class1, div2

171 CCS 760 00 (M1 Processor Adapter)

Key Features

The key features of this processor adapter are:
- Modbus port 1
- I/O bus port
- 256K bytes of internal memory
- 20 MHz clock speed

Note: The Modbus port connector looks like an Ethernet port connector. Do not attempt to use a Modbus adapter as an Ethernet unit. Do not attempt to place an Ethernet connector in a Modbus connector.

Illustration

The connector and LED indicators are shown in the following illustration:

Legend:

Label	Description
1	Modbus Port 1 connector
2	I/0Bus port connector
3	LED indicators

LED Indicators

This processor adapter has two LED indicators, RUN and COM ACT. Their functions are described in the table below:

LED	Status	Function
Start up	Both	Single flash. Indicates good health.
RUN	Green	On continuously when the CPU has received power and is solving logic.
		Flashes an error pattern if the CPU is in kernel mode (see *p. 367*)
	Off	CPU is not powered up or is not solving logic.
COM ACT	Green	May be on continuously or blinking. Indicates activity on Modbus port 1.
	Off	No activity on Modbus port 1.

Specifications

The following table contains specifications for the 171 CCS 760 00 Momentum M1 processor adapter:

Memory	
Internal Memory	256K bytes
User Memory	12K words
Flash RAM	256K bytes
Clock Speed	20 MHz
Input and Output References	
Registers	4096
Discretes	2048 (any combination of 0x and 1x references)
I/O Servicing	
Local I/O	Services all the points on any host Momentum I/O base
Watchdog Timeout	419 ms
Logic Solve Time	0.25 ms/k ladder logic instructions
Mechanical	
Weight	42.5 g (1.5 oz)
Dimensions (HxDxW)	25.9x61.02x125 mm (1.01 x 2.37 x 4.86 in)
Material (Enclosures/ Bezels)	Lexan
Operating Conditions	
Temperature	0 ... 60 degrees C
Humidity	5 ... 95% (noncondensing)

Chemical Interactions	Enclosures and bezels are made of Lexan, a polycarbonate that can be damaged by strong alkaline solutions
Altitude, Full Operation	2000 m (6500 ft)
Vibration	10 ... 57 Hz @ 0.075 mm displacement amplitude 57...150 Hz @ 1 g Ref. IEC 68-2-6 FC
Shock	+/-15 g peak, 11 ms, half sine wave Ref. IEC 68-2-27 EA
RFI Susceptibility/ Immunity	Meets CE mark requirements for open equipment. Open equipment should be installed in an industry-standard enclosure, with access restricted to qualified service personnel.
Storage Conditions	
Temperature	-40 ... +85 degrees C
Humidity	5 ... 95% (noncondensing)
Safety Parameters	
Degree of Protection	Unintentional access (UL 508 Type 1, NEMA250 Type 1, IP20 conforming to IEC529)
Di-electric Strength	RS232 and I/OBus are non-isolated from logic common
Ground Continuity	30 A test on the exposed metal connector
Agency Approvals	UL 508, CSA, CUL, CE; FM class1, div2

171 CCC 760 10 (M1 Processor Adapter)

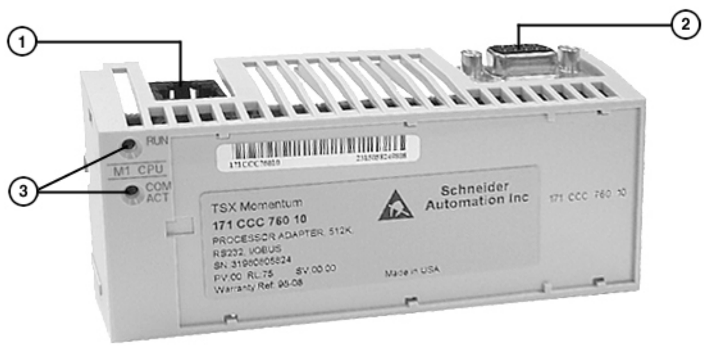
Key Features

The key features of this processor adapter are:
- Modbus port 1
- I/O bus port
- 512K bytes of internal memory
- 32 MHz clock speed

> **Note:** The Modbus port connector looks like an Ethernet port connector. Do not attempt to use a Modbus adapter as an Ethernet unit. Do not attempt to place an Ethernet connector in a Modbus connector.

Illustration

The connector and LED indicators are shown in the following illustration:



Legend:

Label	Description
1	Modbus Port 1 connector
2	I/0Bus port connector
3	LED indicators

LED Indicators

This processor adapter has two LED indicators, RUN and COM ACT. Their functions are described in the table below:

LED	Status	Function
Start up	Both	Single flash. Indicates good health.
RUN	Green	On continuously when the CPU has received power and is solving logic.
		Flashes an error pattern if the CPU is in kernel mode (see *p. 367*)
	Off	CPU is not powered up or is not solving logic.
COM ACT	Green	May be on continuously or blinking. Indicates activity on Modbus port 1.
	Off	No activity on Modbus port 1.

Specifications

The following table contains specifications for the 171 CCC 760 10 Momentum M1 processor adapter:

Memory	
Internal Memory	512K bytes
User Memory	18K words
Flash RAM	512K bytes
Clock Speed	32 MHz
Input and Output References	
Registers	26032
Discretes	8192 0x references 8192 1x references
I/O Servicing	
Local I/O	Services all the points on any host Momentum I/O base
Watchdog Timeout	262 ms
Logic Solve Time	0.16 ms/k ladder logic instructions
Mechanical	
Weight	42.5 g (1.5 oz)
Dimensions (HxDxW)	25.9x61.02x125 mm (1.01 x 2.37 x 4.86 in)
Material (Enclosures/ Bezels)	Lexan
Operating Conditions	
Temperature	0 ... 60 degrees C
Humidity	5 ... 95% (noncondensing)

Chemical Interactions	Enclosures and bezels are made of Lexan, a polycarbonate that can be damaged by strong alkaline solutions
Altitude, Full Operation	2000 m (6500 ft)
Vibration	10 ... 57 Hz @ 0.075 mm displacement amplitude 57...150Hz @ 1g Ref. IEC 68-2-6 FC
Shock	+/-15 g peak, 11 ms, half sine wave Ref. IEC 68-2-27 EA
RFI Susceptibility/ Immunity	Meets CE mark requirements for open equipment. Open equipment should be installed in an industry-standard enclosure, with access restricted to qualified service personnel.
Storage Conditions	
Temperature	-40 ... +85 degrees C
Humidity	5 ... 95% (noncondensing)
Safety Parameters	
Degree of Protection	Unintentional access (UL 508 Type 1, NEMA250 Type 1, IP20 conforming to IEC529)
Di-electric Strength	RS232 and I/OBus are non-isolated from logic common
Ground Continuity	30 A test on the exposed metal connector
Agency Approvals	UL 508, CSA, CUL, CE; FM class1, div2

171 CCS 780 00 (M1 Processor Adapter)

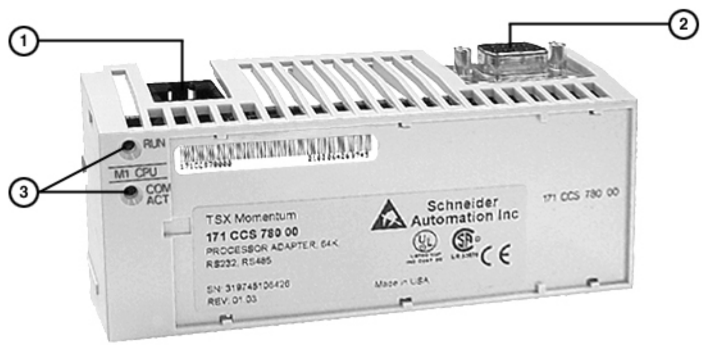
Key Features

The key features of this processor adapter are:
- Modbus port 1
- Modbus port 2
- 64K bytes of internal memory
- 20 MHz clock speed

Note: The Modbus port connector looks like an Ethernet port connector. Do not attempt to use a Modbus adapter as an Ethernet unit. Do not attempt to place an Ethernet connector in a Modbus connector.

Illustration

The connector and LED indicators are shown in the following illustration:



Legend:

Label	Description
1	Modbus Port 1 connector
2	Modbus Port 2 connector
3	LED indicators

LED Indicators

This processor adapter has two LED indicators, RUN and COM ACT. Their functions are described in the table below:

LED	Status	Function
Start up	Both	Single flash. Indicates good health.
RUN	Green	On continuously when the CPU has received power and is solving logic.
		Flashes an error pattern if the CPU is in kernel mode (see *p. 367*)
	Off	CPU is not powered up or is not solving logic.
COM ACT	Green	May be on continuously or blinking. Indicates activity on Modbus port 1.
	Off	No activity on Modbus port 1.

Specifications

The following table contains specifications for the 171 CCS 780 00 Momentum M1 processor adapter:

Memory	
Internal Memory	64K bytes
User Memory	2.4K words
Flash RAM	256K bytes
Clock Speed	20 MHz
Input and Output References	
Registers	2048
Discretes	2048 (any combination of 0x and 1x references)
I/O Servicing	
Local I/O	Services all the points on any host Momentum I/O base
Watchdog Timeout	419 ms
Logic Solve Time	0.25 ms/k ladder logic instructions
Mechanical	
Weight	42.5 g (1.5 oz)
Dimensions (HxDxW)	25.9x61.02x125 mm (1.01 x 2.37 x 4.86 in)
Material (Enclosures/ Bezels)	Lexan
Operating Conditions	
Temperature	0 ... 60 degrees C
Humidity	5 ... 95% (noncondensing)

Chemical Interactions	Enclosures and bezels are made of Lexan, a polycarbonate that can be damaged by strong alkaline solutions
Altitude, Full Operation	2000 m (6500 ft)
Vibration	10 ... 57 Hz @ 0.075 mm displacement amplitude 57...150 Hz @ 1 g Ref. IEC 68-2-6 FC
Shock	+/-15 g peak, 11 ms, half sine wave Ref. IEC 68-2-27 EA
RFI Susceptibility/ Immunity	Meets CE mark requirements for open equipment. Open equipment should be installed in an industry-standard enclosure, with access restricted to qualified service personnel.
Storage Conditions	
Temperature	-40 ... +85 degrees C
Humidity	5 ... 95% (noncondensing)
Safety Parameters	
Degree of Protection	Unintentional access (UL 508 Type 1, NEMA250 Type 1, IP20 conforming to IEC529)
Di-electric Strength	RS232 and I/OBus are non-isolated from logic common
Ground Continuity	30 A test on the exposed metal connector
Agency Approvals	UL 508, CSA, CUL, CE; FM class1, div2

171 CCC 780 10 (M1 Processor Adapter)

Key Features

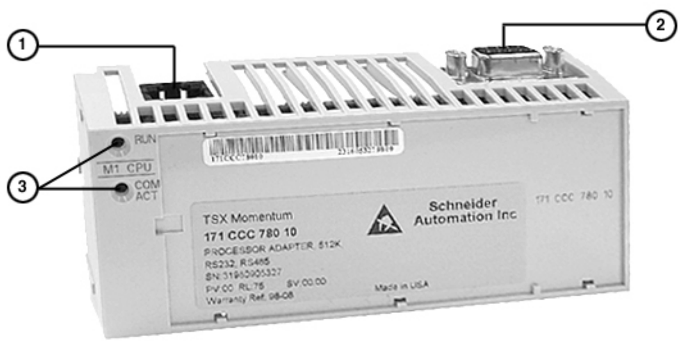
The key features of this processor adapter are:

- Modbus port 1
- Modbus port 2
- 512K bytes of internal memory
- 32 MHz clock speed

Note: The Modbus port connector looks like an Ethernet port connector. Do not attempt to use a Modbus adapter as an Ethernet unit. Do not attempt to place an Ethernet connector in a Modbus connector.

Illustration

The connector and LED indicators are shown in the following illustration:



Legend:

Label	Description
1	Modbus Port 1 connector
2	Modbus Port 2 connector
3	LED indicators

LED Indicators

This processor adapter has two LED indicators, RUN and COM ACT. Their functions are described in the table below:

LED	Status	Function
Start up	Both	Single flash. Indicates good health.
RUN	Green	On continuously when the CPU has received power and is solving logic.
		Flashes an error pattern if the CPU is in kernel mode (see *p. 367*)
	Off	CPU is not powered up or is not solving logic.
COM ACT	Green	May be on continuously or blinking. Indicates activity on Modbus port 1.
	Off	No activity on Modbus port 1.

Specifications

The following table contains specifications for the 171 CCC 780 10 Momentum M1 processor adapter:

Memory	
Internal Memory	512K bytes
User Memory	18K words
Flash RAM	512K bytes
Clock Speed	32 MHz
Input and Output References	
Registers	26032
Discretes	8192 0x references 8192 1x references
I/O Servicing	
Local I/O	Services all the points on any host Momentum I/O base
Watchdog Timeout	262 ms
Logic Solve Time	0.16 ms/k ladder logic instructions
Mechanical	
Weight	42.5 g (1.5 oz)
Dimensions (HxDxW)	25.9x61.02x125 mm (1.01 x 2.37 x 4.86 in)
Material (Enclosures/ Bezels)	Lexan
Operating Conditions	
Temperature	0 ... 60 degrees C
Humidity	5 ... 95% (noncondensing)

Chemical Interactions	Enclosures and bezels are made of Lexan, a polycarbonate that can be damaged by strong alkaline solutions
Altitude, Full Operation	2000 m (6500 ft)
Vibration	10 ... 57 Hz @ 0.075 mm displacement amplitude 57...150 Hz @ 1g Ref. IEC 68-2-6 FC
Shock	+/-15 g peak, 11 ms, half sine wave Ref. IEC 68-2-27 EA
RFI Susceptibility/ Immunity	Meets CE mark requirements for open equipment. Open equipment should be installed in an industry-standard enclosure, with access restricted to qualified service personnel.
Storage Conditions	
Temperature	-40 ... +85 degrees C
Humidity	5 ... 95% (noncondensing)
Safety Parameters	
Degree of Protection	Unintentional access (UL 508 Type 1, NEMA250 Type 1, IP20 conforming to IEC529)
Di-electric Strength	RS232 and I/OBus are non-isolated from logic common
Ground Continuity	30 A test on the exposed metal connector
Agency Approvals	UL 508, CSA, CUL, CE; FM class1, div2

171 CCC 960 20 (M1 Processor Adapter)

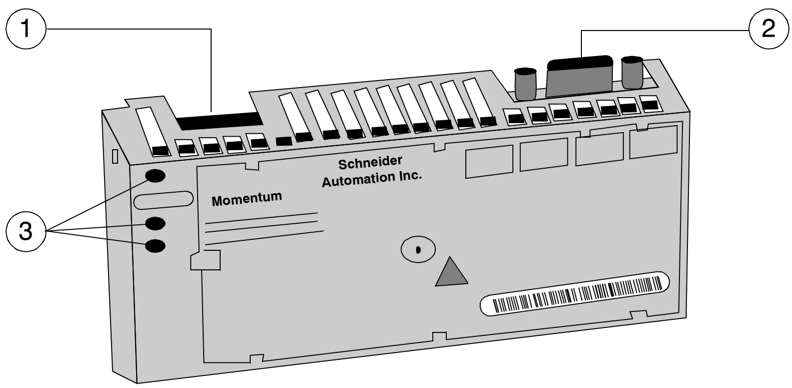
Key Features

The key features of this processor adapter are
- Ethernet port
- I/O bus port
- 544K bytes of internal memory
- 50 MHz clock speed

Note: The Ethernet port connector looks like a Modbus port connector. Do not attempt to use an Ethernet adapter as a Modbus unit. Do not attempt to place a Modbus connector in an Ethernet connector.

Illustration

The connectors and LED indicators are shown in the following illustration:



Legend:

Label	Description
1	Ethernet port connector
2	I/OBus port connector
3	LED indicators

LED Indicators

This processor adapter has three LED indicators, RUN LAN ACT(IVE), and LAN ST(ATUS). Their functions are described in the table below:

LED	Indicator Pattern	Status
Start up	Both	Single flash. Indicates good health.
RUN	Green	On continuously when the CPU has received power and is solving logic.
		Flashes an error pattern if the CPU is in kernel mode.
	Off	CPU is not powered up or is not solving logic.
LAN ACT	Green	May be on continuously or blinking. Indicates activity on Ethernet port.
	Off	No activity on Ethernet port.
LAN ST	Green	On continuously during normal operation.
		Fast blink indicates normal Ethernet initialization at power-up.
		3 flashes indicates no 10BASE-T link pulse detected. Check cable and hub.
		4 flashes indicates duplicate IP address detected.
		5 flashes indicates no IP address available.
	Off	No valid MAC address.

Specifications

The following table contains specifications for the 171 CCC 960 20 Momentum M1 processor adapter.

Memory	
Internal Memory	544K bytes
User Memory	18K words
Flash RAM	512K bytes
Clock Speed	50 MHz
Input and Output References	
Registers	26048
Discretes	8192 0x references 8192 1x references
I/O Servicing	
Local I/O	Services all the points on any host Momentum I/O base
Watchdog Timeout	335 ms
Logic Solve Time	See Scan Time Formula for 984LL Exec

Mechanical	
Weight	42.5 g (1.5 oz)
Dimensions (HxDxW)	25.9x61.02x125 mm (1.01 x 2.37 x 4.86 in)
Material (Enclosures/ Bezels)	Lexan
Operating Conditions	
Temperature	0 ... 60 degrees C
Humidity	5 ... 95% (noncondensing)
Chemical Interactions	Enclosures and bezels are made of Lexan, a polycarbonate that can be damaged by strong alkaline solutions
Altitude, Full Operation	2000 m (6500 ft)
Vibration	10 ... 57 Hz @ 0.075 mm displacement amplitude 57...150 Hz @ 1 g Ref. IEC 68-2-6 FC
Shock	+/-15 g peak, 11 ms, half sine wave Ref. IEC 68-2-27 EA
RFI Susceptibility/ Immunity	Meets CE mark requirements for open equipment. Open equipment should be installed in an industry-standard enclosure, with access restricted to qualified service personnel.
Storage Conditions	
Temperature	-40 ... +85 degrees C
Humidity	5 ... 95% (noncondensing)
Safety Parameters	
Degree of Protection	Unintentional access (UL 508 Type 1, NEMA250 Type 1, IP20 conforming to IEC529)
Di-electric Strength	Ethernet is isolated from logic common 500 VDC.
Ground Continuity	30 A test on the exposed metal connector
Agency Approvals	UL 508, CSA, CUL, CE; FM class1, div2

Scan Time Formula for 984LL Exec

The following formula applies to the M1E processor adapter with the 984LL exec.
Scan time = (0.25 ms/Ethernet device + 0.002 ms/word) + 0.13 ms/K of logic + 0.40 ms + MBPlustime

Note:
- Modbus Plus communications will slow the M1E. If there is no MB+ ring card, then MBPlustime = 0.
- If there is a MB+ ring card, then each scan will be extended 0.3 ms *even if there is no message*.
- Modbus messages will add from 1 to 2 ms per scan, depending on the length of the message.

Note:
- The formula above presumes that all MSTR blocks and all configured connections are set to go as fast as possible. In this case the M1E will attempt to exchange data with each device once per scan.
- If several devices are configured to communicate on a timed basis that is substantially larger than the scan time calculated, then the communications to those devices will be spread out over several scans.

Example

You have 50 ENT modules connected to a single M1E. The M1E has a configured time of 50 ms each, a total of 4k user logic, and no MB+ card. The scan time for all modules configured as fast as possible would be 12.5 ms + 0.52 ms + 0.40 ms = 13.42 ms. However, since the M1E will only communicate to 1/4 of the modules (12.5 ms/50 ms = 1/4) on any given scan, the corrected average scan time would be 1/4 x (12.5) + 0.52 + 0.40 @ 4.1 ms.

171 CCC 960 30 M1 Processor Adapter

Key Features

The key features of this processor adapter are
- Ethernet port
- I/O bus port
- 544K bytes of internal memory
- 50 MHz clock speed

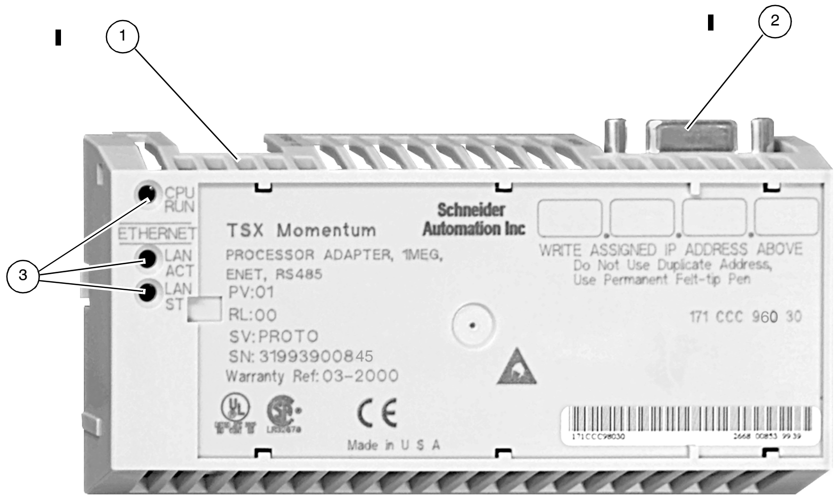
Note: The 171CCC 960 30 units are shipped with the latest IEC exec installed.

Note: The Ethernet port connector looks like a Modbus port connector. Do not attempt to use an Ethernet adapter as a Modbus unit. Do not attempt to place a Modbus connector in an Ethernet connector.

Note: The 984LL exec used in the 171 CCC 960 30 will not operate in a 171 CCC 960 20.

Illustration

The connectors and LED indicators are shown in the following illustration.



Legend:

Label	Description
1	Ethernet port connector
2	I/OBus port connector
3	LED indicators

LED Indicators

This processor adapter has three LED indicators, RUN, LAN ACT(IVE), and LAN ST(ATUS). Their functions are described in the table below.

LED	Indicator Pattern	Status
Start up	Both	Single flash. Indicates good health.
Run	Green	On continuously when the CPU has received power and is solving logic.
		Flashes an error pattern if the CPU is in kernel mode.
	Off	CPU is not powered up or is not solving logic.
LAN ACT	Green	May be on continuously or blinking. Indicates activity on Ethernet port.
	Off	No activity on Ethernet port.
LAN ST	Green	On continuously during normal operation.
		Fast blink indicates normal Ethernet initialization at power-up.
		3 Flashes indicates no 10BASE-T link pulse detected. Check cable and hub.
		4 flashes indicates duplicate IP address detected.
		5 flashes indicates no IP address available.
	Off	No valid MAC address.

Specifications

The following table contains specifications for the 171 CCC 960 30 Momentum M1 processor adapter.

Memory	
Internal Memory	544K bytes
User Memory	18K words 984LL Exec
	200k words IEC Exec
Flash RAM	1 Megabyte
Clock Speed	50 MHz
984LL Input and Output References	
Registers	26048
Discretes	8192 0x References 8192 1x References
IEC Input and Output References	
Registers	11200
Discretes	4096 0x References 4096 1x References
I/O Servicing	

Memory	
Local I/O	Services all the points on any host Momentum I/O base
Watchdog Timeout	335 ms
Logic Solve Time	See Scan Time Formula for 984LL Exec
Mechanical	
Weight	42.5 g (1.5 oz)
Dimensions (HxDxW)	25.9x61.02x125 mm (1.01 x 2.37 x 4.86 in)
Material (Enclosures/ Bezels)	Lexan
Operating Conditions	
Temperature	0 ... 60 degrees C
Humidity	5 ... 95% (noncondensing)
Chemical Interactions	Enclosures and bezels are made of Lexan, a polycarbonate that can be damaged by strong alkaline solutions
Altitude, Full Operation	2000 m (6500 ft)
Vibration	10 ... 57 Hz @ 0.075 mm displacement amplitude 57 ... 150 Hz @ 1 g Ref. IEC 68-2-6 FC
Shock	+/-15 g peak, 11 ms, half sine wave Ref. IEC 68-2-27 EA
RFI Susceptibility/ Immunity	Meets CE mark requirements for open equipment. Open equipment should be installed in an industry-standard enclosure, with access restricted to qualified service personnel.
Storage Conditions	
Temperature	-40 ... +85 degrees C
Humidity	5 ... 95% (noncondensing)
Safety Parameters	
Degree of Protection	Unintentional access (UL 508 Type 1, NEMA250 Type 1, IP20 conforming to IEC529)
Di-electric Strength	Ethernet is isolated from logic common 500 VDC
Ground Continuity	30 A test on the exposed metal connector
Agency approvals	UL 508, CSA, CUL, CE; FM class1, div2 pending

Scan Time Formula for 984LL Exec

The following formula applies to the M1E processor adapter with the 984LL exec. Scan time = (0.25 ms/Ethernet device + 0.002 ms/word) + 0.13 ms/K of logic + 0.40 ms + MBPlustime.

> **Note:**
> - Modbus Plus communications will slow the M1E. If there is no MB+ ring card, then MBPlustime = 0.
> - If there is a MB+ ring card, then each scan will be extended 0.3 ms *even if there is no message*.
> - Modbus Messages will add from 1 to 2 ms per scan, depending on the length of the message.

> **Note:**
> - The formula above presumes that all MSTR blocks and all configured connections are set to go as fast as possible. In this case the M1E will attempt to exchange data with each device once per scan.
> - If several devices are configured to communicate on a timed basis that is substantially larger than the scan time calculated, then the communications to those devices will be spread out over several scans.

Example

You have 50 ENT modules connected to a single M1E. The M1E has a configured time of 50 ms each, a total of 4k user logic and no MB+ card. The scan time for all modules configured as fast as possible would be 12.5 ms + 0.52 ms + 0.40 ms = 13.42 ms. However, since the M1E will only communicate to 1/4 of the modules (12.5 ms/50 ms = 1/4) on any given scan, the corrected average scan time would be 1/4 x (12.5) + 0.52 + 0.40 @ 4.1 ms.

171 CCC 980 20 (M1 Processor Adapter)

Key Features

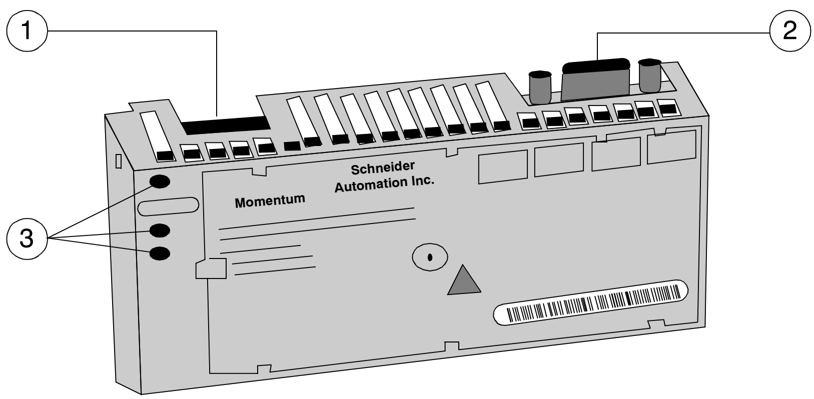
The key features of this processor adapter are

- Ethernet port
- Modbus Port 2/RS485 only
- 544K bytes of internal memory
- 50 MHz clock speed

Note: The Ethernet port connector looks like a Modbus port connector. Do not attempt to use an Ethernet adapter as a Modbus unit. Do not attempt to place a Modbus connector in an Ethernet connector.

Illustration

The connector and LED indicators are shown in the following illustration:



Legend:

Label	Description
1	Ethernet port connector
2	Modbus Port 2 connector
3	LED indicators

LED Indicators

This processor adapter has three LED indicators, RUN LAN ACT(IVE), and LAN ST(ATUS). Their functions are described in the table below.

LED	Indicator Pattern	Status
Start up	Both	Single flash. Indicates good health.
RUN	Green	On continuously when the CPU has received power and is solving logic.
		Flashes an error pattern if the CPU is in kernel mode.
	Off	CPU is not powered up or is not solving logic.
LAN ACT	Green	May be on continuously or blinking. Indicates activity on Ethernet port.
	Off	No activity on Ethernet port.
LAN ST	Green	On continuously during normal operation.
		Fast blink indicates normal Ethernet initialization at power-up.
		3 flashes indicates no 10BASE-T link pulse detected. Check cable and hub.
		4 flashes indicates duplicate IP address detected.
		5 flashes indicates no IP address available.
	Off	No valid MAC address.

Specifications

The following table contains specifications for the 171 CCC 980 20 Momentum M1 processor adapter.

Memory	
Internal Memory	544K bytes
User Memory	18K words
Flash RAM	512K bytes
Clock Speed	50 MHz
Input and Output References	
Registers	26048
Discretes	8192 0x references; 8192 1x references
I/O Servicing	
Local I/O	Services all the points on any host Momentum I/O base
Watchdog Timeout	335 ms
Logic Solve Time	See Scan Time Formula for 984LL Exec
Mechanical	
Weight	42.5 g (1.5 oz.)

Dimensions (HxDxW)	25.9x61.02x125 mm (1.01 x 2.37 x 4.86 in)
Material (Enclosures/ Bezels)	Lexan
Operating Conditions	
Temperature	0 ... 60 degrees C
Humidity	5 ... 95% (noncondensing)
Chemical Interactions	Enclosures and bezels are made of Lexan, a polycarbonate that can be damaged by strong alkaline solutions
Altitude, Full Operation	2000 m (6500 ft)
Vibration	10 ... 57 Hz @ 0.075 mm displacement amplitude 57...150 Hz @ 1 g Ref. IEC 68-2-6 FC
Shock	+/-15 g peak, 11 ms, half sine wave Ref. IEC 68-2-27 EA
RFI Susceptibility/ Immunity	Meets CE mark requirements for open equipment. Open equipment should be installed in an industry-standard enclosure, with access restricted to qualified service personnel.
Storage Conditions	
Temperature	-40 ... +85 degrees C
Humidity	5 ... 95% (noncondensing)
Safety Parameters	
Degree of Protection	Unintentional access (UL 508 Type 1, NEMA250 Type 1, IP20 conforming to IEC529)
Di-electric Strength	Ethernet is isolated from logic common 500 VDC
Ground Continuity	30 A test on the exposed metal connector
Agency Approvals	UL 508, CSA, CUL, CE; FM class1, div2

Scan Time Formula for 984LL Exec

The following formula applies to the M1E processor adapter with the 984LL exec.
Scan time = (0.25 ms/Ethernet device + 0.002 ms/word) + 0.13 ms/K of logic + 0.40 ms + MBPlustime

> **Note:**
> - Modbus Plus communications will slow the M1E. If there is no MB+ ring card, then MBPlustime = 0.
> - If there is a MB+ ring card, then each scan will be extended 0.3 ms *even if there is no message*.
> - Modbus Messages will add from 1 to 2 ms per scan, depending on the length of the message.

> **Note:**
> - The formula above presumes that all MSTR blocks and all configured connections are set to go as fast as possible. In this case the M1E will attempt to exchange data with each device once per scan.
> - If several devices are configured to communicate on a timed basis that is substantially larger than the scan time calculated, then the communications to those devices will be spread out over several scans.

Example

You have 50 ENT modules connected to a single M1E. The M1E has a configured time of 50 ms each, a total of 4k user logic, and no MB+ card. The scan time for all modules configured as fast as possible would be 12.5 ms + 0.52 ms + 0.40 ms = 13.42 ms. However, since the M1E will only communicate to 1/4 of the modules (12.5 ms/50 ms = 1/4) on any given scan, the corrected average scan time would be 1/4 x (12.5) + 0.52 + 0.40 @ 4.1 ms

171 CCC 980 30 (M1 Processor Adapter)

Key Features

The key features of this processor Adapter are
- Ethernet port
- Modbus port 2 / RS485 only
- 544K bytes of internal memory
- 50 MHz clock speed

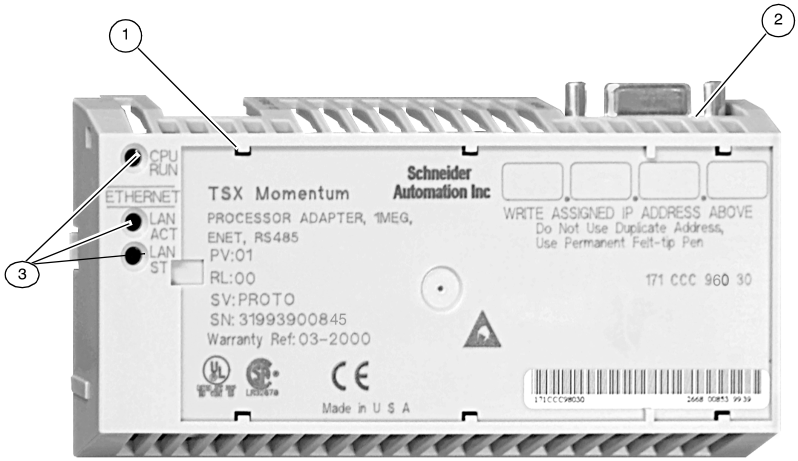
Note: The Ethernet port connector looks like a Modbus port connector. Do not attempt to use an Ethernet adapter as a Modbus unit. Do not attempt to place a Modbus connector in an Ethernet connector.

Note: The 171 CCC 980 30 units are shipped with the latest IEC exec installed.

Note: The 984LL exec used in the 171 CCC 980 30 will not operate in a 171 CCC 980 20.

Illustration

The connectors and LED indicators are shown in the following illustration.



Legend:

Label	Description
1	Ethernet port connector
2	Modbus Port 2 connector
3	LED indicators

LED Indicators

This processor adapter has three LED indicators, RUN, LAN ACT(IVE), and LAN ST(ATUS). Their functions are described in the table below.

LED	Indicator Pattern	Status
Start up	Both	Single flash. Indicates good health.
RUN	Green	On continuously when the CPU and is solving logic.
		Flashes an error pattern if the CPU is in kernel mode.
	Off	CPU is not powered up or is not solving logic.
LAN ACT	Green	Maybe on continuously or blinking. Indicates activity on Ethernet port.
	Off	No activity on Ethernet port.
LAN ST	Green	On continuously during normal operation.
		Fast blink indicates normal Ethernet initialization at power-up.
		3 flashes indicates no 10Base-T link pulse detected. Check cable and hub.
		4 flashes indicates duplicate IP address detected.
		5 flashes indicates no IP address available.
	Off	No valid MAC address.

Specifications

The following table contains specifications for the 171 CCC 980 30 Momentum M1 processor adapter.

Memory	
Internal Memory	544K bytes
User Memory	18K words 984LL Exec
	200k words IEC Exec
Flash RAM	1 Mbyte
Clock Speed	50 MHz
984LL Input and Output References	
Registers	26048
Discretes	8192 0x references 8192 1x references
IEC Input and Output References	
Registers	11200
Discretes	4096 0x references 4096 1x references

I/O Servicing	
Local I/O	Services all the points on any host Momentum I/O base
Watchdog Timeout	335 ms
Logic Solve Time	See Scan Time Formula for 984LL Exec
Mechanical	
Weight	42.5 g (1.5 oz.)
Dimensions (HxDxW)	25.9 x 61.02 x 125 mm (1.01 x 2.37 x 4.86 in)
Material (Enclosures/ Bezels)	Lexan
Operating Conditions	
Temperature	0 ... 60 degrees C
Humidity	5 ... 95% (noncondensing)
Chemical Interactions	Enclosures and bezels are made of Lexan, a polycarbonate that can be damaged by strong alkaline solutions.
Altitude, Full Operation	2000 m (6500 ft)
Vibration	10 ... 57 Hz @ 0.075 mm displacement amplitude 57 ... 150 Hz @ 1 g Ref. IEC 68-2-6 FC
Shock	+/-15 g peak, 11 ms, half sine wave Ref. IEC 68-2-27 EA
RFI Susceptibility/ Immunity	Meets CE mark requirements for open equipment. Open equipment should be installed in an industry-standard enclosure, with access restricted to qualified service personnel.
Storage Conditions	
Temperature	-40 ... +85 degrees C
Humidity	5 ... 95% (noncondensing)
Safety Parameters	
Degree of Protection	Unintentional access (UL 508 Type 1, NEMA250 Type 1, IP20 conforming to IEC529)
Di-electric Strength	Ethernet is isolated from logic common 500 VDC
Ground Continuity	30 A test on the exposed metal connector
Agency Approvals	UL 508, CSA, CUL, CE; FM class 1, div2

Scan Time Formula for 984LL Exec

The following formula applies to the M1E processor adapter with the 984LL exec.
Scan time = (0.25 ms/Ethernet device + 0.002 ms/word) + 0.13 ms/K of logic + 0.40 ms + MBPlustime

> **Note:**
> - Modbus Plus communications will slow the M1E. If there is no MB+ ring card, then MBPlustime = 0.
> - If there is a MB+ ring card, then each scan will be extended 0.3 ms *even if there is no message*.
> - Modbus Messages will add from 1 to 2 ms per scan, depending on the length of the message.

> **Note:**
> - The formula above presumes that all MSTR blocks and all configured connections are set to go as fast as possible. In this case the M1E will attempt to exchange data with each device once per scan.
> - If several devices are configured to communicate on a timed basis that is substantially larger than the scan time calculated, then the communications to those devices will be spread out over several scans.

Example

You have 50 ENT modules connected to a single M1E. The M1E has a configured time of 50 ms each, a total of 4k user logic, and no MB+ card. The scan time for all modules configured as fast as possible would be 12.5 ms + 0.52 ms + 0.40 ms = 13.42 ms. However, since the M1E will only communicate to 1/4 of the modules (12.5 ms/50 ms = 1/4) on any given scan, the corrected average scan time would be 1/4 x (12.5) + 0.52 + 0.40 @ 4.1 ms.

Overview of Momentum Option Adapters

2

At a Glance

Purpose

An option adapter may be inserted between the processor adapter and the I/O base to provide:
- A battery backup for the CPU
- A time-of-day clock
- Extra communication ports

This chapter describes the three types of Momentum option adapters.

What's in this Chapter?

This chapter contains the following sections:

2.1 Introducing the Momentum Option Adapters

Basic Features of Option Adapters

Introduction

This section describes the basic features common to all option adapters.
- the battery
- a time-of-day (TOD) clock
- the communication port(s)

Battery

The battery backs up the CPU's user program and state RAM.

TOD Clock

The TOD clock allows you to use the date and time as an element in your user program.

Communication Ports

The three Momentum option adapters are distinguished by the communications ports they offer, as shown in the table below.

Option Adapter	Communication Port(s)
172 JNN 210 32	Software-selectable RS232/RS485 serial port
172 PNN 210 22	One Modbus Plus port
172 PNN 260 22	Two Modbus Plus ports for a redundant (back-up) cable run

2.2 Serial Option Adapter (Momentum)

Overview

Purpose

This section describes the 172 JNN 210 32 serial option adapter, including the front panel components and specifications.

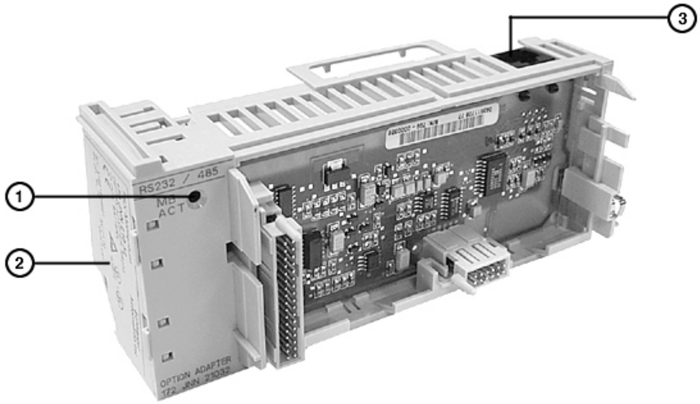
What's in this Section?

This section contains the following topics:

Front Panel Components of Momentum Serial Option Adapter

Illustration

The illustration below shows the location of LED indicator, the battery compartment and the Modbus port 2 connector.



Legend:

Label	Description
1	LED indicator
2	Battery compartment door
3	Modbus Port 2 connector

LED Indicator

This option adapter has one LED indicator, the Com Act indicator. Its functions are described in the table below

LED	Status	Function
COM ACT	Green	May be on steadily or blinking. Indicates activity on the RS232/ RS485 serial port.
	Off	No activity on the RS232/RS485 serial port.

Modbus Port 2

Modbus port 2 is a general-purpose asynchronous serial port with user-selectable RS232/RS485 slave functionality. The choice between RS232 and RS485 is made in the software.

Note: When this option adapter is assembled with a 171 CCS 780 00 processor adapter or a 171 CCC 780 10 processor adapter (with built-in Modbus port 2), the Modbus port 2 on the option adapter is electrically disabled. The TOD clock and the battery backup on the option adapter remain functional.

Auto-Logout Feature On Modbus Port 2

If the RS232 port is chosen, auto-logout is supported. If a programming panel is logged into the CPU via the serial port and its cable gets disconnected, the processor adapter automatically logs out the port. This auto-logout feature is designed to prevent a lock-up situation that could prevent other host stations from logging in on other ports.

Auto-logout is not available for any RS485 port, including the RS485 option on the serial option adapter. The user must log out of the processor using the programming software.

Pinouts for Modbus Port 2

The 172 JNN 210 32 serial option adapter uses the following pinouts:

Pin	For RS232	For RS485
1	DTR	RXD -
2	DSR	RXD +
3	TXD	TXD +
4	RXD	
5	signal common	signal common
6	RTS	TXD -
7	CTS	
8	cable shield	cable shield

Specifications of the Momentum Serial Option Adapter

172 JNN 210 32 Serial Option Adapter Specifications

Mechanical	
Weight	85.05 g (3 oz)
Dimensions (HxDxW)	58.3 (on battery side) x 60.6 x 143.1 mm
	(2.27 x 2.36 x 5.57 in)
Material (enclosures/bezels)	Lexan
Time-of-Day Clock	
Accuracy	+/- 13 s/day
Battery	one 2/3 AA lithium required; included in a separate package with the option adapter
Service Life	< 30 days from the time a battery-low indication is received to actual battery failure @ 40 degrees C maximum ambient temperature with the system continuously powered down.
Shelf Life	In excess of 5 yr @ room temperature
Operating Conditions	
Temperature	0 ... 60 degrees C
Humidity	5 ... 95% (noncondensing)
Chemical Interactions	Enclosures and bezels are made of Lexan, a polycarbonate that can be damaged by strong alkaline solutions
Altitude, full operation	2000 m (6500 ft)
Vibration	10 ... 57 Hz @ 0.075 mm displacement amplitude 57 ... 150 Hz @ 1 g Ref. IEC 68-2-6 FC
Shock	+/-15 g peak, 11 ms, half sine wave Ref. IEC 68-2-27 EA
RFI susceptibility/immunity	Meets CE mark requirements for open equipment. Open equipment should be installed in an industry-standard enclosure, with access restricted to qualified service personnel.
Storage Conditions	
Temperature	-40...+85 degrees C
Humidity	5 ... 95% (noncondensing)
Safety Parameters	
Degree of Protection	Unintentional access (UL 508 Type 1, NEMA250 Type 1, IP20 conforming to IEC529)
Di-electric Strength	RS232/485 is nonisolated from logic common
Ground Continuity	30 A test on the exposed metal connector
Agency Approvals	UL 508, CSA, CUL, CE; FM class1, div2

2.3 Modbus Plus Option Adapter

Overview

Purpose

This section describes the 172 PNN 210 22 Modbus Plus option adapter, including the front panel components and specifications.

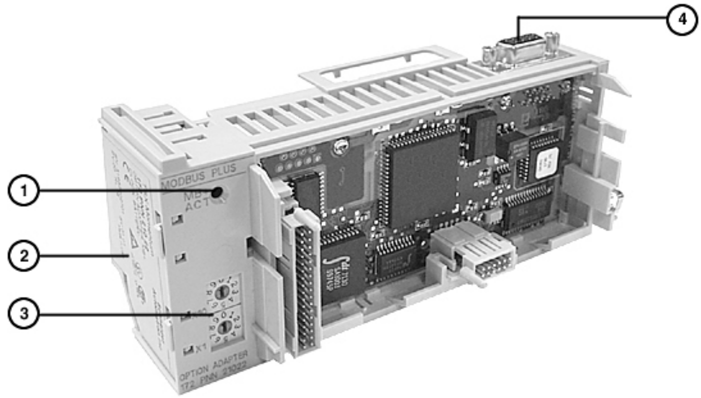
What's in this Section?

This section contains the following topics:

Front Panel Components of the Momentum Modbus Plus Option Adapter

Illustration

The illustration below shows the LED indicator, address switches, Modbus Plus connector, and battery compartment.



Legend:

Label	Description
1	LED indicator
2	Battery compartment door
3	Address switches for Modbus Plus
4	9-pin D-shell connector for Modbus Plus communications

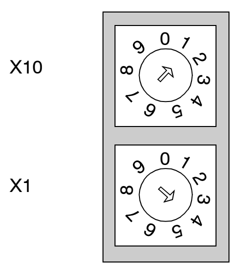
LED Indicator

This option adapter has one LED indicator, the MB+ ACT indicator. This indicator flashes the following patterns, based on the status of the Modbus Plus node:

Pattern	Meaning
6 flashes/s	This is the normal operating state for the node. It is receiving and passing the network token. All nodes on a healthy network flash this pattern.
1 flash/s	The node is offline just after power-up or after exiting the 6 flashes/s mode. In this state, the node monitors the network and builds a table of active nodes. After being in this state for 5s, the node attempts to go to its normal operating state, indicated by 6 flashes/s.
2 flashes, then OFF for 2s	The node detects the token being passed among the other nodes, but never receives the token. Check the network for an open circuit or defective termination.
3 flashes, then OFF for 1.7s	The node is not detecting any tokens being passed among the other nodes. It periodically claims the token but cannot find another node to which to pass it. Check the network for an open circuit or defective termination.
4 flashes, then OFF for 1.4s	The node has detected a valid message from a node using a network address identical to its own address. The node remains in this state for as long as it continues to detect the duplicate address. If the duplicate address is not detected for 5s, the node changes to its 1 flash/s mode.
ON	Indicates an invalid node address.
OFF	Possible fault with Modbus Plus Option Adapter.

Modbus Plus Address Switches

The two rotary switches on the option adapter are used to set a Modbus Plus node address for the CPU module. The switches are shown in the following illustration. Their usage is described in detail on *p. 144*.
The switches in this illustration are set to address 14.



Specifications of the Momentum Modbus Plus Option Adapter

172 PNN 210 22 Serial Option Adapter Specifications

Mechanical	
Weight	85.05 g (3 oz.)
Dimensions (HxDxW)	58.3 (on battery side) x 60.6 x 143.1 mm
	(2.27 x 2.36 x 5.57 in)
Material (enclosures/bezels)	Lexan
Time-of-Day Clock	
Accuracy	+/- 13 s/day
Battery	one 2/3 AA lithium required; included in a separate package with the option adapter
Service Life	< 30 days from the time a battery-low indication is received to actual battery failure @ 40 degrees C maximum ambient temperature with the system continuously powered down.
Shelf Life	In excess of 5 yr. @ room temperature
Operating Conditions	
Temperature	0 ... 60 degrees C
Humidity	5 ... 95% (noncondensing)
Chemical Interactions	Enclosures and bezels are made of Lexan, a polycarbonate that can be damaged by strong alkaline solutions
Altitude, full operation	2000 m (6500 ft)
Vibration	10 ... 57 Hz @ 0.075 mm displacement amplitude 57...150 Hz @ 1 g Ref. IEC 68-2-6 FC
Shock	+/-15 g peak, 11ms, half sine wave Ref. IEC 68-2-27 EA
RFI susceptibility/immunity	Meets CE mark requirements for open equipment. Open equipment should be installed in an industry-standard enclosure, with access restricted to qualified service personnel.
Storage Conditions	
Temperature	-40...+85 degrees C
Humidity	5 ... 95% (noncondensing)

Safety Parameters	
Degree of Protection	Unintentional access (UL 508 Type 1, NEMA250 Type 1, IP20 conforming to IEC529)
Di-electric Strength	RS232/485 is non-isolated from logic common
Ground Continuity	30 A test on the exposed metal connector
Agency Approvals	UL 508, CSA, CUL, CE; FM class1, div2

2.4 Redundant Modbus Plus Option Adapter (A Momentum Component)

Overview

Purpose

This section describes the 172 PNN 260 22 Redundant Modbus Plus option adapter, including the front panel components and specifications.

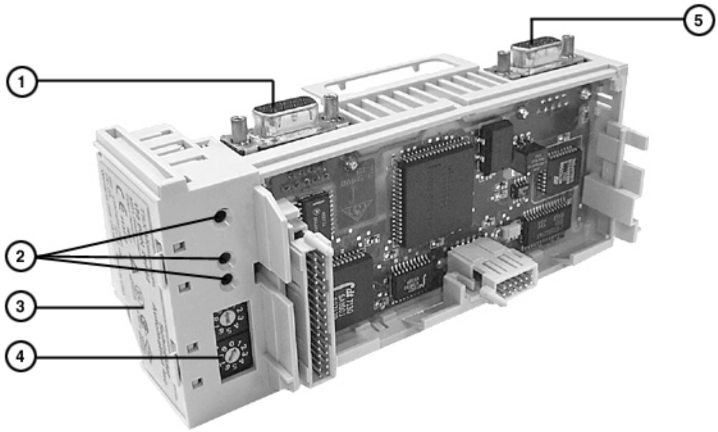
What's in this Section?

This section contains the following topics:

Front Panel Components of the Momentum Redundant Modbus Plus Option Adapter

Illustration

The illustration below shows the LED indicators, address switches, battery compartment and Modbus Plus connectors.



Legend:

Label	Description
1	9-pin D-shell connector for Modbus Plus port B
2	Array of three LED indicators
3	Battery compartment door
4	Address switches for Modbus Plus
5	9-pin D-shell connector for Modbus Plus port A

LED Indicators

This option adapter has three LED indicators. Their functions are described in the table below.

LED	Status	Function
MB+ ACT	Green	Indicates activity on one or both of the Modbus Plus ports (see the flash pattern table below)
	Off	No activity on either Modbus Plus port
ERR A	Red	Indicates a communications failure on Modbus Plus port A*
	Off	No problems detected on Modbus Plus port A
ERR B	Red	Indicates a communications failure on Modbus Plus port B*
	Off	No problems detected on Modbus Plus port B
* If you are not using redundant cabling on the Modbus Plus link (i.e., if only one of the ports is being used) the Error LED for the unused port will be on constantly when Modbus Plus communication occurs on the network.		

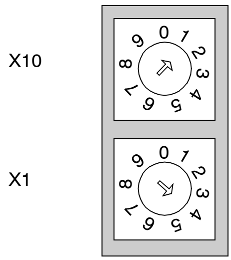
MB+ ACT Flash Patterns

This table provides the patterns that the MB+ ACT indicator will flash to indicate the status of the Modbus Plus node.

Pattern	Meaning
6 flashes/s	This is the normal operating state for the node. It is receiving and passing the network token. All nodes on a healthy network flash this pattern.
1 flash/s	The node is offline just after power-up or after exiting the 6 flashes/s mode. In this state, the node monitors the network and builds a table of active nodes. After being in this state for 5s, the node attempts to go to its normal operating state, indicated by 6 flashes/s.
2 flashes, then OFF for 2s	The node detects the token being passed among the other nodes, but never receives the token. Check the network for an open circuit or defective termination.
3 flashes, then OFF for 1.7s	The node is not detecting any tokens being passed among the other nodes. It periodically claims the token but cannot find another node to which to pass it. Check the network for an open circuit or defective termination.
4 flashes, then OFF for 1.4s	The node has detected a valid message from a node using a network address identical to its own address. The node remains in this state for as long as it continues to detect the duplicate address. If the duplicate address is not detected for 5s, the node changes to its 1flash/s mode.
ON	Indicates an invalid node address.
OFF	Possible fault with Modbus Plus option adapter.

Modbus Plus Address Switches

The two rotary switches on the option adapter are used to set a Modbus Plus node address for the CPU module. The switches are shown in the following illustration. Their usage is described in detail on *p. 144*.
The switches in this illustration are set to address 14.



Modbus Plus Ports A and B

This option adapter has two Modbus Plus ports. Redundant cabling on the Modbus Plus network offers increased protection against cable faults or excessive noise bursts on either one of the two cable paths. When one of the channels experiences communication problems, error-free messaging can continue to be processed on the alternate path.

Specifications of the Momentum Redundant Modbus Plus Option Adapter

172 PNN 260 22 Redundant Modbus Plus Option Adapter Specifications

Mechanical	
Weight	85.05 g (3 oz)
Dimensions (HxDxW)	58.3 (on battery side) x 60.6 x 143.1 mm
	(2.27 x 2.36 x 5.57 in)
Material (enclosures/bezels)	Lexan
Time-of-Day Clock	
Accuracy	+/-13 s/day
Battery	one 2/3 AA lithium required; included in a separate package with the option adapter
Service Life	< 30 days from the time a battery-low indication is received to actual battery failure @ 40 degrees C maximum ambient temperature with the system continuously powered down.
Shelf Life	In excess of 5 yr @ room temperature
Operating Conditions	
Temperature	0 ... 60 degrees C
Humidity	5 ... 95% (noncondensing)
Chemical Interactions	Enclosures and bezels are made of Lexan, a polycarbonate that can be damaged by strong alkaline solutions
Altitude, full operation	2000 m (6500 ft)
Vibration	10 ... 57 Hz @ 0.075 mm displacement amplitude 57...150 Hz @ 1 g Ref. IEC 68-2-6 FC
Shock	+/-15 g peak, 11 ms, half sine wave Ref. IEC 68-2-27 EA
RFI susceptibility/immunity	Meets CE mark requirements for open equipment. Open equipment should be installed in an industry-standard enclosure, with access restricted to qualified service personnel.
Storage Conditions	
Temperature	-40...+85 degrees C
Humidity	5 ... 95% (noncondensing)

Safety Parameters	
Degree of Protection	Unintentional access (UL 508 Type 1, NEMA250 Type 1, IP20 conforming to IEC529)
Di-electric Strength	RS232/485 is non-isolated from logic common
Ground Continuity	30 A test on the exposed metal connector
Agency Approvals	UL 508, CSA, CUL, CE; FM class1, div2

Assembling Momentum Components

3

At a Glance

Purpose

This chapter describes how to assemble and disassemble a Momentum M1 CPU, using the following components:
- processor adapter
- I/O base
- option adapter
- label

It also describes how to install the battery in the option adapter.

What's in this Chapter?

This chapter contains the following sections:

3.1 Assembling an M1 CPU with an I/O Base

Overview

Purpose

This section describes how to assemble a processor adapter with an I/O base and how to disassemble them.

What's in this Section?

This section contains the following topics:

Assembling a Processor Adapter onto an I/O Base

Overview

This section contains safety instructions and a procedure for assembling (attaching) an adapter to an I/O base.

General Description

An Ethernet communication adapter can be snapped directly onto a Momentum I/O base, making connections at three points:

- The plastic snap extensions on the two sides of the Momentum 170ENT11001 unit fit into the two slots on the sides of the I/O base
- The 12-pin connectors on the two units mate together

The components can be snapped together by hand – no assembly tools are required.

This section contains safety instructions for handling components and a procedure for assembling an adapter and an I/O base.

CAUTION

ADAPTER MAY BE DAMAGED BY STATIC ELECTRICITY

The adapter's electrical elements are sensitive to static electricity.

- Use proper electrical static discharge (ESD) procedures when handling the adapter.
- Do not touch the internal elements.

Failure to follow this instruction can result in injury or equipment damage.

CAUTION

EXPOSED ELECTRICAL CIRCUITRY

Electrical circuitry on the I/O base may be exposed when a Momentum adapter is not mounted.

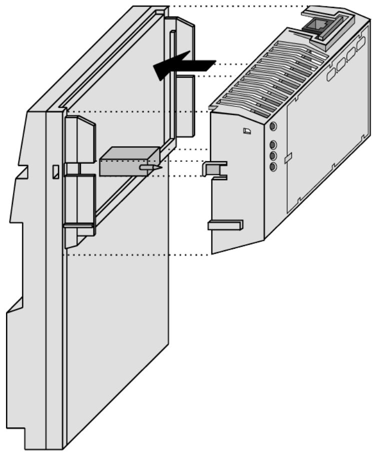
- Ensure that the I/O base is not under power when it does not have an adapter mounted on it.
- To make sure that power is not present, do not insert the wiring connectors to the I/O base until after the adapter has been mounted.

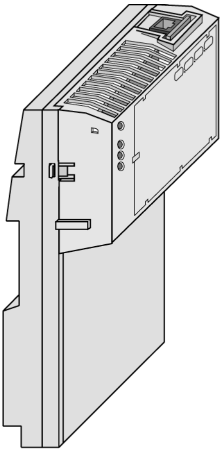
Failure to follow this instruction can result in injury or equipment damage.

For a detailed description of installation procedures and grounding considerations, refer to the *Momentum I/O Bases User Guide, Volumes I and II* (870USE00200).

Procedure: Assembling an Adapter and an I/O Base

Follow the steps in the table below to assemble an adapter and an I/O base.

Step	Action
1	Choose a clean environment to assemble the I/O base and adapter to protect the circuitry from contamination.
2	Make sure that the I/O base is not under power when you assemble the module.
3	Align the two plastic snap extensions on the adapter with the slots on the sides of the I/O base. The 12-pin connectors will automatically line up when the units are in this position. The two devices should be oriented so their communication ports are facing out, on the back side of the assembly. 

Step	Action
4	Push the adapter onto the base, gently pressing the locking tabs inward. Result: The locking tabs on each side of the adapter slide inside the I/O base and out through the locking slot. The 12-pin connectors on the two units are mated to each other in the process. 
5	Once the adapter has been assembled and snapped onto a base, the entire assembly can be mounted on a DIN rail or panel. The device meets CE mark requirements for open equipment. Open equipment should be installed in an industry-standard enclosure, and direct access must be restricted to qualified service personnel.

Disassembling a Momentum Processor from an I/O Base

Overview

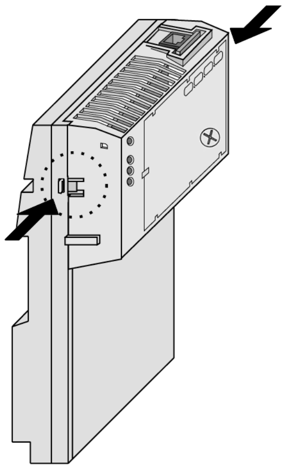
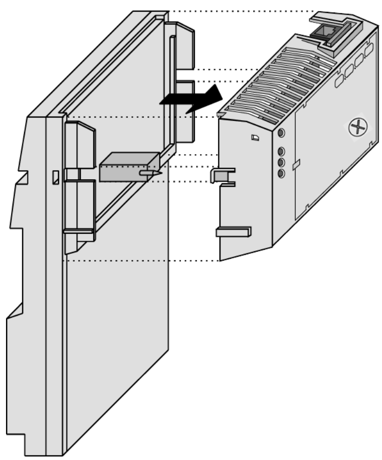
This section contains safety instructions and a procedure for disassembling an adapter from an I/O base.

CAUTION
EXPOSED ELECTRICAL CIRCUITRY Electrical circuitry on the I/O base may be exposed when a Momentum adapter is not mounted. ● Ensure that the I/O base is not under power when it does not have an adapter mounted on it. ● To make sure that power is not present, do not insert the wiring connectors to the I/O base until after the adapter has been mounted. **Failure to follow this instruction can result in injury or equipment damage.**

Tool

Use a flat-head screw driver.

Removing an Adapter from an I/O Base

Step	Action
1	Choose a clean environment to disassemble the unit, in order to protect the circuitry from contamination.
2	Make sure that the I/O base is not under power by removing the terminal connectors from the I/O base.
3	Remove the grounding screw.
4	Use a screwdriver to push the locking tabs on both sides of the adapter inward, as shown in the illustration below. 
5	Lift adapter straight up and away from base, maintaining pressure on locking tabs. 

3.2 Assembling an M1 CPU with a Momentum Option Adapter

Overview

Purpose

An option adapter may only be used in conjunction with a processor adapter. It may not be used alone with an I/O base.
This section describes how to add an option adapter when assembling a Momentum module and how to remove an option adapter from the assembled module.

What's in this Section?

This section contains the following topics:

Assembling an M1 Processor Adapter and a Momentum Option Adapter

Overview

If a Momentum option adapter is used, it is mounted between a Momentum M1 processor adapter and a Momentum I/O base in a three-tiered stack.
This section contains guidelines, safety instructions and a procedure for assembling a processor adapter and an option adapter.
The next section describes how to mount the assembled adapters on an I/O base.

Guidelines

We recommend that you snap together the option adapter and the M1 processor adapter before mounting them on the I/O base.

Connection Points Between Adapters

The option adapter and M1 processor connect at these four points:
- The plastic snap extensions on the two sides of the M1 fit into the two slots on the sides of the option adapter
- The 12-pin connectors on the center of the back walls of the two units mate together
- The 34-pin processor extension connectors that run along the left sidewalls of the components mate together

No Tools Required

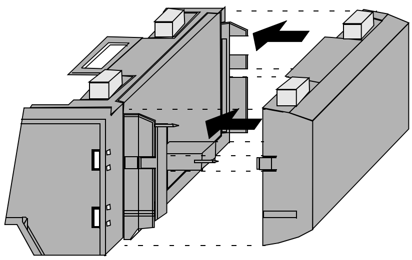
The components can be snapped together by hand; no assembly tools are required.
A flat-head screw driver is required to disassemble the unit.

Procedure: Assembling an Option Adapter and Processor

Follow the steps in the table below to assemble an option adapter and an M1 processor.

Step	Action
1	Choose a clean environment to assemble the option adapter and processor to protect the circuitry from contamination.
2	Align the two plastic snap extensions on the sides of the M1 processor adapter with the slots on the sides of the option adapter. The 12-pin connectors and processor extension connectors will automatically line up when the units are in this position. The two devices should be oriented so that their communication ports are facing out on the back side of the assembly.

CAUTION
PIN ALIGNMENT Proper assembly requires that the 34 pins on the processor extension connector be aligned correctly with the mating socket on the M1 processor adapter. ● Align pins exactly. ● Do not connect one side and try to rotate the M1 onto the option adapter. **Failure to follow this instruction can result in injury or equipment damage.**

3	Push the processor adapter onto the option adapter, gently pressing the locking tabs inward.  Result: The locking tabs on each side of the processor adapter slide inside the option adapter and out through the locking slot. The 12-pin and 34-pin connectors on the two units are mated to each other in the process.

Mounting the Assembled Adapters on the I/O Base

Overview

This section gives guidelines, safety instructions and a procedure for mounting the assembled processor and option adapter on an I/O base.

Guidelines

The assembled adapters connect with the I/O base at these seven points:
- Two plastic snaps on the front of the option adapter fit into two slots on the front of the I/O base
- The plastic snap extensions on the two sides of the option adapter fit into the two slots on the sides of the I/O base
- The 12-pin connectors on the center of the back walls of the two units mate together
- The plastic stirrup on the back of the option adapter clips onto the bottom of the I/O base

CAUTION

EXPOSED ELECTRICAL CIRCUITRY

Electrical circuitry on the I/O base may be exposed when an adapter is not mounted.
- Ensure that power is not present.
- Mount the adapter onto the I/O base before inserting the wiring connectors.

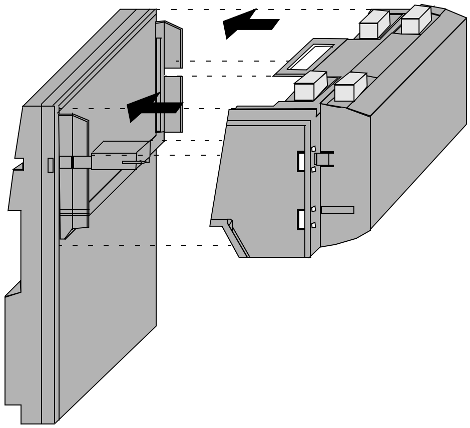
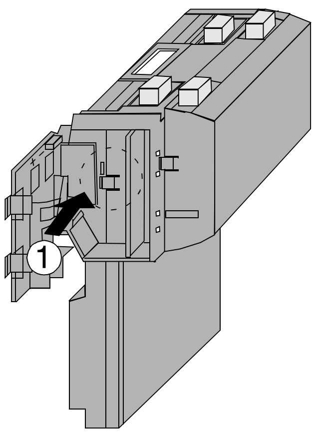
If an I/O base has no Momentum adapter mounted,
- Ensure that the I/O base receives no power.

When more than one connector is attached to the I/O base,
- Remove all connectors to prevent the unit from receiving power from an unexpected source.

Failure to follow this instruction can result in injury or equipment damage.

Procedure: Mounting the Assembled Adapters on an I/O Base

Follow the steps in the table below to mount the assembly on an I/O base.

Step	Action
1	Be sure that the I/O base is not under power when you assemble the module.
2	Align the four plastic snap extensions (on the front and sides of the option adapter) with the slots on the I/O base. The 12-pin connectors will automatically line up when the units are in this position. The devices should be oriented such that their communication ports are facing out on the back side of the assembly. 
3	Push the assembled adapters onto the base, gently pressing the locking tabs inward. Snap #1 shown in the illustration below will not align properly with the mating slot in the I/O base unless the option adapter is placed straight onto the base. Do not attach just one latch and rotate the option adapter onto the I/O base.  The locking tabs on each side of the option adapter slide inside the I/O base and out through the locking slot. The 12-pin connectors on the two units are mated to each other in the process.

Disassembling a Momentum Module with an Option Adapter

Overview

The three-tiered assembly is designed to fit together tightly so it can withstand shock and vibration in an operating environment. This section contains two procedures:

- Removing the assembled adapters from the I/O base
- Removing the option adapter from the processor

Tools Required

Flat-head screwdriver.

Procedure: Removing the Adapter Assembly from the I/O Base

Follow the steps in the table below to remove the assembled option adapter and M1 processor adapter from the I/O base.

Step	Action
1	Make sure that the power is off by removing the terminal connectors from the I/O base.
2	Remove the assembled unit from its wall or DIN rail mounting surface.

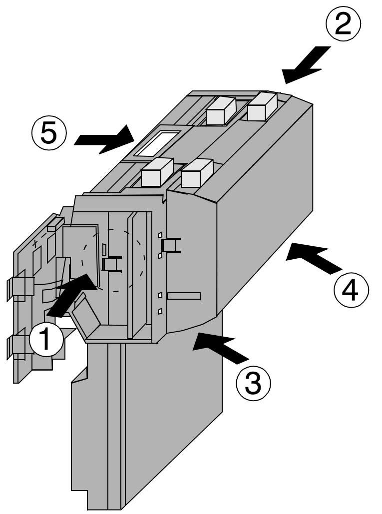
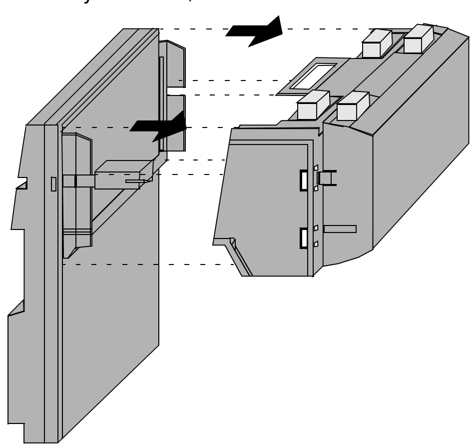
CAUTION

EXPOSED CIRCUITRY IN BATTERY COMPARTMENT

When you open a battery compartment, electrical circuitry can be exposed and can be damaged by a flat-head screwdriver inserted into the compartment.

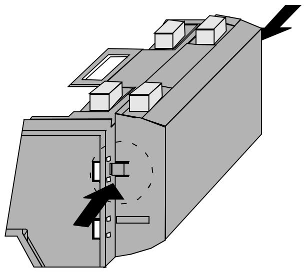
- Use care when you insert a screwdriver in the battery compartment.
- Avoid scratching any exposed elements.

Failure to follow this instruction can result in injury or equipment damage.

<table>
<tr><td>3</td><td>Open the battery door and use a flat-head screwdriver to release snaps 1 and 2 as shown in the illustration below.

</td></tr>
<tr><td>4</td><td>Once snaps 1 and 2 have been disengaged, use the screwdriver to release snaps 3 and 4 on the front of the assembly.</td></tr>
<tr><td>5</td><td>Gently lift the stirrup on the back of the option adapter with your fingers until it disengages from the bottom of the I/O base. Then lift the option adapter and M1 assembly from the I/O base.
</td></tr>
</table>

Procedure: Disassembling an Option Adapter and M1 Processor

Follow the steps in the table below to remove the option adapter from the M1 processor.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Use a screwdriver to push the clips on both sides of the adapter inward.
</td></tr>
<tr><td>2</td><td>Lift off the adapter.</td></tr>
</table>

3.3 Installing Batteries in a Momentum Option Adapter

Installation Guidelines

Why Install the Battery?

If you are using a Momentum option adapter in your CPU assembly, you have a battery-backup capability. The battery maintains user logic, state RAM values and the TOD clock in the event that the CPU loses power.

What Kind of Battery?

One 2/3 AA lithium battery needs to be installed in the compartment on the side of the option adapter. Each module is shipped with a battery. You must install this battery. Please see the appendices for an explanation of battery life.

CAUTION

ELECTRONIC CIRCUITRY EXPOSED

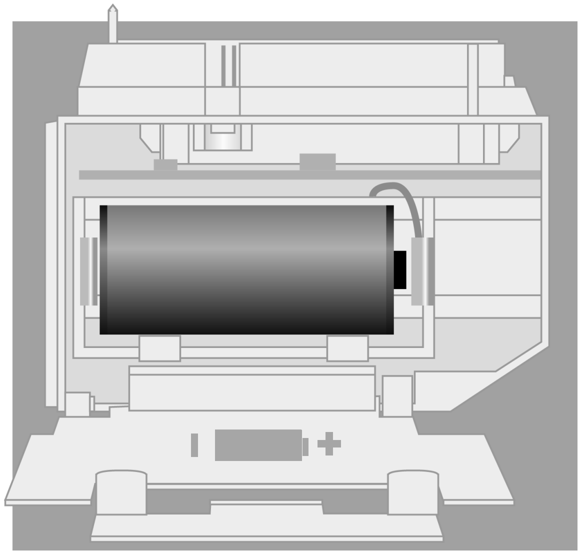
When the battery door is open, electronic circuitry is exposed.

- Follow proper electrical static discharge (ESD) measures while handling the equipment during battery maintenance.

Failure to follow this instruction can result in injury or equipment damage.

Installing the Battery

When installing the battery, observe correct polarity, as indicated on the compartment door.

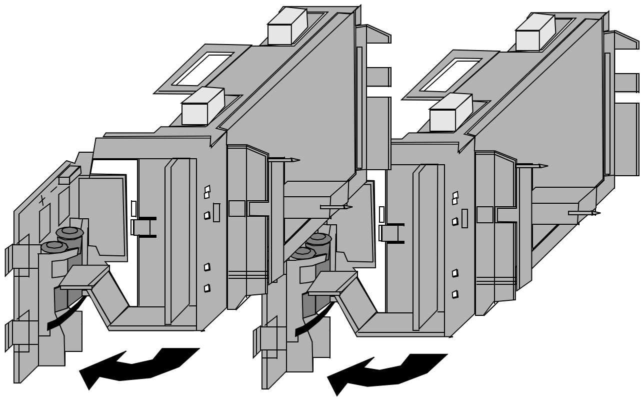


Leave Power On When Changing the Battery

Once your CPU has been commissioned and is running, maintain power to the module whenever you change the battery.
Unless you save to flash, you will need to reload the user logic program from the original files if you change the battery while the power is OFF.

Removing and Replacing the Battery

Battery maintenance should be performed only by qualified personnel according to the following illustration.



Monitor the Battery

Because a Momentum CPU assembly is designed to be installed in a cabinet where it cannot be seen at all times, no LED was created to monitor health.

We recommend that you reserve a battery coil in your programming panel software configuration and use it to monitor the health of your battery and report the need for replacement prior to battery failure. (Refer to *Reserving and Monitoring a Battery Coil with Modsoft for Momentum Option Adapters, p. 187* for Modsoft or *Reserving and Monitoring a Battery Coil, p. 273* for Concept.)

3.4 Labeling the M1 CPU

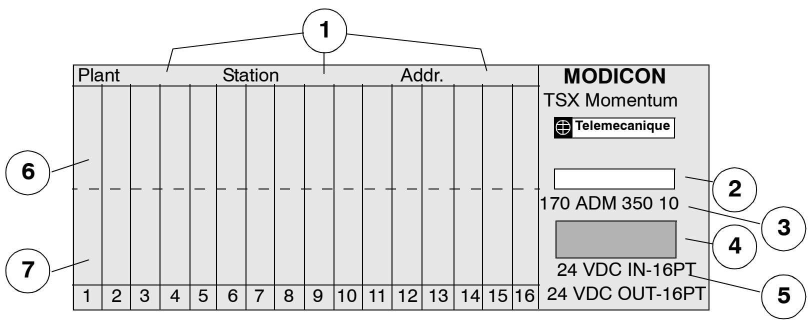
Fill-In Label

A fill-in label is shipped with each I/O base. This label should be placed on the Momentum processor adapter that you mount on that base.
A completed label provides information about the assembled module and its I/O field devices that can be used by service and maintenance personnel.
The model number of the I/O base is marked on the fill-in label directly above the color code. The cutout area above the I/O model number allows the model number of the adapter to show through.

> **Note:** An option adapter may also be used in the assembled module. You will find its model number printed in the upper left corner of adapter housing.

Example of a Fill-In Label

A fill-in label is illustrated in the illustration below. The numbered pointers in the illustration refer to the descriptions in the table that follows.



1	Fields for plant name, station name and network address
2	Cutout: the model number of the adapter shows through
3	Model number of the I/O base
4	Color code of the I/O base
5	Short description of the I/O base
6	Field for the symbol name of inputs
7	Field for the symbol name of outputs

Communication Ports on Momentum Components

II

At a Glance

Purpose

This part describes the communication ports available with Momentum processor adapters and option adapters.

What's in this Part?

This part contains the following chapters:

Using the Modbus Ports for Momentum Components

4

At a Glance

Purpose

This chapter describes Modbus port 1 and Modbus port 2, including communication parameters, cabling guidelines for Modbus RS485 networks, cable accessories and pinouts.

What's in this Chapter?

This chapter contains the following sections:

4.1 Modbus Port 1 (on Selected M1 Processor Adapters)

Overview

Purpose

Modbus port 1 is standard on all Momentum M1 processor adapters, except the Ethernet processor adapters. This section describes the port, the recommended cable accessories and the connection pinouts.

What's in this Section?

This section contains the following topics:

Modbus Port 1 (On Selected M1 Processor Adapters)

Introduction

Modbus port 1 is an RS232 asynchronous serial port that permits a host computer to communicate to the CPU for:
- programming
- data transfer
- upload/download
- other host operations

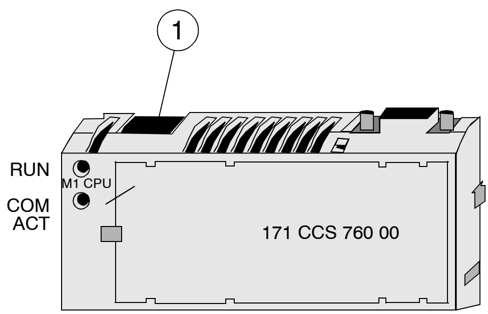
This section describes the port.

Connector Type

The Modbus port 1 connector is a female RJ45 phone jack.

Illustration

The following illustration shows the position of Modbus port 1 on a processor adapter.



Legend:

Label	Description
1	Modbus port 1

Port Parameters

Modbus port 1 supports the following communication parameters.

Baud	50	1800
	75	2000
	110	2400
	134	3600
	150	4800
	300	7200
	600	9600
	1200	19,200
Parity	EVEN	
	ODD	
	NONE	
Mode/Data Bits	7-bit ASCII	
	8-bit RTU	
Stop Bit	1	
Modbus Address	In the range 1... 247	

Default Parameters

The factory-set default communication parameters for Modbus port 1 are:
- 9600 baud
- EVEN parity
- 8-bit RTU mode
- 1 stop bit
- Modbus address

A processor adapter cannot support more than one stop bit. If you change this default setting in the configuration software, the processor adapter will ignore the change.
All other port parameters can be successfully modified in the configuration software.

Auto-Logout Feature

If a programming panel is logged into the CPU via the RS232 serial port and its cable gets disconnected, the CPU automatically logs out the port. This auto-logout feature is designed to prevent a lock-up situation that could prevent other host stations from logging in on other ports.

Cable Accessories for Modbus Port 1 on M1 Processor Adapters

Overview

This section describes the cable and D-shell adapters needed to connect Modbus port 1 to a programming station. It also provides pinouts for the adapters.

Cables

The cable connecting a programming station to the CPU (via Modbus port 1) can be up to 9.5m long. Three premade cable assemblies are available from Schneider Electric.

Length	Part Number
1 m (3 ft)	110 XCA 282 01
3 m (10 ft)	110 XCA 282 02
6 m (20 ft)	110 XCA 282 03

All three assemblies are standard eight-position, foil-shielded, flat telephone cables with male RJ45 connectors on each end. One RJ45 connector plugs into Modbus port 1 on the CPU, and the other plugs into a female D-shell adapter that fits onto the program

D-Shell Adapters

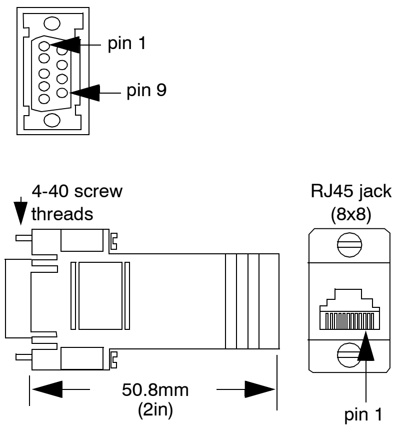
Two D-shell adapters are available from Schneider Automation for CPU-to-computer connections:
- A 110 XCA 203 00 9-pin adapter for 9 pin serial ports
- A 110 XCA 204 00 25-pin adapter for 25 pin serial ports

These adapters have an RJ45 jack on one end that allows them to clip directly onto a cable assembly.

Pinouts for Modbus Port 1 on M1 Processor Adapters

110 XCA 203 00 Pinout

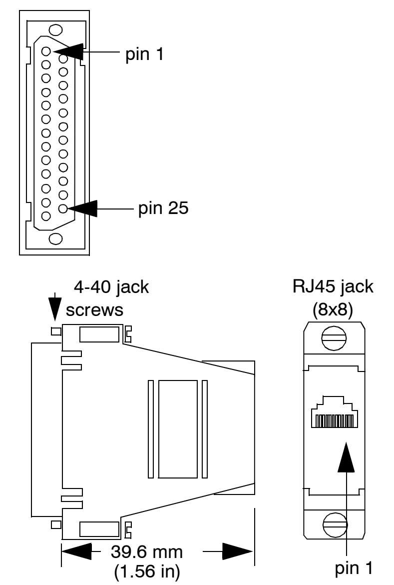
110 XCA 203 00 9-pin Female Adapter



CPU ◄► PC-AT Pinouts	
RJ45 Connector	9-pin D-shell
DTR 1	1
TXD 3	2 RXD
RXD 4	3 TXD
DSR 2	4 DTR
GND 5	5 GND
	6 DSR
CTS 7	7 RTS
RTS 6	8 CTS
	9 RI
cable 8 shield	cable of the connector

110 XCA 204 00 Pinout

110 XCA 204 00 25-pin Female Adapter



CPU ◄► PC-XT Pinouts	
RJ45 Connector	25-pin D-shell
DTR 1	1
RXD 4	2 TXD
TXD 3	3 RXD
CTS 7	4 RTS
RTS 6	5 CTS
	6 DSR
GND 5	7 GND
	8 DCD
DSR 2	20 DTR
cable 8 shield	1 chassis ground

4.2 Modbus Port 2 (On Selected Momentum Components)

Purpose

Five Momentum components offer this port.
- 171 CCS 780 00 processor adapter
- 171 CCC 780 10 processor adapter
- 171 CCC 980 20 processor adapter
- 171 CCC 980 30 processor adapter
- 172 JNN 210 32 serial option adapter

This section describes the port and provides guidelines for Modbus RS485 networks.

Features of an RS485 Port

The RS485 protocol handles messaging over long distances with higher level of noise immunity than RS232 without the need for modems.

What's in this Section?

This section contains the following topics:

Modbus Port 2 (on Selected Momentum Components)

Two Types of Ports

Modbus port 2 is available in two types:

Component	Type of Port	Type of Connector
171 CCS 780 00 171 CCC 780 10 171 CCC 980 20 171 CCC 980 30 Processor Adapters	Built-in, dedicated RS485 port	9-pin D-shell connector
172 JNN 210 32 Serial Option Adapter	User may configure port as RS232 or RS485*	RJ45 phone jack connector
*If the Option Adapter is combined with the 171 CCS 780 00, 171 CCC 780 10, 171 CCC 980 20 or 171 CCC 980 30 processor adapter, the Modbus port on the option adapter will be disabled.		

RS485 port Modbus port 2 can be configured as an RS485 port. RS485 supports two-wire or four-wire cabling. A multimaster/slave system must use two-wire cabling. A single master/slave system may use two- or four-wire cabling.
The RS485 protocol handles messaging over long distances with higher level of noise immunity than RS232 without the need for modems.

Features of an RS485 Port

Modbus port 2 can be configured as an RS485 port. RS485 supports two-wire or four-wire cabling. A multimaster/slave system must use two-wire cabling. A single master/slave system may use two- or four-wire cabling.
The RS485 protocol handles messaging over long distances with higher level of noise immunity than RS232 without the need for modems.

Limit of Two Modbus Ports

The Momentum M1 processor adapters can support a maximum of two Modbus ports.
If a 172JNN 210 32 serial option adapter is used in conjunction with a 171 CCS 780 00 or 171 CCC 780 10 processor adapter, the RS485 port on the processor adapter becomes Modbus port 2.The port on the option adapter becomes electrically neutral and does not support any communication activities. (The TOD clock and battery backup system on the option adapter continue to work.)

Port Parameters

Modbus port 2 offers the following communication parameters.

Baud	50	1800
	75	2000
	110	2400
	134	3600
	150	4800
	300	7200
	600	9600
	1200	19,200
Parity	EVEN	
	ODD	
	NONE	
Mode/Data Bits	8-bit RTU	
	7-bit ASCII	
Stop Bit	1	
Modbus Address	In the range 1 ... 247	
Comm Protocol	RS232	
	RS485	

Default Parameters

The factory-set default communication parameters for Modbus Port 2 are:
- 9600 baud
- EVEN parity
- 8-bit RTU mode
- 1 stop bit
- Modbus network address 1
- RS232 protocol

Note: Processor adapters support only one stop bit. If you change this default setting in the configuration software, the processor adapter will ignore the change.

Note: The default protocol must be changed from RS232 to RS485 for the 171 CCS 780 00,171 CCC 780 10 processor adapters or the port will not function.The 171 CCC 980 20 and 171 CCC 980 30 change automatically.

Auto-Logout Feature Only with RS232

If the serial option adapter is used and the RS232 port is chosen, auto-logout is supported. If a programming panel is logged into the CPU via the serial port and its cable gets disconnected, the processor adapter automatically logs out the port. This auto-logout feature is designed to prevent a lock-up situation that could prevent other host stations from logging in on other ports.

Auto-logout is not available for any RS485 port, including the RS485 option on the serial option adapter. The user must log out of the processor using the programming software.

Four-Wire Cabling Schemes for Modbus RS485 Networks Connecting Momentum Components

Introduction

Four-wire cabling schemes may be used for single master/slave communications. Only one master is allowed. The master may be located anywhere in the network.

Length

The maximum length of cable from one end of network to other is 609 m (2000 ft).

Number of Devices

The maximum number of devices in a network is 64 if all are Momentum devices. Otherwise, the maximum is 32.

Termination

You must terminate both ends of the cable run with special terminating resistors.

Description	Part Number
Modbus Plus or Modbus RS485 terminating RJ45 resistor plugs (pack of 2)	170 XTS 021 00
Color code	red

Master Cable

The master of this master/slave cabling scheme must be connected on at least one side to a master cable, a special cable that crosses the transmit and receive lines. The other side may be connected to a master cable, or, if the master is at one end of the cable run, a terminating resistor.

Description	Part Number
Modbus RS485 (RJ45/RJ45) Master Communication Cable	170 MCI 041 10
Modbus Plus or Modbus RS485 terminating RJ45 resistor plugs (pack of 2)	170 XTS 021 00
Color code	blue

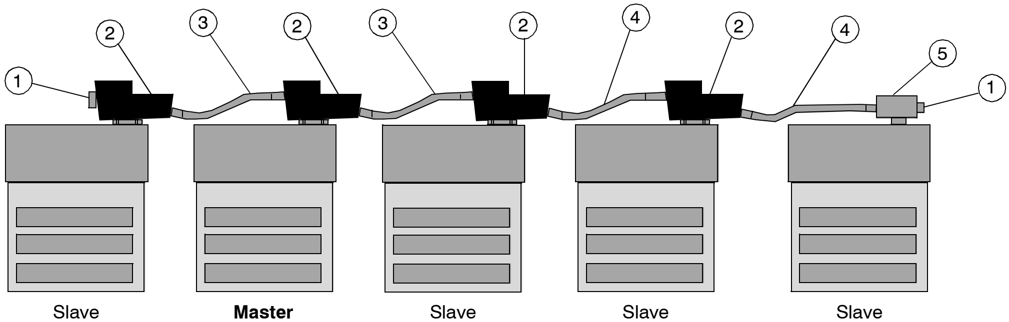
Slave Cabling

The slaves use a pin-for-pin cable, such as the Modbus Plus / Modbus RS485 short interconnect cable or any Cat. 5 4-twisted pair Ethernet cable AWG#24.

Description	Part Number
Modbus Plus / Modbus RS485 short interconnect cable	170 MCI 020 10
Color code	black

Single Master/ Slave Option 1

The following illustration shows components used in a four-wire single master/slave cabling scheme. In this view, a master cable (#3) is used on both sides of the master. Each Momentum module must include a processor adapter or option adapter with a Modbus RS485 port.



Note: Each cable has different colored boots. The color of the boots signifies the cable's function.

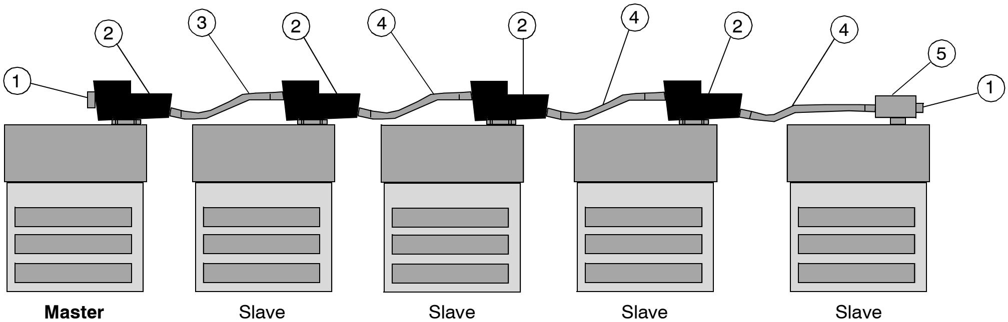
Legend:

Label	Description	Part Number
1	Terminating resistor plug	170 XTS 021 00
2	Modbus RS485 connector T (DB9 base)	170 XTS 040 00
3	Modbus RS485 master communication cable	170 MCI 041 10
4	Modbus Plus / Modbus RS485 short interconnect cable	170 MCI 020 10
5	Modbus RS485 connector T (RJ45 base)	170 XTS 041 00

Single Master/ Slave Option 2

The following illustration shows components used in a four-wire single master/slave cabling scheme. In this view, the master is at one end of the network and is connected by a single master cable (#3). Terminating resistors (#1) are used at both ends of the network.

Each Momentum module must include a processor adapter or option adapter with a Modbus RS485 port.



Legend:

Label	Description	Part Number
1	Terminating resistor plug	170 XTS 021 00
2	Modbus RS485 connector T (DB9 base)	170 XTS 040 00
3	Modbus RS485 master communication cable	170 MCI 041 10
4	Modbus Plus / Modbus RS485 short interconnect cable	170 MCI 020 10
5	Modbus RS485 connector T (RJ45 base)	170 XTS 041 00

Two-Wire Cabling Schemes for Modbus RS485 Networks Connecting Momentum Components

Introduction

Two-wire cabling schemes may be used for single master/slave or multimaster/slave communications. Masters may be located anywhere in the network.

CAUTION

POTENTIAL FOR MULTIMASTER CONFLICTS

Conflicting messages to a slave module can cause problems.

- Configure a multimaster network carefully to avoid masters issuing simultaneous or conflicting commands to the same slave module.

Failure to follow this instruction can result in injury or equipment damage.

Length

The maximum length of cable from one end of network to other is 2000 ft. (609 m).

Number of Devices

The maximum number of devices in a network is 64 if all are Momentum devices. Otherwise, the maximum is 32.

Termination

One end of the cable run must be terminated with a terminating resistor (color code is red).
The other end of the cable must be terminated with a terminating shunt, which connects the transmit pair to the receiver pair (color code is blue).

Description	Part Number
Modbus Plus or Modbus RS485 terminating RJ45 resistor plugs (pack of 2)	170 XTS 021 00
Modbus RS485 terminating RJ45 shunt plugs	170 XTS 042 00

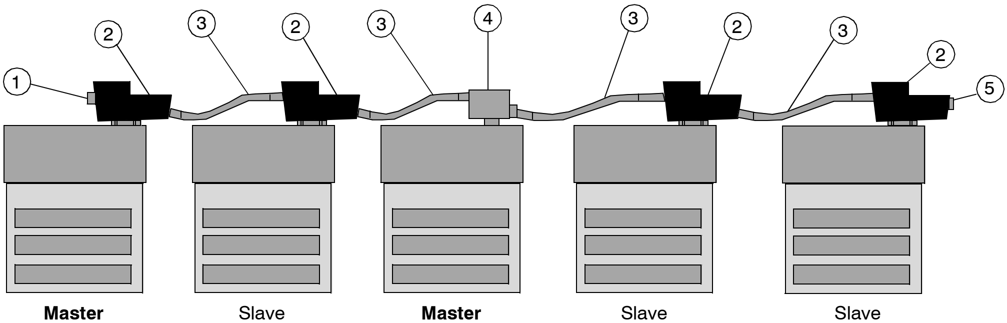
Cable

All devices are connected with the same pin-for-pin cable, such as the Modbus Plus or Modbus RS485 short interconnect cable or any Cat. 5 4-twisted pair Ethernet cable AWG#24. A master/slave system using 2-wire cabling does not require the special master communication cable.

Description	Part Number
Modbus Plus or Modbus RS485 short interconnect cable Color code: black	170 MCI 020 10

Multimaster/ Slave Cabling

The following illustration shows components used in a multimaster/slave network. Each Momentum module must include a processor adapter or option adapter with a Modbus RS485 port.



Legend:

Label	Description	
1	Terminating resistor plug	170 XTS 021 00
	Color code	red
2	Modbus RS485 connector T (DB9 base)	170 XTS 040 00
3	Modbus Plus / Modbus RS485 Short Interconnect Cable	170 MCI 020 10
	Color code	black
4	Modbus RS485 connector T (RJ45 base)	170 XTS 041 00
5	Terminating shunt plug	170 XTS 042 00
	Color code	blue

Cable for Modbus RS485 Networks Connecting Momentum Components

Overview

This section describes the cables which should be used in constructing an RS485 network for Momentum components.

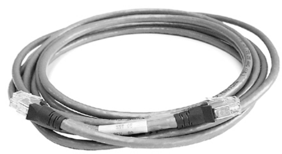
Master Communication Cable

This cable is required for master/slave communications in a four-wire cabling scheme. This cable is 10" long and has a blue boot.

Description	Part Number	Illustration
Modbus RS485 (RJ45/RJ45) master communication cable	170 MCI 041 10	

Interconnect Cables

Cable for connecting two Modbus RS485 devices, such as Momentum modules, is available from Schneider Automation in four lengths. These cables have a black boot.

Description	Part Number	Illustration
Modbus Plus or Modbus RS485 short interconnect cable (10") Can be used for Ethernet	170 MCI 020 10	
Modbus Plus or Modbus RS485 3 ft. interconnect cable Can be used for Ethernet	170 MCI 020 36	
Modbus Plus or Modbus RS485 10 ft. interconnect cable Cannot be used for Ethernet	170 MCI 021 80	
Modbus Plus or Modbus RS485 30 ft. interconnect cable Cannot be used for Ethernet	170 MCI 020 80	

Other Premade Cable

Interconnect and Ethernet cable in various lengths and boot colors may be obtained from other vendors, including Amp.

Description	Amp Part Number
2 ft	621 894-2
5 ft	621 894-4
7 ft	621 894-5
10 ft	621 894-6
14 ft	621 894-7

Custom Cable

For custom cabling, use Cat. 5 4-twisted pair Ethernet cable AWG#26. It may be shielded or unshielded. Shielded cable is recommended for long runs and for noisy environments. You may use stranded or unstranded cable.

Custom Cable Vendors

Vendors include:

Vendor	Part # for Shielded Cable	Part # for Unshielded Cable
Belden	1633A	1583A non plenum 1585A plenum
Berk/Tek	530131	540022
Alcatel Cable Net	--	Hipernet Cat. 5 - UTP (LSZH-rated cable)

Crimping Tool

Schneider Automation provides a crimping tool (490 NAB 000 10) and an RJ45 die set (170 XTS 023 00) to attach the 170 XTS 022 00 connector to the cable.

Connectors for Modbus RS485 Networks Connecting Momentum Components

Overview

This section describes the connectors which should be used in constructing an RS485 network for Momentum components.

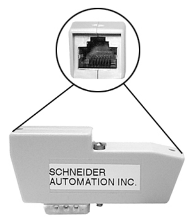
RJ45 Connector T

This connector is used with the RS485 port on the 172 JNN 210 32 option adapter.

Description	Part Number	Illustration
Modbus RS485 connector T (RJ45 base)	170 XTS 041 00	

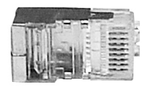
DB9 Connector T

This connector is used with the RS485 port on the processor adapters.

Description	Part Number	Illustration
Modbus RS485 connector T (DB9 base)	170 XTS 040 00	

Connectors for Custom Cabling

This RJ45 connector should be used when constructing custom cable for an RS485 network.

Description	Part Number	Illustration
RJ45 connector (pack of 25)	170 XTS 022 00	

Terminating Devices for Modbus RS485 Networks Connecting Momentum Components

Overview

This section describes terminating devices which should be used in constructing Modbus RS485 networks for Momentum devices.

Terminating Resistor Plugs

Terminating resistor plugs are used with the RS485 connector (RJ45 base) at the last device on either end of a four-wire cable network or at one end of a two-wire cable network.

Description	Part Number	Illustration
Modbus Plus or Modbus RS485 terminating RJ45 resistor plugs (pack of 2) Color code: red	170 XTS 021 00	

Shunt Plugs

Shunt plugs are used with the RS485 connector (RJ45 base) at one end of a two-wire cable network. The plug is used at the last device on the network.

Description	Part Number	Illustration
Modbus RS485 terminating RJ45 shunt plugs Color code: blue	170 XTS 042 00	

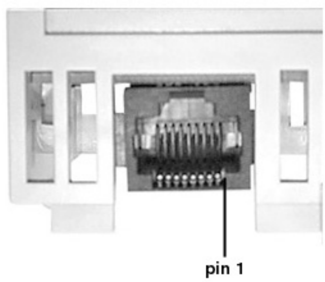
Pinouts for Modbus RS485 Networks Connecting Momentum Components

Overview

This section contains pinouts for wiring an RS485 network for Momentum components.

RJ45 Pinout

The illustration below shows the pinouts for wiring an RJ45 connector for RS485.

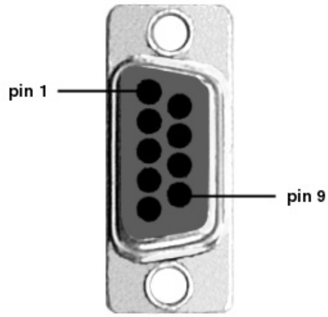


Legend:

Pin	Function
1	RXD -
2	RXD +
3	TXD +
4	Reserved
5	Signal common
6	TXD -
7	Reserved
8	Shield

9-Pin D-Shell Pinout

The illustration below shows the pinouts for wiring a male 9-pin D-shell connector for RS485. The metal shell is connected to chassis ground.

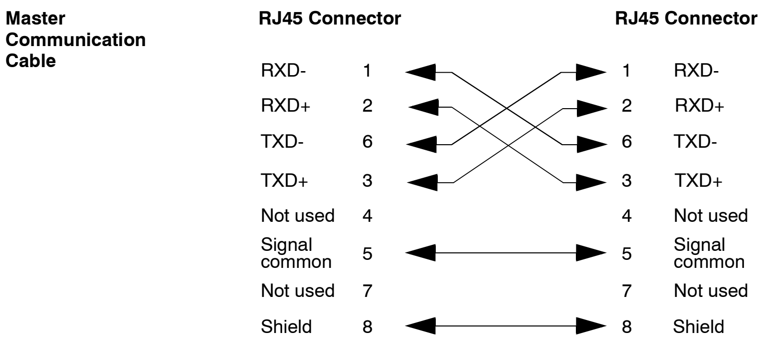


Legend:

Pin	Function
1	TXD +
2	RXD +
3	Signal common
4	Reserved
5	Reserved
6	TXD -
7	RXD -
8	Reserved
9	Reserved

Master Communication Cable

The illustration below shows the pinout for the 170 MCI 041 10 Modbus RS485 (RJ45/RJ45) master communication cable.



Interconnect Cables

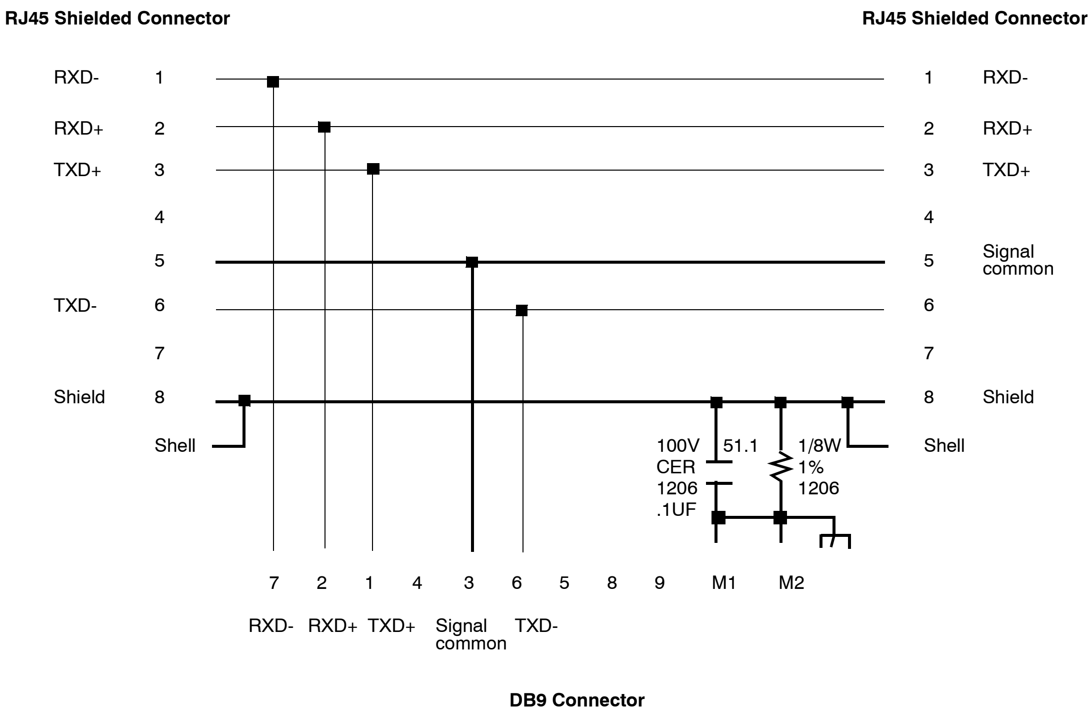
The illustration below shows the pinout for the 170 MCI 02x xx Modbus Plus or Modbus RS485 interconnect cables (10 in, 3 ft, 10 ft and 30 ft).

Interconnect Cables

RJ45 Connector				**RJ45 Connector**
RXD-	1	◄──►	1	RXD-
RXD+	2	◄──►	2	RXD+
TXD+	3	◄──►	3	TXD+
TXD-	6	◄──►	6	TXD-
Not used	4		4	Not used
Signal common	5	◄──►	5	Signal common
Not used	7		7	Not used
Shield	8	◄──►	8	Shield

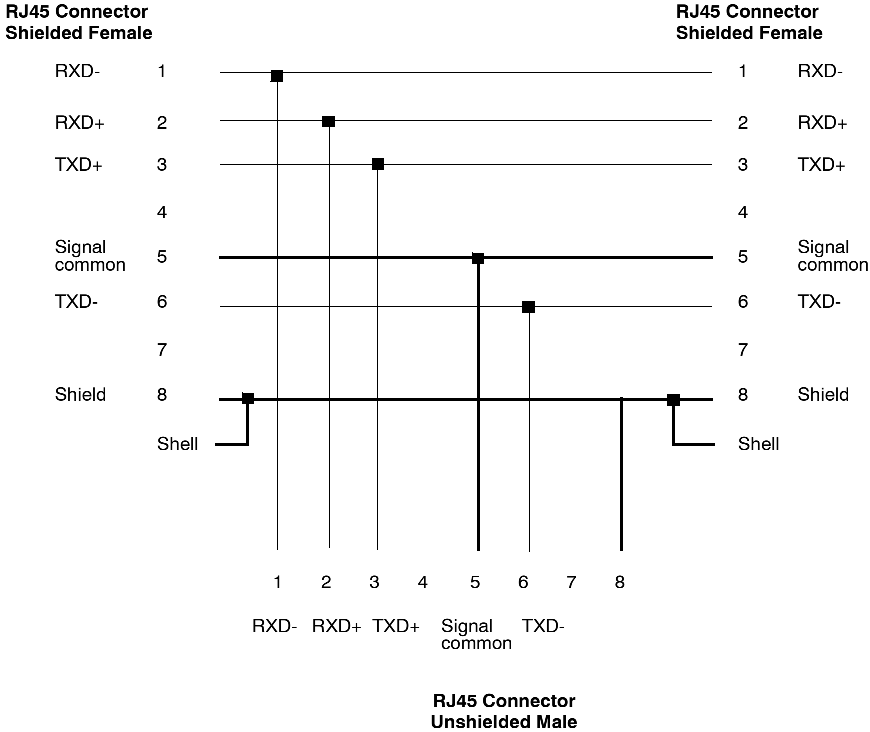
Modbus RS485 Connector T (DB9 Base)

The illustration below shows the pinout for the Modbus RS485 connector T (DB9 base).



Modbus RS485 Connector T (RJ45 Base)

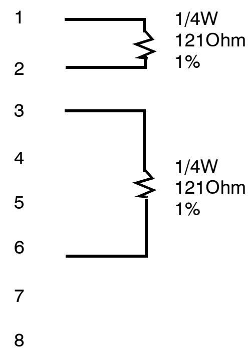
The illustration below shows the pinout for the Modbus RS485 connector T (RJ45 base).



Terminating Resistor Plugs

The illustration below shows the pinout for the Modbus Plus or Modbus RS485 terminating RJ45 resistor plugs.

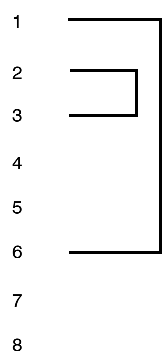
RJ45 Connector



Terminating Shunt Plugs

The illustration below shows the pinout for the Modbus RS485 terminating RJ45 shunt plugs.

RJ45 Connector



Using the Modbus Plus Ports with Momentum Components

5

At a Glance

Purpose

Modbus Plus ports are available with:
- 172 PNN 210 22 option adapter (single port)
- 172 PNN 260 22 option adapter (redundant ports)

This section gives an overview of Modbus Plus networks for Momentum components.

Note: The Modbus Plus Network Planning and Installation Manual (890 USE 100 00) provides details for the complete design and installation of a Modbus Plus cable system.

What's in this Chapter?

This chapter contains the following topics:

Modbus Plus Features for Momentum

Introduction

When a Modbus Plus network is constructed entirely of Momentum components, it may take advantage of two new features:
- cluster mode, which allows small groups of devices to be linked by short lengths of cable
- supporting up to 64 nodes on a single section of cable

Cluster Mode

A cluster may consist of up to eight Momentum devices. A network may contain up to eight clusters.
The cable between devices in a cluster may be 10 in to 3 ft. The cable between clusters or between a cluster and the trunk must be at least 10 ft.
The maximum length of the network continues to be 1500 ft. The maximum number of devices in a network continues to be 64.

Note: Only Momentum devices are allowed in a cluster.

64 Nodes

When a Modbus Plus network consists entirely of Momentum devices, then a single section of cable may support 64 nodes instead of the standard 32 nodes.
Example: If a single SA85 is added to a network of Momentum modules, the network is no longer Momentum only, but a mixture of devices. Each cable section must be limited to 32 nodes. Cable sections must be connected by a repeater.

Two Types of Modbus Plus Networks for Momentum Components

I/O Networks and Supervisory Networks

In a distributed control environment, Modbus Plus can be used in either of two ways:
- as an I/O network
- as a supervisory network

> **CAUTION**
>
> **CRITICAL I/O MUST BE SERVICED IN AN I/O NETWORK**
>
> For programming, the user interface, and third party Mod Connect devices, Modbus Plus offers either deterministic I/O servicing or non-deterministic supervisory servicing.
> - Design your Modbus Plus architecture to meet the needs of your network.
> - Do not use a supervisory network to service critical I/O.
>
> **Failure to follow this instruction can result in injury or equipment damage.**

I/O Networks

In a deterministic I/O network architecture, one CPU services up to 63 Momentum I/O modules, Terminal I/O modules or other Modbus Plus devices.

Note: When a programming panel or other human-machine interface (HMI) device is used as part of a deterministic Modbus Plus I/O network, it should be connected via the RS232 port on the CPU, not as a Modbus Plus node.

Supervisory Networks

In a supervisory architecture, several intelligent processing devices share system data with each other. Many kinds of devices may be part of the network. You should be aware of each device's requirement for access to the network and of the impact each device will have on the timing of your network communication, especially when servicing non-critical (and non-deterministic) I/O.

What if I Need Both Types?

If your system requires both supervisory and I/O handling architectures, one solution is to use a processor adapter with I/O bus capabilities as the I/O network and either a 172 PNN 210 22 or 172 PNN 260 22 option adapter with Modbus Plus for the supervisory network.

Standard Cabling Schemes

Introduction

In a standard Modbus Plus cabling scheme, each peer device connects via a drop cable to a tap along a trunk cable.

Length

The maximum length of cable from one end of the network to the other is 1500 ft (450 m) if no repeaters are used.
You can use up to three Modicon RR85 Repeaters to extend the cable up to 6000 ft (1800 m). Each repeater allows you to extend the cable 1500 ft (450 m).

Description	Part Number
Modicon RR85 repeater	NW-RR85-000

Distance Between Nodes

Nodes must be separated by at least 10 ft of cable. This requirement is more than satisfied by standard drop cables.

Description	Part Number
Modbus Plus drop cable 2.4 m (8 ft)	990 NAD 211 10
Modbus Plus drop cable 6 m (20 ft)	990 NAD 211 30

Number of Devices

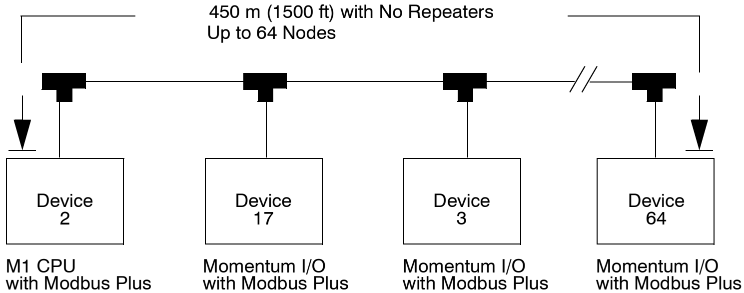
The maximum number of devices in a network is 64:
- If you use only Momentum products, you may use up to 64 devices on one cable section without a repeater.
- If you use a mixture of devices, you may use up to 32 devices on one cable section. You must use a repeater to connect to another cable section. You may use up to three repeaters and four cable sections in all.

Termination

You must terminate both ends of the network. If your network consists of two or more sections separated by a repeater, each section must be terminated at both ends.

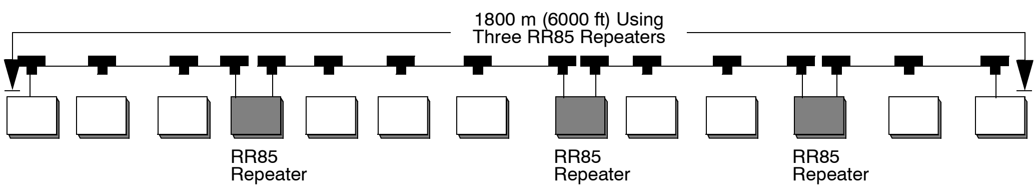
Momentum Network

This illustration depicts a Modbus Plus network constructed with a Momentum CPU and Momentum I/O. One cable segment supports all 64 nodes. No repeater is used.



Mixture of Devices

This illustration depicts a mixture of Momentum and other Modbus Plus devices. Three repeaters are used to connect four cable sections.



Cluster Mode Cabling Schemes

Introduction

In cluster mode, Momentum I/O devices may be placed in small groups, connected by much shorter lengths of cable than in standard Modbus Plus cabling schemes. You may use clusters and standard single nodes in the same network.

Length of Network

The maximum length of cable from one end of the network to the other is 1500 ft (450 m) if no repeaters are used.
You can use up to three Modicon RR85 Repeaters to extend the cable to up to 6000 ft (1800 m). Each repeater allows you to extend the cable 1500 ft (450 m
The following table shows the repeater information.

Description	Part Number
Modicon RR85 repeater	NW-RR85-000

Number of Devices in Network

The maximum number of devices in a network is 64:
- If you use only Momentum products, you may use up to 64 devices on one cable segment without a repeater.
- If you use a mixture of devices, you may use up to 32 devices on one cable section. You must use a repeater to connect to another cable section. You may use up to three repeaters and four cable sections in all.

Clusters in a Network

The maximum number of clusters in a network is 8. The maximum number of devices in a cluster is 8. Only Momentum devices may be used in the cluster.

Termination

You must terminate both ends of the network with special terminating resistors.

Description	Part Number
Modbus Plus or Modbus RS485 terminating RJ45 resistor plugs (pack of 2)	170 XTS 021 00

Cable Between Nodes in a Cluster

The minimum length of cable between nodes in a cluster is 10 in (.25 m).

Description	Part Number
Modbus Plus / Modbus RS485 short interconnect cable	170 MCI 020 10
Modbus Plus or Modbus RS485 3 ft. interconnect cable	170 MCI 020 36

Cable Between Clusters

The minimum length of cable between clusters is 3 m (10 ft).

Description	Part Number
Modbus Plus or Modbus RS485 10 ft. interconnect cable	170 MCI 021 80
Modbus Plus or Modbus RS485 30 ft. interconnect cable	170 MCI 020 80

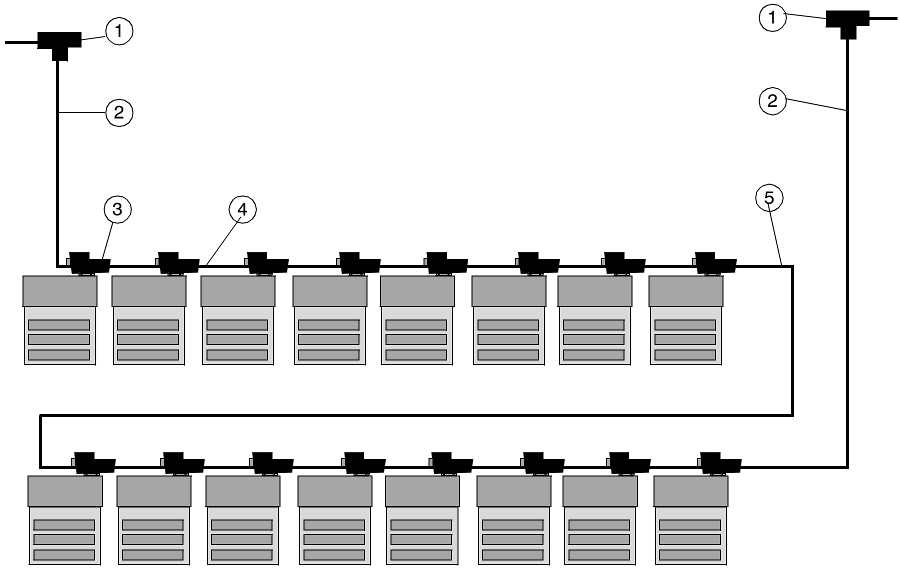
Drop Cables

Drop cables connecting a cluster to the trunk cable must be at least 10 ft (3 m) long. A 10 ft drop cable is available. A 30 ft drop cable may be fabricated by removing one RJ45 connector from a 30 ft interconnect cable. Connect the open end of the cable to a Modbus Plus tap, using the wiring illustrations on *p. 141*.

Description	Part Number
Modbus Plus 10 ft drop cable	170 MCI 021 20
Modbus Plus or Modbus RS485 30 ft. interconnect cable	170 MCI 020 80

Cluster Scheme #1

In this example, two clusters of Momentum I/O modules are connected in sequence. The trunk cable continues from the clusters in both directions.

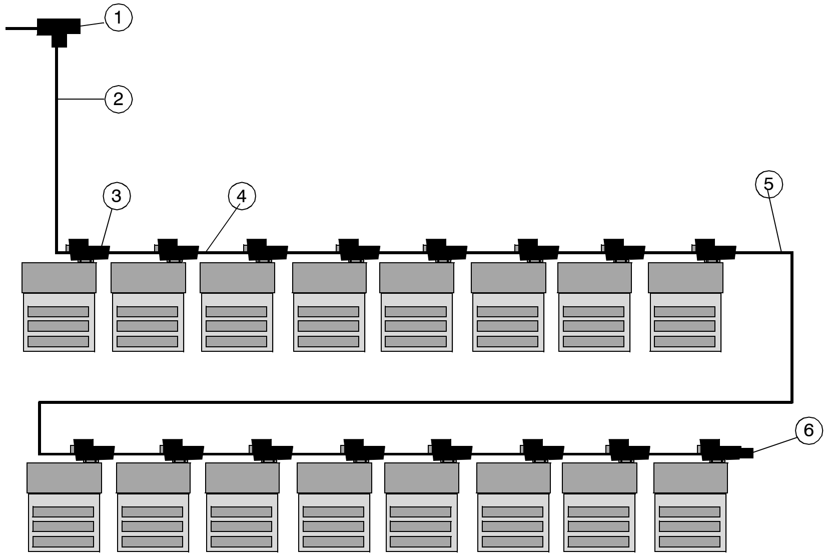


Legend:

Label	Description	Part Number
1	Modbus Plus Tap	990 NAD 230 00
2	Modbus Plus 10 ft. drop cable	170 MCI 021 20
3	Modbus Plus connector T (DB9 base)	170 XTS 020 00
4	Modbus Plus / Modbus RS485 short interconnect cable or Modbus Plus / Modbus RS485 3 ft. interconnect cable	170 MCI 020 10 170 MCI 020 36
5	Modbus Plus / Modbus RS485 30 ft Interconnect Cable	170 MCI 020 80

Cluster Scheme #2

In this example, two clusters are connected in sequence. The network ends with the second cluster.



Legend:

Label	Description	Part Number
1	Modbus Plus Tap	990 NAD 230 00
2	Modbus Plus 10 ft. drop cable	170 MCI 021 20
3	Modbus Plus connector T (DB9 base)	170 XTS 020 00
4	Modbus Plus / Modbus RS485 short interconnect cable or Modbus Plus / Modbus RS485 3 ft. interconnect cable	170 MCI 020 10 170 MCI 020 36
5	Modbus Plus / Modbus RS485 30 ft. interconnect cable	170 MCI 020 80
6	Terminating resistor plug	170 XTS 021 00

Cable Accessories for Modbus Plus Networks

Overview

This section describes the cables, connector and terminating device which should be used in constructing a Modbus Plus network for Momentum components.

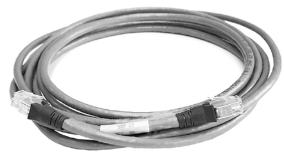
Cable Within Clusters

Cable for connecting two Modbus Plus devices within a cluster is available from Schneider Automation in two lengths. These cables have a black boot.

Description	Part Number	Illustration
Modbus Plus or Modbus RS485 short interconnect cable (10 ft)	170 MCI 020 10	
Modbus Plus or Modbus RS485 3 ft interconnect cable	170 MCI 020 36	

Cable Between Clusters

Cable for connecting two Modbus Plus clusters, or for fabricating drop cables to and from clusters, is available from Schneider Automation in two lengths. These cables have a black boot.

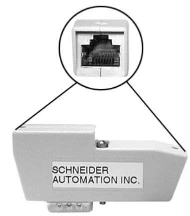
Description	Part Number	Illustration
Modbus Plus 10 ft drop cable	170 MCI 021 20	
Modbus Plus or Modbus RS485 10 ft interconnect cable	170 MCI 021 80	
Modbus Plus or Modbus RS485 30 ft interconnect cable	170 MCI 020 80	

DB9 Connector T

This connector is used in cluster mode with a Modbus Plus Communication Adapter or with the 172 PNN 210 22 or 172 PNN 260 22 Modbus Plus option adapters.

Note: Only one connector T may be used with each adapter, making it impossible to use redundant cabling in cluster mode.

Details

Description	Part Number	Illustration
Modbus Plus connector T (DB9 base)	170 XTS 020 00	

Terminating Resistor Plugs

Terminating resistor plugs are used with the connector T at the last device in a cluster when it is also the last device in the Modbus Plus network. The plug is red.

Description	Part Number	Illustration
Modbus Plus or Modbus RS485 terminating RJ45 resistor plugs (pack of 2)	170 XTS 021 00	

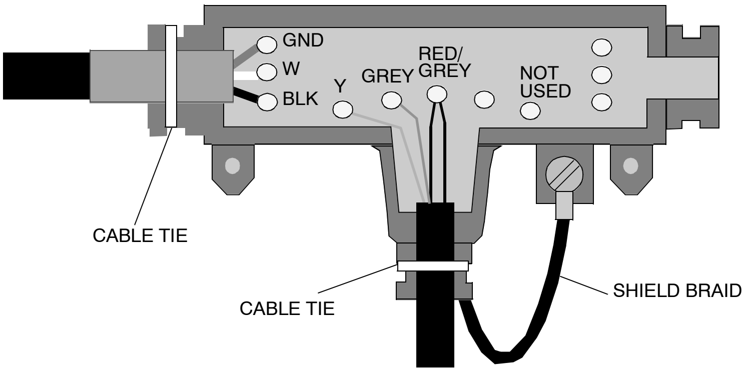
Pinouts and Wiring Illustrations for Modbus Plus Networks with Momentum Components

Overview

This section contains pinouts and wiring illustrations for constructing a Modbus Plus network for Momentum components.

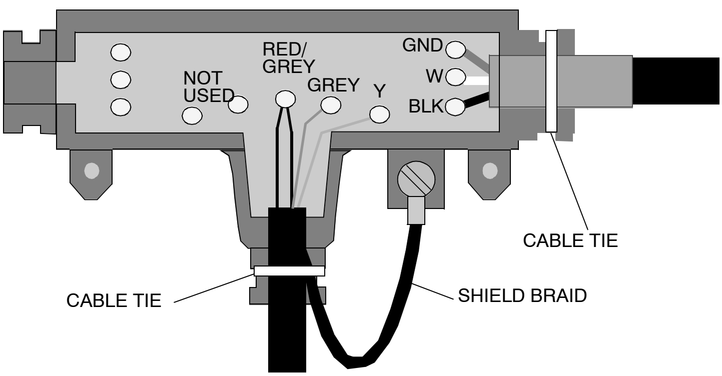
Drop Cable from Tap to Cluster

The following illustration shows wiring an interconnect cable (with one RJ45 connector removed) from a Modbus Plus tap to a cluster:



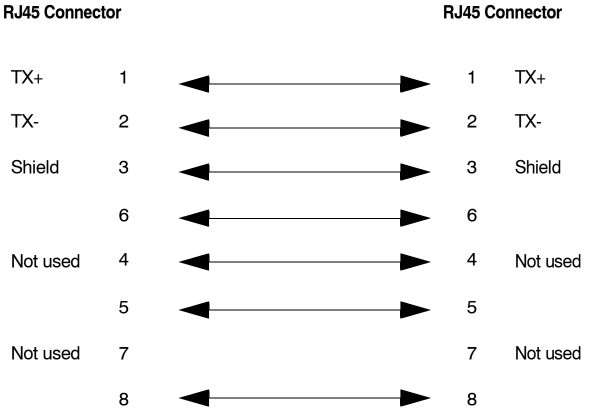
Drop Cable from Cluster to Tap

The following illustration shows wiring an interconnect cable (with one RJ45 connector removed) from a cluster to a Modbus Plus tap:



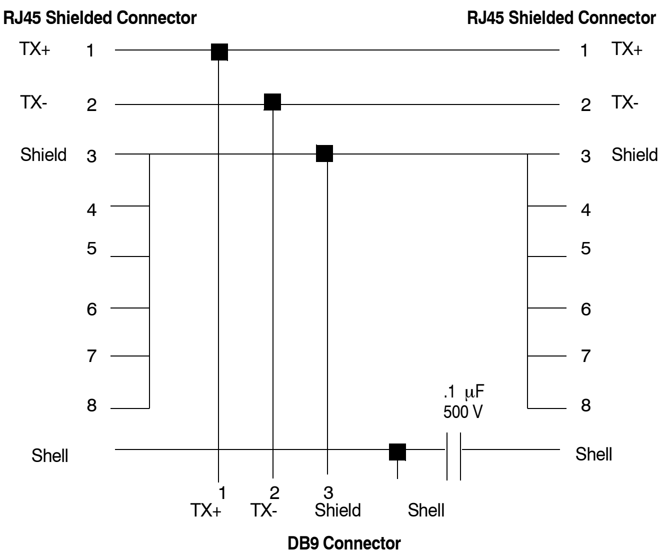
Interconnect Cables

The following illustration shows the pinout for the 170 MCI 02x xx Modbus Plus or Modbus RS485 interconnect cables (10 in, 3 ft, 10 ft and 30 ft).



Modbus Plus Connector T (DB9 Base)

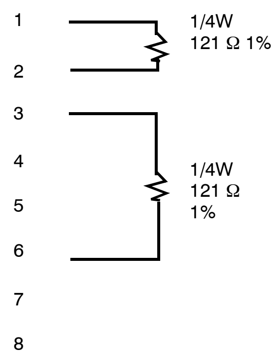
The following illustration shows the pinout for the Modbus Plus connector T (DB9 base).



Terminating Resistor Plugs

The following illustration shows the pinout for the Modbus Plus or Modbus RS485 terminating RJ45 resistor plugs.

RJ45 Connector



Modbus Plus Addresses in Networks with Momentum Components

Introduction

Modbus Plus devices function as peers on a logical ring. Each device accesses the network by acquiring a token frame that is passed in a rotating address sequence. Each device on a Modbus Plus network needs a unique address in the range 1...64. The device address determines the logical order in which the network token will be passed from device to device.

CAUTION

COMMUNICATION ERRORS MAY RESULT

Failure to assign a unique address to a device or two identical addresses on the same network will cause communication errors and network problems.

- Do not install a Modbus Plus option adapter before you have set its Modbus Plus address for your application.
- See your network administrator to get the Modbus Plus node address for this module.

Failure to follow this instruction can result in injury or equipment damage.

Address Sequence

The assignment of addresses does not have to map to the physical layout of the network–e.g., device 17 is placed physically before device 3. This is important to understand because the network's token rotation is defined by device addresses- e.g., device 2 will pass the token to device 3, device 3 to device 4, etc.

Illegal Addresses

If you set the node address to 00 or to a value greater than 64:

- The COM LED will go ON steadily to indicate an illegal address assignment.
- The Run LED will flash 4 times.
- The processor adapter will not run until you set a valid, unused address on the option adapter and cycle power.

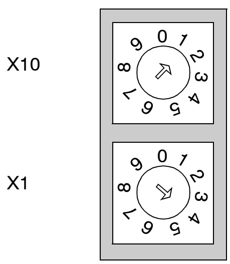
Setting Modbus Plus Addresses

Two rotary switches on the Momentum option adapter are used to set the network address. The top switch (X10) sets the upper digit (tens) of the address. The lower switch (X1) sets the lower digit (ones) of the address.

Node Address	X10 Setting	X1 Setting
1 ... 9	0	1 ... 9
10 ... 19	1	0 ... 9
20 ... 29	2	0 ... 9
30 ... 39	3	0 ... 9
40 ... 49	4	0 ... 9
50 ... 59	5	0 ... 9
60 ... 64	6	0 ... 4

Example of an Address

The illustration below shows a sample setting for address 14.



Peer Cop on Modbus Plus Networks with Momentum Components

What Is Peer Cop?

A Momentum M1 processor adapter has the ability to define point-to-point transactions between itself and other devices on the Modbus Plus network. The tool for defining these transactions is a panel software configuration utility known as Peer Cop.

Configuring Network Devices with Peer Cop

Each device on the network can be configured to send and receive Peer Cop data.

- In a Modbus Plus I/O networking architecture, the CPU on the network can be used to configure the entire Peer Cop database.
- In a Modbus Plus supervisory architecture, each CPU on the network needs to be configured to handle the Peer Cop data that it will send or receive.

Four Types of Data Transactions

Peer Cop allows you to define four types of data transactions.

Peer Cop Data Transaction	Function	Maximum Data Length/Token Frame
Global Output	Data to be broadcast globally to all devices on the network	32 words
Specific Output	Data to be transmitted to individual devices	32 words/device
		500 words to all specific devices
Global Input	Data messages received by all devices on the network	32 words
Specific Input	Data received by a specific device from a specific device	32 words/device
		500 words from all specific devices

Sources and Destinations

Peer Cop uses defined data references (like PLC discretes or registers) as sources and destinations. For example, a block of registers can constitute the data source for the transmitting device, and that same or another block of registers can be the data destination for the receiving device.

How Peer Cop Data Is Sent and Received

The reception of Peer Cop source data and the delivery of Peer Cop destination data are handled by the token rotation. The token is always passed to the next logical device in the network's address sequence.

Because all the Modbus Plus devices monitor the network, any one device can extract the data addressed specifically to it. Likewise, all devices can extract global data. Peer Cop then enables the Modbus Plus device currently holding the token to direct specific data to individual devices and broadcast global data to all devices on the network as part of its token frame.

Effect of Using Peer Cop

The net effect of using Peer Cop for data transactions is that each sending device can specify unique references as data sources and each receiving device can specify the same or different references as data destinations. When devices receive global data, each device can index to specific locations in the incoming data and extract specific lengths of data from these points. Data transactions therefore happen quickly as part of the token rotation and can be directly mapped between data references in the sending and receiving devices.

Using the Ethernet Port on Selected M1 Processor Adapters

6

At a Glance

Purpose

Ethernet ports are available with:
- 171 CCC 960 20 processor adapter
- 171 CCC 960 30 processor adapter
- 171 CCC 980 20 processor adapter
- 171 CCC 980 30 processor adapter

What's in this Chapter?

This chapter contains the following topics:

Ethernet Port

Introduction

The Ethernet port allows a processor adapter to connect to an Ethernet network for
- high-speed I/O servicing
- high-speed data transfer
- programming
- worldwide connectivity via the Internet
- interfaces with a wide array of standard Modbus over TCP/IP Ethernet-aware devices

CAUTION

COMMUNICATION ERRORS MAY RESULT

Ethernet networks demand careful attention to addressing.
After taking an Ethernet processor out of service,
- clear the program and IP address to prevent future conflicts.

Before installing a replacement Ethernet processor on your network,
- verify that the processor contains the correct IP address and program for your application.

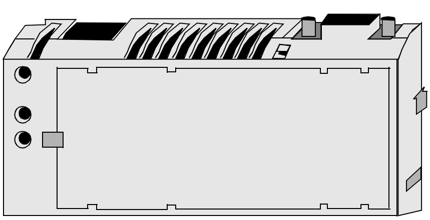
Failure to follow this instruction can result in injury or equipment damage.

Connector Type

The Ethernet connector is a female RJ45 style phone jack.

Illustration

The following illustration shows the position of the Ethernet port on a processor adapter.



Network Design Considerations for M1 Ethernet Processors

Introduction

In a distributed control environment, Ethernet can be used as:
- an I/O network
- a supervisory network
- a network that combines I/O and supervisory functions

This section discusses how to design your network to make communication between related devices as effective and deterministic as possible.

Note: Preserve your ARP cache information.

When installed on a new network, the M1 Ethernet processor will obtain the MAC and IP addresses of other devices on the network. This process may require several minutes.

When the module is successfully communicating with these devices, if a ring adapter with battery back up is not present, it is recommended that you stop the processor and save the user program to Flash. This will save the processor's ARP cache and enable it to remember this information if power is lost or removed. If you do not save to flash, the processor must repeat acquiring the ARP cache information from the network.

This procedure should also be followed whenever:
- a new or substitute device is installed on the network
- the IP address of a network device has been changed

CAUTION

CONTROL NETWORKS MUST BE ISOLATED FROM MIS DATA NETWORKS

To maintain a deterministic Ethernet network, you must isolate Momentum processor adapters and related devices from MIS data networks. Traffic from MIS data networks can interrupt communication between control devices, causing your control application to behave unpredictably.

Additionally, the high message rates that may be generated between M1 processors and I/O adapters may bog down an MIS network, causing loss of productivity.

Failure to follow this instruction can result in injury or equipment damage.

I/O Networks

In an Ethernet I/O network architecture, an M1 processor adapter is used to control Momentum I/O points equipped with an Ethernet communication adapter or other Modbus over TCP/IP Ethernet-aware devices. Communication between these devices should be isolated not only from MIS data traffic, but also from unrelated communication between other control devices.
You may isolate communication by creating a separate network or by using switches.

Supervisory Networks

In a supervisory architecture, several intelligent processing devices share system data with each other. Many kinds of devices may be part of the network. You should be aware of each device's requirement for access to the network and of the impact each device will have on the timing of your network communication.

Combined Supervisory and I/O Handling

If your system requires both supervisory and I/O handling architectures, one solution is to use the I/O bus capabilities of the 171 CCC 960 20 processor adapter for the I/O network and the Ethernet capabilities for the supervisory network.
If you intend to use Ethernet to handle both functions, use switches to isolate the network traffic and supply additional buffering of network packets.

Concurrent Communication

A maximum of 96 devices may be communicating with the processor adapter via the Ethernet at any one time. This 96-device limit consists of:
- up to 2 programming panels (one must be in monitor mode)
- up to 14 general purpose Modbus server paths
- up to 16 MSTR elements which support Modbus read, write or read/write commands
- up to 64 cyclic configured data slave paths

Security Firewalls for Networks with M1 Ethernet Processors

Overview

To restrict access to your Ethernet controller and I/O network, you may want to consider a firewall. A firewall is a gateway which controls access to your network.

Types of Firewalls

There are two types of firewalls:
- network-level firewalls
- application-level firewalls

Network-Level Firewalls

Network-level firewalls are frequently installed between the Internet and a single point of entry to an internal, protected network.

Application-Level Firewalls

An application-level firewall acts on behalf of an application. It intercepts all traffic destined for that application and decides whether to forward that traffic to the application. Application-level firewalls reside on individual host computers.

Cabling Schemes for Ethernet Networks with Momentum Components

Introduction

In a standard Ethernet cabling scheme, each device connects via a cable to a port on a central Ethernet hub.

Length

The maximum length of cable between devices depends on the type of hub used, as shown in the following table.

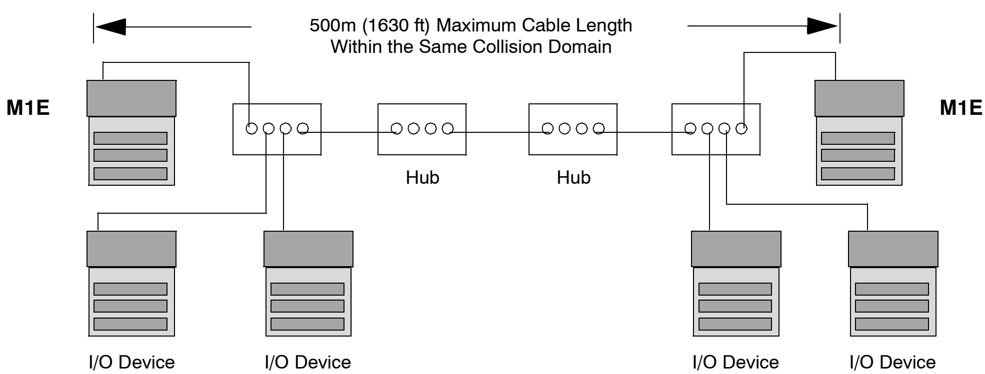
Type of Hub	Max. Cable from Device to Hub	Max. Hubs Between Any Two Nodes	Max. Cable Between Most Distant Nodes on Network
Traditional (Non-switching)	100 m	4	500 m
Switches	100 m	Unlimited	Unlimited

Note: 10/100 hubs/switches can be used. This will allow 100 Base T networks to use the M1E.

Cabling with Traditional Hubs

The following illustration shows the maximum number of hubs and the maximum cable length between devices when using traditional (non-switching) hubs.

Cabling with Traditional Hubs



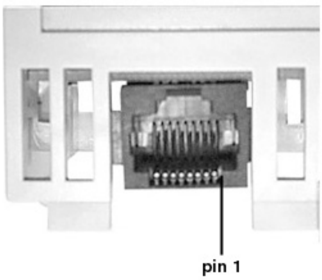
Pinouts for Networks with Momentum Components

Overview

This section contains pinouts for wiring an Ethernet network for Momentum components.

RJ45 Pinout

The illustration below shows the pinouts for wiring an RJ45 connector for Ethernet.



Legend:

Pin	Function
1	TXD +
2	TXD -
3	RXD +
4	-
5	-
6	RXD -
7	-
8	-

Note: These are industry standard pinouts. Prefabricated patch cables can be used.

Assigning Ethernet Address Parameters on M1 Ethernet Processors

Overview

As shipped from the factory, the M1 Ethernet processor does not contain an IP address. This is also true if you have not programmed the unit with an Ethernet configuration extension. In this condition, when the module starts up, it will attempt to obtain an I's BOOTP server.
You can use Concept to assign an IP address, default gateway and subnetwork mask (see *p. 293*).
You can also assign IP address parameters using the BOOTP Lite software utility (see *p. 158*).

CAUTION

DUPLICATE ADDRESS HAZARD

Be sure that your processor adapter will receive a unique IP address. Having two or more devices with the same IP address can cause unpredictable operation of your network.

Failure to follow this instruction can result in injury or equipment damage.

Using a BOOTP Server

A BOOTP server is a program which manages the IP addresses assigned to devices on the network. Your system administrator can confirm whether a BOOTP server exists on your network and can help you use the server to maintain the adapter's IP address.

How an Unconsidered Module Obtains an IP Address

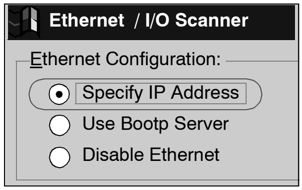
On startup, an unconfigured processor will attempt to obtain an IP address by issuing BOOTP requests. When a response from a BOOTP server is obtained, that IP address will be used.

Specifying Address Parameters

Consult your system administrator to obtain a valid IP address and appropriate gateway and subnet mask, if required. Then follow the instructions on *p. 293*.

When the Processor Adapter is Powered-up with a Configuration for Specify IP Address

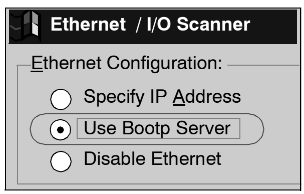
When the processor adapter is powered-up with a configuration for *Specify IP Address*, the following dialog box displays.



If the processor adapter is powered-up without battery backup and its IP address was previously saved to flash; the adapter will listen for any BOOTP messages but will not will not issue any BOOTP requests. Instead it will use the IP address that is specified in the configuration. Then, three ARP broadcasts are made, five seconds apart, to check for duplicate a IP address. Then, three gratuitous ARP broadcasts are made, two seconds apart, with the station's MAC address and IP address.

When the Processor Adapter is Powered-up with a Configuration for Use BOOTP Server

When the processor adapter is powered-up with a configuration for *Use BOOTP Server*, the following dialog box displays.



If the processor adapter is powered up without battery backup, and its IP address was previously saved to flash, the adapter will issue three BOOTP requests five seconds apart.

- If a BOOTP response is received from the server, the IP address will be assigned but will not be saved to flash. Use the programming software to save the IP address to flash. If a power cycle occurs on the processor adapter, the IP address that is currently saved in flash will be used.
- If a BOOTP response is not received from the server, the processor adapter will use the IP address that is stored in flash. Three ARP broadcasts are made, five seconds apart, to check for duplicate IP addresses. Then, three gratuitous ARP broadcasts are made two seconds apart with the station's MAC address and IP address.

To Retain Settings

After setting the module's address mode, you must save your program to Flash memory if you want this setting to be retained when power is removed from the module. This is not necessary if the module is attached to a ring adapter, which provides battery back up (see *p. 337*).

Using BOOTP Lite to Assign Address Parameters for Momentum Components

CAUTION

UNINTENDED OPERATION – INCORRECT MAC ADDRESS

An incorrect MAC address may result in an unwanted change to another device or cause unexpected results.

- Enter the correct parameters of the target controller.
  Otherwise, the controller runs on its old, or existing, configuration.
- Verify the MAC address of the target device before invoking the Bootp Lite Server Software.

Failure to follow this instruction can result in injury or equipment damage.

Specifying Addresses/ Stopping the Processor

Instead of a BOOTP server, Schneider Electric's BOOTP Lite utility software can be used to provide the IP address, subnet mask and default gateway to the processor. A response from BOOTP Lite will cause the processor to enter Stopped mode on completion of power up, if the processor has been set to *Specify IP Address* mode via Concept. This is useful when inappropriate outbound network traffic might result if the processor immediately transitioned into Run mode after power up.
Refer to the BOOTP Lite user documentation for instructions.

Note: BOOTP Lite and the user document are available for download at www.modicon.com.

Reading Ethernet Network Statistics

Overview

Ethernet network statistics are stored in the processor adapter and can be viewed by the user.

Procedure

The M1 Ethernet processor adapter's Ethernet network statistics can be viewed using the Network Options Ethernet Tester. This software utility is available with the Quantum NOE 771 xx Ethernet Modules User Guide (840 USE 116 00).

Table of Statistics

Network statistics occupy word 4 through word 35 in the Modbus Status Table, as follows.

Word	Data
00 ... 02	MAC Address
03	Board Status
04, 05	Rx Interrupt
06, 07	Tx Interrupt
08, 09	NA
10, 11	Total Collisions
12, 13	Rx Missed Packet Errors
14, 15	NA
16, 17	Chip Restart Count Lo word – Collision Peak Detector
18, 19	Framing Errors (Giant Frame Error)
20, 21	Overflow Errors
22, 23	CRC Errors
24, 25	Receive Buffer Errors (Out of Server Paths)
26, 27	Transmit Buffer Errors
28, 29	Silo Underflow (TCP retries)
30, 31	Late Collision
32, 33	Lost Carrier
34, 35	16 Collision Tx Failure
36, 37	IP Address

Description of Ethernet Network Statistics for Momentum Components

Operational Statistics

Words	Description
Words 4, 5 Receive Interrupts	Number of frames received by this station. Only broadcast frames pertinent to this station and individual address match frames are received and counted.
Words 6, 7 Transmit Interrupts	Number of frames transmitted from this station. Includes all transmitted broadcast frames for ARP and BOOTP.

Ethernet Network Functioning Errors

Words	Description
Words 8, 9	Not used.
Words 10, 11 Total Collisions	This field contains the total number of transmit collisions.
Words 12, 13 Rx Missed packet Errors	Receive frame was missed because no buffer space was available to store the frame. Indicates firmware unable to keep up with link. The only time this should increment is during the save user logic to flash command, when all interrupts are disabled for 10 seconds.
Words 14, 15	Not used.
Words 16, 17	• High word not used, always 0 • Low word: peak collision detector This field contains the number of consecutive collisions that occurred before the frame was successfully transmitted out onto the Ethernet. Most transmitted frames have zero collisions. Some have one collision on the first transmit attempt and succeed on the second attempt. Some have more than one collision followed by success. The largest number of consecutive collisions, since clear statistics command, is stored and displayed in this field.

Receiver Errors

Receiver errors table:

Words	Description
Words 18, 19 Framing Errors	Counts the number of received frames addressed to this node that are greater than 320 bytes in length. Any such large frame has no relevance to the M1 Ethernet adapter and therefore is skipped. This error should not occur.
Overflow Errors	Increments whenever a received frame cannot be copied into the frame buffer, because the frame buffer is full. This situation should never occur under legal Ethernet traffic.
Words 20, 21 CRC Errors	Increments when the received packet is received under any of the following error conditions: ● CRC error ● extra data error ● runtime error This counter can be made to increment by continuously disconnecting and reconnecting the M1 Ethernet cable during cyclic communication.
Words 24, 25 Receive Buffer Errors	Increments whenever a client attempts to connect to the M1 Ethernet, and fails, because there is no available server path. The M1 Ethernet supports 14 simultaneous data paths and 2 program paths before this counter can increment. This error indicates poor application architecture.

Transmission Errors

Transmission errors table

Words	Description
Words 26, 27 Transmit Buffer Errors	Increments when the M1 is unable to transmit an Ethernet response frame because all frame buffers are in use. For example, the M1 has 16 ping reply buffers. If all 16 ping buffers contain ping replies, ready to be transmitted, but this station's transmission is delayed because of collisions and back-off, and one more ping request is received, then the new ping request is discarded and the counter is incremented. This error can occur for ping, ARP, and connection attempt to server path. Although this error is theoretically possible, it is not usually encountered.
Words 28, 29 Silo Underflow	This field counts M1 TCP/IP retries. All M1 clients and server use the TCP/IP protocol which implements sequence numbers and time-outs. Whenever TCP/IP data is pushed from the M1, a subsequent acknowledgement of receipt of M1 data must be received within the timeout period, or else the M1 issues a retry. Retries may be the result of any of the following conditions: ● The original M1 data frame was garbled, corrupted, and lost ● The target TCP/IP stack is operating more slowly than the M1 retry rate For Modbus 502 servers, the M1 initiates retries after (1, 1, 2, 2, 4, 8) seconds. For Modbus 502 clients, the M1 retry rate is the larger of: ● 1/4 the health timeout for Ethernet I/O Scanner data (see *p. 290*) or ● 4 times the previous measured TCP/IP round trip time for I/O scanner MSTR block.
Words 30, 31 Late Collision	Increments when the transmit frame process is aborted because of late collision detected after the first 64 bytes of the frame was transmitted collision free. This error could possibly occur if the Ethernet cable is intermittently connected and disconnected.
Words 32, 33, Lost Carrier	Increments whenever the Ethernet cable, connected to the M1, is disconnected from the hub. Also increments whenever the Ethernet cable, connected to the hub, is disconnected from the M1.
Words 34,35 16 Collision Transmit Failure	Transmit frame process was aborted after 16 consecutive collisions. The frame was not successfully transmitted out onto Ethernet link. This error should never occur.

Using the I/O Bus Port for Networks Momentum Components

7

At a Glance

Purpose

Three Momentum components offer I/O bus master capabilities:

- 171 CCS 760 00 processor adapter
- 171 CCC 760 10 processor adapter
- 171 CCC 960 20 processor adapter

This section describes the I/O bus port, explains how I/O bus works, provides guidelines for creating I/O bus networks with Momentum components, and describes recommended cable accessories.

What's in this Chapter?

This chapter contains the following topics:

I/O Bus Ports on Momentum Components

Introduction

The I/O bus port allows a Momentum CPU to assume bus master capabilities over as many as 255 slave devices over an INTERBUS cable.

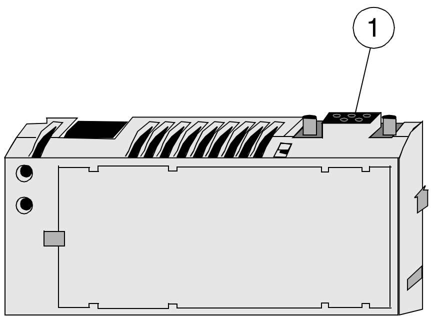
> **Note:** Processors that support IEC are limited to a maximum number of 1408 used I/O points, regardless of the number of modules.

Connector Type

The I/O bus port has a female 9-pin D-shell connector.

Illustration

The following illustration shows the position of the I/O bus port on a processor adapter.



Legend:

Label	Description
1	I/O bus port

How I/O Bus Works with Momentum Components

Introduction

This section describes how signals are passed and how data is transferred in an I/O bus network.

How Signals are Passed

I/O bus operates as a logical ring, with signals being passed by the master over a remote bus cable to each slave device in series. The slaves return signals to the master over the same cable.

How Data is Transferred

The I/O bus functions as a logical shift register. The application's entire data stream, originating at the master, is transferred serially from slave to slave down the remote bus. Each slave regenerates the entire stream before passing it on.

Transmission Speed

Data is transmitted at 500 kbits/s.

Amount of Data

The number of 16 bit words in the data stream is dependent on the processor model.

Model	Max Input Words	Max Output Words
171 CCS 760 00	128	128
171 CCC 760 10	256	256
171 CCC 960 20	256	256
171 CCC 960 30	256	256

Note: Processors that support IEC are limited to a maximum number of 1408 used I/O points, regardless of the number of modules.

Network Status Indication in the M1 Ethernet Module

Overview

The M1 Ethernet Module can provide I/O bus network status via the Module Status function in the programming panel or by a STAT element in user logic. The fourth word of the status element contains information regarding the integrity of the network.

Operation

The I/O bus status word contains a valid value only when the processor is running.
A zero value indicates that normal I/O bus communication is occurring.
A non-zero value indicates a problem.

Failure Indication

If there is a communications error, bit values in the I/O bus status word contain information on the failure mode, as follows.

Status Word Values	Description
Bits 0 - 14	These bits contain a value from 1 to 255, signifying the network position of the module that cannot be reached. For example, a value of 8 indicates a communications failure in accessing the 8th module on the network.
Bit 15	This bit contains a value of 0 or 1. A value of zero indicates a general communication failure, for example, no power to the module or a break in its input cable. A value of 1 indicates that communication is possible, but the I/O bus ID received from the module does not match the module type contained in the traffic cop for that position.

Guidelines for Momentum M1 I/OBus Networks

Overview

This section gives guidelines for creating an I/O bus network using a TSX Momentum CPU as bus master.

Length

The maximum distance between the Momentum CPU master and the farthest slave is 13 km (8 mi).

Distance Between Nodes

The maximum distance between nodes is 400 m (1300 ft).

Number of Devices

A network may consist of as many as 256 nodes, including one Momentum CPU bus master and up to 255 slave I/O devices.

> **Note:** Processors that support IEC are limited to a maximum number of 1408 used I/O points, regardless of the number of modules.

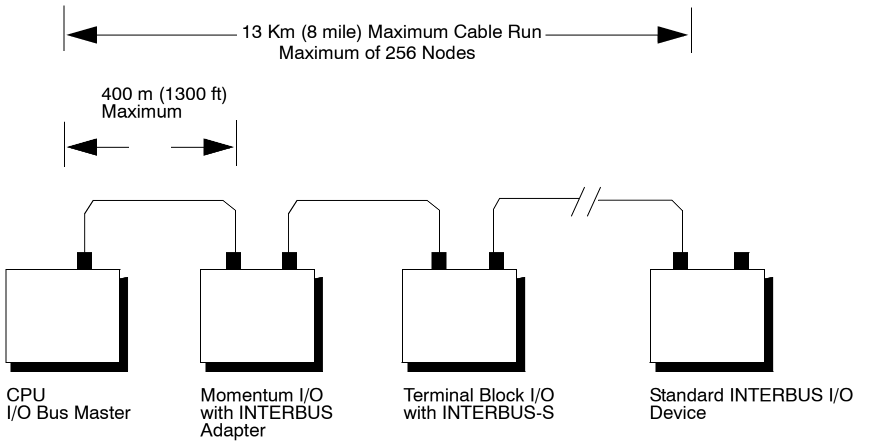
Acceptable Slave Devices

An I/Obus slave device can be:
- a Momentum I/O base with a 170 INT 110 00 INTERBUS communication adapter mounted on it
- a Modicon terminal block I/O module enabled for INTERBUS communications
- a standard INTERBUS module designed by a third party manufacturer

Unacceptable Slave Devices

The I/Obus network does not support INTERBUS-compatible devices that require the INTERBUS PCP protocol.

Network Scheme The slave devices are distributed along a trunk, as shown in the illustration below.



Cable Accessories for I/OBus Networks with Momentum Components

Overview

Modicon provides several cabling solutions for I/O bus:
- low profile cables in two lengths
- 1 m cable with high profile rear shell
- connector kit for building custom-length INTERBUS cables

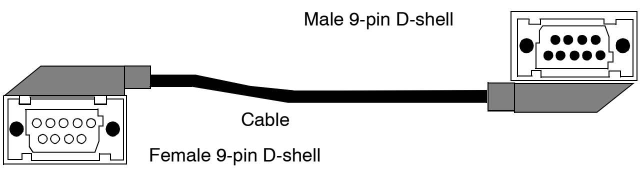
This section describes those solutions.

Low Profile Cables

For side-by-side mounting of the CPU with INTERBUS I/O modules on a DIN rail or wall, Modicon provides two specially molded low profile cables.

Part Number	Length
170 MCI 007 00	11.4 cm (4.5 in)
170 MCI 100 01	100 cm (39 in)

These cables have a male 9-in D-shell connector on one end and a female 9-pin D-shell on the other. The male connector plugs into the female I/O bus port on the processor adapter, and the female connector plugs into the male connector on the left side of a 170 INT 110 00 INTERBUS communications adapter on an I/O base. Additional cables can then be used to connect a series of I/O modules via their INTERBUS communication ports.



INTERBUS Cable Connector Kit

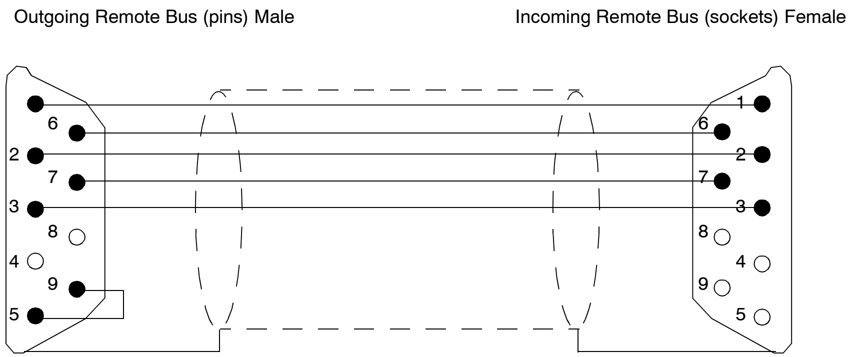
I/O bus communicates over INTERBUS full duplex cable. For custom cable lengths, Modicon offers an INTERBUS cable connector kit (part number 170 XTS 009 00). The kit includes two connectors, one male and one female, that can be soldered to an INTERBUS full duplex cable of the appropriate length.
The recommended cable is Belden 8103 or equivalent.

Note: The connectors in the 170 XTS 009 00 kit are high profile.

Pinouts for Momentum I/OBus Remote Bus Cables

INTERBUS Cable

The following illustration shows how to wire the connectors of the remote bus cable.



Legend:

Pin	Wire Color	Outgoing Connection		Pin	Wire Color	Ingoing Connection
1	Yellow	DO Data Out		1	Yellow	DO Data Out
2	Gray	DI Data In		2	Gray	DI Data In
3	Brown	Common		3	Brown	Common*
4		GND Reference conductor, fiber-optic adapter		4		GND* Reference conductor, fiber-optic adapter
5		Vcc Power-supply for fiber-optic adapter		5		Vcc* Power-supply for fiber-optic adapter
6	Green	DO_N Data Out Negated		6	Green	DO_N Data Out Negated
7	Pink	DI_N Data In Negated		7	Pink	DI_N Data In Negated
8		Vcc Additional power supply for fiber-optic adapter		8		Vcc* Additional power supply for fiber-optic adapter
9		Plug identification		9		Not used
* Physically isolated						

Modsoft and Momentum Components

III

At a Glance

Purpose

This part describes how to configure an M1 CPU, how to I/O map an I/O bus network, how to configure a Modbus Plus network with Peer Cop and how to save to Flash using Modsoft 2.6.

What's in this Part?

This part contains the following chapters:

Configuring an M1 CPU with Modsoft

8

At a Glance

Introduction

This chapter explains how to configure a CPU using Modsoft 2.6. The procedures and examples described here can be applied with Modsoft Lite 2.6 as well.

What's in this Chapter?

This chapter contains the following sections:

8.1 Configuring the Processor Adapter

Overview

Purpose

This section describes how to configure a Momentum M1 processor adapter using Modsoft 2.6.

What's in this Section?

This section contains the following topics:

Selecting an M1 Processor Adapter with Modsoft

Introduction

This section describes how to select an M1 processor adapter with Modsoft 2.6, starting from the Configuration Overview editor.

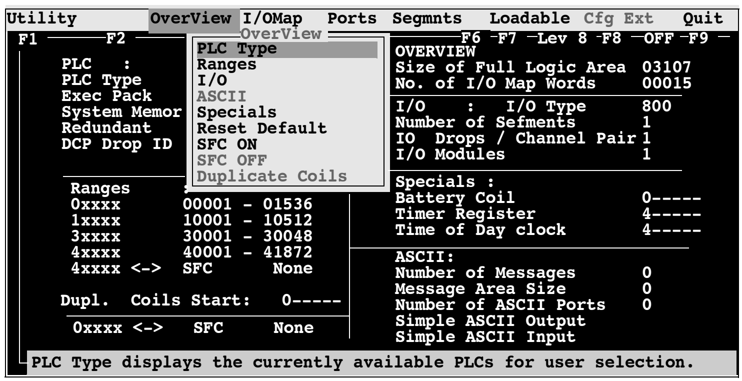
> **Note:** For a full description of how to use Modsoft 2.6, refer to Modicon Modsoft Programmer Software (V.2.6) User Guide (890 USE 115 00).

Procedure

Follow the steps below to select an M1 processor adapter.

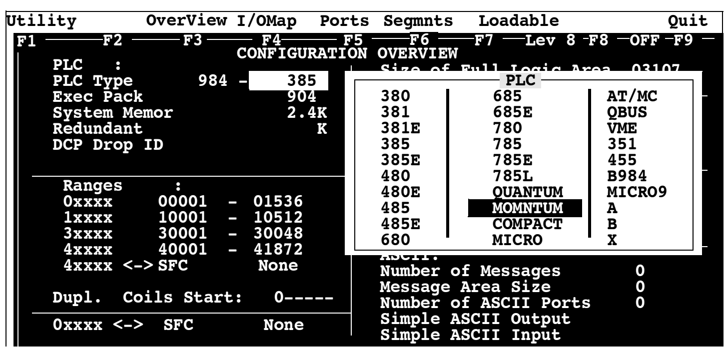
<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>

With a new Configuration Overview editor on the screen, move the cursor onto the **OverView** selection on the top menu bar.
A pull-down list of options appears

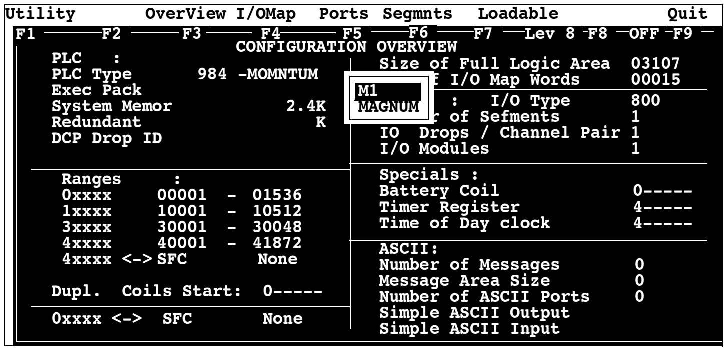


</td></tr>
<tr><td>2</td><td>

Move the cursor onto **PLC Type** in the pull-down list and push **<Enter>**.
The following list of PLC types appears on the screen:



</td></tr>
</table>

Step	Action
3	Move the cursor onto **MOMNTUM** and push **<Enter>**. **Result:** You will be prompted to select between the M1 Processor type and the Magnum. 
4	Place the cursor on **M1** and push **<Enter>.**

Next Step

You are now ready to specify the type of M1 Momentum Processor Adapter for configuration (see *p. 177*).

Specifying an M1 Processor Type in Modsoft

Introduction

Once you have selected an M1 processor adapter in Modsoft 2.6, you must choose between three types of M1 processors.
- a 2.4K machine
- a 12.0K machine
- an 18.0K machine

These numbers refer to the amount of user memory in the CPU.

Which Type Should I Choose?

Use the table below to determine which processor type to choose.

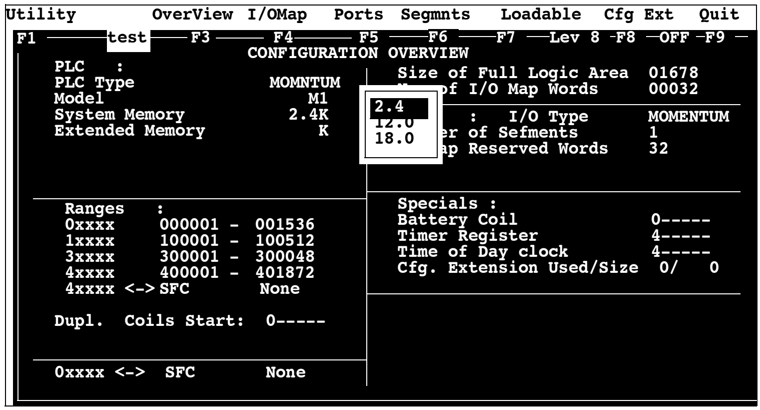
Processor Adapter	Type
171 CCS 700 00	2.4
171 CCS 700 10	2.4
171 CCS 760 00	12.0
171 CCC 760 10	18.0
171 CCS 780 00	2.4
171 CCC 780 10	18.0

If You Choose the Wrong Type

If you choose the wrong machine type for the CPU you are configuring, you can run into the following kinds of problems.
- If you specify too much memory, Modsoft allows you to create a configuration and logic program that could be too big for the CPU you are using. When you try to transfer your program to the CPU, your transfer will fail.
- If you specify too little memory, Modsoft restricts the size of your configuration and logic program, and may not allow you to I/O Map an I/O bus network.

Procedure

Follow the steps below to specify an M1 processor type.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>As a result of selecting an M1 processor adapter, you will be presented with a pop-up screen that allows you to select the machine type. Move the cursor onto the desired memory size (2.4, 12.0 or 18.0).

</td></tr>
<tr><td>2</td><td>Push <Enter>.</td></tr>
</table>

Default Modsoft Configuration Parameters (for Momentum Components)

Overview

This section describes the default configuration parameters.

Defaults for a 2.4K Adapter

This sample Configuration Overview screen shows the default configuration parameters.

```
Utility        OverView  I/OMap   Ports  Segmnts   Loadable   Cfg Ext   Quit
 F1 ---------F2 ------F3 ------- F4-------- F5 -----F6 -----F7 ---Lev 8 -F8 --OFF -F9
                              CONFIGURATION OVERVIEW
    PLC   :                            Size of Full Logic Area  01678
    PLC Type              MOMNTUM      No. of I/O Map Words     00032
    Model                      M1
    System Memory            2.4K      I/O    :   I/O Type      MOMENTUM
    Extended Memory             K      Number of Sefments       1
                                       I/O Map Reserved Words   32

     Ranges    :                       Specials :
     0xxxx     000001 -  001536        Battery Coil             0-----
     1xxxx     100001 -  100512        Timer Register           4-----
     3xxxx     300001 -  300048        Time of Day clock        4-----
     4xxxx     400001 -  401872        Cfg. Extension Used/Size  0/   0
     4xxxx <-> SFC        None

    Dupl.  Coils Start:  0-----

    0xxxx <->  SFC        None
 Segments determines the order and kind of segment processing taking place.
```

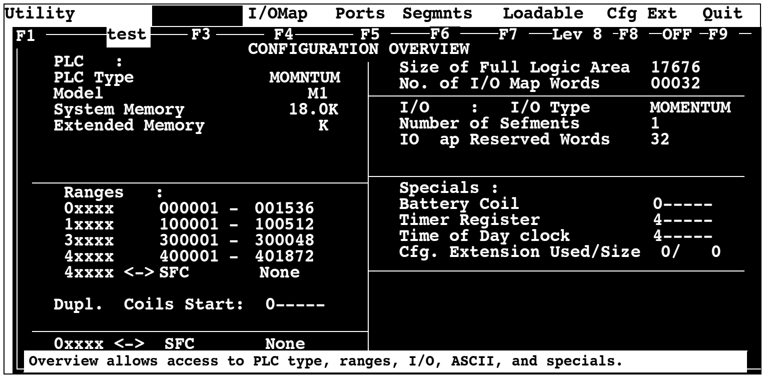
Defaults for a 12.0K Adapter

This sample Configuration Overview screen shows the default configuration parameters.

```
Utility        OverView I/OMap   Ports  Segmnts   Loadable  Cfg Ext   Quit
 F1 ---------F2 ------F3 ------ F4-------- F5 -----F6 -----F7 ---Lev 8 -F8 --OFF -F9
                            CONFIGURATION OVERVIEW
    PLC   :                            Size of Full Logic Area  11532
    PLC Type              MOMNTUM      No. of I/O Map Words     00032
    Model                      M1
    System Memory           12.0K      I/O    :   I/O Type      MOMENTUM
    Extended Memory             K      Number of Sefments       1
                                       I/O Map Reserved Words   32

     Ranges    :                       Specials :
     0xxxx     000001 -  001536        Battery Coil             0-----
     1xxxx     100001 -  100512        Timer Register           4-----
     3xxxx     300001 -  300048        Time of Day clock        4-----
     4xxxx     400001 -  401872        Cfg. Extension Used/Size  0/   0
     4xxxx <-> SFC        None

    Dupl.  Coils Start:  0-----

    0xxxx <->  SFC        None
 Ports access the PLCs MODBUS and ASCII ports for data transmission.
```

Defaults for an 18.0 Adapter

This sample Configuration Overview screen shows the default configuration parameters.



Default Values

Here are the default parameters.

Parameter	2.4K Adapter	12.0K Adapter	18.0K Adapter
Coils in state RAM	1536 (0x)	1536 (0x)	1536 (0x)
Discrete inputs in state RAM	512 (1x)	512 (1x)	512 (1x)
Input registers in state RAM	48 (3x)	48 (3x)	48 (3x)
Output registers in state RAM	1872 (4x)	1872 (4x)	1872 (4x)
Bytes of user memory space available for application logic	1678	13100	17676
Words of user memory space for the I/O map	32	512	32
I/O logic segments	One, which will allow you to I/O Map the I/O points on the local base unit	One, which will allow you to I/O Map the I/O points on the local base unit	One, which will allow you to I/O Map the I/O points on the local base unit
Memory allocated for configuration extension	None	None	None

Changing the Range of Discrete and Register References for an M1 CPU with Modsoft

Introduction

This section provides guidelines and a procedure for changing the range of discrete (0x and 1x) and register (3x and 4x) references.

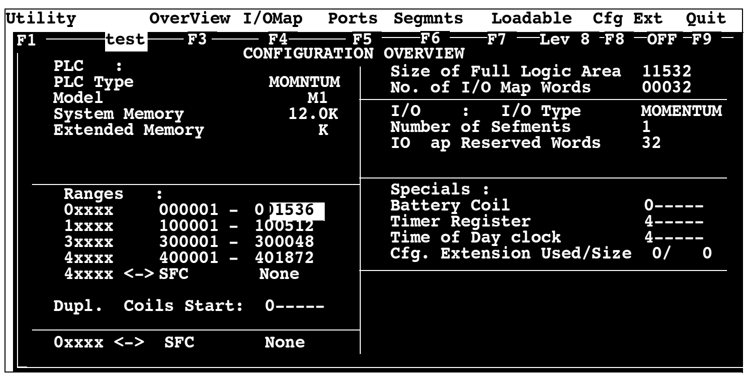
Guidelines

When you change the range of discrete and register references, follow these guidelines.

- Adjust the range of discretes in increments of 16. Sixteen discretes consume one word.
- Adjust the range of registers in increments of 1. Each register consumes one word.
- The total number of register and discrete references cannot exceed 3k words.
- A minimum configuration of 16 0x discretes, 16 1x discretes, one 3x register, and one 4x register is required.

Procedure

From the Configuration Overview screen, follow the steps below to change the range of discrete and register references.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>From the Overview menu, select Ranges.
Result: The cursor will appear in the Ranges field of the editor on the high range 0x value.

</td></tr>
<tr><td>2</td><td>Modify the range of your discrete and register references by changing the high value, in keeping with the guidelines described above. Press <Enter> after completing each field.</td></tr>
</table>

Changing the Size of Your Application Logic Space with Modsoft for M1 CPUs

Introduction

The number shown in the Size of Full Logic Area field in the Configuration Overview screen indicates the total amount of memory available for your application logic. You cannot directly enter this field to modify the value. You can, however, change the amount of memory available by manipulating the size of other fields in the Configuration Overview screen.

Example 1

If you reduce the size of the I/O map area, the number in the Full Logic Area field automatically increases. Say you are using a 12.0K machine and you change the size of the I/O map from the default value of 512 to 256 – a decrease of 256 words. The default Size of Full Logic Area will automatically increase from 1198 to 1454.

Example 2

Similarly, if you allocate some number of words to configuration extension memory (to support Peer Cop), you will reduce the Size of Full Logic Area by the number of words allocated the configuration extension memory.

Changing the Number of Segments for M1 CPUs with Modsoft

Introduction

The number of segments specified in the Configuration Overview screen determines the number of I/O map drops that you will be able to set up for your CPU.
The number of segments you will need depends on whether your processor adapter will support an I/O bus network.

For I/OBus Networks

You must change the number of segments to 2 if you want to create an I/O map to support an I/O bus network.

For All Other Cases

The default number of segments (1) is correct. You only need one drop because the only points to be I/O mapped are those on the local base.

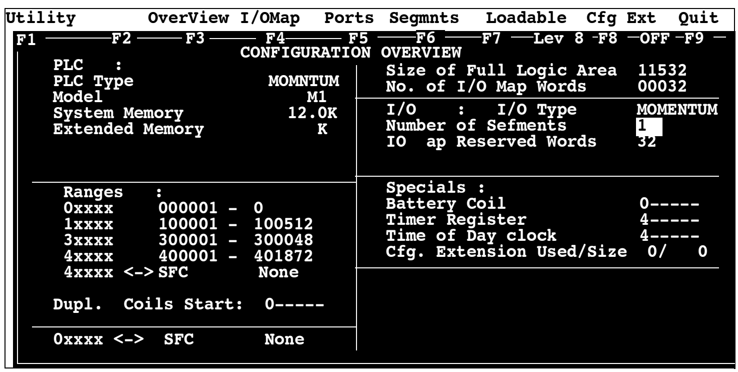
Procedure

From the Configuration Overview screen, follow the steps below to change the number of segments.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>

From the Overview menu, select **I/O**.

Result: The cursor will appear in the I/O field of the editor on the number of segments.



</td></tr>
<tr><td>2</td><td>Type the new number of segments.</td></tr>
<tr><td>3</td><td>Push <Enter>.</td></tr>
</table>

Changing the Size of the I/O Map for M1 CPUs with Modsoft

Processors For I/O Bus Networks

With I/O bus, an I/O map table is used to define the number, location, and type of I/O devices on the network bus.

Default	512 words
Minimum	17 words

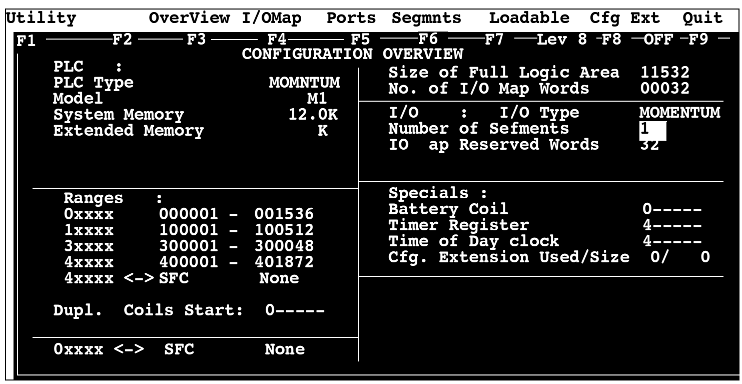
All Other Processors

Other processor adapters only use the I/O map for local I/O. The default of 32 words is sufficient for any Momentum I/O base. Depending on the requirements of your I/O base, you may be able to reduce the number of words to the minimum, 17.

Default	32 words
Minimum	17 words

Procedure

From the Configuration Overview screen, follow the steps below to change the size of the I/O map.

Step	Action
1	From the Overview menu, select **I/O**. **Result:** The cursor will appear in the I/O field of the editor on the number of segments. 
2	Push <**Enter**>. **Result:** The cursor moves to the I/O Map Reserved Words field.
3	Modify the I/O Map size by typing a new number in this field.
4	Push <**Enter**>.

Establishing Configuration Extension Memory for M1 CPUs with Modsoft

Introduction

By default, no memory space is allocated for configuration extension memory. If you want to use the Peer Cop capability to handle Modbus Plus communications, you need to define some configuration extension memory to enable Peer Cop.
Extension memory is specified as a number of 16-bit words. That number is entered in the ExtSize entry of the Configuration editor. Once an adequate number of words has been specified here, Peer Cop will be enabled in the CfgExt pull-down list.

How Much Memory?

The minimum Peer Cop ExtSize memory requirement is 20 words; the maximum is 1366 words.
Follow these guidelines for estimating the amount of extension memory you will need for your Peer Cop database:

For...	Add...	Up to a maximum of ...
Overhead	9 words	--
Global output	5 words	--
Global input	number of words= number of devices x (1 + 2 x number of device subentries)	1088 words
Specific output	2 words for every device entry in Peer Cop	128 words
Specific input	2 words for every device entry in Peer Cop	128 words

Procedure

From the Configuration Overview screen, follow the steps below to establish configuration extension memory:

Step	Action
1	From the Cfg Ext menu, select **Cfg. Extension Size**. **Result:** The cursor will appear in the Cfg. Extension Used/Size entry.
2	Type the desired size.
3	Push **<Enter>**.

8.2 Configuring Momentum Option Adapter Features in Modsoft

Overview

Purpose

This section describes how to implement the battery backup and time-of-day (TOD) clock features of the Momentum option adapters.

What's in this Section?

This section contains the following topics:

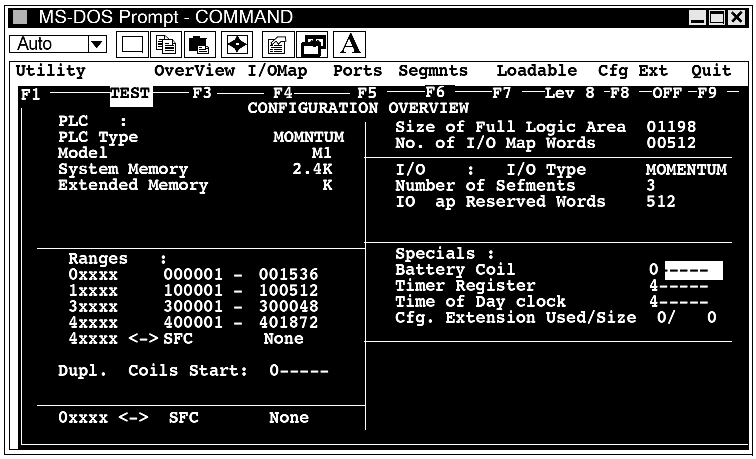
Reserving and Monitoring a Battery Coil with Modsoft for Momentum Option Adapters

Introduction

Since the option adapter does not have an LED to indicate when the battery is low, you should reserve a 0x reference to monitor the health of the battery using the Configuration Overview editor in Modsoft 2.6.

Reserving a Battery Coil

To reserve a battery coil, perform the steps in the following table.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>From the Overview menu, select Specials.
Result: The cursor moves into the Battery Coil field on the Configuration Overview screen.

</td></tr>
<tr><td>2</td><td>Enter a coil number in the range of available 0xxxx references.
Example: If you have set the range of 0x's at 000001...001536, you might want to enter the reference value of the last coil–1536.</td></tr>
<tr><td>3</td><td>Push <Enter>.</td></tr>
</table>

Monitoring the Battery Coil

Monitor the battery coil in ladder logic or tie it to a lamp or alarm that will indicate when the battery is low.

Interpreting the Battery Coil

The battery coil will always read either 0 or 1.
- A coil state of 0 indicates that the battery is healthy.
- A coil state of 1 indicates that the battery should be changed.

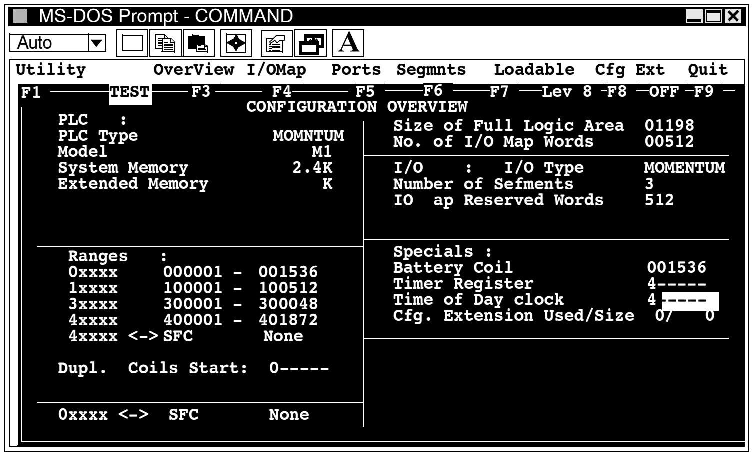
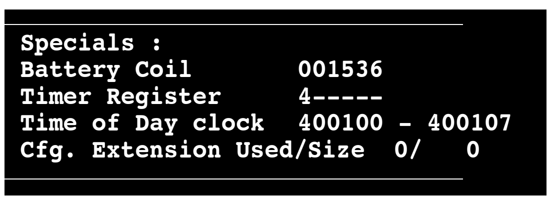
Setting up the Time-of-Day Clock in Modsoft for Momentum Option Adapters

Overview

Each option adapter has a time-of-day clock. To use this feature, you must reserve a block of eight 4x registers.This section describes how to reserve those registers, using Modsoft 2.6.

Reserving Registers for the TOD Clock

To reserve registers for the time-of-day clock, perform the steps in the following table.

Step	Action
1	From the Overview menu, select **Specials**. **Result:** The cursor moves into the Battery Coil field on the Configuration Overview screen.
2	Push the **down arrow key** twice to move the cursor into the Time of Day Clock field. 
3	Enter a number (the first in a series of eight) in the range of available 4xxxx references. **Example:** If you want registers 400100...400107 reserved for the TOD clock, enter **100**.
4	Push **<Enter>.** **Result:** The reference value you specified and the seven that follow it are now reserved for TOD clock data. 

Next Step

Setting the time (see *p. 190*).

Setting the Time on Momentum Components in Modsoft

Overview

Once you have reserved a block of registers for the time-of-day clock, you have to set the correct time. Modsoft offers two ways to do this.
- using the Set Hardware Clock dialogue
- setting the register bits individually

Note: The time-of-day clock complies with guidelines for the year 2000.

Option 1

You must be online or in combined mode to access the Set Hardware Clock dialogue.

Step	Action
1	From the PlcOps menu, select **Set Hardware Clock**. The Set Hardware Clock dialogue appears.
2	You may set the time directly or copy the current time setting from your programming panel. ● To set the time directly, proceed to step 3. ● To copy the setting from your programming panel, proceed to step 4.
3	The time setting for your programming panel is displayed on the left. The controller time setting is displayed on the right. The time is expressed as hh:mm:ss. The date is expressed as mm-dd-yy. ● To modify the settings, type a new value in the date or time field for the controller. ● To confirm the default settings or your modified settings, press **<Enter>**.
4	To copy the current time setting from your programming panel, type **Y** in response to the question: `Write PANEL clock data to PLC? (Y/N)`. Then press **<Enter>**.

Option 2

Go online and set the register values individually, using the following guidelines and procedure for setting the status bits and setting the time bits. The CPU must be running while you are setting the bits.

Setting the Status Bits

The control register (4x) uses its four most significant bits to report status:

Control Register															
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
			1 = error												
		1 = All clock values have been set													
	1 = Clock values are being read														
1 = Clock values are being set															

Setting the Time Bits

The following table shows how the registers handle time-of-day clock data, where register 4x is the first register in the block reserved for the clock.

Register	Data Content
4x	The control register
4x + 1	Day of the week (Sunday = 1, Monday = 2, etc.)
4x + 2	Month of the year (Jan = 1, Feb = 2, etc.)
4x + 3	Day of the month (1...31)
4x + 4	Year (00...99)
4x + 5	Hour in military time (0...23)
4x + 6	Minute (0...59)
4x + 7	Second (0...59)

Procedure

Follow the steps in the table below to set the register values for the time-of-day clock.

Step	Action
1	Set the correct date and time in registers 4x + 1 through 4x + 7. Example: To set the clock for Thursday, April 9, 1998 at 4:17:00, set the following values in the registers: 4x + 1 54x + 2 44x + 3 94x + 4 984x + 5 44x + 6 174x + 7 00
2	Load the value 8000H in register 4x to write the data to the clock.

Reading the Time-of-Day Clock on Momentum Components with Modsoft

Overview

This section tells how to read the time-of-day clock and uses an example to describe how to interpret the time-of-day clock registers.

Reading the Clock

Set the value **4000H** in register 4x to read data from the clock.

Example

If you reserved registers 400100...400107 as your TOD clock registers, set the time bits, and then read the clock at 9:25:30 on Thursday, July 16, 1998, the registers would display the following values:

Register	Reading	Indication
400100	0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0	All clock values have been set; clock values are being read
400101	5 (decimal)	Thursday
400102	7 (decimal)	July
400103	16 (decimal)	16
400104	98 (decimal)	1998
400105	9 (decimal)	9 a.m.
40010 6	25 (decimal)	25 minutes
40010 7	30 (decimal)	30 seconds

8.3 Modifying Momentum Modbus Communication Port Parameters with Modsoft

Overview

Purpose

The communication parameters on the Modbus ports are set at the factory. This section describes how to access the port editor and how to edit the default parameters.

What's in this Section?

This section contains the following topics:

Accessing the Port Editor Screen with Modsoft to Modify Modbus Port Settings for Momentum Components

Introduction

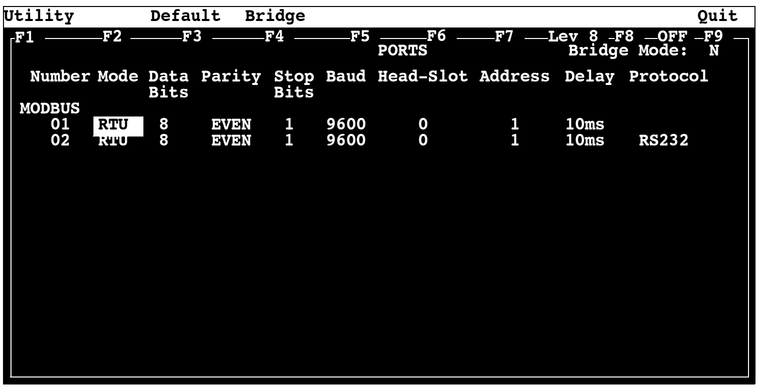
Modbus port parameters can be modified using the Port editor in Modsoft 2.6. This screen is accessed from the Configuration Overview editor.

How To Get There

To access the port editor from the Configuration Overview editor, move the cursor onto the Ports selection on the top menu bar, then push <Enter>.

Port Editor Showing Default Values

If you have not previously modified any port parameters, the following screen will appear. The screen shows the default parameters for two Modbus ports, 01 and 02. If you have previously modified any communication port parameters, the new values will appear in the screen.



Two Sets of Parameters

This screen will always show two sets of port parameters, even if your particular CPU configuration supports only Modbus port 1. In that case, ignore any parameter values shown for port 2.

Modbus Communication Port Parameters (on Momentum Components) Which Should Not Be Changed

Overview

Two parameters on the port editor screen should not be changed. These are the stop bit and head-slot parameters.

Stop Bit

Each port operates only with 1 stop bit. While Modsoft will allow you to select 2 stop bits, this setting is invalid.

Head-Slot

The head-slot parameter is set to 0 and should be left at this value for the Momentum M1 CPUs.

Changing the Mode and Data Bits on Modbus Ports for Momentum Components with Modsoft

Introduction

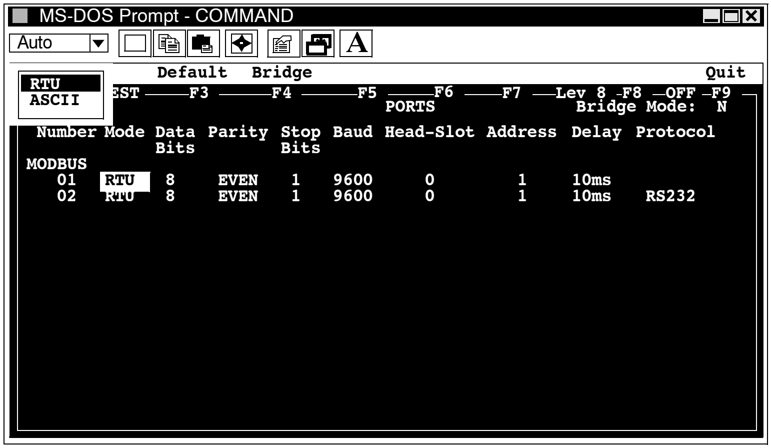
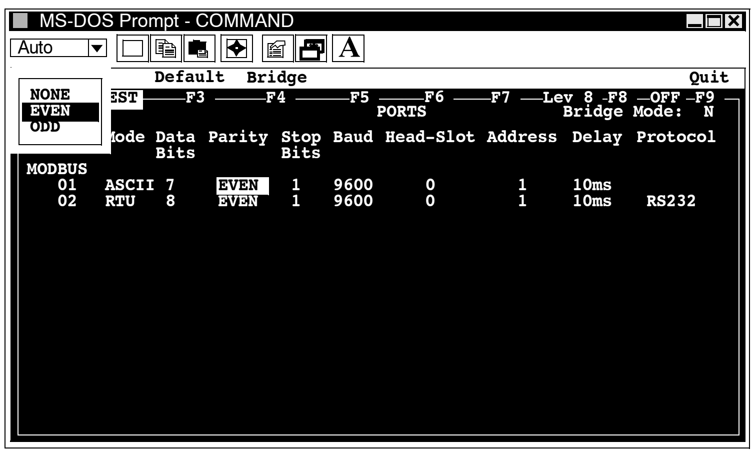
From the port editor screen, each port can be configured to operate in one of two possible modes – RTU or ASCII.

- If the mode is RTU, the number of data bits is always 8.
- If the mode is ASCII, the number of data bits is always 7.

Note: The factory-set default is 8-bit RTU.

Procedure

To change the mode and data bit parameters, perform the steps in the following table.

Step	Action
1	Place the cursor on the current Mode entry for the Modbus port you want to enter. Push **<Enter>**. **Result:** A popup window appears in the top left corner of the screen displaying your two Mode options. 
2	Use an arrow key to toggle the cursor onto the desired Mode selection in the popup window, then push **<Enter>**. **Result**: The Port editor screen is updated with the Mode type you have specified, the corresponding Data Bit value appears, and the cursor moves to the Parity column. For example, if you change Modbus port 1 from RTU mode to ASCII mode, the Data Bit value also automatically changes from 8 to 7, as shown below. 

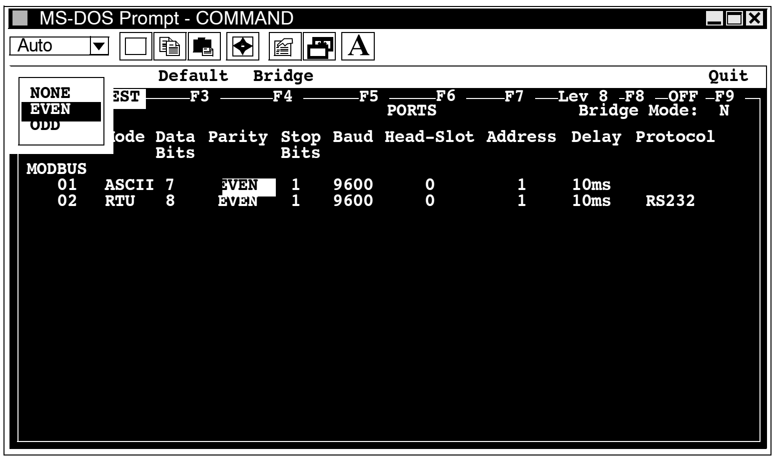
Changing Parity on Modbus Communication Ports for Momentum Components Using Modsoft

Introduction

From the port editor screen, a port can be configured for even, odd, or no parity checking. The factory-set default is EVEN parity.

Procedure

To change the parity parameter, perform the steps in the following table.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Place the cursor on the current parity entry for the Modbus port you want to enter. Push <Enter>.
Result: A popup window appears in the top left corner of the screen displaying your three parity options


</td></tr>
<tr><td>2</td><td>Use an arrow key to toggle the cursor onto the desired parity selection in the popup window, then push <Enter>.
Result: The Port editor screen is updated with the parity type you have specified, and the cursor moves to the Stop Bits column.</td></tr>
</table>

Changing the Baud Rate on Modbus Communication Ports for Momentum Components Using Modsoft

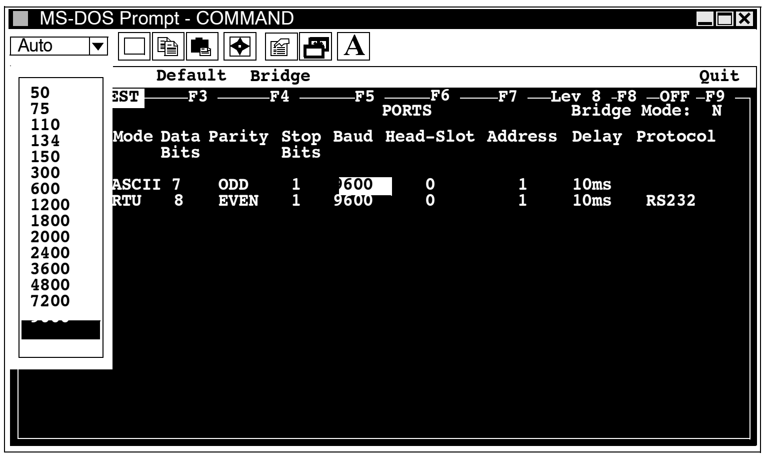
Overview

Each port can be configured for a baud in the range 50...19,200. Sixteen valid bauds are user-selectable. The factory-set default is 9600 baud.

> **Note:** If you use a baud rate lower than 4800, you should adjust the default delay parameter. See *Changing the Delay Parameter on Modbus Communication Ports for Momentum Components Using Modsoft, p. 201*

Procedure

To change the baud parameter, perform the steps in the following table.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Place the cursor on the current Baud entry for the Modbus port you want to enter. Push <Enter>.
Result: A popup window appears in the top left corner of the screen displaying 16 baud values.


</td></tr>
<tr><td>2</td><td>Use an arrow key to toggle the cursor onto the desired baud selection in the popup window, then push <Enter>.
Result: The Port editor screen is updated with the baud number you have specified, and the cursor moves to the head-slot column.</td></tr>
</table>

Changing the Modbus Address for Modbus Communication Ports for Momentum Components Using Modsoft

Overview

Each port can be assigned a Modbus network address in the range 1...247. That address must be unique with respect to all other device addresses on the same Modbus networks.
Since Modbus port 1 and Modbus port 2 are always on different Modbus networks, they can both be assigned the same address value without conflict. The factory-set default for both ports is address 1.

Procedure

From the port editor screen, perform the steps in the following table to change the Modbus address:

Step	Action
1	Place the cursor on the current address entry for the Modbus port.
2	Type a number in the range 1...247. Push **<Enter>**. **Result:** The Port editor screen is updated with the address number you have typed, and the cursor moves to the delay column.

Changing the Delay Parameter on Modbus Communication Ports for Momentum Components Using Modsoft

Overview

The default value for the delay parameter is 10 ms. This value is appropriate for most Momentum applications.
However, if you use baud rates lower than 4800, you should adjust the delay timing.

Delay Timing

If you use baud rates lower than 4800, adjust the delay timing as indicated in the following table:

Baud Rate	Delay (in ms)
2400	20
1200	30
600	50
300	100

Valid Delay Values

The delay must always be a value between 10 and 200 ms, expressed in 10 ms increments.

Procedure

From the port editor screen, perform the steps in the following table to change the delay parameter:

Step	Action
1	Place the cursor on the current delay entry for the Modbus port.
2	Type a new value in the range 10 ... 200 ms, using 10 ms increments. Push **<Enter>**. **Result:** The port editor screen is updated with the delay you have specified.

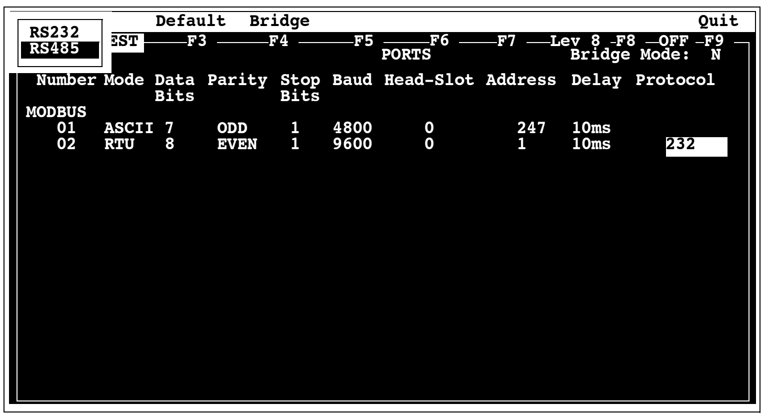
Changing the Protocol on Modbus Port 2 on Momentum Components

Overview

If your Momentum M1 CPU is using the Modbus port 2 provided by the 172 JNN 210 32 option adapter, you can specify whether it will use the RS232 or RS485 protocol. The factory-set default for Modbus port 2 is RS232.
If you are using the Modbus port 2 provided on the 171 CCS 780 00 or 171 CCC 780 10 processor adapter, the port is hardwired as a dedicated RS485 protocol. However, you must change the default setting on the port editor screen from RS232 to RS485, or the port will not function.

Procedure

From the port editor screen, perform the steps in the following table to change the protocol on Modbus port 2.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Place the cursor on the current Protocol entry for Modbus port 2. Push <Enter>.
Result: A popup window appears in the top left corner of the screen displaying the two protocol options.


</td></tr>
<tr><td>2</td><td>Use an arrow key to toggle the cursor onto the desired protocol selection in the popup window, then push <Enter>.
Result: The Port editor screen is updated with the protocol you have specified.</td></tr>
</table>

8.4 I/O Mapping Local I/O Points for M1 Processor Adapters with Modsoft

Accessing and Editing the I/O Map in Modsoft to Configure I/O Points for M1 CPUs

Introduction

Every M1 processor adapter is assembled on an I/O base. The I/O points on the base are the local I/O for that processor.
As part of the configuration process, you need to create an I/O map for the local I/O. The I/O map assigns the appropriate range and type of (0x, 1x, 3x, or 4x) reference values from the CPU's state RAM to the input and/or output points on the local base unit

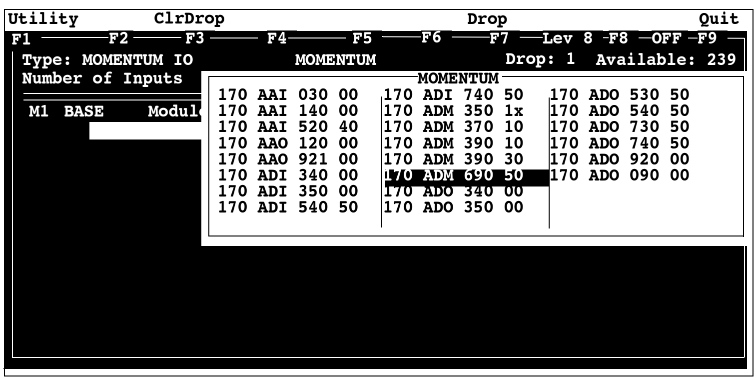
Accessing an I/O Map Screen

To access an I/O map screen from the Configuration Overview screen, move the cursor onto the I/O map command on the top menu and push <Enter>.
Result: An I/O map screen appears with the cursor placed in the module field. The label in the top left corner of the screen identifies it as Type: MOMENTUM I/O.

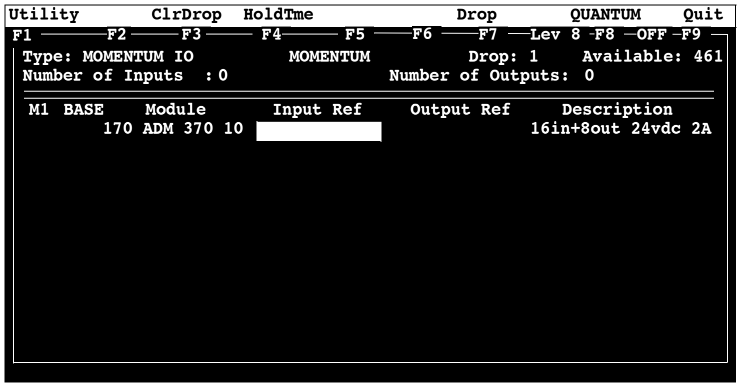
Editing the Local I/O Map

To edit the local I/O map, perform the steps in the following table.

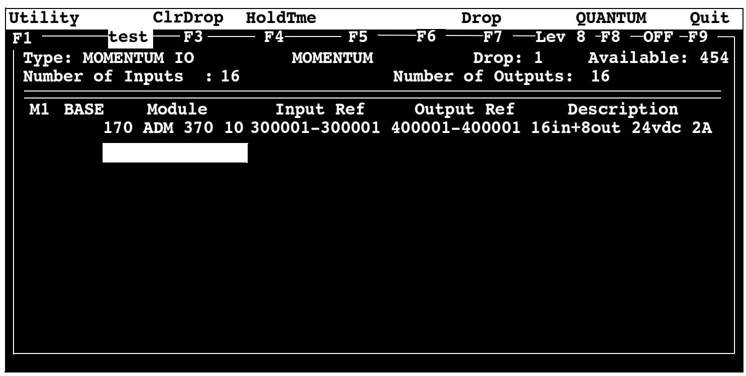
Step	Action
1	To select the local base unit for drop 1, push **<Shift><?>** . **Result:** A list of all available Momentum base units appears in a window over the I/O Map screen, as shown below. The list includes all Momentum I/O bases.



<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>2</td><td>Move the cursor onto the model number of your local base unit (e.g., the 170 ADM 370 10 24 VDC 16-point in/ 8-point out base in the sample screen). Push <Enter>.
Result: The module type and description of the base you select appears in the (Drop 1) I/O map screen.



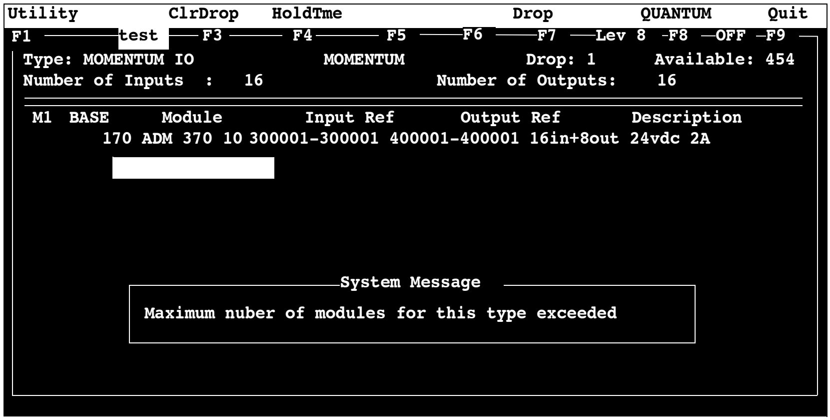
</td></tr>
<tr><td>3</td><td>Assign the appropriate state RAM reference(s) to the unit.
Example: In the screen below, one 3x register (300001) has been assigned for the input points and one 4x register (400001) has been assigned for the output points.



</td></tr>
<tr><td>4</td><td>Press <Esc> to return to the Configuration Overview editor.</td></tr>
</table>

Local I/O Only

This screen is always used to I/O map the local I/O base only. No other I/O base units can be I/O mapped on this screen.
If you attempt to select a second Momentum I/O base in this screen, the following error message appears.



I/O Bus: A Special Case

If you are I/O mapping a processor adapter which supports I/O bus communication stations, you will need to go to a separate I/O map screen for drop 2.

I/O Mapping an I/O Bus Network for Momentum Components with Modsoft

9

At a Glance

Purpose

This chapter describes how to I/O map an I/O bus network using Modsoft 2.6.

Note: Modsoft 2.6 does not support the 171 CCC 960 20 processor adapter. This processor adapter must be configured with Concept.

What's in this Chapter?

This chapter contains the following topics:

Supporting an I/O Map for an I/O Bus Network with Modsoft for Momentum Components

Introduction

The 171 CCS 760 00 and 171 CCC 760 10 processor adapters have an I/O bus communication port that enables them to control and communicate with network slave I/O.
If you are using I/O bus to control network I/O, you need to write an I/O map in your configuration. This section describes the configuration parameters required to support an I/O map for I/O bus.

I/O Map Reserved Words

By default, 512 words are reserved for I/O mapping. This may or may not be the appropriate memory allocation to support your I/O bus network. A rule of thumb for roughly estimating the number of words required for I/O mapping is:
- 16 words for overhead
- 10 words/module on the network (including both the local and the network I/O)

The idea behind adjusting the memory size is to allow you to completely I/O map your network while preserving as much user memory as possible for your application program.

Required Settings

Be sure that the following parameters are set on the Configuration Overview screen.

Parameter	Setting
Processor type	• 12.0 for a 171 CCS 760 00 processor adapter • 18.0 for a 171 CCC 760 10 processor adapter
Number of segments	2
I/O map reserved words	Enough to support your I/O map

Next Step

Once you are sure that your Configuration Overview parameters are set properly, you can access a second I/O Map screen for the I/OBus network (see *p. 209*).

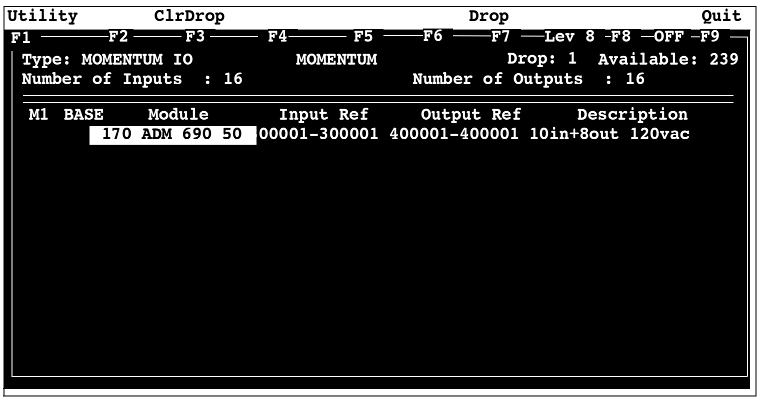
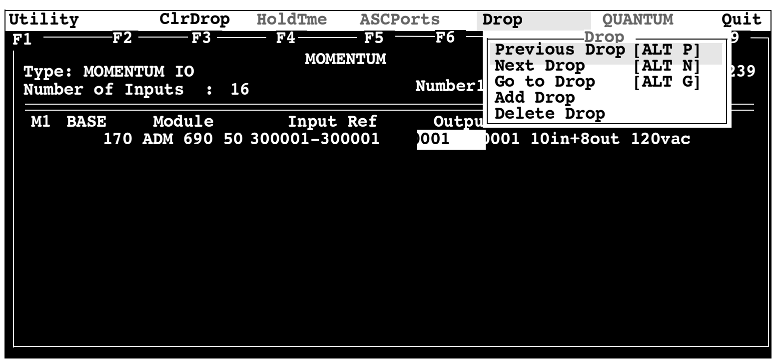
Accessing an I/O Map Screen for an I/OBus Network with Modsoft for Momentum Components

Overview

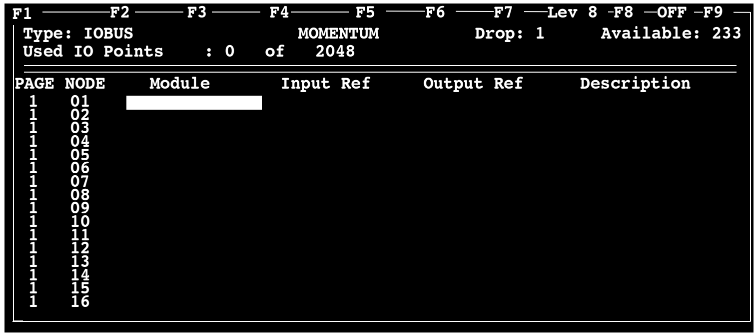
This section describes how to access an I/O map screen for an I/O bus network.

Procedure

To access the I/O map screen for your I/O bus network, perform the steps in the following table.

Step	Action
1	From the Configuration Overview screen, move the cursor onto the I/O map command on the top menu and push **<Enter>**. **Result:** The Type: MOMENTUM I/O screen for the local I/O base appears. 
2	Select **Drop** from the top menu bar of this I/O map screen. **Result:** A pull-down menu appears. 

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>3</td><td>Select Add Drop (or Next Drop if you have already established the drop) from the pull-down menu, then push <Enter>.
Result: A new I/O map screen appears labeled Type: IOBUS. You are now ready to start I/O mapping the I/O bus network.



</td></tr>
</table>

Next Step

Editing the I/OBus I/O Map (see *p. 211*)

Editing the I/O Bus I/O Map with Modsoft for Momentum Components

Overview

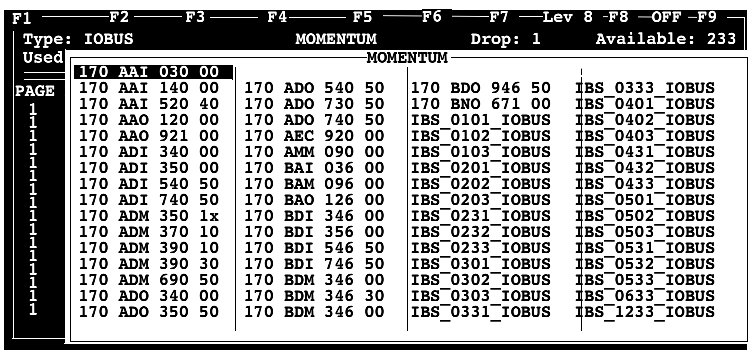
The maximum number of modules which can be I/O mapped on the I/O bus network depends on your processor adapter:

Processor Adapter	Max. Modules	Max. I/O Bits
171 CCS 760 00	128	2048
171 CCC 760 10	256	4096
171 CCC 960 20	128	2048
171 CCC 960 30	256	4096

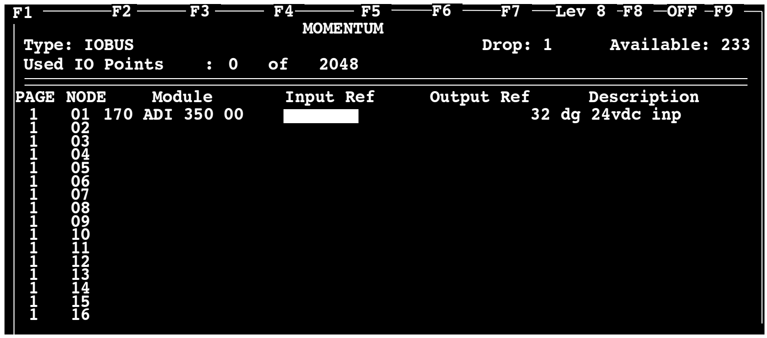
You may use up to 16 IOBUS screens to map your I/O bus network. Each page allows you to enter up to 16 I/O base and/or INTERBUS I/O modules.
The first column on the screen tells you which page you are on.

Procedure

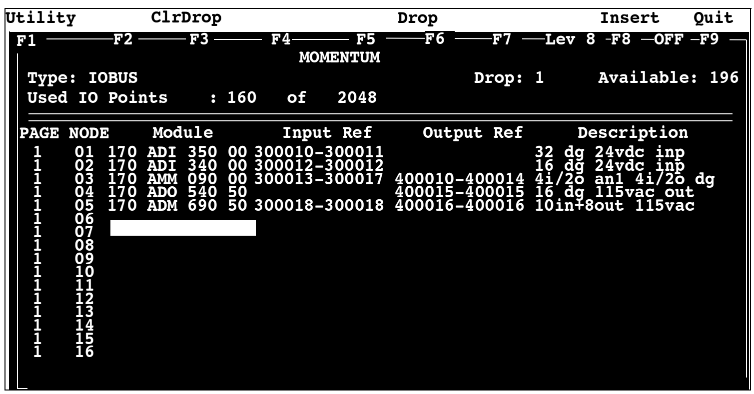
To enter I/O bases or INTERBUS I/O modules in the I/O bus I/O map, perform the steps in the following table.

Step	Action
1	Place the cursor in the module column in row 1 (for NODE 01) and push the **<F8>** key OR **<Shift> <?>**. **Result:** A list of I/O names appears, as shown below. This list includes model numbers for the available Momentum I/O bases and terminal block I/O modules. It also includes a series of INTERBUS module identifier codes (see the list at the end of this section). 

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>2</td><td>Move the cursor onto the desired model number and push <Enter>.
Result: The module type and its description are displayed on the I/O map screen. The cursor is positioned so that you can assign the appropriate state RAM reference(s) to the unit.
Example: If you select a 170 ADI 350 00 32-point input base, the screen will look like this.



</td></tr>
<tr><td>3</td><td>Enter the desired reference number–in this case a 3x register (300020), which will be the first of two contiguous input registers for the 32-bit input base. The second register is automatically assigned.</td></tr>
<tr><td>4</td><td>Move the cursor to the Module column opposite NODE 02 and push <Shift> <?>.
Result: The base/module selection popup appears again over the I/O map screen.</td></tr>
<tr><td>5</td><td>Continue to select and map modules one after the other. You must enter the modules in contiguous node slots on the screen, e.g. you cannot enter a module in slot 7 if you have not filled slot 6.



</td></tr>
</table>

Generic INTERBUS Module Identifier Codes

INTERBUS device manufacturers embed an identifier code in their network slave modules in conformance with INTERBUS standards. The code identifies a device by its I/O type but not its specific model or name.
I/O bus recognizes the INTERBUS identifier codes provided below and allows you to I/O map devices that use these codes. However, you cannot use the module zoom screens to define the parameters for these INTERBUS modules.

Identifier Code	I/O Type
0101_IOBUS	One-word discrete output
0102_IOBUS	One-word discrete input
0103_IOBUS	One-word discrete bidirectional
0201_IOBUS	Two-word discrete output
0202_IOBUS	Two-word discrete input
0203_IOBUS	Two-word discrete bidirectional
0231_IOBUS	Two-word analog output
0232_IOBUS	Two-word analog input
0233_IOBUS	Two-word analog bidirectional
0301_IOBUS	Three-word discrete output
0302_IOBUS	Three-word discrete input
0303_IOBUS	Three-word discrete bidirectional
0331_IOBUS	Three-word analog output
0332_IOBUS	Three-word analog input
0333_IOBUS	Three-word analog bidirectional
0401_IOBUS	Four-word discrete output
0402_IOBUS	Four-word discrete input
0403_IOBUS	Four-word discrete bidirectional
0431_IOBUS	Four-word analog output
0432_IOBUS	Four-word analog input
0433_IOBUS	Four-word analog bidirectional
0501_IOBUS	Five-word discrete output
0502_IOBUS	Five-word discrete input
0503_IOBUS	Five-word discrete bidirectional
0531_IOBUS	Five-word analog output
0532_IOBUS	Five-word analog input
0533_IOBUS	Five-word analog bidirectional
0633_IOBUS	Eight-word analog bidirectional
1233_IOBUS	Sixteen-word analog bidirectional

Moving Between Pages

To move from one I/O map page to the another, use the **<PageUp>** and **<PageDown>** keys.

- **<PageDown>** opens the next page – e.g., to move from page 1 to page 2
- **<PageUp>** opens the previous page – e.g., to move from page 2 to page 1

Configuring a Modbus Plus Network in Modsoft with Peer Cop for Momentum Components

10

At a Glance

Purpose

Communication transactions over Modbus Plus are defined in Modsoft 2.6 by a configuration tool called Peer Cop. This section uses examples to explain how to use Peer Cop to configure the two types of network architecture.
- an I/O network, where the Peer Cop of the CPU defines all the communication transactions over the full network
- a supervisory network with two or more CPUs communicating with each other and with additional devices on the network

What's in this Chapter?

This chapter contains the following sections:

10.1 Getting Started (Configuring a Modbus Plus Network in Modsoft with Peer Cop for Momentum Components)

Overview

Purpose

This section explains how to access the Peer Cop Configuration Extension screen and describes the default screen.

What's in this Section?

This section contains the following topics:

Accessing the Peer Cop Configuration Extension Screen with Modsoft for Momentum Components

Introduction

Before you can access the Peer Cop Configuration Extension screen, you must have specified enough extension memory to support your Peer Cop database. This section describes how to access the screen and, if necessary, adjust the amount of configuration extension memory.

Accessing the Screen

Starting from the Configuration Overview screen, select Peer Cop from the Cfg Ext menu.

Note: If Peer Cop is disabled in the pull-down list, you will need to specify enough extension memory to support your Peer Cop database before you can continue.

Adjusting Extension Memory

Extension memory is specified as a number of 16-bit words. That number is entered in the ExtSize field of the Configuration Overview screen. Once an adequate number of words has been specified there, Peer Cop will be enabled in the Cfg Ext menu.

Extension Memory Size

The minimum Peer Cop memory requirement is 20 words. The maximum is 1366 words.

Estimating How Much Memory to Reserve

Follow these guidelines for estimating the amount of extension memory you will need for your Peer Cop database.

For...	Add...	Up to a maximum of...
Overhead	9 words	--
Global output	5 words	--
Global input	number of words= number of devices x (1 + 2 x number of device subentries)	1088 words
Specific output	2 words for every device entry in Peer Cop	128 words
Specific input	2 words for every device entry in Peer Cop	128 words

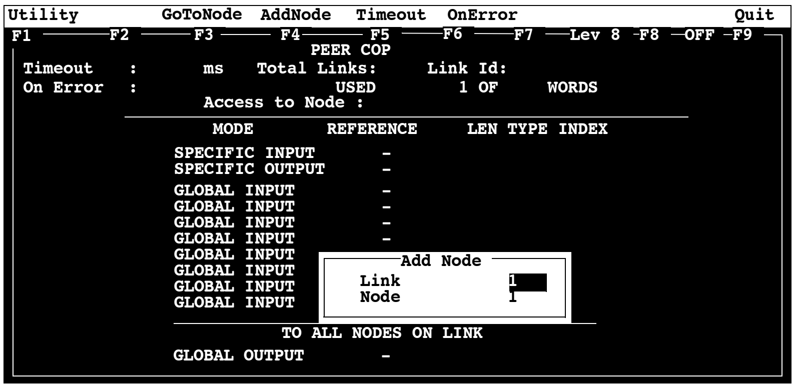
The Default Peer Cop Screen (with Modsoft for Momentum Components)

Overview

This section describes the Peer Cop screen as it appears the first time you access it.

Illustration

The first time you click on **Peer Cop** in the Cfg Ext menu, the following screen appears.



Description

The Peer Cop screen is divided into two regions by a horizontal rule.
At the top of the screen is a group of Peer Cop summary entries.

- Timeout
- ON Error
- Total Links
- Access to Node

The lower half of the screen displays the Peer Cop reference information, i.e., the register or discrete references that the CPU uses to handle specific and global inputs/outputs with other nodes on the network.
The Add Node popup menu appears near the bottom of the screen.

Next Step

No values are set anywhere in the default Peer Cop screen. The following two examples show how to set up Peer Cop to configure different types of Modbus Plus networks (see *p. 219*).

10.2 Using Modbus Plus with Modsoft to Handle I/O on Networks with Momentum Components

Overview

Purpose

This section uses an example to explain how to configure a Modbus Plus network for I/O servicing. In this example, a CPU will control four Momentum I/O modules.

What's in this Section?

This section contains the following topics:

Devices on a Sample Modbus Plus I/O Network with Components (Using Modsoft)

Introduction

This section describes the five devices which comprise the sample network and the strategy used to assign addresses.

The Network Devices

The following table lists the Modbus Plus address and components of each Momentum module on the network.

Modbus Plus Address	I/O Base Type	Adapter Type
1	(type not specified)	M1 processor adapter (type not specified) 172 PNN 210 22 Modbus Plus Option Adapter
2	170 ADI 340 00 16-point input	170 PNT 110 20 Modbus Plus communication adapter
3	170 ADO 340 00 16-point output	170 PNT 110 20 Modbus Plus communication adapter
4	170 ADI 350 00 32-point input	170 PNT 110 20 Modbus Plus communication adapter
5	170 ADO 350 00 32-point output	170 PNT 110 20 Modbus Plus communication adapter

Address Strategy

In this type of architecture, assign the lowest network address (1) to the CPU. When the network initializes, the CPU will be the first device to get the token, and the token rotation table will be built with respect to the controlling device on the network.

Defining the Link and Accessing a Node Using on a Modbus Plus Network with Momentum Components

Overview

When you reach the default Peer Cop screen, a popup menu asks you to define a link and access a node.

What Is a Link?

The link is the Modbus Plus network on which the CPU resides.
The only valid link value for a Momentum M1 CPU is 1. An M1 can function only on one Modbus Plus network–multiple Modbus Plus links are not supported.

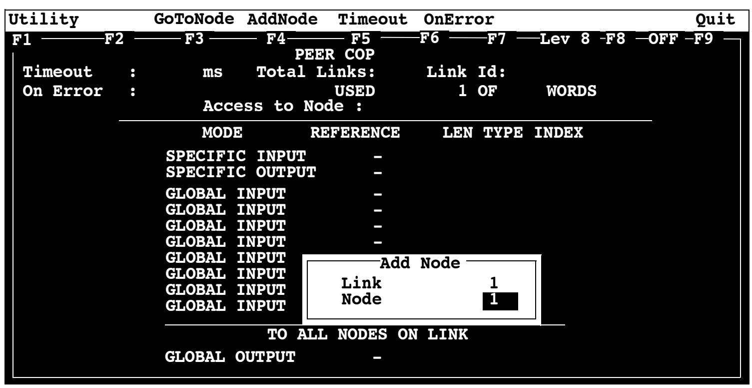
What Is a Node?

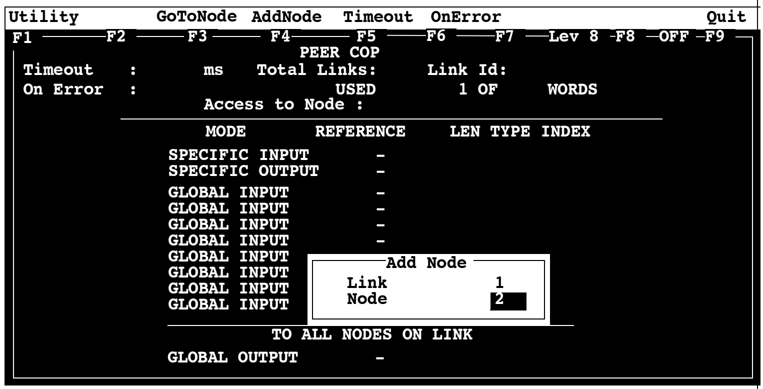
The node is the Modbus Plus address of one of the I/O devices on the network.
A valid node value in our example is any number in the range 2...5. For our example, we will first access the170 ADI 340 00 16-point input module at Modbus Plus address 2.

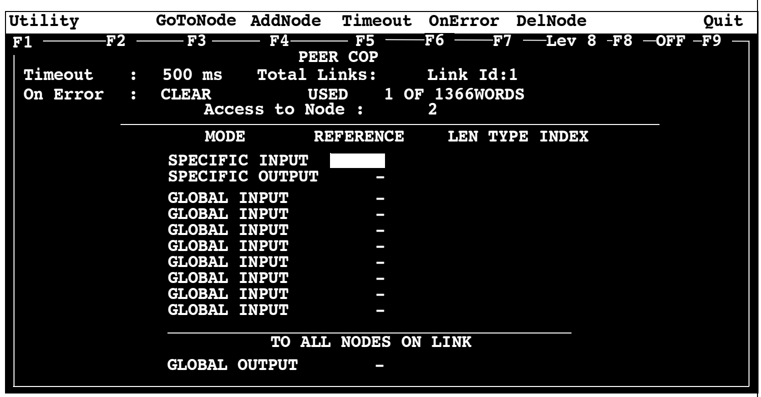
Note: Address 1, the network address of the CPU itself, is not a valid node to access since the CPU does not need to access itself over the network.

Procedure

Follow the steps below to define the link and access a node, using the popup menu.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>With the cursor flashing in the Link value field, make sure that the Link value in the popup is 1. Push <Enter>.
Result: The Link value is set to 1, and the cursor moves to the Node field.

</td></tr>
</table>

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>2</td><td>Enter the value 2 in the Node field.


</td></tr>
<tr><td>3</td><td>Push <Enter>.
Result: The Add Node popup disappears, and the Peer Cop summary information values are set as follows.


</td></tr>
</table>

Next Step

Confirming the Peer Cop summary information (see *p. 223*).

Confirming Peer Cop Summary Information (with Modsoft for a Modbus Network with Momentum Components)

Overview

Once you have defined the link and accessed a node, the Peer Cop summary information values assume default settings. This section describes those settings and how to confirm or change them.

Timeout

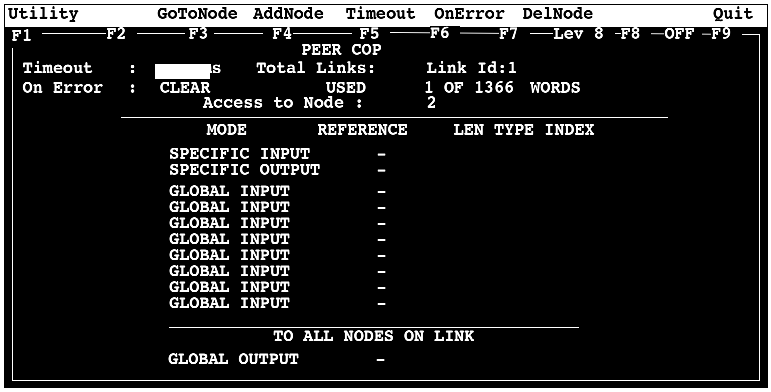
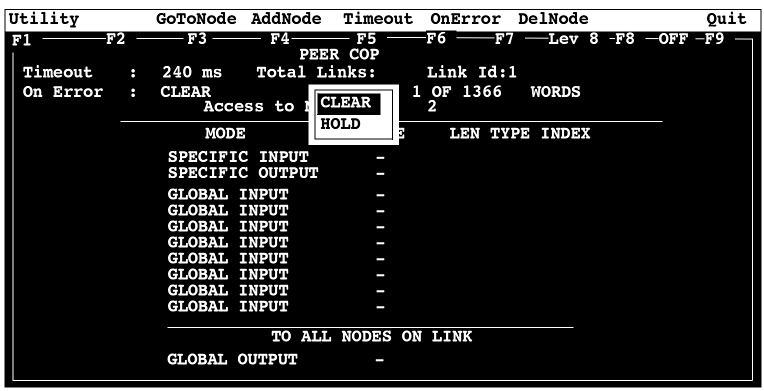
The default timeout is 500 ms.
Timeout is the maximum interval that Modbus Plus on a Peer-Copped device will remain healthy without communication activity. If this interval is exceeded, the device will clear its network health bit and will no longer try to communicate via Modbus Plus.
The timeout interval must be in the range 20 ... 2000 ms, and it must be specified as an increment of 20ms.
For our example, we will change the timeout value to 240 ms.

On Error

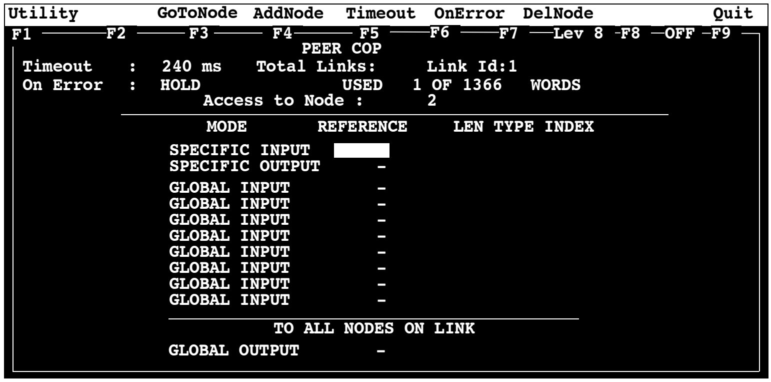
The default On Error setting is CLEAR.
The On Error setting specifies how the Peer-Copped device will treat the last values received before a timeout, once Modbus Plus communications have been restored.
One of two settings may be used–CLEAR or HOLD. CLEAR sets all the previously received values to 0, and HOLD retains the previous values.
For our example, we will change the setting to HOLD

Procedure

Follow the steps in the table below to change the Peer Cop summary information.

Step	Action
1	Push **<Tab>** to move the cursor to the menu bar at the top of the Peer Cop screen.
2	Move the cursor onto the Timeout command. Push **<Enter>**. **Result:** The cursor moves into the Timeout field in the Peer Cop summary information region, and the default value, 500, is cleared. 
3	Type the number **240**, then push **<Enter>**.
4	Now select **On Error** from the menu bar. **Result:** The cursor moves into the On Error field in the Peer Cop summary information region, and a popup menu appears with two choices listed – CLEAR and HOLD. 

Step	Action
5	Move the cursor onto **HOLD** and push **<Enter>**. **Result:** The On Error value in the Peer Cop summary information region is set to HOLD. Your Peer Cop screen should now look like this:



Next Step

Specifying references for input data (see *p. 226*).

Specifying References for Input Data (with Modsoft for a Modbus Network with Momentum Components)

Introduction

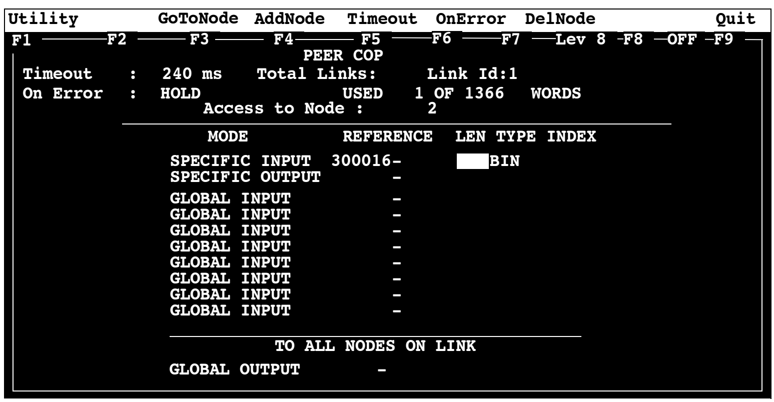
The Peer Cop screen is now set to access the device at Modbus Plus address 2, which for this example is a 170 ADI 340 00 16-point input module.
This section explains how to specify the reference for input data from this module.

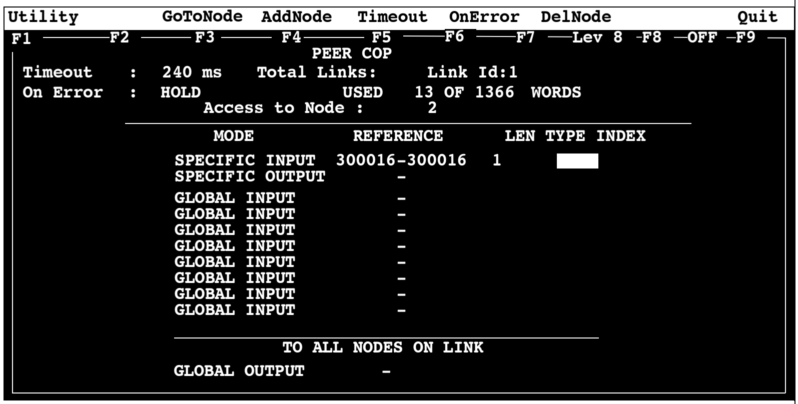
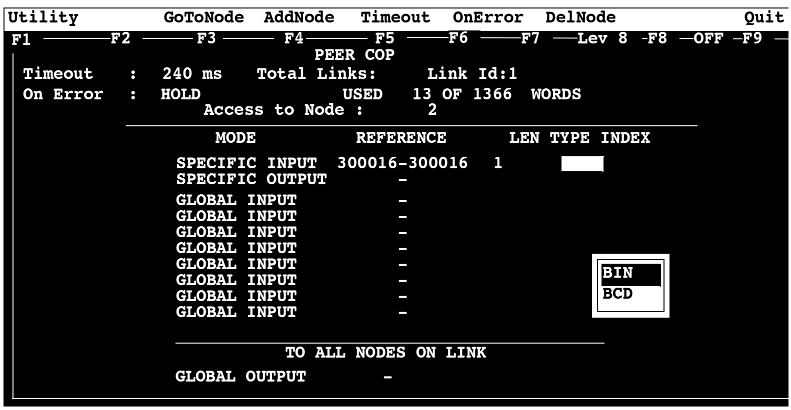
Device Requirements

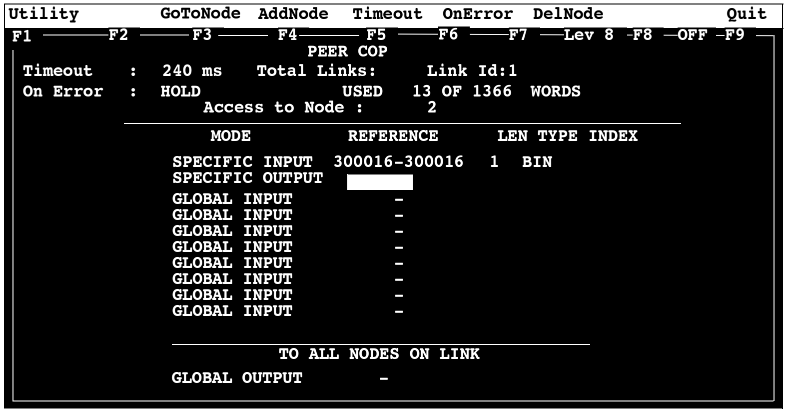
When you use Peer Cop to handle a Modbus Plus I/O architecture, you need to be aware of the type of I/O you are configuring at each network address. Peer Cop does not know that the device at address 2 is a discrete 16-point input module.
You need to know that a specific input reference with a length of one word (16 bits) is required to handle this module.
We will assign a 3x register (300016) as a specific input to the CPU. When the 170 ADI 340 00 sends input data to the CPU, it will be sent to this register.

Procedure

Follow the steps in the table below to define the specific input in Peer Cop.

Step	Action
1	Move the cursor to the REFERENCE column of the SPECIFIC INPUT field, using the cursor arrow keys.
2	Type the value 300016 in the REFERENCE column of the SPECIFIC INPUT field, then push <Enter>. Result: The cursor moves into the LEN column of the SPECIFIC INPUT field. 

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>3</td><td>Type the value 1 in the LEN column of the SPECIFIC INPUT field, indicating that the device at address 2 will transmit 1 word of data (or 16 bits). Then push <Enter>.
Result: The cursor is now on BIN (binary) the TYPE column.

</td></tr>
<tr><td>4</td><td>Push <Enter>.
Result: A popup menu appears. You can choose between leaving the data type as binary or changing it to BCD.

</td></tr>
</table>

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>5</td><td>In this case, we will leave the default BIN setting. Push <Enter>.
Result: The Peer Cop screen is now set to handle a 16-point input module at Modbus Plus address 2. The screen should like this:


</td></tr>
</table>

Next Step

Accessing the remaining devices (see *p. 229*).

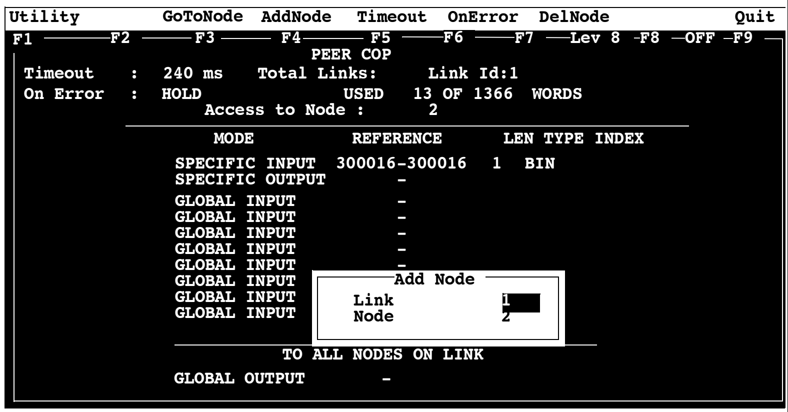
Accessing the Remaining Devices

Introduction

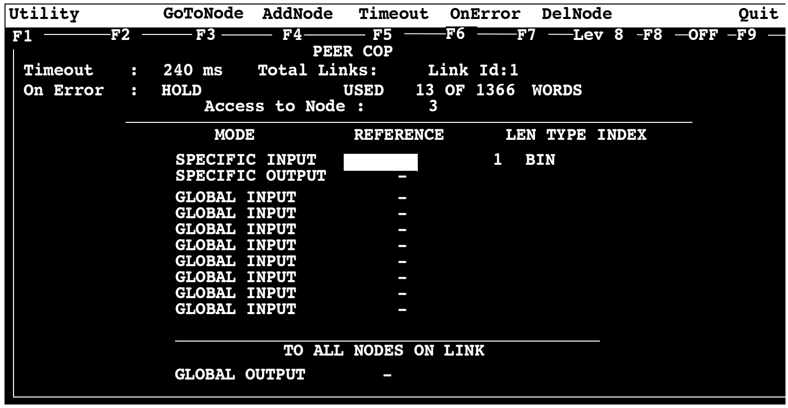
The I/O modules at Modbus Plus addresses 3 ... 5 can be configured individually in a manner similar to that used for the 170 ADI 340 00 module at address 2.

Procedure

Follow the steps in the table below to access a new device address (in this case, address 3), using the AddNode command.

Step	Action
1	Push <Tab> to move the cursor to the menu at the top of the Peer Cop screen.
2	Using a left or right arrow key as necessary, move the cursor onto the AddNode command. Push <Enter>. Result: The Add Node popup appears over the Peer Cop screen with the cursor flashing in the Link value field. 
3	Make sure that the Link value in the Add Node popup is 1. Push <Enter>. Result: The Link value is set to 1, and the cursor moves to the Node value field of the Add Node popup.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>4</td><td>Enter the value 3 in the Node field. Push <Enter>.
Result: The Add Node popup disappears, and the Peer Cop summary information values are set as follows:



</td></tr>
</table>

Next Step

You are now ready to configure Peer Cop for the device at Modbus Plus address 3, which for this example is a 170 ADO 340 00 16-point output module.

Completing the I/O Device Configuration in Peer Cop

Introduction

Using the procedures described previously, you can complete the I/O configuration in Peer Cop. This section shows completed Peer Cop screens for this example.

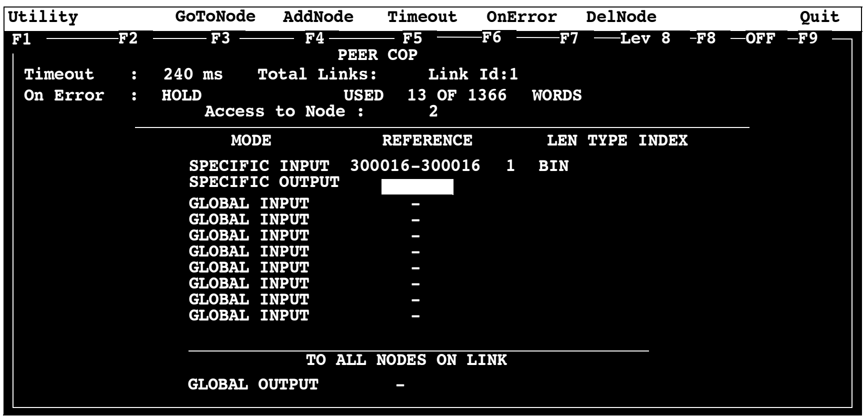
Register Assignments

For this example, we have made the following register assignments:

MB+ Address	Device Type	Register Assignment
2	16-point discrete input	300016
3	16-point discrete output	400016
4	32-point discrete input	300017 and 300018
5	32-point discrete output	400017 and 400018

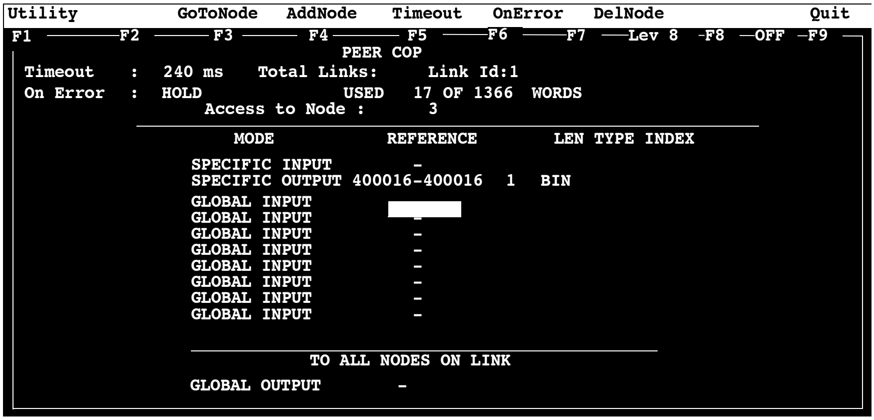
Completed Screen: Node 2

The completed Peer Cop screen for node 2 should look like this:



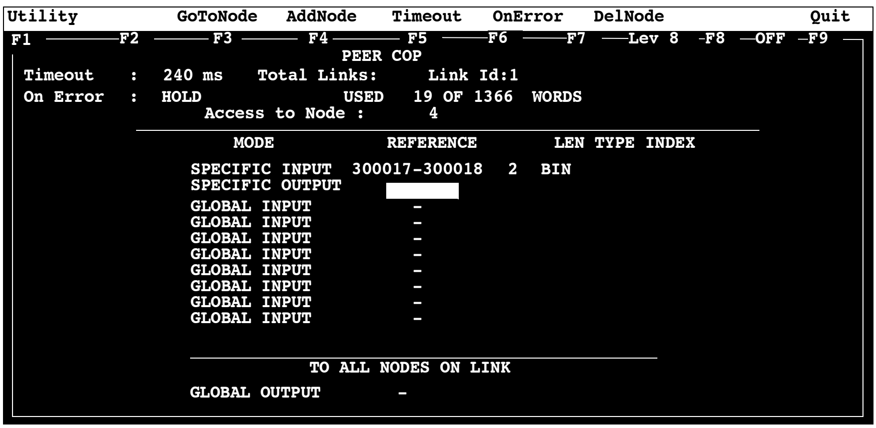
Completed Screen: Node 3

The completed Peer Cop screen for node 3 should look like this:



Completed Screen: Node 4

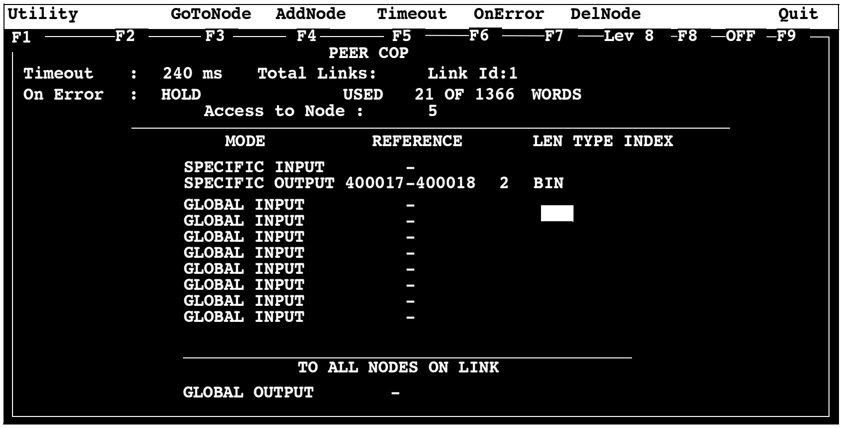
The completed Peer Cop screen for node 4 should look like this:



Note: The lengths (LEN) for the 32-bit I/O devices at addresses 4 and 5 need to be specified as 2 words (32 bits).

Completed Screen: Node 5

The completed Peer Cop screen for node 5 should look like this:



Note: The lengths (LEN) for the 32-bit I/O devices at addresses 4 and 5 need to be specified as 2 words (32 bits).

10.3 Passing Supervisory Data over Modbus Plus

Overview

Purpose

This Peer Cop example deals with a network where three CPUs communicate over Modbus Plus. Each device needs its own Peer Cop configuration.

What's in this Section?

This section contains the following topics:

Devices on a Sample Modbus Plus Supervisory Network with Components (Using Modsoft)

Introduction

This section describes the three CPUs which exchange data over the sample Modbus Plus network and the strategy used to assign node addresses.

Devices

The three CPUs and their functions are described in the following table:

MB+ Address	CPU	Function
1	Pentium supervisory computer with an AT984 host-based PLC card	Receives specific input data and sends global outputs
2	171 CCS 760 00 Momentum M1 processor adapter with 172 PNN 210 22 Modbus Plus option adapter	Controls I/OBus network and exchanges data with AT984 supervisor
3	171 CCS 760 00 Momentum M1 processor adapter with 172 PNN 210 22 Modbus Plus option adapter	Controls I/OBus network and exchanges data with AT984 supervisor

Address Strategy

In this type of architecture, assign the lowest network address (1) to the supervisory computer. When the network initializes, the supervisor will be the first device to get the token, and the token rotation table will be built with respect to the supervising device.

Configuring a Node to Exchange Data on a Modbus Plus Supervisory Network with TSX Momentum Components (Using Modsoft)

Getting Started

To Peer Cop this sample configuration, each CPU must be separately programmed to communicate with the others over Modbus Plus. Begin by connecting your programming panel to the 171 CCS 760 00 TSX Momentum M1 device at Modbus Plus address 2. Access the Peer Cop with your Modsoft 2.6 software.

When you reach the default Peer Cop screen, you need to initialize the summary information region. To do this, define a link value and a node value in the Add Node popup.

What Is a Link?

The link is the Modbus Plus network on which the CPU resides.

The only valid link value for a Momentum M1 CPU is 1. An M1 can function only on one Modbus Plus network–multiple Modbus Plus links are not supported.

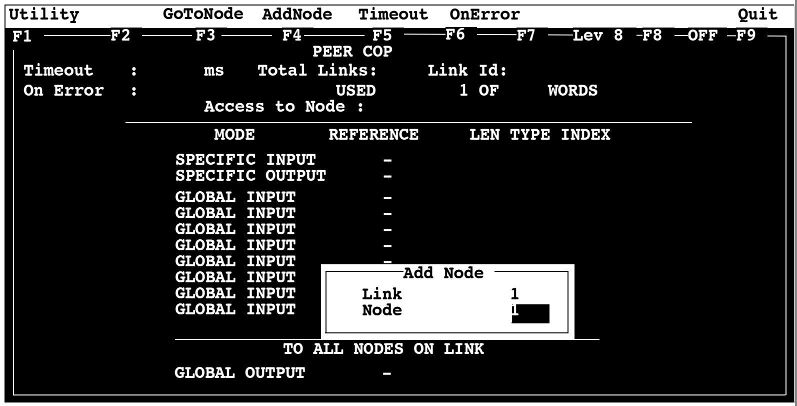
What Is a Node?

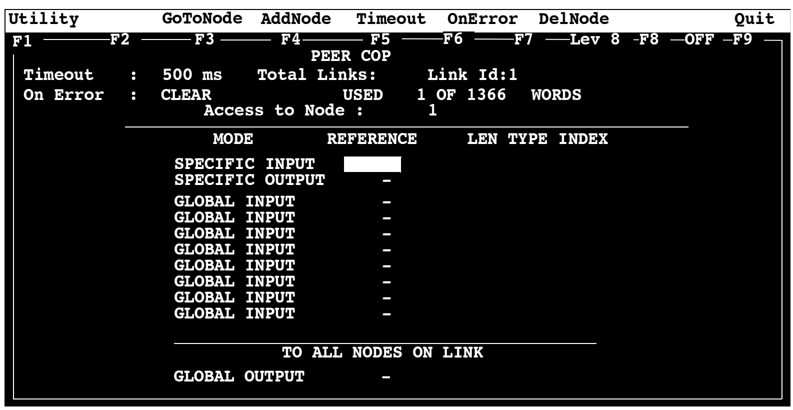
The node is the Modbus Plus address of one of the I/O devices on the network.

For our example, we will first access the AT984 supervisory PLC at Modbus Plus address 1.

Procedure

Follow the steps in the table below to define the link and access a node.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>With the cursor flashing in the Link value field of the Add Node popup, make sure that the Link value in the popup is 1. Push <Enter>.
Result: The Link value is set to 1, and the cursor moves to the Node value field of the Add Node popup.


</td></tr>
<tr><td>2</td><td>If the value in the Node field is 1, as in our example, press <Enter>.
Otherwise, enter the value 1 in the Node field to indicate that you will access the CPU at address 1. Then press <Enter>.
Result: The Add Node popup disappears, and the Peer Cop summary information values are set as follows:


</td></tr>
</table>

Next Step

Confirming the Peer Cop summary information (see *p. 238*).

Confirming the Peer Cop Summary Information on a Modbus Supervisory Network with Momentum Components (Using Modsoft)

Overview

Once you have defined the link and accessed a node, the Peer Cop summary information values assume default settings. This section describes those settings

Timeout

The default Timeout is 500 ms.
Timeout is the maximum interval that Modbus Plus on a Peer-Copped device will remain healthy without communication activity. If this interval is exceeded, the device will clear its network health bit and will no longer try to communicate via Modbus Plus.
The timeout interval must be in the range 20 ... 2000 ms, and it must be specified as an increment of 20 ms.
For our example, we will use the default setting.

On Error

The default On Error setting is CLEAR.
The On Error setting specifies how the Peer-Copped device will treat the last values received before a timeout, once Modbus Plus communications have been restored. One of two settings may be used–CLEAR or HOLD. CLEAR sets all the previously received values to 0, and HOLD retains the previous values.
For our example, we will use the default setting.

Next Step

Specifying references for input and output data (see *p. 239*).

Specifying References for Input and Output Data on a Modbus Supervisory Network with Momentum Components (Using Modsoft)

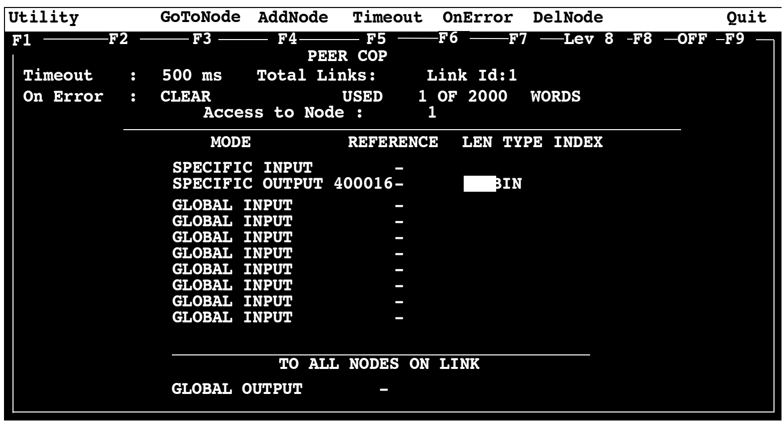
Overview

We will now set up the 171 CCS 760 00 Momentum M1 CPU at Modbus Plus address 2. This device will:

- send eight 4x registers of specific output to the supervisory computer at Modbus Plus address 1.
- receive five 4x registers of global input from the supervisory computer. These registers are the first five registers in a 10-register block broadcast by the supervisor.

Defining the Specific Output

The following table describes how to define the specific output in Peer Cop.

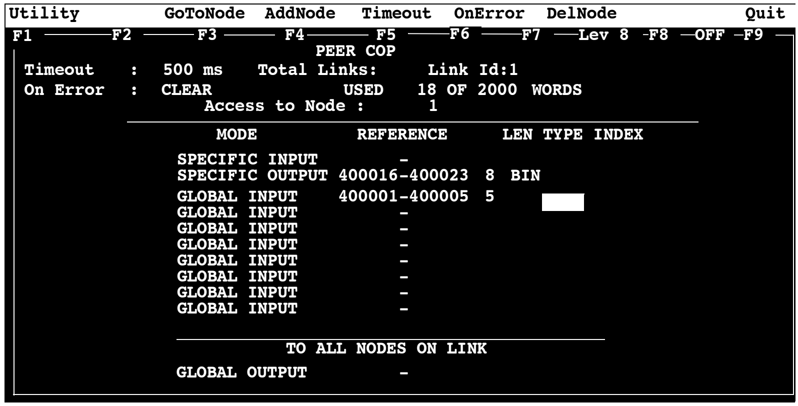
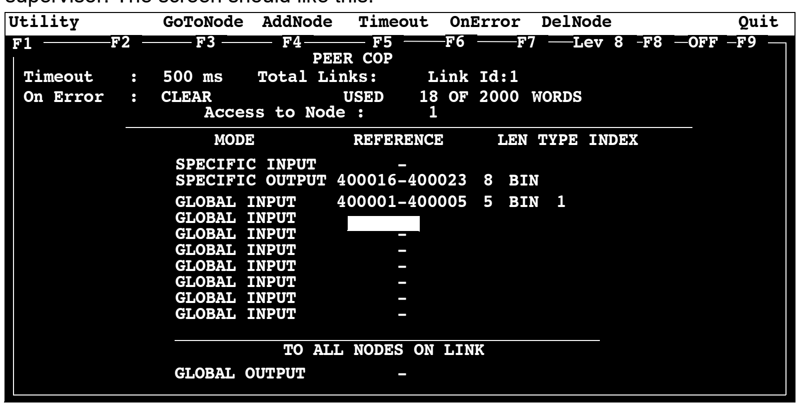
<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Move the cursor to the REFERENCE column of the SPECIFIC OUTPUT field with the cursor arrow keys.</td></tr>
<tr><td>2</td><td>In the REFERENCE column of the SPECIFIC OUTPUT field, type the value 400016. Push <Enter>.
Result: The cursor moves into the LEN column of the SPECIFIC OUTPUT field.

</td></tr>
</table>

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>3</td><td>In the LEN column of the SPECIFIC OUTPUT field, type the value 8, indicating that the M1 CPU at address 2 will send eight 16-bit words to the supervisory PLC. Push <Enter>.
Result: The Peer Cop screen should like this:<pre>
Utility   GoToNode AddNode Timeout OnError DelNode   Quit
F1 ------F2 -----F3 ----- F4------ F5 -----F6 -----F7 ---Lev 8 -F8 --OFF -F9 --
                                PEER COP
 Timeout   : 500 ms   Total Links: Link Id:1
 On Error   : CLEAR   USED   13 OF 2000 WORDS
                  Access to Node :   1
               MODE   REFERENCE   LEN TYPE INDEX
          SPECIFIC INPUT   -
          SPECIFIC OUTPUT 400016-400023 8 BIN
          GLOBAL INPUT
          GLOBAL INPUT   -
          GLOBAL INPUT   -
          GLOBAL INPUT   -
          GLOBAL INPUT   -
          GLOBAL INPUT   -
          GLOBAL INPUT   -
          GLOBAL INPUT   -
                     TO ALL NODES ON LINK
          GLOBAL OUTPUT   -
</pre></td></tr>
</table>

Defining the Global Inputs

Now the M1 needs to be Peer Copped to receive five words of global data from the supervisory PLC at Modbus Plus address 1. Follow the steps in the table below to specify the global input references.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>In the REFERENCE column on the first line of the GLOBAL INPUT field, type the value 400001, the first register in which the CPU will store data. Push <Enter>.
Result: The cursor moves into the LEN column of the GLOBAL INPUT field.<pre>
Utility   GoToNode AddNode Timeout OnError DelNode   Quit
F1 ------F2 -----F3 ----- F4------ F5 -----F6 -----F7 ---Lev 8 -F8 --OFF -F9 --
                                PEER COP
 Timeout   : 500 ms   Total Links: Link Id:1
 On Error   : CLEAR   USED   13 OF 2000 WORDS
                  Access to Node :   1
               MODE   REFERENCE   LEN TYPE INDEX
          SPECIFIC INPUT   -
          SPECIFIC OUTPUT 400016-400023 8 BIN
          GLOBAL INPUT   400001-   N
          GLOBAL INPUT   -
          GLOBAL INPUT   -
          GLOBAL INPUT   -
          GLOBAL INPUT   -
          GLOBAL INPUT   -
          GLOBAL INPUT   -
          GLOBAL INPUT   -
                     TO ALL NODES ON LINK
          GLOBAL OUTPUT   -
</pre></td></tr>
</table>

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>2</td><td>Type the value 5 in the LEN column of the GLOBAL INPUT field, indicating that the CPU will receive five words of global data from the supervisory computer. Push <Enter>. The cursor moves into the TYPE column of the GLOBAL INPUT field.

</td></tr>
<tr><td>3</td><td>The default data format for these words is binary (BIN). This is the desired type for our example, so push <Enter> twice.
Result: The cursor moves into the INDEX column of the GLOBAL INPUT field.</td></tr>
<tr><td>4</td><td>Type the value 1 in the INDEX column of the GLOBAL INPUT field, indicating that the M1 CPU at Modbus Plus address 2 will receive the five words of global input data beginning with word 1. Push <Enter>.
Result: The Peer Cop screen is now set to send eight words of specific output to the supervisor at Modbus Plus address 1 and receive five words of global data from the supervisor. The screen should like this:

</td></tr>
</table>

Next Step

Defining the references for the next node (see *p. 242*).

Defining the References for the Next Node on a Modbus Supervisory Network with Momentum Components (Using Modsoft)

Overview

We now want to attach the Modsoft 2.6 programming panel to the 171 CCS 760 00 Momentum M1 CPU at Modbus Plus address 3 and create a similar Peer Cop for this device to communicate with the supervisory PLC at Modbus Plus address 1. In this case, we want the M1:

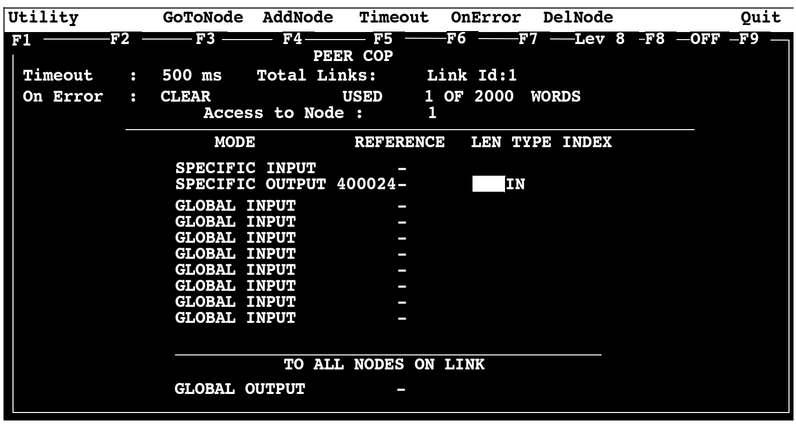
- to send 16 words of specific output to the supervisor.
- to receive the last seven words of global input from the supervisor. (Remember that the supervisor will be transmitting a total of 10 contiguous words of global data over the network.)

Link and Node Settings

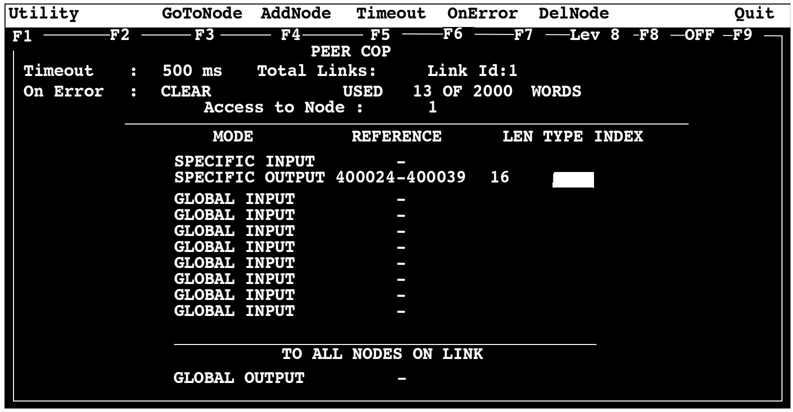
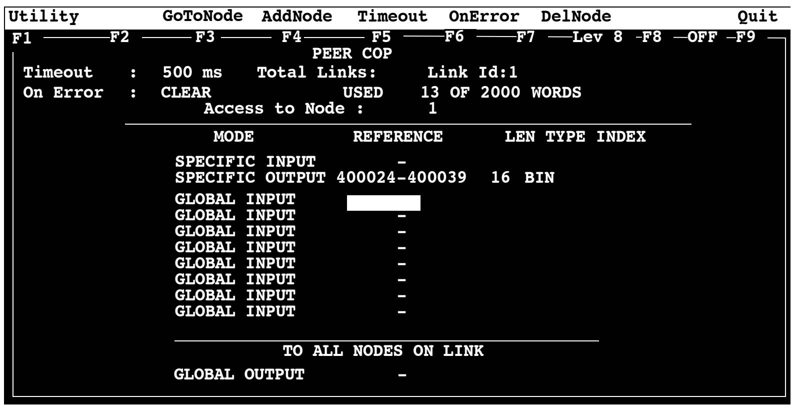
Make sure that the Link setting is 1 and the Node setting is 1, indicating that this CPU will be exchanging data with the supervisory computer at address 1.

Defining Specific Outputs

Follow the steps in the table below to define the specific output in Peer Cop.

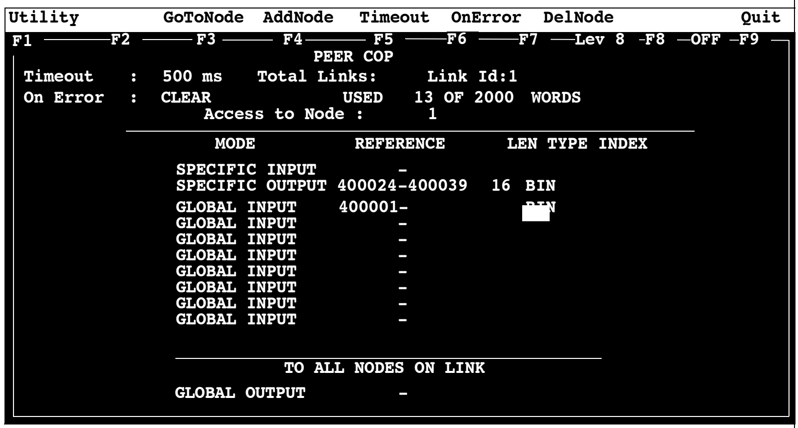
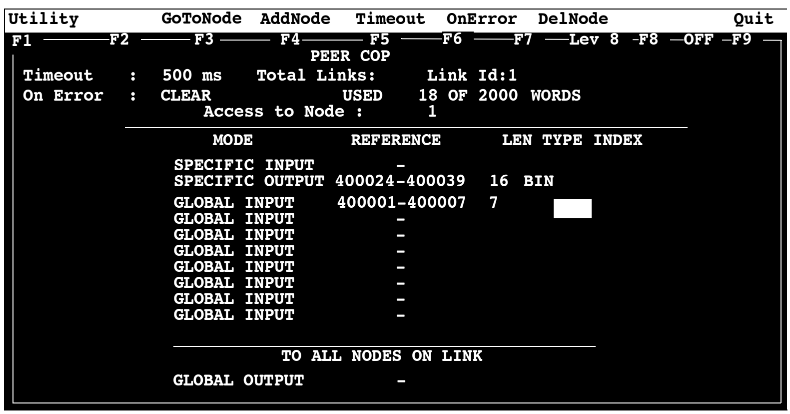
<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>In the REFERENCE column of the SPECIFIC OUTPUT field, type the value 400024. Push <Enter>.


</td></tr>
</table>

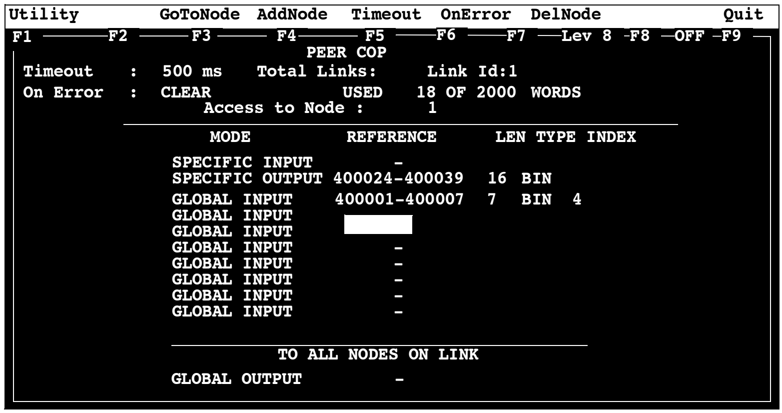
<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>2</td><td>Type the value 16 in the LEN column of the SPECIFIC OUTPUT field. Push <Enter>.

</td></tr>
<tr><td>3</td><td>
</td></tr>
</table>

Defining Global Inputs

Follow the steps in the table below to define the global input data from the supervisory PLC at Modbus Plus address 1.

Step	Action
1	In the REFERENCE column of the first GLOBAL INPUT field, type the value **400001**, the first register which will be used to store global input data. Push **<Enter>**. **Result:** The cursor moves to the LEN column. 
2	Type the value **7** in the LEN column of the GLOBAL INPUT field to indicate that seven words will be accepted. Then push **<Enter>**. **Result:** The remaining reference field is filled automatically and the cursor moves to the TYPE column. 
3	With the TYPE column of the SPECIFIC OUTPUT filed set to **BIN**, push **<Enter>** twice.

Step	Action
4	Type the value **4** in the INDEX column of the GLOBAL INPUT field, indicating that the M1 CPU at Modbus Plus address 3 will receive the seven words of global data starting with word 4. **Result:** The Peer Cop screen is now set to send 16 words of specific output to the supervisor at Modbus Plus address 1 and to receive seven words of global data from the supervisor. The screen should like this:



Next Step

Defining references for the supervisory computer (see *p. 246*).

Defining References for the Supervisory Computer on a Modbus Network with Momentum Components (Using Modsoft)

Overview

At this point, we will attach the Modsoft 2.6 programming panel to the AT984 supervisory PLC at Modbus Plus address 1 and set up two Peer Cop screens to handle the M1 CPUs at addresses 2 and 3.

We know that the M1 at Modbus Plus address 2 is sending eight words of specific output to the supervisor and that the M1 at Modbus Plus address 3 is sending 16 words of specific output to the supervisor. The supervisor will receive this data as specific inputs.

We also know that the supervisor is sending 10 words of global data, parts of which will be received by both of the M1 CPUs.

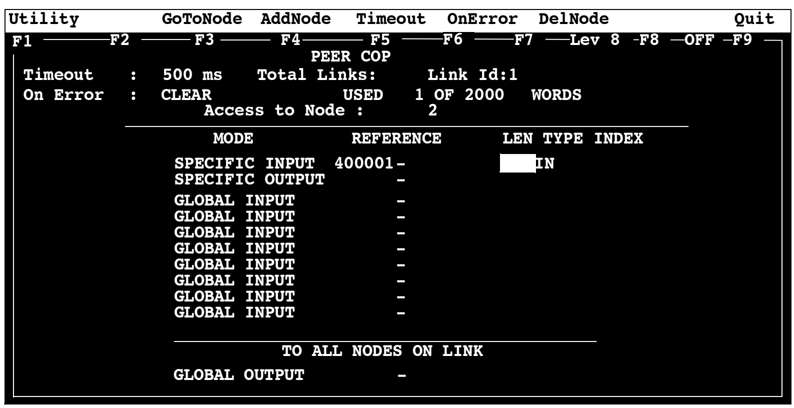
Accessing Node 2

Make sure the Link setting is 1 and the Node setting is 2, indicating that the supervisory computer will exchange data with the CPU at address 2.

Specifying References for Node 2

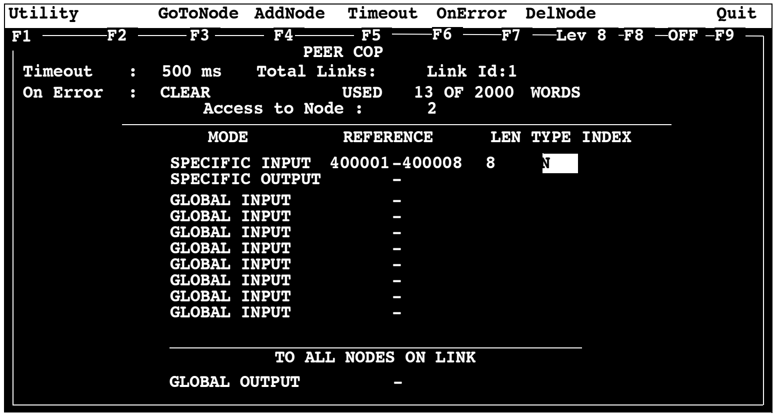
We know that this M1 CPU sends eight words of specific output to the supervisor and receives five words of global data from the supervisor. Follow the steps in the table below to define the registers that the supervisor will transmit to and receive from the M1 CPU at Modbus Plus address 2.

Step	Action
1	In the REFERENCE column of the SPECIFIC INPUT field, type the value **400001**, the first register which will receive the input. Push **<Enter>**. The cursor moves to the LEN column.



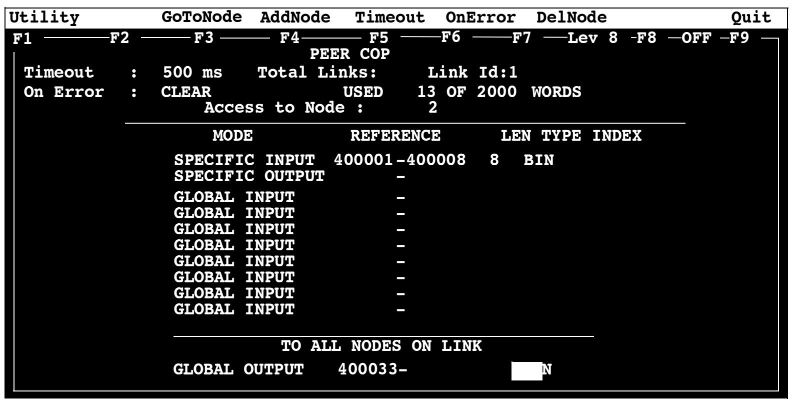
<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>2</td><td>

Type the value **8** in the LEN column of the SPECIFIC INPUT field to indicate the number of registers that will be received. Push **<Enter>**. The REFERENCE field is completed automatically and the cursor moves to the TYPE column.

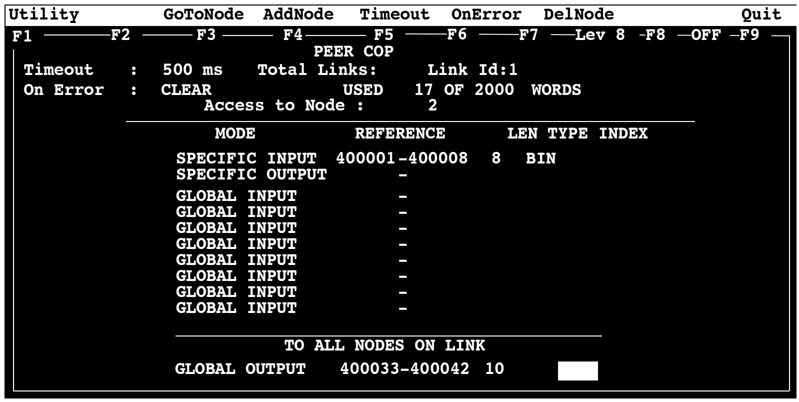
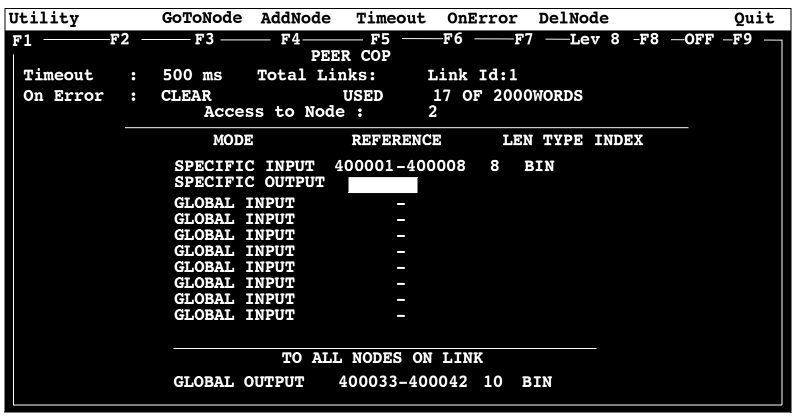


</td></tr>
<tr><td>3</td><td>With the TYPE column of the SPECIFIC INPUT filed set to BIN, push <Enter> twice.</td></tr>
<tr><td>4</td><td>

In the REFERENCE column of the GLOBAL OUTPUT field (at the bottom of the screen), type **400033**, the first register which will be sent. Push **<Enter>**. The cursor moves to the LEN column.



</td></tr>
</table>

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>5</td><td>Type the value 10 in the LEN column of the GLOBAL OUTPUT field to indicate the number of registers to be sent. Push <Enter>. The REFERENCE field is completed automatically and the cursor moves to the TYPE column.

</td></tr>
<tr><td>6</td><td>With the TYPE column of the GLOBAL OUTPUT filed set to BIN, push <Enter> twice. The Peer Cop screen should like this:

</td></tr>
</table>

Next Step

Complete the configuration by creating a Peer Cop screen from the supervisor that accesses node 3 and defines the references for that node.

Completing the Configuration of a Modbus Plus Supervisory Network with Momentum Components (Using Modsoft)

Overview

To complete the configuration of the supervisory computer at Modbus Plus address 1, create a Peer Cop screen that accesses the CPU at address 3 and defines the references for that CPU.

Accessing Node 3

Using the AddNode command, create a new Peer Cop screen with a Link setting of 1 and a Node setting of 3.

Specifying References for Node 3

We know that this M1 CPU sends 16 words of specific output to the supervisor and receive seven words of global data from the supervisor. Follow the steps in the table below to define the registers that the supervisor will transmit to and receive from the M1 CPU at Modbus Plus address 3.

Step	Action
1	In the REFERENCE column of the SPECIFIC INPUT field, type the value **400020**, the first register which will receive the input. Push **<Enter>**.
2	Type the value **16** in the LEN column of the SPECIFIC INPUT field, indicating the number of registers that will be received. Push **<Enter>**.
3	The GLOBAL OUTPUT fields should already be complete, since you filled them out for node 2. The completed Peer Cop screen should look like this:

```
Utility       GoToNode  AddNode   Timeout  OnError  Denude            Quit
F1 ------F2 -----F3 -----F4------F5 -----F6 -----F7 ---Lev 8 -F8 --OFF -F9 -
                                PEER COP
 Timeout    :  500 ms   Total Links:     Link Id:1
 On Error   :  CLEAR            USED    19 OF 2000  WORDS
                    Access to Node :      3
            -------------------------------------------------------
                    MODE          REFERENCE      LEN TYPE INDEX

                SPECIFIC INPUT  400020-400035   16  BIN
                SPECIFIC OUTPUT       -

                GLOBAL INPUT          -
                GLOBAL INPUT          -
                GLOBAL INPUT          -
                GLOBAL INPUT          -
                GLOBAL INPUT          -
                GLOBAL INPUT          -
                GLOBAL INPUT          -
                GLOBAL INPUT          -
                ------------------------------------------
                          TO ALL NODES ON LINK
                GLOBAL OUTPUT    400033-400042  10  BIN
```

Saving to Flash in Modsoft for Momentum Components

11

Overview

Purpose

You save data to Flash so that in the event of an unexpected loss of power, the application logic and state RAM values will be preserved.
This section describes how to save the application logic and state RAM values to Flash using Modsoft 2.6.

What's in this Chapter?

This chapter contains the following topics:

Preparing to Save to Flash in Modsoft for Momentum Components

Before You Save to Flash

Before you can save to Flash in Modsoft, you need to specify how the controller will react when power is re-established. This section describes three options. The next section describes how to specify an option.

Three Parameters

Modsoft will ask you three questions:
- Q1 Continue power down Run state? Y/N
- Q2 Start PLC after download? Y/N
- Q3 Continue? Y/N

Q1 and Q2 define the state of the controller after power is re-established. Q3 simply initiates a save-to-Flash operation in the controller. Q3 cannot be invoked unless Q1 and Q2 have been answered Y(es) or N(o).

Three Possible States

The following table shows you the three states that you may specify for the controller

If the Answer Is ...	Then the Controller ...
Q1 = Y	Comes back in the state it was in (Running or Stopped) before power was lost
Q2 = N	
Q1 = N	Comes back Running when power is restored
Q2 = Y	
Q1 = N	Comes back Stopped when power is restored
Q2 = N	

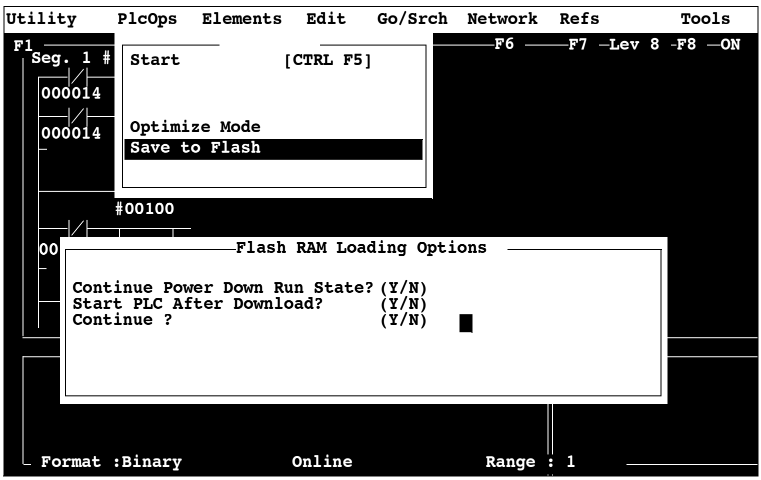
Saving to Flash in Modsoft for Momentum Components

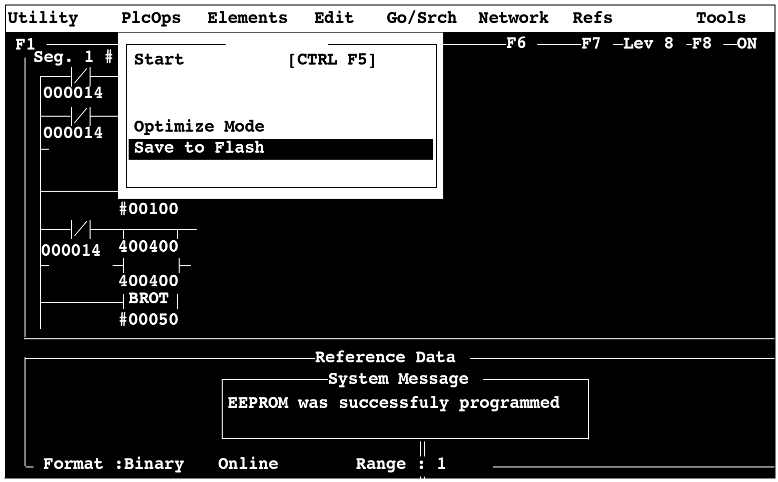
Conditions for Saving to Flash

In order to save the application program and state RAM values to Flash:
- The Modsoft panel must be Online
- The PLC must be stopped (not solving logic)

Save-to-Flash Procedure

Follow the steps below to save to Flash.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>With the PLC online, go to the Ladder diagram editor or the Segment Status Display.</td></tr>
<tr><td>2</td><td>From the PlcOps pull-down on the top menu, select Save to Flash.
Result: If the PLC is stopped when you select Save to Flash, the following screen appears:

</td></tr>
<tr><td>3</td><td>Answer the first two questions to specify the way you want the PLC to restart after a power-down.</td></tr>
</table>

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>4</td><td>Type Y in response to question 3.
Result: The PLC will save your application logic and state RAM table to Flash. When the save is completed, the following system message appears:


</td></tr>
</table>

Concept and Momentum Components

IV

At a Glance

Purpose

This part describes how to configure an M1 CPU, how to I/O map an I/OBus network, how to configure a Modbus Plus network with Peer Cop and how to save to Flash using Concept.

What's in this Part?

This part contains the following chapters:

Configuring an M1 CPU with Concept

12

At a Glance

Purpose

This chapter explains how to configure a CPU using Concept.

What's in this Chapter?

This chapter contains the following sections:

12.1 Configuring the M1 CPU Processor Adapter with Concept

Overview

Purpose

This section describes how to configure a Momentum M1 processor adapter using Concept.

What's in this Section?

This section contains the following topics:

Selecting an M1 Processor Adapter

Introduction

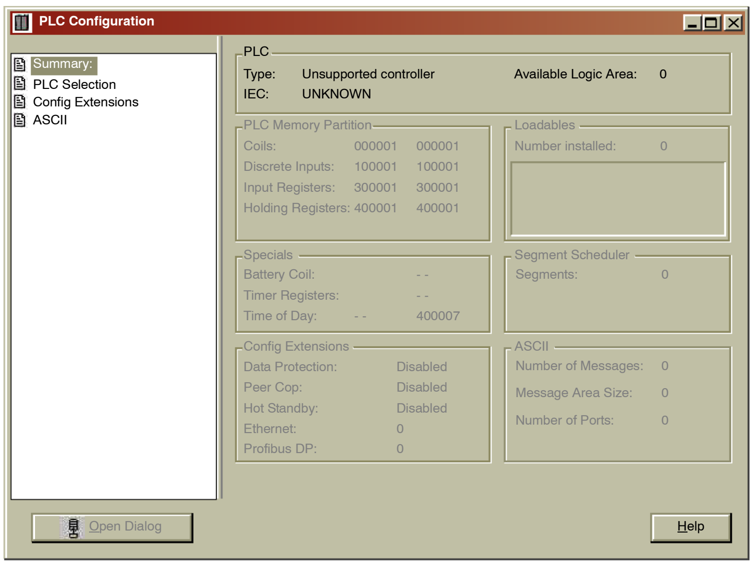
This section describes how to select an M1 processor adapter for a new project using Concept.

> **Note:** For a full description of Concept, refer to the set of manuals shipped with the software.

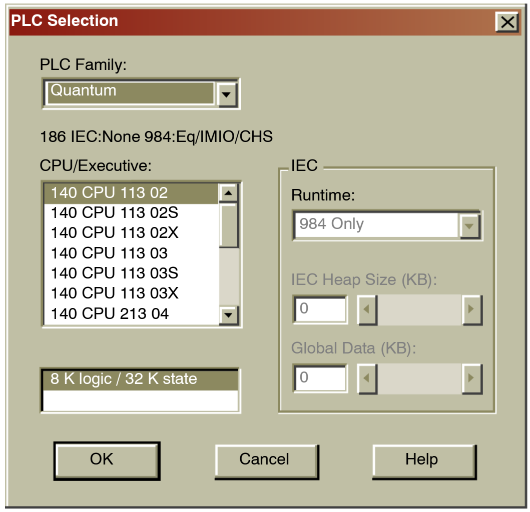
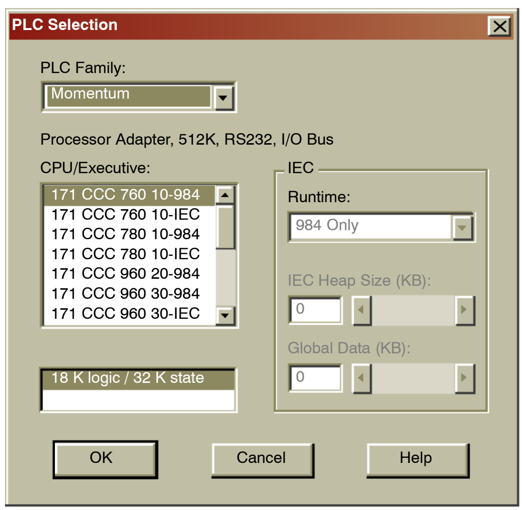
Procedure

Follow the steps below to select an M1 processor adapter for a new project.

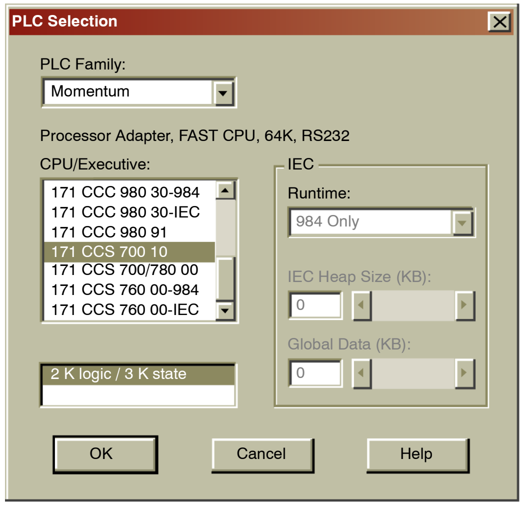
<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>From the File menu, select New Project.
Result: A new project is opened and the file name [untitled] appears over the menu bar.</td></tr>
<tr><td>2</td><td>From the Configure menu, select PLC Type OR double-click on the PLC selection in the left window pane. The PLC Configuration screen appears.



</td></tr>
</table>

Step	Action
3	Double click the PLC selection folder. **Result:** The PLC Selection dialog box appears. The default selection is Quantum. 
4	From the **PLC Family** drop down list, select **MOMENTUM**.  The CPU/Executive menu changes to reflect the choices available for Momentum.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>5</td><td>Choose your PLC type from the CPU/Executive menu.



The remaining fields are filled with corresponding values.</td></tr>
<tr><td>6</td><td>Click the <OK> button.
Result: Your PLC type and default configuration parameters are displayed in the PLC Configuration screen.</td></tr>
</table>

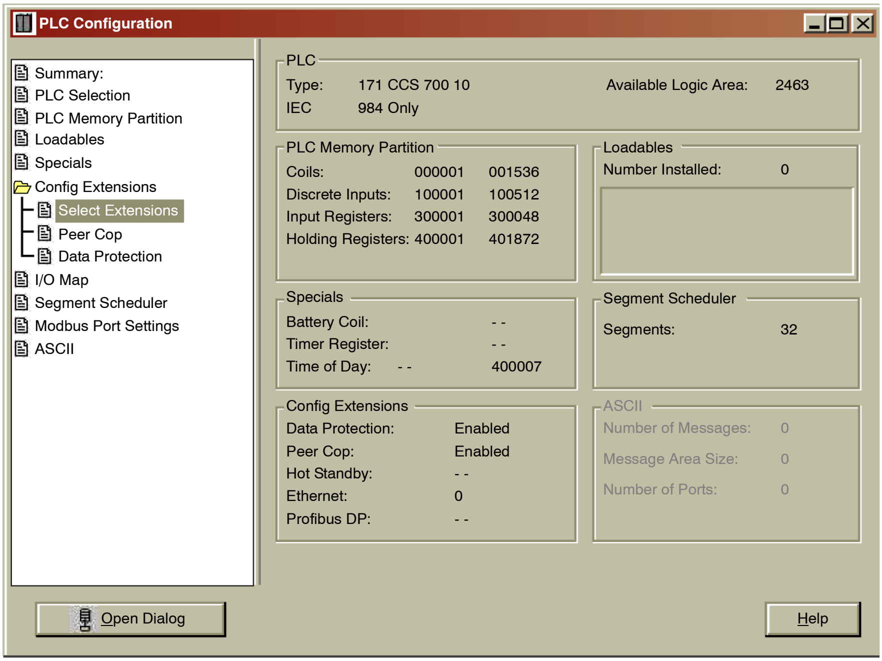
Default Configuration Parameters

Overview

This section describes the default configuration parameters.

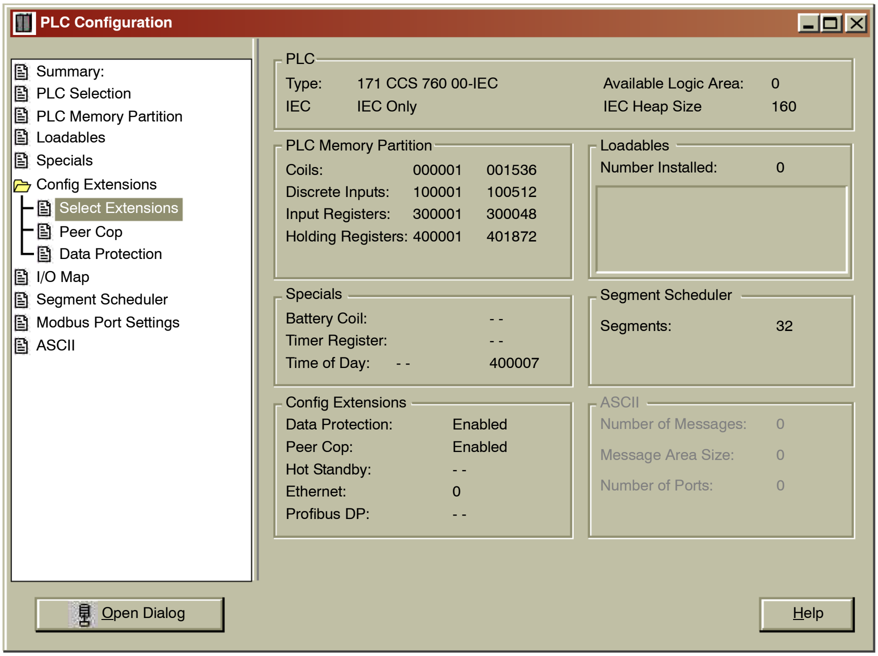
Defaults for a 2K Machine

This sample PLC Configuration screen shows the default configuration parameters.



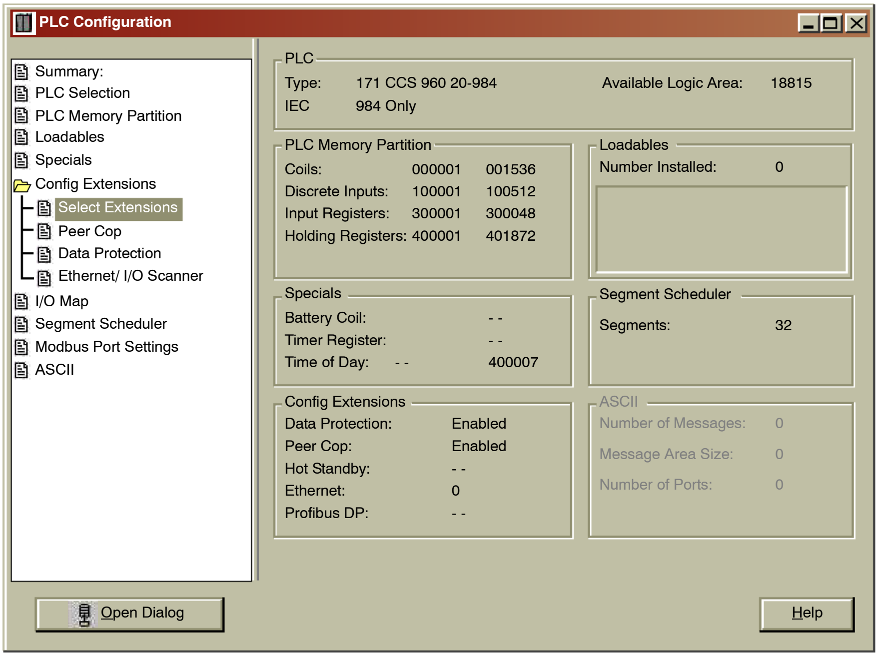
Example of PLC using IEC

This sample PLC Configuration screen shows the default configuration parameters.



Example of PLC using 984

This sample PLC Configuration screen shows the default configuration parameters.



Default Values

Here are the default parameters:

Parameter	2.4K Machine	12.2K Machine	18.4K Machine
Coils in state RAM	1536 (0x)	1536 (0x)	1536 (0x)
Discrete inputs in state RAM	512 (1x)	512 (1x)	512 (1x)
Input registers in state RAM	48 (3x)	48 (3x)	48 (3x)
Output registers in state RAM	1872 (4x)	1872 (4x)	1872 (4x)
Full logic area (in nodes)	1678	11532	17649
Words of user memory space for the I/O Map	144	144	144
Memory allocated for configuration extension	None	None	None

Changing the Range of Discrete and Register References for an M1 CPU with Concept

Introduction

This section provides guidelines and a procedure for changing the range of discrete (0x and 1x) and register (3x and 4x) references.

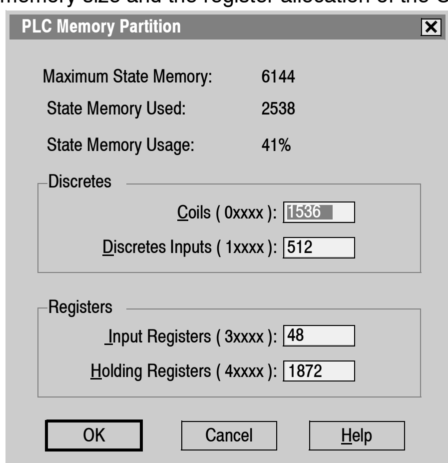
Guidelines

When you change the range of discrete and register references, follow these guidelines:

- Adjust the range of discretes in increments of 16 (one word)
- Adjust the range of registers in increments of 1 (one word)
- The total number of register and discrete references cannot exceed the maximum of state memory displayed at the top of the dialog.
- A minimum configuration of 16 0x discretes, 16 1x discretes, one 3x register, and one 4x register is required.

Procedure

Follow the steps below to change the range of discrete and register references using the PLC Configuration screen.

Step	Action
1	From the Configure menu, select **Memory Partitions** OR double-click on any field in the PLC Memory Partition section of the dialog box. Result: The PLC Memory Partition dialog box appears, showing the maximum memory size and the register allocation of the CPU. 
2	Modify the range of your discrete and register references by changing the value in the variable boxes, in keeping with the guidelines described above.
3	Click the **<OK>** button.

Changing the Size of the Full Logic Area for an M1 CPU with Concept

Introduction

The number shown in the Available Logic Area field in the PLC Configuration screen indicates the total amount of memory available for your application logic. You cannot directly enter this field to modify the value. You can, however, change the amount of memory available by manipulating the size of other fields in the PLC Configuration screen.

Example 1

For example, if you reduce the expansion size of the I/O map, the number in the Available Logic Area field automatically increases. Say you are using a 12.2K machine and you change the size of the I/O map from 512 to 256, a decrease of 256 words. The Available Logic Area will automatically increase from 1198 to 1454.

Example 2

Similarly, if you allocate some number of words to the Peer Cop expansion size, you will reduce the Available Logic Area by the number of words allocated for Peer Cop.

Understanding the Number of Segments

Only the First Segment is Solved

The number of segments specified in the Configuration Overview screen determines the number of I/O map drops that you will be able to set up for your CPU. When you are using Concept, the default number of segments is 32 in most CPUs.
This number is adequate for all processor adapters and does not need to be changed. However, you should only use the second segment for I/O bus I/O mapping or other subroutines.

Changing the Size of the I/O Map for M1 CPUs with Concept

Introduction

The default size of the I/O map is 144 words. You may want to adjust this number to provide more support for an I/O bus network or to increase the size of the full logic area.

Processors for I/OBus Networks

With I/O bus, an I/O map table is used to define the number, location and type of I/O devices on the network bus.

Default	144 words
Minimum	4 words
Maximum	6143 words, or not to exceed the PLC’s memory size.

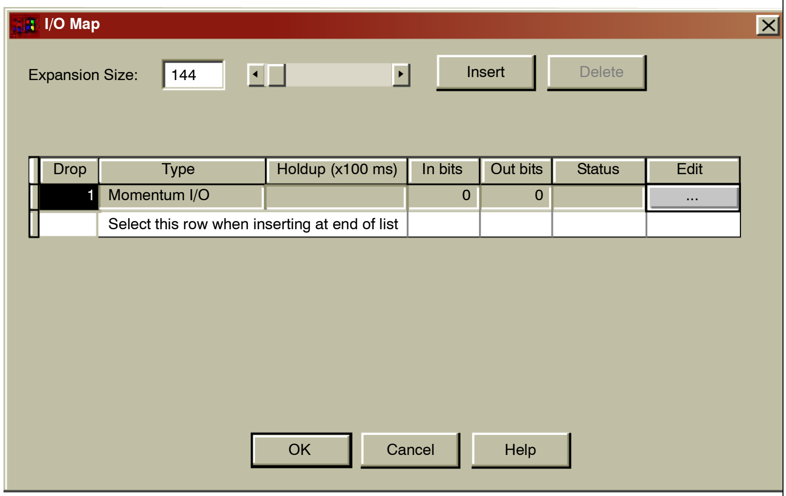
All Other Processors

Other processor adapters only use the I/O map for local I/O. The default of 144 words is more than sufficient for any Momentum I/O base. Depending on the requirements of your I/O base, you may be able to reduce the number of words to the minimum, 4, in order to increase the Available Logic Area.

Default	144 words
Minimum	4 words

Procedure

From the PLC Configuration screen, follow the steps below to change the size of the I/O map.

Step	Action
1	From the Configure menu, select **I/O Map**. Result: The I/O map dialog box appears. 
2	Modify the size of the I/O map by typing a new value in the Expansion Size field OR by adjusting the sliding scale.
3	Click the **<OK>** button.

Establishing Configuration Extension Memory for Peer Cop for M1 CPUs with Concept

Introduction

By default, the Peer Cop capability is disabled. If you want to use Peer Cop to handle Modbus Plus communications, you need to enable this capability and adjust the amount of configuration extension memory.

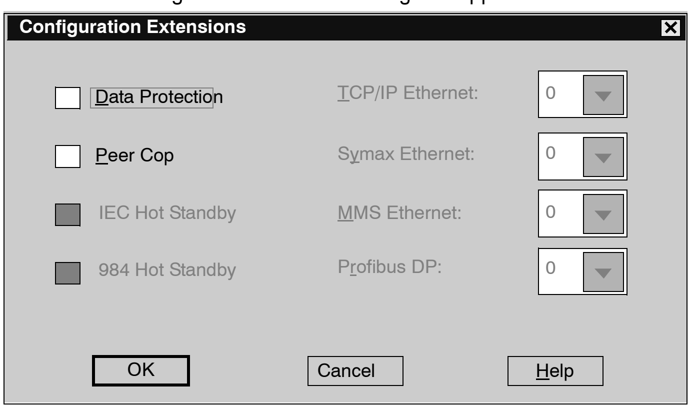
How Much Memory?

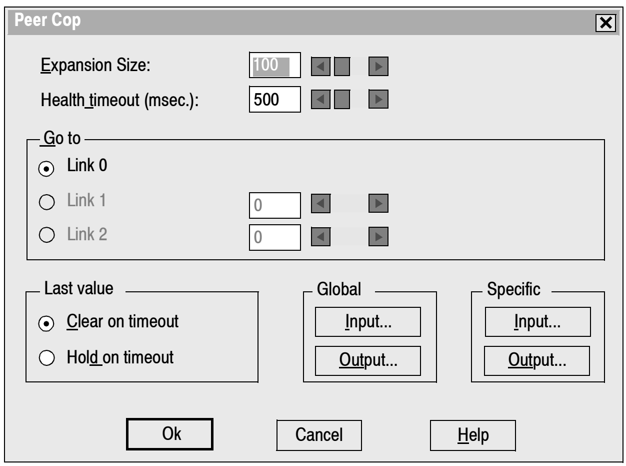
The minimum Peer Cop memory requirement is 20 words; the maximum is 1366 words.
Follow these guidelines for estimating the amount of extension memory you will need for your Peer Cop database.

For...	Add...	Up to a maximum of...
Overhead	9 words	--
Global output	5 words	--
Global input	number of words= number of devices x 1 + 2 x number of device subentries)	1088 words
Specific output	2 words for every device entry in Peer Cop	128 words
Specific input	2 words for every device entry in Peer Cop	128 words

Procedure

From the PLC Configuration screen, follow the steps below to enable Peer Cop and adjust the amount of Configuration Extension memory:

Step	Action
1	From the Configure menu, select **Config extensions** OR double-click anywhere in the Config Extensions region of the screen. You can also double-click on Select Extensions at PLC Configuration Tree in the left window pane. **Result:** The Configuration Extension dialog box appears. 

Step	Action
2	Click the check box next to Peer Cop, then click **<OK>**. **Result:** Peer Cop status changes from Disabled to Enabled in the PLC Configuration screen. Config Extensions Data Protection: Disabled Peer Cop: Enabled Hot Standby: Not Applicable Ethernet: 0 Profibus DP: Not Applicable
3	From the Configure menu or the Configuration Tree in left window pane, select **Peer Cop**. 
4	Modify the amount of configuration extension memory allocated to Peer Cop by typing a new value in the Expansion Size field OR by adjusting the sliding scale next to the field.
5	Click the **<OK>** button.

12.2 Configuring Option Adapter Features

Overview

Purpose

This section describes how to implement the battery backup and time-of-day (TOD) clock features of the Momentum option adapters using Concept.

What's in this Section?

This section contains the following topics:

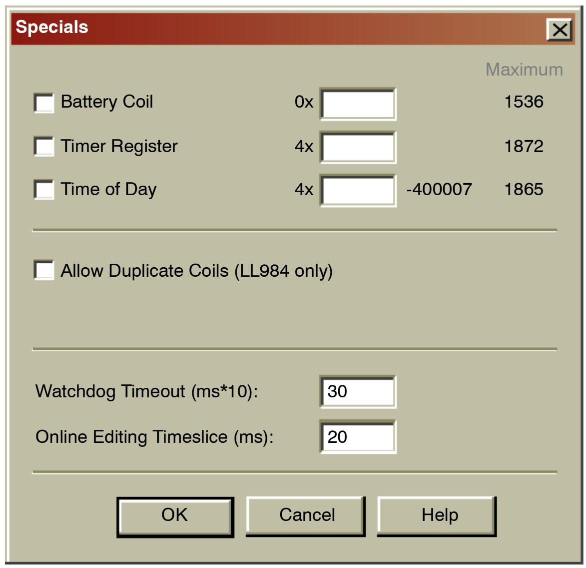
Reserving and Monitoring a Battery Coil

Introduction

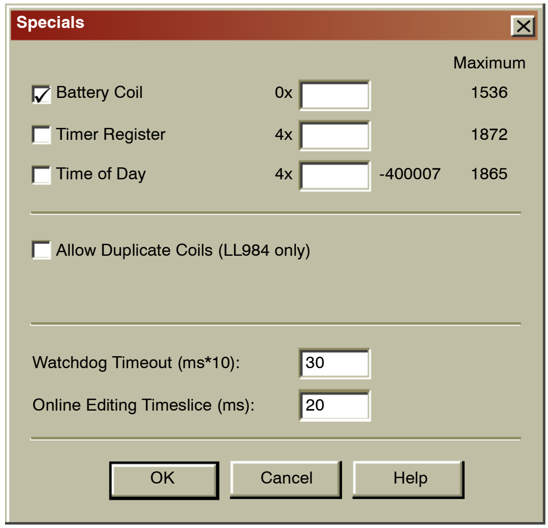
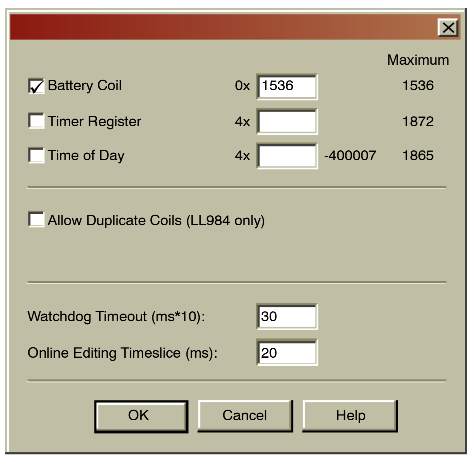
Since the option adapter does not have an LED to indicate when the battery is low, we recommend that you reserve a 0x reference to monitor the health of the battery. This section describes how to reserve and monitor a battery coil, using the Specials dialog box in Concept.

Reserving a Battery Coil

From the PLC Configuration screen, perform the steps in the following table to reserve a battery coil.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>From the Configure menu, select Specials... OR double-click on any field in the Specials region of the dialog box.
Result: The Specials dialog box appears.


</td></tr>
</table>

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>2</td><td>Click the check box next to Battery Coil.

</td></tr>
<tr><td>3</td><td>Type a number from the range of available 0xxxx references in the box marked Ox.
Example: If you have set the range of 0x's at 000001...001536, you might want to enter the reference value of the last coil-1536.

</td></tr>
<tr><td>4</td><td>Click the <OK> button. The dialog box closes and the register you have specified is displayed on the PLC Configuration screen.</td></tr>
</table>

Monitoring the Battery Coil

Monitor the battery coil in ladder logic or tie it to a lamp or alarm that will indicate when the battery is low.

Interpreting the Battery Coil

The battery coil will always read either 0 or 1.

- A coil state of 0 indicates that the battery is healthy.
- A coil state of 1 indicates that the battery should be changed.

Setting up the Time-of-Day Clock on Momentum Components with Concept

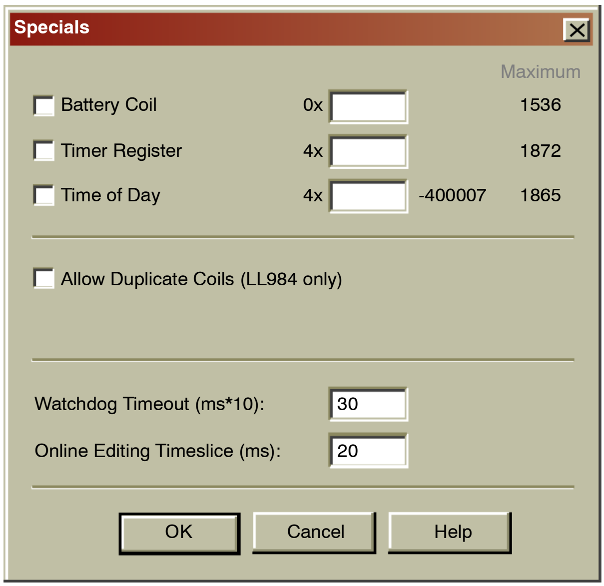
Overview

Each option adapter has a time-of-day clock. To use this feature, you must reserve a block of eight 4x registers.
This section describes how to reserve those registers, using Concept.

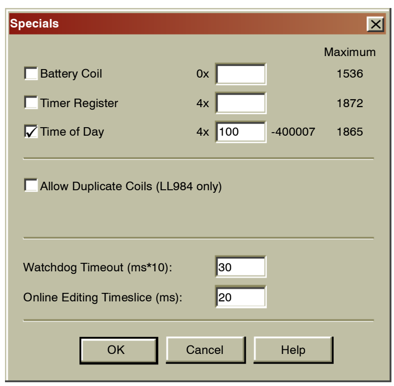
Reserving Registers for the TOD Clock

To reserve registers for the TOD clock, perform the steps in the following table

Step	Action
1	From the Configure menu, select **Specials...** OR double-click on any field in the Specials region of the dialog box. The Specials dialog box appears.



<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>2</td><td>Click the check box next to Time Of Day.

</td></tr>
<tr><td>3</td><td>Type a number (the first in a series of eight) from the range of available 4xxxx references in the corresponding field. Observe the maximum register value.
Example: If you want registers 400100 ... 400107 reserved for the TOD clock, type 100.

</td></tr>
<tr><td>4</td><td>Click the <OK> button. The registers you have specified are displayed on the PLC Configuration screen.</td></tr>
</table>

Setting the Time on Momentum Components with Concept

Overview

Once you have reserved a block of registers for the time-of-day clock, you have to set the correct time. With Concept, you must go online and set the register bits individually, using the following guidelines for setting the status bits and setting the time bits. The CPU must be running.

Setting the Status Bits

The control register (4x) uses its four most significant bits to report status.

<table>
<tr><th colspan="16">Control Register</th></tr>
<tr><td>1</td><td>2</td><td>3</td><td>4</td><td>5</td><td>6</td><td>7</td><td>8</td><td>9</td><td>10</td><td>11</td><td>12</td><td>13</td><td>14</td><td>15</td><td>16</td></tr>
<tr><td></td><td></td><td></td><td colspan="13">1 = error</td></tr>
<tr><td></td><td></td><td colspan="14">1 = All clock values have been set</td></tr>
<tr><td></td><td colspan="15">1 = Clock values are being read</td></tr>
<tr><td colspan="16">1 = Clock values are being set</td></tr>
</table>

Setting the Time Bits

The following table shows how the registers handle time-of-day clock data, where register 4x is the first register in the block reserved for the clock:

Register	Data Content
4x	The control register
4x + 1	Day of the week (Sunday = 1, Monday = 2, etc.)
4x + 2	Month of the year (Jan = 1, Feb = 2, etc.)
4x + 3	Day of the month (1...31)
4x + 4	Year (00...99)
4x + 5	Hour in military time (0...23)
4x + 6	Minute (0...59)
4x + 7	Second (0...59)

Reading the Time-of-Day Clock on Momentum Components with Concept

Overview

This section uses an example to describe how to interpret the time-of-day clock registers.

Example

If you reserved registers 400100...400107 as your TOD clock registers, set the time bits, and then read the clock at 9:25:30 on Thursday, July 16, 1998, the registers would display the following values:

Register	Reading	Indication
400100	0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0	All clock values have been set; clock values are being read
400101	5 (decimal)	Thursday
400102	7 (decimal)	July
400103	16 (decimal)	16
400104	98 (decimal)	1998
400105	9 (decimal)	9 a.m.
40010 6	25 (decimal)	25 minutes
40010 7	30 (decimal)	30 seconds

12.3 Modifying Modbus Port Parameters

Overview

Purpose

The communication parameters on the Modbus ports are set at the factory. This section describes how to access the Modbus Port Settings dialog box and edit the default parameters.

What's in this Section?

This section contains the following topics:

Accessing the Modbus Port Settings Dialog Box

Introduction

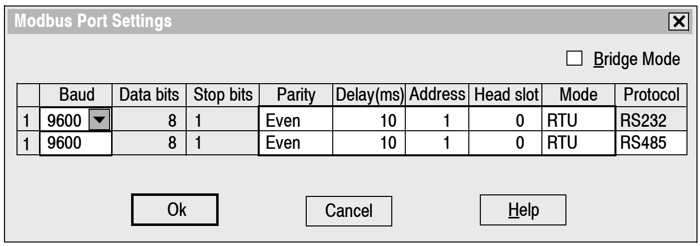
Modbus port parameters can be modified using the Modbus Port Settings dialog box in Concept.

How to Get There

From the Configure menu, select **Modbus port settings...** .

Modbus Port Default Settings

If you have not previously modified any port parameters, the following dialog box will appear. The dialog box shows the default parameters for two Modbus ports, 1 and 2, if your system configuration supports two ports.
If you have previously modified any communication port parameters, the new values will appear in the dialog box.



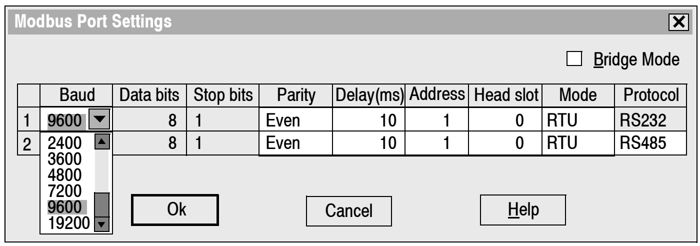
Changing the Baud Rate on Modbus Comm Ports for Momentum Components Using Concept

Overview

Each port can be configured for a baud in the range 50 ... 19,200. Sixteen valid baud rates are user-selectable. The factory-set default is 9600 baud.

Procedure

To change the baud parameter, perform the steps in the following table

Step	Action
1	Click on the down arrow under the Baud heading. Result: A menu appears displaying 16 baud values. 
2	Click on the desired rate. **Result:** The Modbus Port Settings dialog box is updated with the Baud number you have specified.

Changing Mode and Data Bits

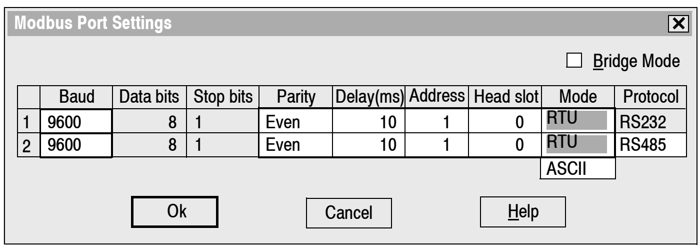
Introduction

From the Modbus Port Settings dialog box, each port can be configured to operate in one of two possible modes – RTU or ASCII.
- If the mode is RTU, the number of data bits is always 8.
- If the mode is ASCII, the number of data bits is always 7.

Note: The factory-set default is 8-bit RTU.

Procedure

To change the mode and data bit parameters, perform the steps in the following table.

<table>
<tr><th>Step</th><th></th></tr>
<tr><td>1</td><td>Click on the down arrow under Mode. A menu appears displaying your two Mode options


</td></tr>
<tr><td>2</td><td>Click on the RTU or ASCII entry.
Result: The Ports setting Window is updated with the Mode type you have specified, the corresponding Data Bit value appears.
Example: If you change Modbus Port 1 from RTU mode to ASCII mode, the Data Bit value also automatically changes from 8 to 7.</td></tr>
</table>

Stop Bit Should Not Be Changed

The stop bit default is 1. Do not change.

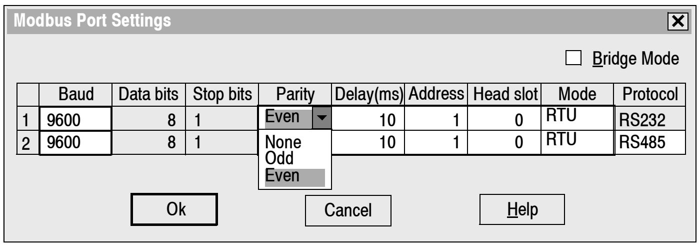
Changing Parity on Modbus Comm Ports

Introduction

From the Modbus Port Setting screen, a port can be configured for even, odd, or no parity checking. The factory-set default is EVEN parity

Procedure

To change the parity parameter, perform the steps in the following table.

Step	Action
1	Click on the down arrow under the **Parity** heading. **Result:** A menu appears with the three Parity choices. 
2	Click on the **None**, **Odd** or **Even** entry. **Result:** The Modbus Port Settings dialog box is updated with the Parity type you have specified.

Changing the Delay on Modbus Ports

Overview

The Delay parameter is set to 10 ms and should be left at this value for most applications. Do not change this parameter unless your application demands it.
If you must change this parameter, you may select a value from 10 ... 1000 ms, in 10 ms increments.

Delay Timing

If you use baud rates lower than 4800, adjust the delay timing as indicated in the following table

Baud Rate	Delay (in ms)
2400	20
1200	30
600	50
300	100

Procedure

Follow the steps in the table below to change the delay:

Step	Action
1	Click on the Delay parameter for the port.
2	Type a new value in the range 10 ... 1000 ms, using increments of 10 ms.

Changing the Modbus Address

Overview

Each port can be assigned a Modbus network address in the range 1 ... 247. That address must be unique with respect to all other device addresses on the same Modbus networks.
Since Modbus port 1 and Modbus port 2 are always on different Modbus networks, they can both be assigned the same address value without conflict. The factory-set default for both ports is address 1.

Procedure

From the Modbus Port Settings dialog box, perform the steps in the following table to change the Modbus Address.

Step	Address
1	Click on the Address field for the appropriate Modbus port.
2	Type a new value in the range 1 ... 247.

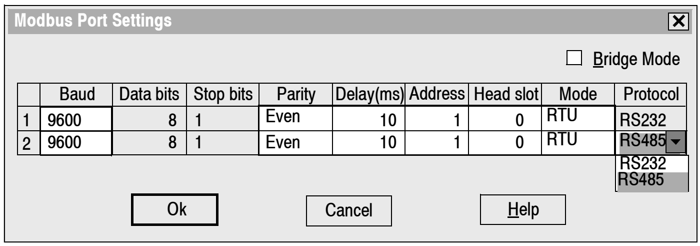
Changing the Protocol on Modbus Port 2 for Momentum Components Using Concept

Overview

If your Momentum M1 CPU is using the Modbus port 2 provided by the 172 JNN 210 32 option adapter, you can specify whether it will use the RS232 or RS485 protocol. The factory-set default for Modbus port 2 is RS485.

Procedure

From the Modbus Port Settings dialog box, perform the steps in the following table to change the protocol on Modbus port 2.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Click on the down arrow under the Protocol heading.
Result: A menu appears with the two protocol options.


</td></tr>
<tr><td>2</td><td>Click on RS232 or RS485.
Result: The Modbus Port Settings dialog box is updated with the protocol you have specified.</td></tr>
</table>

12.4 Configuring Ethernet Address Parameters and I/O Scanning

Overview

Purpose

This section describes how to configure the Ethernet port using Concept, including IP address, other address parameters and I/O scanning.

What's in this Section?

This section contains the following topics:

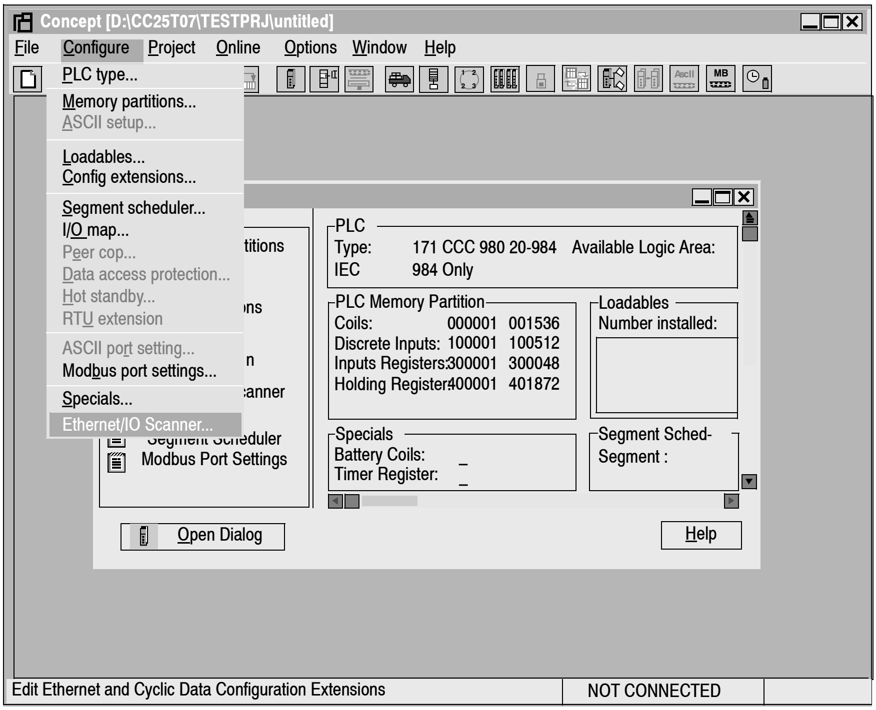
Accessing the Ethernet / I/O Scanner Screen

Introduction

Ethernet address and I/O scanning parameters can be modified using the Ethernet I/O Scanner dialog box in Concept.

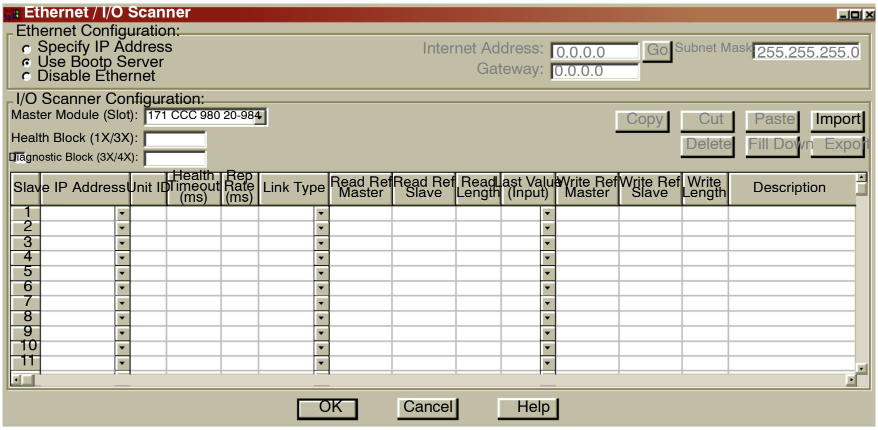
How to Get There

From the Configure menu, select Ethernet / I/O Scanner.... This menu option will only be available if you have selected an M1 processor adapter with an Ethernet port.



Ethernet Port Default Settings

If you have not previously modified any port parameters, the following dialog box will appear. The dialog box shows the default parameters for the Ethernet port.
If you have previously modified any communication port parameters, the new values will appear in the dialog box.



Ethernet Configuration Options for Networks with Momentum Components (Using Concept)

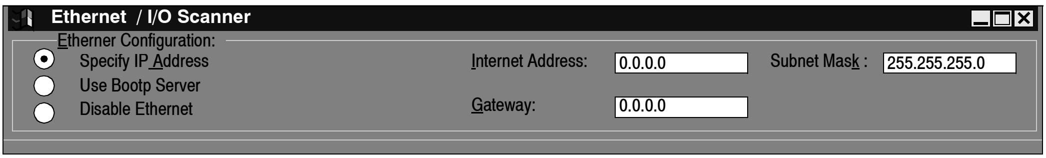
Overview

The Ethernet / I/O Scanner screen offers three options for configuring the Ethernet port on an M1 processor adapter.

- Specify IP Address
- Use Bootp Server
- Disable Ethernet

Specify IP Address

This option allows you to type the IP address, gateway and subnet mask in the text boxes in the upper right-hand corner of the screen.



Use Bootp Server

This is the default. Click this radio button if you want the address parameters to be assigned by a Bootp server. If you select this option, the address parameter text boxes in the upper right-hand corner of the screen will be grayed out. They will not display the actual address parameters.

Disable Ethernet

Click this radio button if you want to disable the Ethernet port. Disabling the port will reduce the scan time for the processor adapter.

> **Note:** If you choose the Disable Ethernet option, you will no longer be able to communicate with the adapter via the Ethernet port. Programming must then be done via an RS485/232 port or via a Modbus Plus port.

Setting Ethernet Address Parameters for a Network with Momentum Components (Using Concept)

Overview

If you choose to specify the IP address, you should complete all three text boxes in the upper right-hand corner of the dialog box:

- IP Address
- Gateway
- Subnet Mask

CAUTION

UNINTENDED OPERATION - DUPLICATE IP ADDRESS

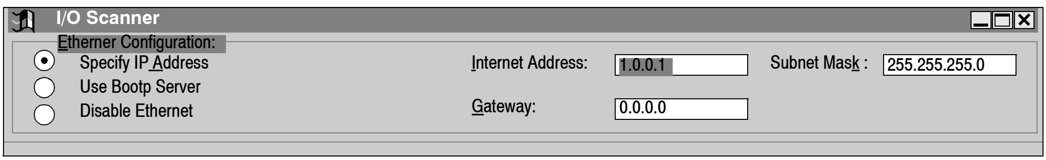
Having two or more devices with the same IP address can cause unpredictable operation of your network.

- Obtain a valid IP address from your system administrator to avoid duplication.
- Ensure that this device will receive a unique IP address.

Failure to follow this instruction can result in injury or equipment damage.

IP Address

Type a valid IP address in the Internet Address text box, as shown.

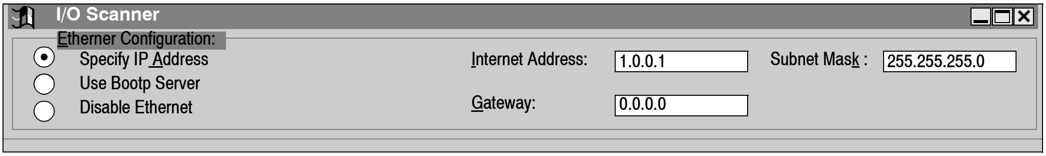


Gateway

Consult your system administrator to determine the appropriate gateway. Type it in the Gateway text box, as shown.

Subnet Mask

Consult your system administrator to obtain the appropriate subnet mask. Type it in the Subnet Mask text box, as shown.



Configuring Ethernet I/O for Momentum Components (Using Concept)

Overview

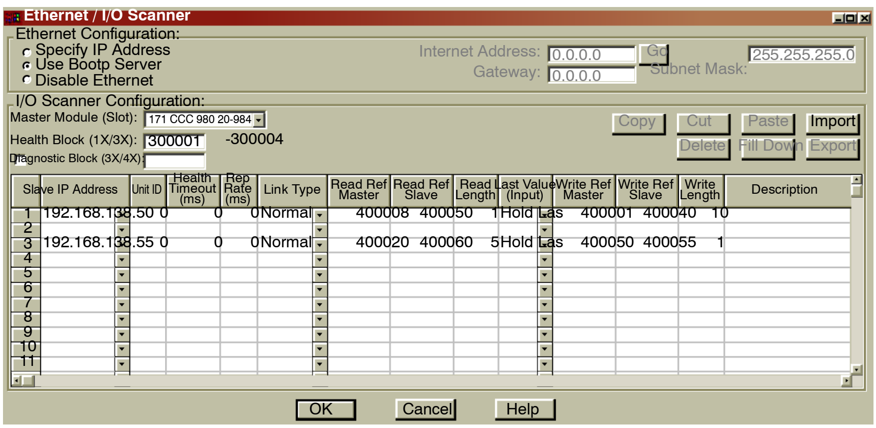
Once the Ethernet port address parameters have been set, you may assign parameters for I/O scanning.

Health Block

Specify the starting register of the register block which will contain the health bits for each of the IO Scanner transactions that you intend to configure.
If you designate a 3x register, the health bits for 64 transactions (maximum) will be stored in 4 contiguous registers starting at the address you specify
If you designate a 1x register, the health bits will be stored in 64 contiguous discrete registers.
A health bit is set only if the associated transaction has completed successfully within the last health timeout period for that transaction (see below). When the PLC is started, all configured transactions have their respective health bit preset to 1. If the transaction subsequently fails, then the health bit is cleared after the programmed health timeout period has expired.

IP Address

Type the IP address of the slave module in the IP address column. This address will be stored in a pull-down menu, so that you may use it in another row by clicking on the down arrow and selecting it, as shown:



Unit ID

If the slave module is an I/O device attached to the specified slave module, use the Unit ID column to indicate the device number.

Health Timeout

Use this column to specify the length of time in ms to try the transaction before timing out. Valid values are 0 ... 65,000 ms (1 min). To avoid timing out, specify 0.

Rep Rate

Use this column to specify how often in ms to repeat the transaction. Valid values are 0 ... 65,000 ms (1 min). To repeat the transaction continually, specify 0.

Read

Use the read function to read data from the slave to the master. The **Read Ref Slave** column specifies the first address to be read. The **Read Length** column specifies the number of registers to read. The **Read Ref Master** column specifies the first address to read to.

Write

Use the write function to write data from the master to the slave. The **Write Ref Master** column specifies the first address to write. The **Write Length** column specifies the number of registers to write. The **Write Ref Slave** column specifies the first address to write to:

Read and Write

You may include read and write commands on the same line, as shown in the preceding screen capture.

Description

You can type a brief description (up to 32 characters) of the transaction in the Description column.

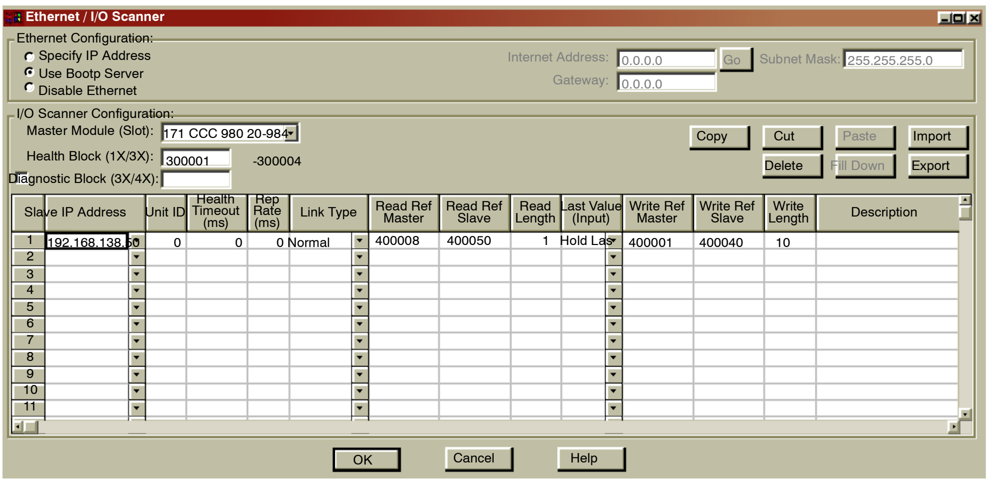
Completing the Ethernet I/O Configuration

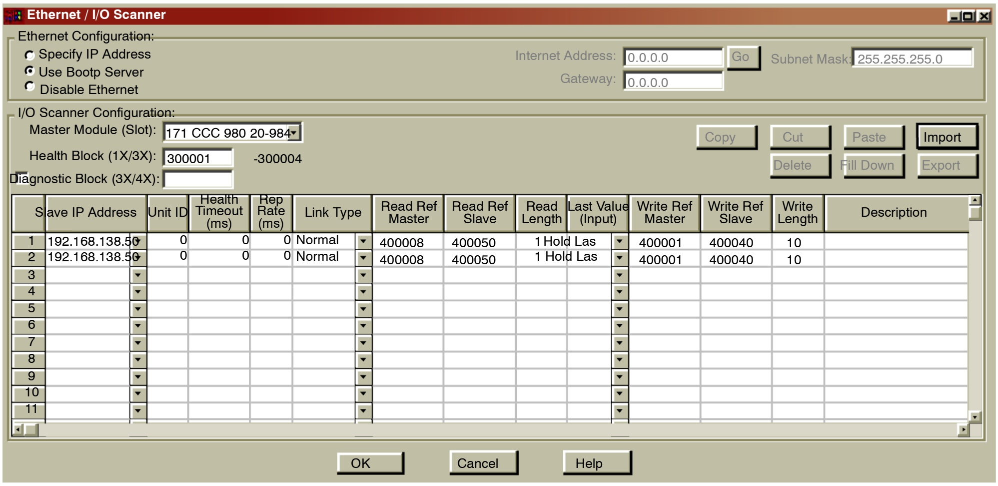
Introduction

This section describes how to complete your Ethernet I/O configuration using the Copy, Cut, Paste, Delete, Sort and Fill Down buttons.

Copy and Paste

To save time when typing similar read and write commands, you may copy and paste entire rows within your configuration. Follow the steps in the table below:

Step	Action
1	Select the row you want to copy by clicking on the row number at the far left. As shown below: 
2	Click the **Copy** button above the I/O configuration list.
3	Select the row where you would like to paste the data (by clicking on the row number at the far left).

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>4</td><td>Click the Paste button above the I/O configuration list.
As shown below:


</td></tr>
</table>

Cut and Paste

To move a row within the configuration list, follow the directions for copying, only use the **Cut** button instead of the **Copy** button.

Delete

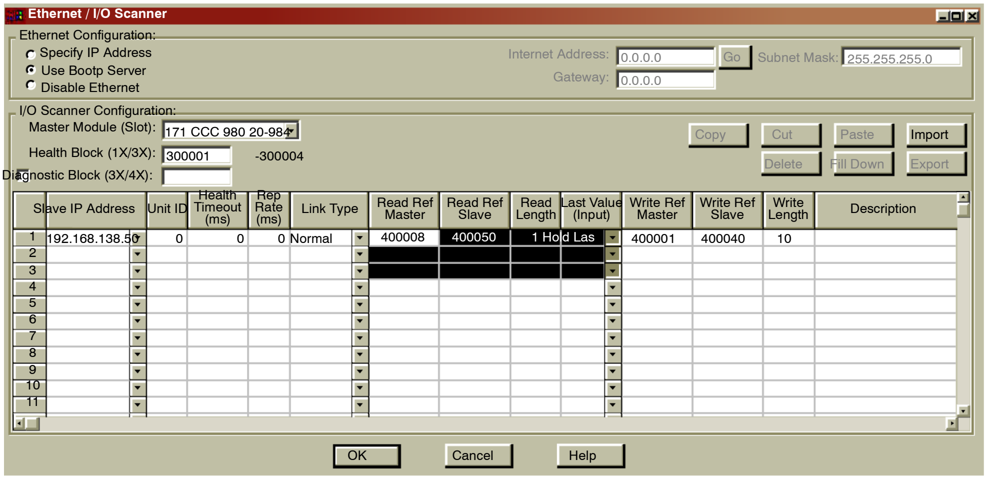
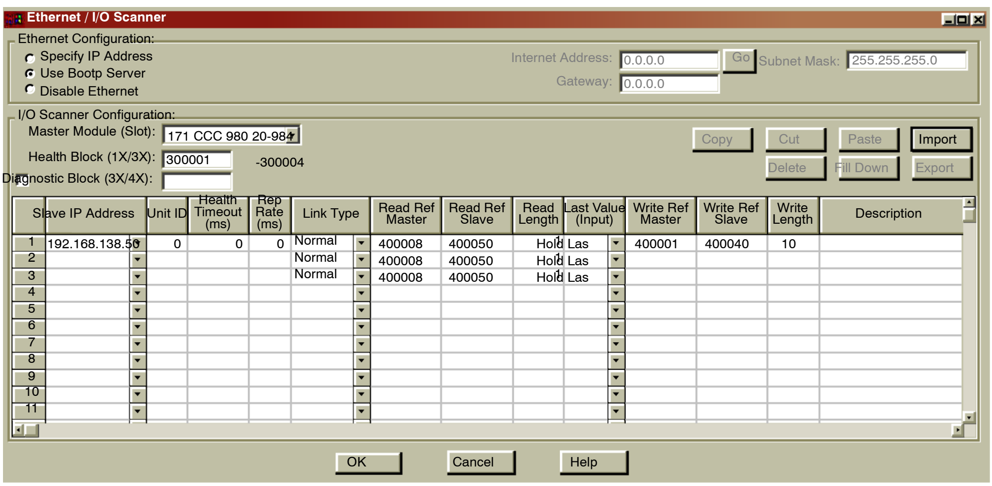
To delete a row from the configuration list, select the row by clicking on the row number at the far left. Then click the **Delete** button.

Sort

To sort the I/O configuration list, select a column by clicking on the column heading (i.e., Read Ref Master). Then click the **Sort** button.

Fill Down

To copy part of any row to the next row or to a series of adjoining rows, use the **Fill Down** button, following the steps in the table below:

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Use your mouse to select the data you would like to copy and the cells you would like to copy it to.
Note: You must select one contiguous block of cells, with the data to be copied in the first row. You cannot select two separate blocks.

</td></tr>
<tr><td>2</td><td>Click the Fill Down button.


Result: The data from the first row is copied to the selected cells below.</td></tr>
</table>

12.5 I/O Mapping the Local I/O Points

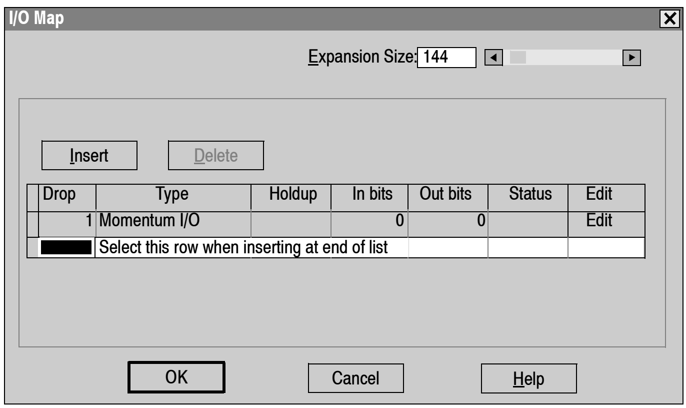
Accessing and Editing the I/O Map

Introduction

Every M1 processor adapter is assembled on an I/O base. The I/O points on the base are the local I/O for that processor.
As part of the configuration process, you need to create an I/O map for the local I/O. The I/O map assigns the appropriate range and type of reference values (0x, 1x, 3x, or 4x) from the CPU's state RAM to the input and/or output points on the local base.

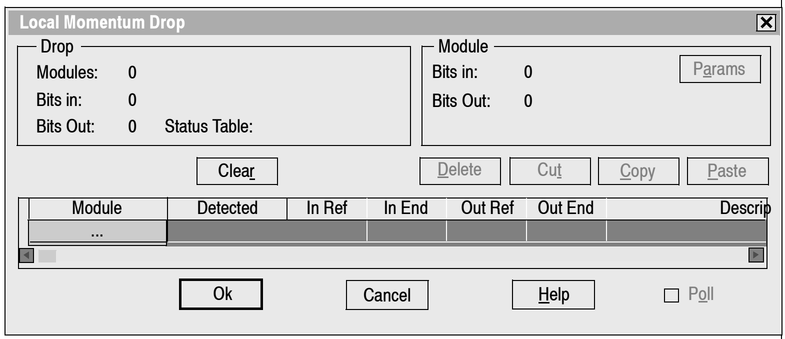
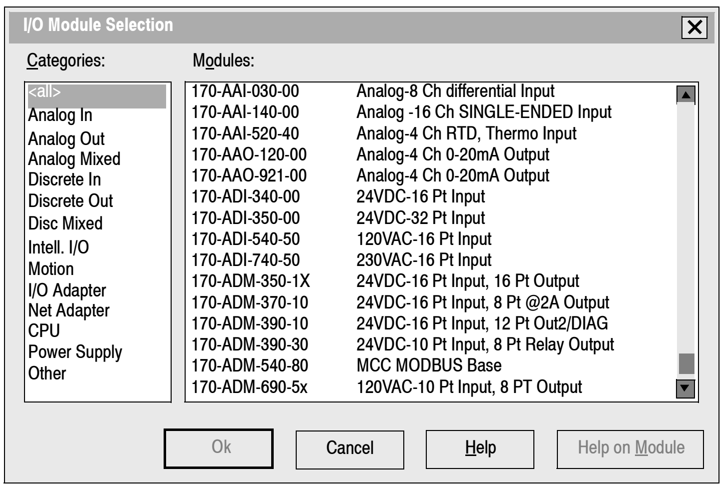
Accessing an I/O Map Screen

To access an I/O map screen from the PLC Configuration screen, select **I/O map...** from the Configure menu.
Result: The I/O Map dialog box appears.



Editing the Local I/O Map

From the I/O map dialog box, perform the steps in the following table to edit the local I/O map.

Step	Action
1	Click the **Edit...** button at the end of the row. **Result:** The Local Momentum I/O dialog box appears. 
2	Click the button under Module and select your local I/O base from the menu by scrolling down to the Module OR select the appropriate category and then select the module. 
3	Double-click on your selection or click the **<OK>** button. The I/O base you selected is displayed in the Local Momentum Drop dialog box.
4	Complete any required fields for Input and Output References.
5	Click the <OK> button.

Local I/O Only

This screen is always used to I/O map the local I/O base only. No other I/O base units can be I/O mapped on this first screen.

I/O Bus: A Special Case

If you are I/O mapping a processor adapter which supports I/O bus communication stations, you will need to go to a separate I/O map screen for drop 2. That process is described on *p. 303*.

I/O Mapping an I/O Bus Network with Concept

13

At a Glance

Purpose

This chapter describes how to I/O Map an I/OBus network using Concept 2.2.

What's in this Chapter?

This chapter contains the following topics:

Supporting an I/O Map for an I/OBus Network

Introduction

Three processor adapters have an I/O bus communication port that enables them to control and communicate with other network slave.
- 171 CCS 760 00
- 171 CCC 760 10
- 171 CCC 960 20
- 171 CCC 960 30

If you are using I/O bus to control network I/O, you need to write an I/O map in your configuration. This section describes the configuration parameters required to support an I/O map for I/O bus.

I/O Map Reserved Words

Be sure that you have reserved enough words for I/O mapping to support your I/O bus network. The default setting is 144 words. To estimate the number of words you require, allow:
- 16 words for overhead
- 10 words/module on the network (including both the local and the network I/O)

Allot sufficient memory to completely I/O map your network, while preserving as much user memory as possible for your application program.

Number of Segments

Be sure that the number of segments is set to 2. If you have changed this setting to 1, you will not be able to support an I/O bus network

Next Step

Once you are sure that your Configuration Overview parameters are set properly, you can access an I/O map screen for an I/O bus network (see *p. 305*).

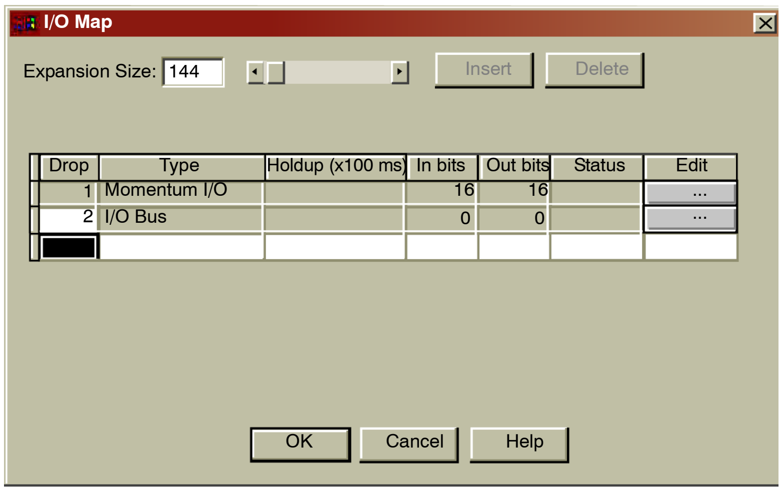
Accessing an I/O Map Screen for an I/OBus Network

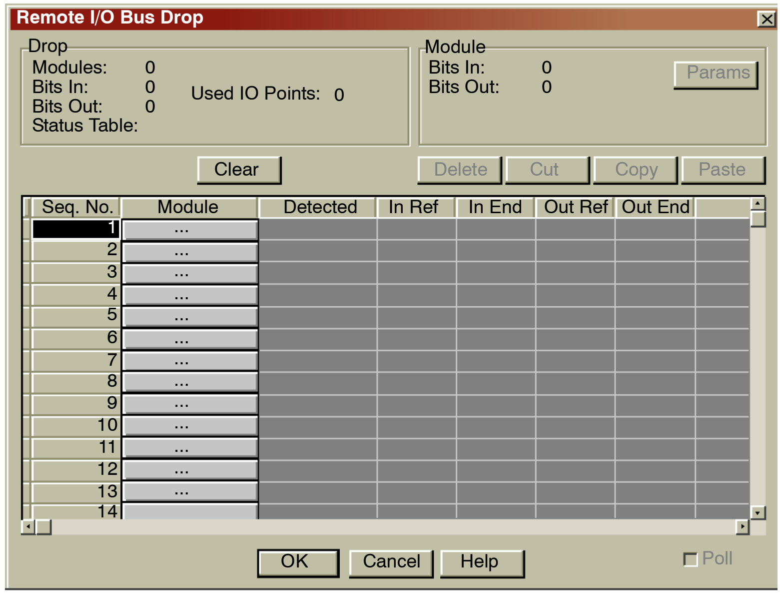
Overview

This section describes how to access an I/O map screen for an I/O bus network using Concept.

Procedure

To access the I/O map screen for your I/O bus network, perform the steps in the following table.

Step	Action
1	From the Configure menu, select **I/OMap**. **Result:** The I/O Map dialog is displayed.
2	Click on the **Insert** button. **Result:** I/OBus is displayed as the Type for Drop 2. 

Step	Action
3	Click the **Edit...** button on the I/OBus line of the I/O Map dialog. The Remote I/O Bus Drop dialog appears. 
4	Editing the I/O bus I/O map (see *p. 307*).

Editing the I/OBus I/O Map for Components Using Concept

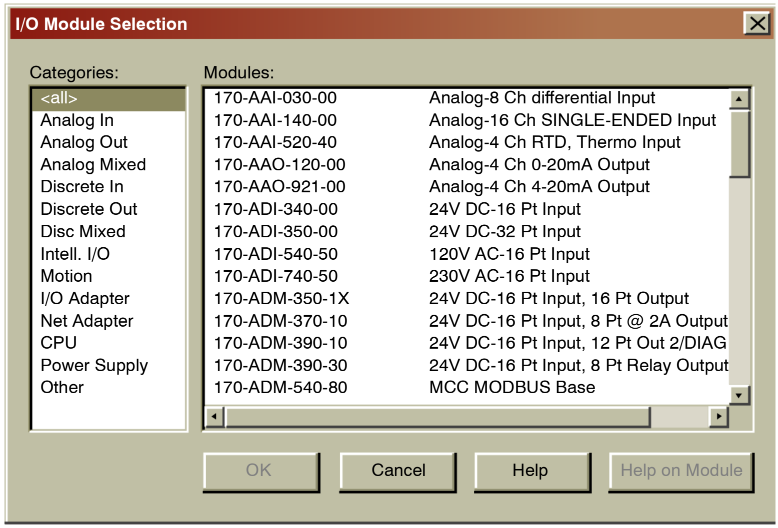
Overview

The maximum number of modules which can be I/O mapped on the I/O bus network depends on your processor adapter and its executive.

Processor Adapter	Executive	Max. Modules	Max. I/O Bits
171 CCS 760 00	984	128	2048
	IEC	44	1408
171 CCC 760 10	984	128	2048
	IEC	44	1408
171 CCC 960 20	984	256	4069
	IEC	128	1408
171 CCC 960 30	984	256	4096
	IEC	128	1408

Procedure

To enter I/O bases or INTERBUS I/O modules using the Remote I/O Bus Drop dialog, perform the steps in the following table.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Click on the button under the Module heading. A list of module types is displayed, including I/OBus modules identified by code number (a list of codes is provided at the end of this section):

</td></tr>
<tr><td>2</td><td>Click on the desired model number and then click the <OK> button.
Result: The module type and its description are displayed on the Remote I/O Bus Drop screen. The proper field is enabled so that you can assign state RAM reference(s) to the unit.</td></tr>
<tr><td>3</td><td>Enter the desired reference number. Where there is more than one register the balance is automatically assigned.</td></tr>
<tr><td>4</td><td>Continue to select and map modules one after the other. You must enter the modules in contiguous node slots on the screen, e.g. you cannot enter a module in slot 7 if you have not filled slot 6.</td></tr>
</table>

Generic INTERBUS Module Identifier Codes

INTERBUS device manufacturers embed an identifier code in their network slave modules in conformance with INTERBUS standards. The code identifies a device by its I/O type but not its specific model or name.

I/O bus recognizes the INTERBUS identifier codes provided below and allows you to I/O map devices that use these codes. However, you cannot use the module zoom screens to define the parameters for these INTERBUS modules.

Identifier Code	I/O Type
0101_IOBUS	One-word discrete output
0102_IOBUS	One-word discrete input
0103_IOBUS	One-word discrete bidirectional
0201_IOBUS	Two-word discrete output
0202_IOBUS	Two-word discrete input
0203_IOBUS	Two-word discrete bidirectional
0231_IOBUS	Two-word analog output
0232_IOBUS	Two-word analog input
0233_IOBUS	Two-word analog bidirectional
0301_IOBUS	Three-word discrete output
0302_IOBUS	Three-word discrete input
0303_IOBUS	Three-word discrete bidirectional
0331_IOBUS	Three-word analog output
0332_IOBUS	Three-word analog input
0333_IOBUS	Three-word analog bidirectional
0401_IOBUS	Four-word discrete output
0402_IOBUS	Four-word discrete input
0403_IOBUS	Four-word discrete bidirectional
0431_IOBUS	Four-word analog output
0432_IOBUS	Four-word analog input
0433_IOBUS	Four-word analog bidirectional
0501_IOBUS	Five-word discrete output
0502_IOBUS	Five-word discrete input
0503_IOBUS	Five-word discrete bidirectional
0531_IOBUS	Five-word analog output
0532_IOBUS	Five-word analog input
0533_IOBUS	Five-word analog bidirectional
0633_IOBUS	Eight-word analog bidirectional
1233_IOBUS	Sixteen-word analog bidirectional

Configuring a Modbus Plus Network in Concept with Peer Cop

14

At a Glance

Purpose

Communication transactions over Modbus Plus are defined in Concept by a configuration tool called Peer Cop. This section uses examples to explain how to use Peer Cop to configure the two types of network architecture:
- An I/O network, where the Peer Cop of the CPU defines all the communication transactions over the full network.
- A supervisory network with two or more CPUs communicating with each other and with additional devices on the network.

Note: The minimum Concept version for the 171CCC96030 and 171CCC98030 is v2.2, Service Release 2.

What's in this Chapter?

This chapter contains the following sections:

14.1 Getting Started

Overview

Purpose

This section explains how to access the Peer Cop Configuration Extension screen and describes the default screen.

What's in this Section?

This section contains the following topics:

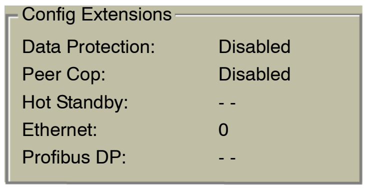
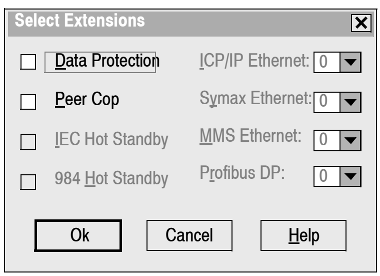
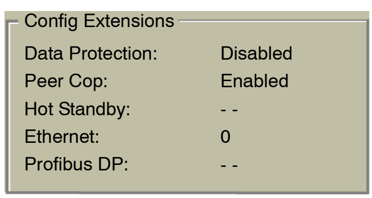
Accessing the Peer Cop Dialog Box

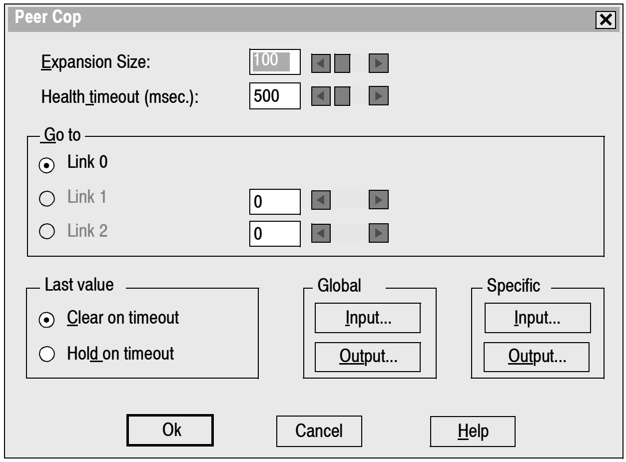
Introduction

This section describes how to access the Peer Cop dialog box in Concept.

Accessing the Screen

Follow the steps below to access the Peer Cop from the PLC Configuration Screen.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Check the status of Peer Cop.
If Peer Cop is enabled, jump to step 4.
If Peer Cop is disabled, continue with step 2.
Example: The Peer Cop status is reported in the Configuration Extensions section of the PLC Configuration Screen. Here Peer Cop is disabled:

</td></tr>
<tr><td>2</td><td>Double-click on the Peer Cop field.
Result: The Configuration Extension dialog box appears.

</td></tr>
<tr><td>3</td><td>Click the check box next to Peer Cop, then click OK.
Result: Peer Cop status changes from Disabled to Enabled in the PLC Configuration screen.

</td></tr>
</table>

Step	Action
4	Select **Peer Cop** from the Configure menu. **Result:** The Peer Cop dialog box appears. 

Adjusting the Amount of Extension Memory with Peer Cop

Introduction

The default amount of memory allotted for Configuration Extension is 100 words. This amount may be adjusted within the Peer Cop dialog box

Extension Memory Size

The minimum Peer Cop memory requirement is 20 words; the maximum is 4041 words.

Estimating How Much Memory to Reserve

Follow these guidelines for estimating the amount of extension memory you will need for your Peer Cop database:

For...	Add...	Up to a maximum of...
Overhead	9 words	--
Global output	5 words	--
Global input	number of words= number of devices x (1 + 2 x number of device subentries)	1088 words
Specific output	2 words for every device entry in Peer Cop	128 words
Specific input	2 words for every device entry in Peer Cop	128 words

Changing the Amount of Memory

Type the desired size in the Expansion Size text box or use your mouse to adjust the button on the horizontal slider.

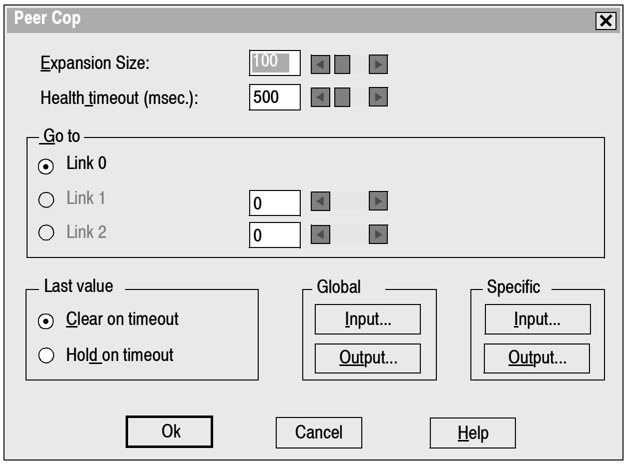
Other Default Settings in the Peer Cop Dialog Box

Overview

This section describes the default settings for Health Timeout and Last Value.

Diagram

The first time you access the Peer Cop dialog box, the following screen appears:



Health Timeout

The default timeout is 500 ms.
Timeout is the maximum interval that Modbus Plus on a Peer-Copped device will remain healthy without communication activity. If this interval is exceeded, the device will clear its network health bit and will no longer try to communicate via Modbus Plus.
The timeout interval must be in the range 20...2000 ms, and it must be specified as an increment of 20 ms.

Last Value

The default Last Value setting is Clear on timeout. This setting specifies how a peer-copped device will treat the last values received before a timeout, once Modbus Plus communications have been restored.

Option	Effect
Clear on timeout	Sets all values received before timeout to 0.
Hold on timeout	Retains the values received before timeout.

14.2 Using Modbus Plus to Handle I/O

Overview

Purpose

This section uses an example to explain how to configure a Modbus Plus network for I/O servicing. In this example, a CPU will control four Momentum I/O modules.

What's in this Section?

This section contains the following topics:

Devices on the Network

Introduction

This section describes the five devices which comprise the sample network and the strategy used to assign addresses.

Procedure

The following table list the Modbus plus address and components of each TSX module on the network.

Modbus Plus Address	I/O Base Type	Adapter Type
1	(type not specified)	M1 processor adapter (type not specified) 172 PNN 210 22 Modbus Plus option adapter
2	170 ADI 340 00 16-point input	170 PNT 110 20 Modbus Plus communication adapter
3	170 ADO 340 00 16-point output	170 PNT 110 20 Modbus Plus communication adapter
4	170 ADI 350 00 32-point input	170 PNT 110 20 Modbus Plus communication adapter
5	170 ADO 350 00 32-point output	170 PNT 110 20 Modbus Plus communication adapter

Address Strategy

In this type of architecture, assign the lowest network address (1) to the CPU. When the network initializes, the CPU will be the first device to get the token, and the token rotation table will be built with respect to the controlling device on the network.

Changing the Peer Cop Summary Information

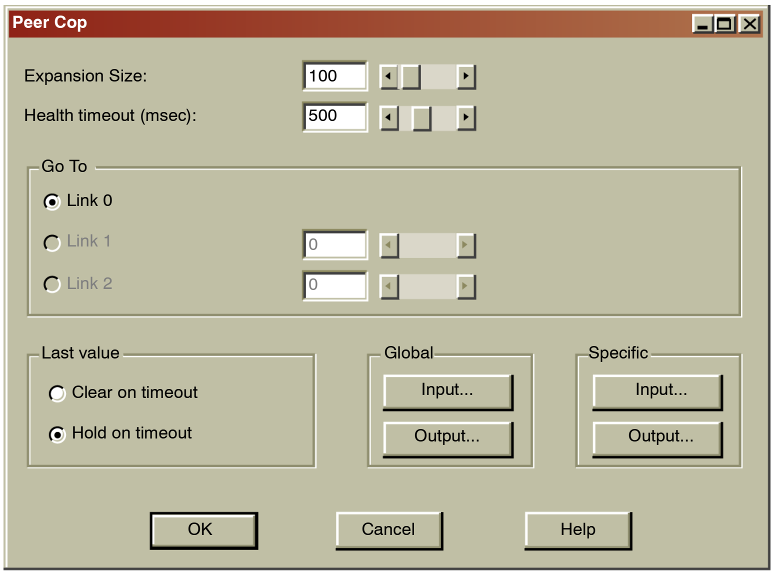
Overview

For our example, we will change the default Health Timeout setting to 240 ms and the default Last Value setting to Hold on timeout.

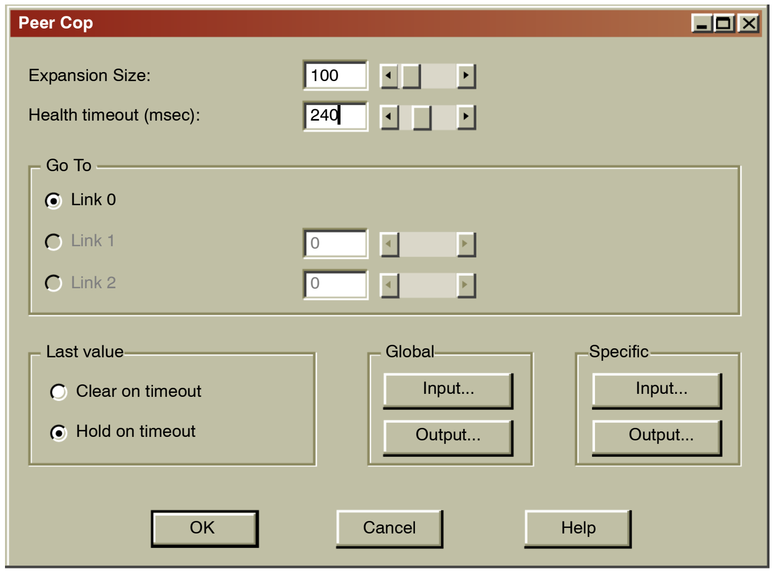
Procedure

Follow the steps in the table below to change the default values, using the Peer Cop dialog box.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Click the Hold on Timeout radio button.
Result: The Hold on Timeout option is selected and the Clear on Timeout option is deselected.



</td></tr>
</table>

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>2</td><td>Select the Health Timeout default value (500) with your mouse and type the new value (240) in its place OR use the horizontal slider to change the value.
Result: The new Health Timeout value is 240.

</td></tr>
<tr><td>3</td><td>Specifying references for input data (see p. 321).</td></tr>
</table>

Specifying References for Input Data

Introduction

This section describes how to specify the references for input data. In this example, you will start by accessing the device at Modbus Plus address 2, which is a 170 ADI 340 00 16-point input module.

Device Requirements

When you use Peer Cop to handle a Modbus Plus I/O architecture, you need to be aware of the type of I/O you are configuring at each network address. Peer Cop does not know that the device at address 2 is a discrete 16-point input module. You need to know that a specific input reference with a length of one word (16 bits) is required to handle this module.

We will assign a 3x register (300016) as a specific input to the CPU. When the 170 ADI 340 00 sends input data to the CPU, it will be sent to this register.

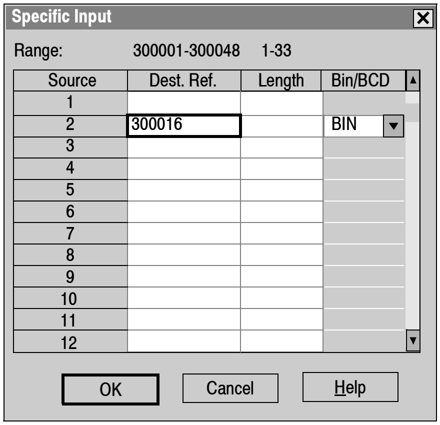
Procedure

Follow the steps in the table below to define the specific input, starting from the Peer Cop dialog box.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>

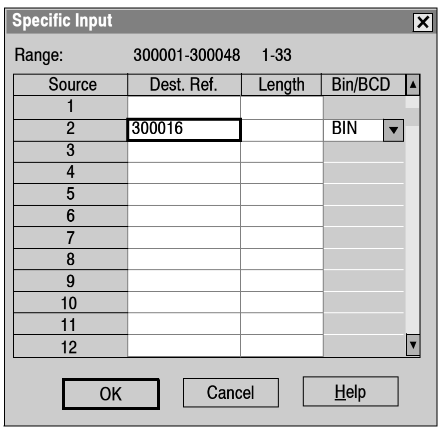
Click on the **Specific Input...** button.

Result: The Specific Input dialog box appears.

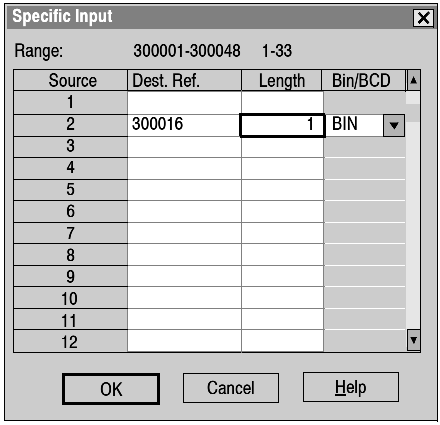
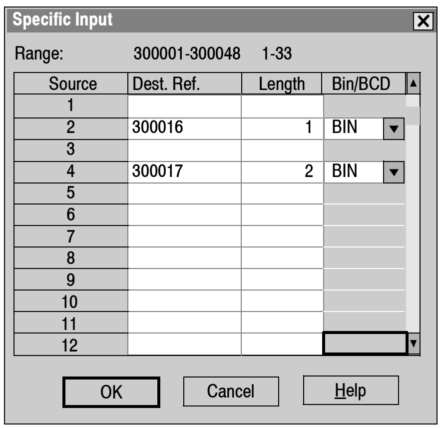


</td></tr>
<tr><td>2</td><td>

Since you are addressing the device at address 2, you will use the line for Source 2. Type the value **300016** on that line in the **Dest. Ref. column**.



</td></tr>
</table>

Step	Action
3	Type the value **1** in the **Length column**, indicating that the device at address 2 will exchange one word of data. In this case, we will leave the default BIN setting. 
4	Repeat steps 2 and 3 for the device at address 4, using the settings in the figure below. Then click **<OK>**. 

Next Step Specifying output references (see *p. 324*).

Specifying References for Output Data

Introduction

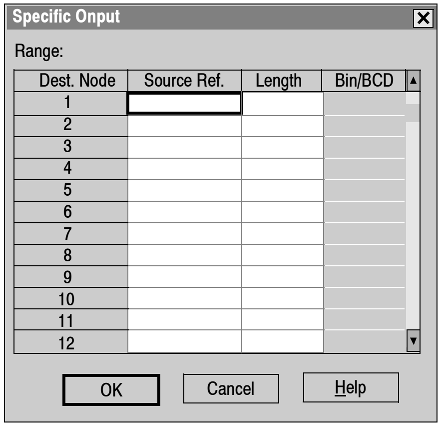
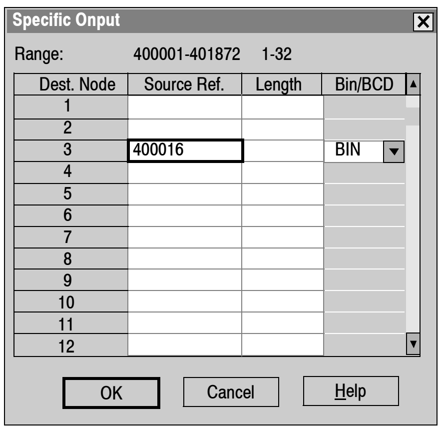
This section describes how to specify the references for output data. In this example, you will start by accessing the device at Modbus Plus address 3, which is a 170 AD0 340 00 16-point output module.

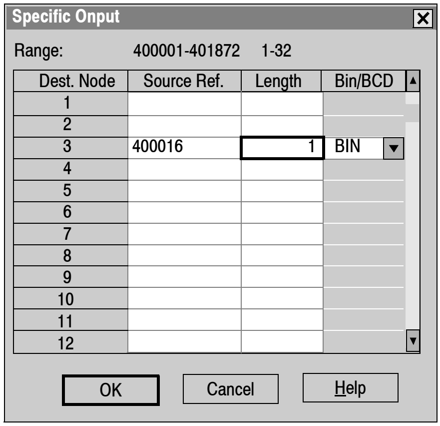
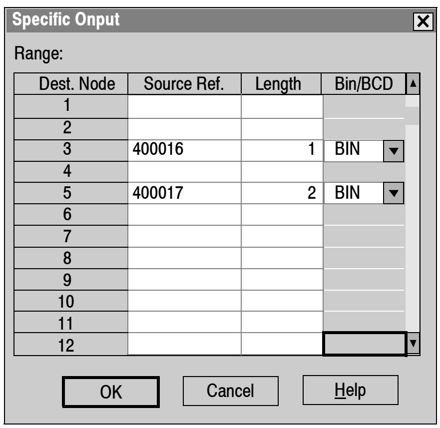
Device Requirements

When you use Peer Cop to handle a Modbus Plus I/O architecture, you need to know which type of I/O you are configuring at each network address and how many input or output references each device requires. In this example, we will create a specific output reference with a length of one word (16 bits).
We also will assign a 4x register (400016) as a specific input to the CPU. When the the 170 ADO 340 00 sends input data to the CPU, it will be sent to this register

Procedure

Follow the steps in the table below to define the specific output.

Step	Action
1	Click on the **Specific Output...** button in the Peer Cop dialog box. **Result:** The Specific Output dialog box appears. 
2	Since you are addressing the device at address 3, you will use the line for Source 3. Type the value **400016** on that line in the **Dest. Ref. column**. 

Step	Action
3	Type the value **1** in the **Length column**, indicating that the device at address 3 will supply one word of data. In this case, we will leave the default BIN setting. 
4	Repeat steps 2 and 3 for the device at address 5, using the settings in the figure below. Then click **<OK>**. 

14.3 Passing Supervisory Data over Modbus

Overview

Purpose

This Peer Cop example deals with a network where three CPUs communicate over Modbus Plus. Each device will need to have its own Peer Cop configuration.

What's in this Section?

This section contains the following topics:

Devices on a Supervisory Modbus Plus Network

Introduction

This section describes the three CPUs which exchange data over the sample Modbus Plus network and the strategy used to assign node addresses.

Devices

The three CPUs and their functions are described in the following table.

MB+ Address	CPU	Function
1	Pentium supervisory computer with an ATRIUM 180-CCO-111-01 host-based PLC card	Receives specific input data and sends global outputs
2	171 CCS 760 00 Momentum M1 processor adapter with 172 PNN 210 22 Modbus Plus option adapter	Controls I/O bus network and exchanges data with ATRIUM supervisor
3	171 CCS 760 00 Momentum M1 processor adapter with 172 PNN 210 22 Modbus Plus option adapter	Controls I/O bus network and exchanges data with ATRIUM supervisor

Address Strategy

In this type of architecture, assign the lowest network address (1) to the supervisory computer. When the network initializes, the supervisor will be the first device to get the token, and the token rotation table will be built with respect to the supervising device.

Specifying References for Input and Output Data

Overview

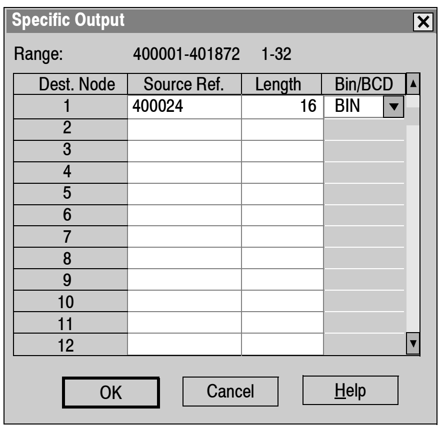
We will now set up the 171 CCS 760 00 Momentum M1 CPU at Modbus Plus address 2 to:

- send 16 4x registers of specific output to the supervisory computer at Modbus Plus address 1
- receive five 4x registers of global input data from the ATRIUM supervisor. These registers are the first five registers in a 10-register block of global outputs broadcast by the supervisory controller.

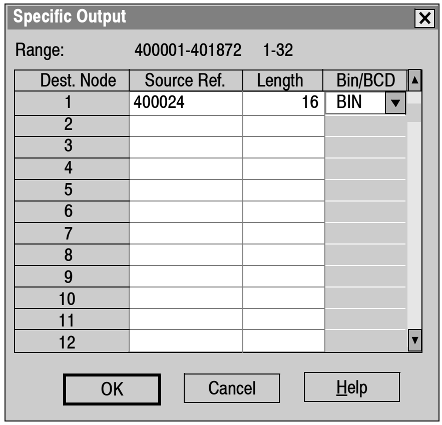
> **Note:** For this example, we will use the default values for Health Timeout (500 ms) and Last Value (Clear on timeout).

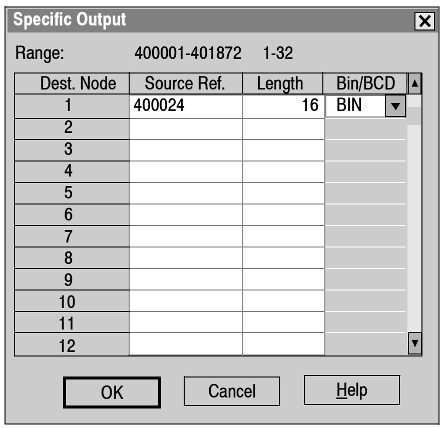
Defining the Specific Output

The following table describes how to define the specific output, starting from the Peer Cop dialog box.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Click on the Specific Output... button.
Result The Specific Output dialog box appears.

</td></tr>
</table>

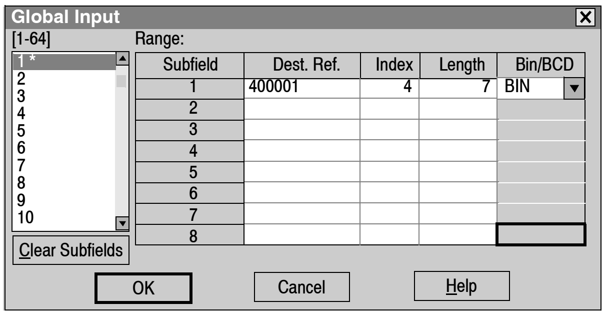
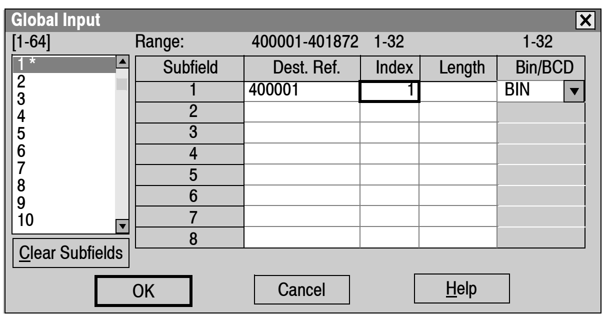
<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>2</td><td>Since you are addressing the device at address 1, you will use the line for Source 1. Type the value 400024 on that line in the Source Ref. column.

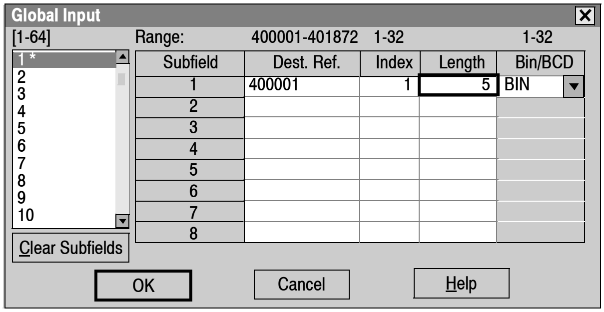

</td></tr>
<tr><td>3</td><td>Type the value 16 in the Length column, indicating that 16 words of data will be exchanged. In this case, we will leave the default BIN setting. Click <OK>.


</td></tr>
</table>

Defining the Global Inputs

Now the M1 needs to be Peer Copped to receive five words of global data from the supervisory PLC at Modbus Plus address 1. Follow the steps in the table specify the input reference.

Step	Action
1	Click on the **Global Input...** button. **Result:** The Global Input dialog box appears.
2	Since this device will be receiving data from the CPU at address 1, you do not need to change the default sending address (selected under the heading 1-64). Type **400001** in the **Dest. Ref column** on the first line, to indicate the first register the CPU will use to store the input data. 
3	Type the value **1** in the **Index column**, indicating that the CPU will receive part of the global input data beginning with the first word. 

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>4</td><td>Type the value 5 in the Length column, indicating that the CPU will accept five words of the global input data. Leave the default BIN setting.

</td></tr>
<tr><td>5</td><td>Click <OK>.</td></tr>
</table>

Next Step

Defining the references for the next node (see *p. 333*).

Defining the References for the Next Node

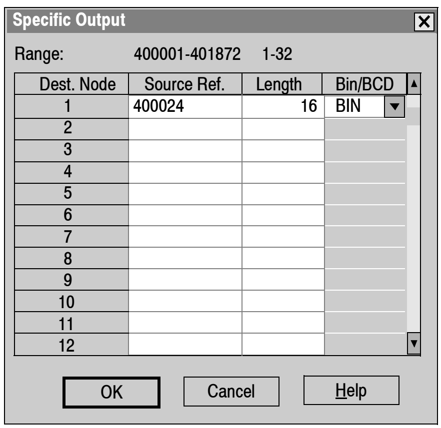
Overview

We now want to attach the Concept programming panel to the 171 CCS 760 00 Momentum M1 CPU at Modbus Plus address 3 and create a similar Peer Cop for this device to communicate with the supervisory PLC at Modbus Plus address 1. In this case, we want the M1:

- to send 16 words of specific output to the supervisor
- to receive the last seven words of global input from the supervisor. (Remember that the supervisor will be transmitting a total of 10 contiguous words of global data over the network.)

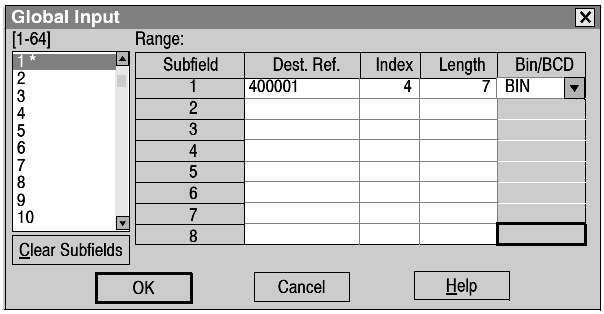
Defining Specific Outputs

Follow the steps in the table below to define the specific output in Peer Cop.

Step	Action
1	Click on the **Specific Output...** button. **Result:** The Specific Output dialog box appears.
2	Since you are addressing the device at address 1, you will use the line for Source 1. Type the value **400024** on that line in the **Dest. Ref. column**.
3	Type the value **16** in the **Length column**, indicating that 16 words of data will be exchanged. In this case, we will leave the default BIN setting. 
4	Click **<OK>**.

Defining Global Inputs

Follow the steps in the table below to define the global input data from the supervisory PLC at Modbus Plus address 1.

Step	Action
1	Click on the **Global Input...** button. **Result:** The Global Input dialog box appears.
2	Since this device will be receiving data from the CPU at address 1, you do not need to change the default sending address (selected under the heading 1-64). Type **400001** in the **Dest. Ref column** on the first line, to indicate the first register the CPU will use to store the input data.
3	Type the value **4** in the **Index column**, indicating that the CPU will receive part of the global input data beginning with the fourth word.
4	Type the value **7** in the **Length column**, indicating that the CPU will accept seven words of the global input data. Leave the default BIN setting. 
5	Click **<OK>**.

Next Step

Defining references for the supervisory PLC (see *p. 335*).

Defining References for the Supervisory PLC

Overview

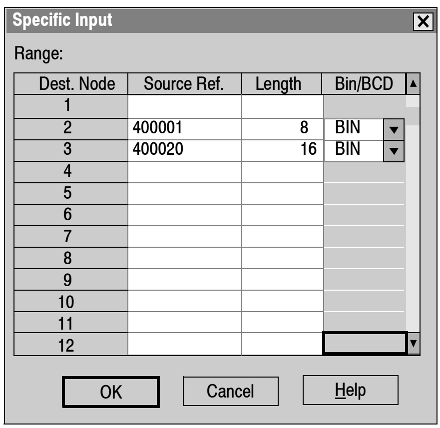
At this point, we will attach the Concept programming panel to the ATRIUM 180-CCO-111-01 supervisory PLC at Modbus Plus address 1 and set up Peer Cop screens to handle the M1 CPUs at addresses 2 and 3.

We know that the M1 at Modbus Plus address 2 is sending eight words of specific output to the supervisor and that the M1 at Modbus Plus address 3 is sending 16 words of specific output to the supervisor. The supervisor will receive this data as specific inputs.

We also know that the supervisor is sending 10 words of global data, parts of which will be received by both of the M1 CPUs.

Defining the Specific Inputs

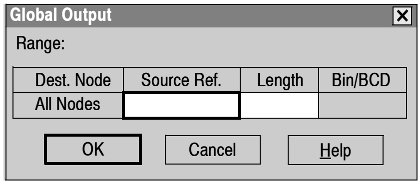
First we will define the specific inputs to be received by the supervisor.

Step	Action
1	Click on the **Specific Input...** button. **Result:** The Specific Input dialog box appears.
2	Enter the references for each CPU on the appropriate source line, as shown below. Then click **<OK>**. 

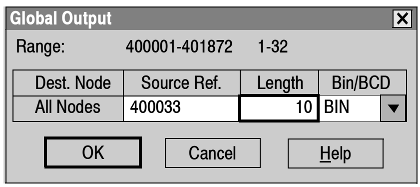
Defining the Global Outputs

This supervisory CPU sends out 10 words of global output, parts of which are received by each of the M1 CPUs.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Click on the Global Output... button.
Result: The Global Output dialog box appears.



</td></tr>
<tr><td>2</td><td>In the Source Ref. column, type the value 400033, the first register which will be sent.</td></tr>
<tr><td>3</td><td>In the Length column, type the value 10, the number of registers that will be sent.



</td></tr>
<tr><td>4</td><td>Click <OK>.</td></tr>
</table>

Saving to Flash in Concept

15

Saving to Flash in Concept

Overview

Save to Flash. In the event of an unexpected loss of power, the application logic and state RAM values will be preserved.
This section describes how to save the application logic and state RAM values to Flash using Concept.

Note: The following conditions apply for saving to Flash:

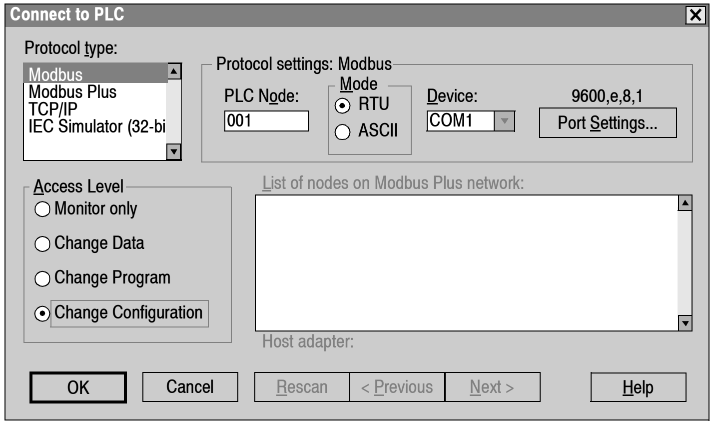
- All M1 programs using the 984LL Exec. have the option of saving to Flash.
- M1 programs using IEC Execs cannot be saved to Flash.
  The contents of memory must be retained using batteries, which are contained in the Option Adapter module.
- 171CCC96020s and 171CCC93020s can only use 984LL Execs. and have the option of saving to Flash.
- 171CCC96030s and 171CCC98030s can use either IEC or 984LL Execs., but the minimum 984LL Exec. version that can be used is v. 1.06.
  Both IEC and 984LL Execs. allow the option of saving to Flash.

Note: The 171CCC96030 and 171CCC98030 require Concept 2.2 with service release 2.

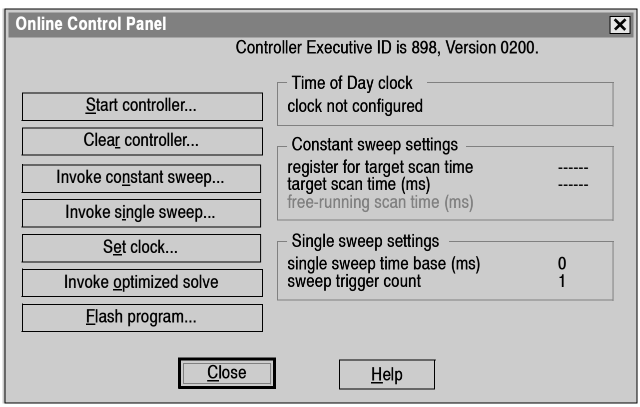
Procedure

Follow the steps in the table below to save to Flash.

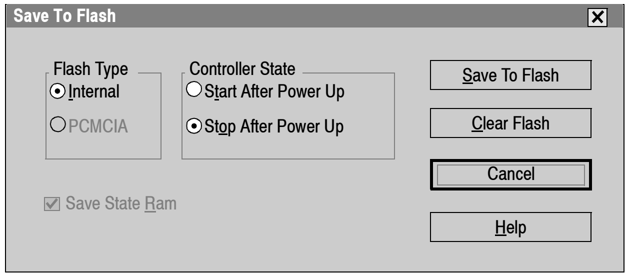
<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>From the Online menu on the main menu bar, select Connect.
Result: The Connect to PLC dialog box appears.



</td></tr>
<tr><td>2</td><td>Select the correct parameters to connect with your PLC. Under Access Level, select the radio button to Change Configuration.</td></tr>
<tr><td>3</td><td>Click <OK>.
Result: The Connect to PLC dialog box disappears and Concept connects to your PLC.</td></tr>
<tr><td>4</td><td>From the Online menu on the main menu bar, select Online Control Panel.
Result: The Online Control Panel appears.



</td></tr>
</table>

Step	Action
5	Click the **Flash program...** button. **Result:** The **Save to Flash** dialog box appears. 
6	Select the appropriate parameters in the dialog box and click the **Save to Flash** button. **Result:** A dialog box appears asking if you really want to save to Flash.
7	Click the **Yes** button. **Note:** Clicking **Yes** (to save to Flash) overwrites the previous application. **Result:** Concept completes the save to Flash operation, and a message appears on the screen confirming the completed save.

ProWORX32 and Momentum Components

V

At a Glance

Purpose

This part describes how to configure an M1 using ProWORX32.
Using ProWORX32 you can

- Configure an M1 Module
- Configure an I/O map and an I/O bus with the Configuration Tool
- Configure additional I/O with Traffic Cop
- Configure a Modbus Plus network with Peer Cop and I/O Scanner
- Monitor the health of the system
- Save your configuration to Flash

What's in this Part?

This part contains the following chapters:

Configuring an M1 with ProWORX32

16

At a Glance

Purpose

This chapter explains how to configure an M1 using ProWORX32.

What's in this Chapter?

This chapter contains the following topics:

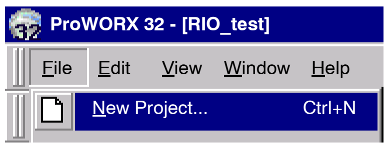
Configuring an M1 Module with ProWORX32

Introduction

Every M1 processor adapter is assembled onto an I/O base.
Use the **Configuration** wizard to configure the CPU and the I/O Base. The project configuration wizard walks you through creating a new default project or modifying existing projects. Each screen in the wizard has a caption stating which step you are currently competing. Also, each screen has a diagram and a description detailing what the current step involves.

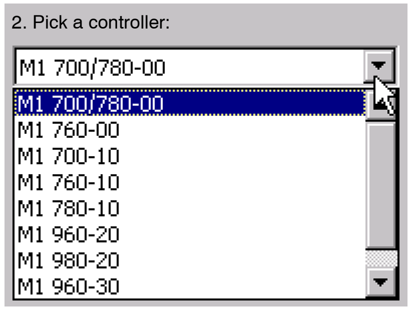
Creating a New Project

Follow these steps to create a new project.

Step	Action
1	Start ProWORX32.
2	Select **File | New Project...** . 
3	The **Select Project Name** dialog box appears. Enter a project name in the **New Project Name:** field. Click **OK**.
4	The **New Project** wizard appears.
5	In the **New Project [name of project] - Select creation method** window, select the default: ● Offline ● Select Controller Type Other options are available, but Schneider Electric recommends selecting the default.
6	Click **Next >** .

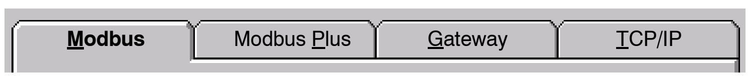
Selecting a Controller Family and a Controller

Working through the wizard, in the **New Project [name of project] - Select Controller** window, do the following.

Step	Action
1	Select **Momentum** from the **Pick a controller family:** drop-down list.
2	Select a Momentum controller from the **Pick a controller:** drop-down list box. 
3	Click **Next >** .

Selecting a Communications Mode to the Controller and Finishing

Still in the wizard, in the **New Project [name of project] - Communications Setup** window, do the following.

Step	Action
1	Select and configure the desired communication mode to the controller:  Each communication mode has specific settings found under one of the four tabs shown in the preceding figure.
2	Click **Next >** .
3	The **New Project [name of project] - Finish** window appears. This window confirms the **Controller Type**, the **User Memory**, and the **Progress**. If you need to make changes, click **< Back** and make your changes.
4	Your project and communication method is complete. Click **Finish**. The newly created project appears in the project navigation tree in the projects panel.

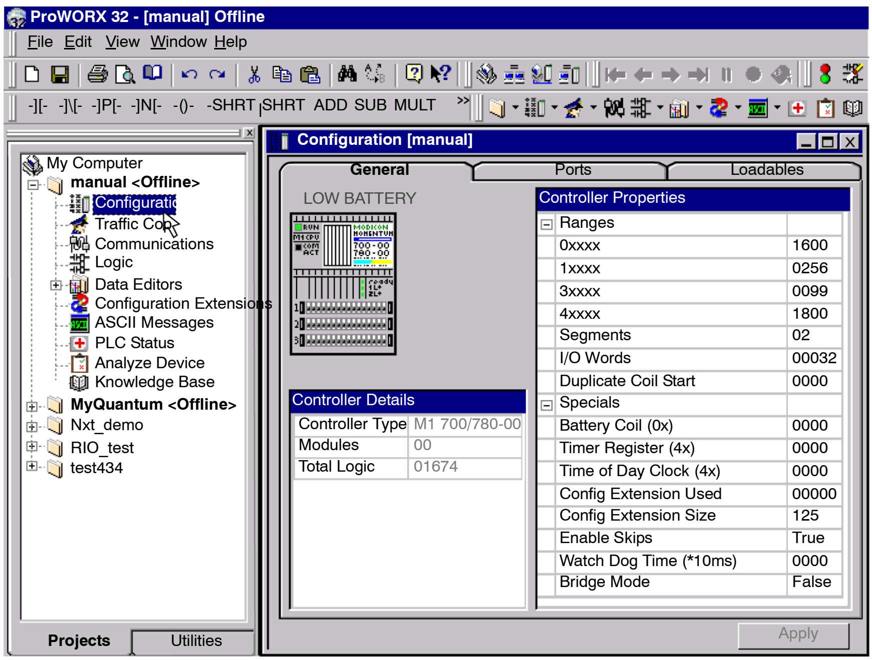
Configuring an I/OMap and I/OBus with the Configuration Tool

Introduction

As part of the configuration process, you need to create an I/O map for the local I/O. Use the ProWORX32 configuration tool. Use the configuration tool to edit or view your project's current controller configuration.
The I/O map assigns the appropriate range and type of reference values (0x, 1x, 3x, or 4x) from the CPU's state RAM to the input and/or output points on the local base unit.

Using the Configuration Tool

To use the Configuration tool, you need to open a project. In the examples used in this section the name of the project is **manual**.
In the following graphic, the icon for the **Configuration** tool is selected in the tree hierarchy of the **Projects** tab and the **Configuration [manual]** panel appears to the right of the Projects tab.



Number of Segments

Note: Be sure that the number of segments is set to 2 to be able to support an I/OBus network

Configuration Extensions

To access the **Configuration Extensions** tool, you must allocate memory. Enter the amount of memory required in the **Config Extension Size** field. If you do not enter an amount into the **Config Extension Size** field, the **Configuration Extensions** tool will not open.

Monitoring Battery Coils

If you want to monitor the battery coils, you must enter an address in the **Battery Coil (0x)** field.

Configuring the Hardware Clock

Many controllers have a built-in Hardware Clock, also called the Time of Day Clock. In order to set the clock, you must have the necessary rights, and you must ensure that the controller's starting register is configured in the **Configuration** panel.

Step	Action
1	Ensure the controller state is **Online** and **Running**.
2	In the **Configuration** panel, select the **Time of Day Clock (4x)** field and enter a value into that field.
3	Close the **Configuration** panel.
4	Select the **Logic** icon in the hierarchy tree of the **Projects** tab. The **Logic** panel with the **Network Navigator** tree appears.
5	Right-click the **Network Navigator** tree. A shortcut menu appears
6	Select **Hardware Clock** from the shortcut menu. The **Hardware Clock** dialog box appears.
7	The **First Day of Week:** field contains a drop-down list box. In the list box, select the day, Sunday through Saturday, that the controller will use as the first day of the week.

Setting the Time

You can set the date and time either automatically (using **Auto Set**) or manually.

Step	Action
1	If you set the time automatically, click the **Auto Set** button.
2	Click **OK**.
3	If you want to set the time manually, enter the desired date in the **Controller Date** field and the desired time into the **Controller Time** field. (See **Hardware Clock Registers** following.)
4	Click **OK**.

Hardware Clock Registers

The time of day clock requires eight 4xxxx registers in your controller.

Register	Content
4xxxx	Controller Information From the left: • **Bit 1:** Set Clock Values • **Bit 2:** Read Clock Values • **Bit 3:** Done • **Bit 4:** Errors
4xxxx + 1	Day of week (from 1 to 7)
4xxxx + 2	Month
4xxxx + 3	Day
4xxxx + 4	Year
4xxxx + 5	Hour (in 24-hour format)
4xxxx + 6	Minutes
4xxxx + 7	Seconds

Configuring Additional I/O with Traffic Cop

Introduction

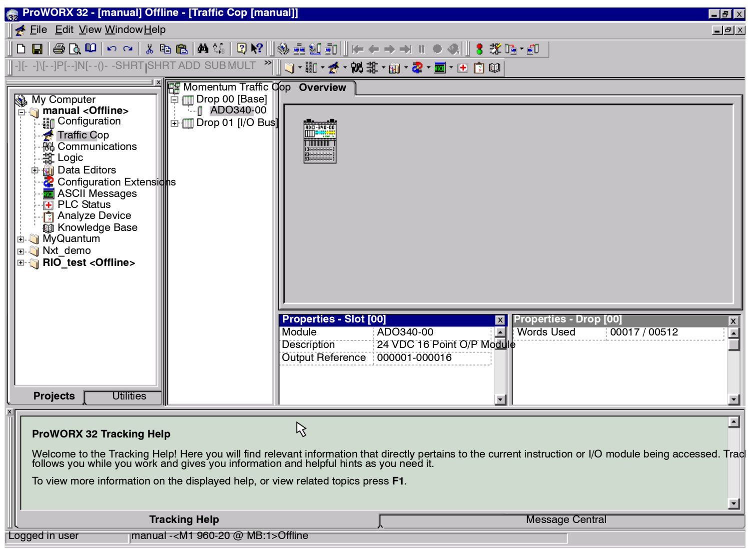
The Traffic Cop is used to visualize and configure

- I/O series
- drops
- cards
- slots

Each I/O series has the same look and feel. Although, some series have different I/O structures.

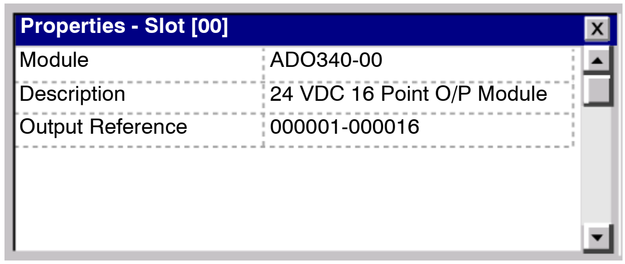
Accessing an I/O Map Screen

Use the following steps to access Traffic Cop.

Step	Action
1	In the **Projects** tab, select and expand your project by clicking on the project icon in the project navigation tree. 
2	A list of submenu icons appears.
3	Double click the **Traffic Cop** icon.
4	The **Traffic Cop** appears in the right panel. The **Traffic Cop** has one tab, **Overview**.

Selecting the Module

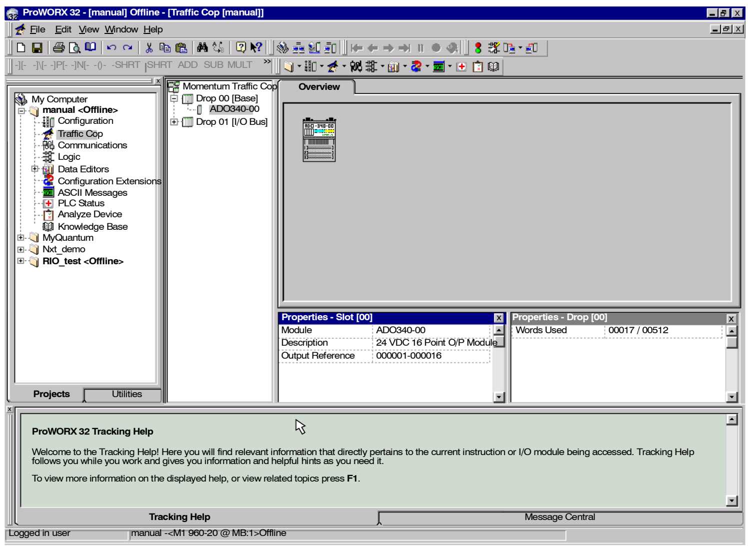
To select modules, do the following.

Step	Action
1	In the **Properties - Slot [00]** panel, select an I/O module and double click in the module drop-down list. 
2	In the **Overview** tab, a graphic of the selected module appears and the data in the **Properties - Slot** panel changes to display the parameters of the module selected.
3	If the module has setup parameters, click the **Card Config** expansion button located at the bottom of the **Slot Properties** panel. A configuration setup dialog box appears. The title bar of the configuration setup dialog box displays the name of the selected module.
4	Configure the module in the configuration setup dialog box.
5	Repeat the steps above for the remaining modules.

Traffic Cop and I/O Bus Networks

Configuring an I/O Bus Network with Traffic Cop

Use the following steps to configure an I/O bus network.

Step	Action
1	Launch **Traffic Cop** by double-clicking on the **Traffic Cop** icon on the project tree.
2	The **Traffic Cop** panel displays. 
3	In the **Properties - Slot** panel, select the module from the drop-down list box.
4	If the module requires configuration, click the Expansion button in the **Config** field located in the **Properties - Slot** panel. The configuration dialog box appears.
5	Configure the module if needed.
6	Click **OK** to dismiss the configuration dialog box.
7	For additional modules, repeat steps 3, 4, and 5.
8	Close the window. ProWORX32 automatically saves the changes.

I/O Words

Be sure that you have reserved enough words for I/O mapping to support your I/O bus network. The default setting is 32 words. To estimate the number of words you require, reserve 26 words by allowing

- 16 words for system overhead
- 10 words for module on the network (including both the local I/O and the network I/O)

Recommendation: Allot sufficient memory to completely I/O map your network, while preserving as much user memory as possible for your application program.

Maximum Number of Modules

The maximum number of modules that can be I/O mapped on the I/O bus network depends on your processor adapter and its executive. The following table offers guidelines.

Processor Adapter	Executive	Max. Modules	Max. I/O Bits
171 CCS 760 00	984	128	2048
	IEC	44	1408
171 CCC 760 10	984	128	2048
	IEC	44	1408
171 CCC 960 20	984	256	4069
	IEC	128	1408
171 CCC 960 30	984	256	4096
	IEC	128	1408

Generic INTERBUS Module Identifier Codes

INTERBUS device manufacturers embed an identifier code in their network slave modules in conformance with INTERBUS standards. The code identifies a device by its I/O type but not its specific model or name.
I/O bus recognizes the INTERBUS identifier codes provided in the following table and allows you to I/O map devices that use these codes. However, you cannot use the module zoom screens to define the parameters for these INTERBUS modules.

Identifier Code	I/O Type
0101_IOBUS	One-word discrete output
0102_IOBUS	One-word discrete input
0103_IOBUS	One-word discrete bidirectional
0201_IOBUS	Two-word discrete output
0202_IOBUS	Two-word discrete input
0203_IOBUS	Two-word discrete bidirectional
0231_IOBUS	Two-word analog output
0232_IOBUS	Two-word analog input
0233_IOBUS	Two-word analog bidirectional
0301_IOBUS	Three-word discrete output
0302_IOBUS	Three-word discrete input
0303_IOBUS	Three-word discrete bidirectional
0331_IOBUS	Three-word analog output
0332_IOBUS	Three-word analog input
0333_IOBUS	Three-word analog bidirectional
0401_IOBUS	Four-word discrete output
0402_IOBUS	Four-word discrete input
0403_IOBUS	Four-word discrete bidirectional
0431_IOBUS	Four-word analog output
0432_IOBUS	Four-word analog input
0433_IOBUS	Four-word analog bidirectional
0501_IOBUS	Five-word discrete output
0502_IOBUS	Five-word discrete input
0503_IOBUS	Five-word discrete bidirectional
0531_IOBUS	Five-word analog output
0532_IOBUS	Five-word analog input
0533_IOBUS	Five-word analog bidirectional
0633_IOBUS	Eight-word analog bidirectional
1233_IOBUS	Sixteen-word analog bidirectional

Monitoring the Health of the System

Configuring Parameters – Health Block

Once you have established communication with the controller, you may assign parameters for I/O scanning.
Specify the starting register of the register block which will contain the health bits for each of the I/O scanner transactions that you intend to configure.
If you designate a 3x register, the health bits for 64 transactions (maximum) will be stored in 4 contiguous registers starting at the address you specify
If you designate a 1x register, the health bits will be stored in 64 contiguous discrete registers.
A health bit is set only if the associated transaction has completed successfully within the last health timeout period for that transaction. When the PLC is started, all configured transactions have their respective health bit preset to 1. If the transaction subsequently fails, then the health bit is cleared after the programmed health timeout period has expired.
The health bits can be viewed by clicking on the **PLC Status** icon located in the project tree.

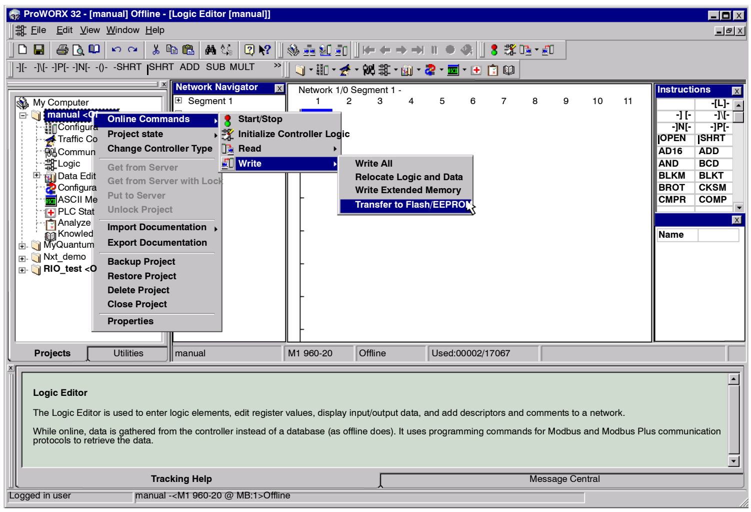
Saving to Flash with ProWORX32

Overview

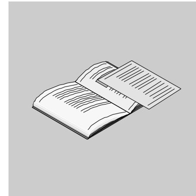
You save to Flash so that, in the event of an unexpected loss of power, the application logic and state RAM values will be preserved.
This section describes how to save the application logic and state RAM values to Flash using ProWORX32.

Procedure for Saving to Flash

Follow the steps in the table below to save to Flash.

Step	Action
1	Go to the **Projects** tab in the left panel. ● Right click on the project icon, and a sub menu appears. ● Select **Online Commands | Write | Transfer to Flash/EEPROM**. 
2	Select **Transfer** when the **Transfer to Flash** option appears.

Appendices



At a Glance

Purpose

This part provides supplemental information on ladder logic elements and instructions, and LED flash patterns and error codes.

What's in this Appendix?

The appendix contains the following chapters:

Ladder Logic Elements and Instructions

A

At a Glance

Overview

The executive firmware for the Momentum M1 processor adapters supports the ladder logic programming language for control applications. The following core set of ladder logic elements (contacts, coils, vertical and horizontal shorts) and instructions are built into the CPU's firmware package. For a detailed description of all instructions, see the Ladder Logic Block Library User Guide (840 USE 101 00).

What's in this Chapter?

This chapter contains the following topics:

Standard Ladder Logic Elements for M1 Processor Adapters

Ladder Logic Symbols

The table below provides the meaning of standard ladder logic symbols.

Symbol	Meaning	Nodes Consumed
⊣ ⊢	Normally open (N.O.) contact	1
⊣/⊢	Normally closed (N.C.) contact	1
⊣↑⊢	Positive transitional (P.T.) contact	1
⊣↓⊢	Negative transitional (N.T.) contact	1
-( )-	Normal coil	1
-(L)- -(M)-	Memory-retentive or latched coil; the two symbols mean the same thing, and the user may select the preferred version for online display.	1
──	Horizontal short	1
│	Vertical short	0

Standard Ladder Logic Instructions

The table below provides standard ladder logic instructions and their meaning.

Symbol	Meaning	Nodes Consumed
Counter and Timer Instructions		
UCTR	Counts up from 0 to a preset value	2
DCTR	Counts down from a preset value to 0	2
T1.0	Timer that increments in seconds	2
T0.1	Timer that increments in tenths of a second	2
T.01	Timer that increments in hundredths of a second	2
T1MS	A timer that increments in milliseconds	3
Integer Math Instructions		
ADD	Adds top node value to middle node value	3
SUB	Subtracts middle node value from top node value	3
MUL	Multiplies top node value by middle node value	3
DIV	Divides top node value by middle node value	3
DX Move Instructions		
R"T	Moves register values to a table	3
T"R	Moves specified table values to a register	3
T"T	Moves a specified set of values from one table to another table	3
BLKM	Moves a specified block of data	3
FIN	Specifies first-entry in a FIFO queue	3
FOUT	Specifies first-entry out of a FIFO queue	3
SRCH	Performs a table search	3
STAT	CROSS REF	1
DX Matrix Instructions		
AND	Logically ANDs two matrices	3
OR	Does logical inclusive OR of two matrices	3
XOR	Does logical exclusive OR of two matrices	3
COMP	Performs logical complement of values in a matrix	3
CMPR	Logically compares values in two matrices	3
MBIT	Logical bit modify	3
SENS	Logical bit sense	3
BROT	Logical bit rotate	3
AD16	Signed/unsigned 16-bit addition	3
SU16	Signed/unsigned 16-bit subtraction	3

Symbol	Meaning	Nodes Consumed
TEST	Compares the magnitudes of the values in the top and middle nodes	3
MU16	Signed/unsigned 16-bit multiplication	3
DV16	Signed/unsigned 16-bit division	3
ITOF	Signed/unsigned integer-to-floating point conversion	3
FTOI	Floating point-to-signed/unsigned integer conversion	3
EMTH	Performs 38 math operations, including floating point math operations and extra integer math operations such as square root	3
Ladder Logic Subroutine Instructions		
JSR	Jumps from scheduled logic scan to a ladder logic subroutine	2
LAB	Labels the entry point of a ladder logic subroutine	1
RET	Returns from the subroutine to scheduled logic	1
Other Special Purpose Instructions		
CKSM	Calculates any of four types of checksum operations (CRC-16, LRC, straight CKSM, and binary add)	3
MSTR	Specifies a function from a menu of networking operations	3
PID2	Performs proportional-integral-derivative calculations for closed-loop control	3
TBLK	Moves a block of data from a table to another specified block area	3
BLKT	Moves a block of registers to specified locations in a table	3
XMIT	Allows CPU to act as a Modbus master	3

A Special STAT Instruction

Overview

A special version of the STAT instruction has been developed to support Momentum M1 CPUs. The STAT instruction accesses a specified number of words in a status table in the CPU's system memory. Here vital diagnostic information regarding the health of the CPU and the I/O bus I/O under its control is posted.

From the STAT instruction, you can copy some or all of the status words into a block of registers or a block of contiguous discrete references.

This section describes the STAT instruction.

Avoid Discretes

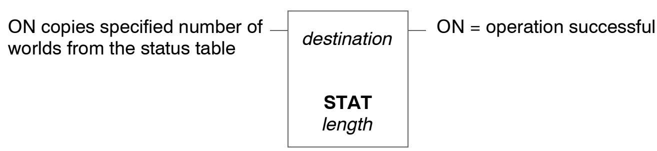
We recommend that you do not use discretes in the STAT destination node because of the excessive number required to contain status information.

Specify Length

The copy to the STAT block always begins with the first word in the table up to the last word of interest to you. For example, if the status table is 20 words long and you are interested only in the statistics provided in word 11, you need to copy only words 1...11 by specifying a length of 11 in the STAT instruction.

Diagram of STAT Block

The STAT block includes a top node (for destination) and a bottom node (for length). The STAT block is represented in the following illustration.



Top Node Content

The reference number entered in the top node is the first position in the destination block .....–i.e., the block where the current words of interest from the status table will be copied. The reference may be:

- The first 0x reference in a block of contiguous discrete outputs
- The first 4x reference in a block of contiguous holding registers

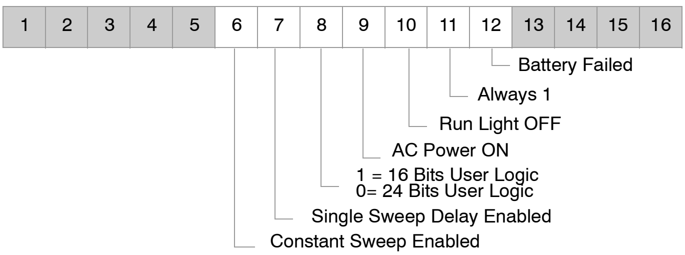
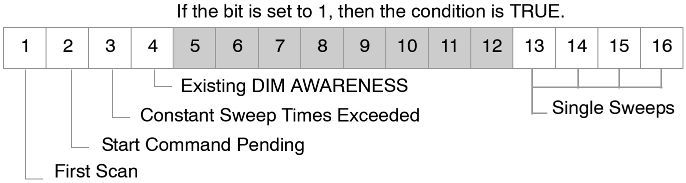
Bottom Node Content

The integer value entered in the bottom node specifies the number of registers or 16-bit words in the destination block where the current status information will be written.

The length – i.e., number of words – in the status table will vary depending on whether or not I/O bus I/O is being supported.

- Without I/O bus, the STAT instruction is 12 words long.
- With I/O bus, the instruction is 20 words long.

Words 1...12 The first 12 words describe the CPU status and are detailed in the following table.

Words	Description
1	Displays the following aspects of the PLC's status: If the bit is set to 1, then the condition is TRUE. 
2	Displays the following aspects of the PLC's status:
3	Displays more aspects of the controller status: If the bit is set to 1, then the condition is TRUE. 
4	Not used.

Words	Description
5	Displays the PLC's stop state conditions: If the bit is set to 1, then the condition is TRUE. 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 Bit 1: Peripheral Port Stop Bit 2: Error in the I/O Map Bit 3: Controller in DIM AWARENESS Bit 4: Illegal Peripheral Intervention Bit 5: Segment Scheduler Invalid Bit 6: Start of Node Did Not Start Segment Bit 7: State RAM Test Failed Bit 8: Bad number of I/O modules on I/OBus or End of Logic Nodes Bit 9: Watchdog Timer Expired Bit 10: Real Time Clock Error Bit 11: CPU Logic Solver Failed (for chassis mount *controllers) or Coil Use Table (for other controllers)* If the bit = 1 in a chassis mount controller, the internal diagnostics have detected a CPU failure. If the bit = 1 in any controller other than a chassis mount, then the Coil Use table does not match the coils in user logic. Bit 13: Invalid Node Bit 14: Logic checksum Bit 15: Coil Disabled in RUN Mode Bit 16: Bad Config
6	Displays the number of segments in ladder logic; a binary number is shown: 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 Bits 1–16: Number of Segments (expressed as a binary number)
7	Displays the address of the end-of-logic (EOL) pointer: 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 Bits 1–16: EOL Pointer Address
8	Not Used
9	Not Used
10	Uses its two least significant bits to display RUN/LOAD/DEBUG status: If the bit is set to 1, then the condition is TRUE. 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 Bit 15, Bit 16: Debug = 0 0 Run = 0 1 Load = 1 0
11	Not used.

Words	Description
12	Indicates the health of the local I/O Base: If the bit is set to 1, then the condition is TRUE 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 1 = ATI healthy 0 = ATI Not Healthy

Words 13...20

Words 13...20 are available only for the 171 CCS 760 00 and 171 CCS 760 10 Momentum M1 processor adapters to indicate the status of I/O bus modules controlled over the I/O bus network.

This Word...	Indicates the Status of These I/O Modules...
13	1...16
14	17...32
15	33...48
16	49...64
17	65...80
18	81...96
19	97...112
20	113...128

Run LED Flash Patterns and Error Codes

B

Run LED Flash Pattern and Error Codes

Error Codes Table

The following table lists the flash pattern of the Run LED on the Momentum processor adapters. It also lists the associated codes (in hex format).

Number of Blinks	Code (hex)	Error
Continuous	0000	Requested Kernel mode
2	080B	ram error during sizing
	080C	run output active failed
	082E	MB command handler stack error
	0835	Main loop broken
	0836	Power down / Power holdup
	0837	Power down reset absent
3	072B	master config write bad

4	0607	modbus cmd-buffer overflow
	0608	modbus cmd-length is zero
	0609	modbus abort command error
	0614	mbp bus interface error
	0615	bad mbp response opcode
	0616	timeout waiting for mbp
	0617	mbp out of synchronization
	0618	mbp invalid path
	0619	page 0 not paragraph aligned
	061E	bad external uart hardware
	061F	bad external uart interrupt
	0620	bad receive comm state
	0621	bad transmit comm state
	0622	bad comm state trn_asc
	0623	bad comm state trn_rtu
	0624	bad comm state rcv_rtu
	0625	bad comm state rcv_asc
	0626	bad modbus state tmr0_evt
	0627	bad modbus state trn-int
	0628	bad modbus state rcv-int
	0631	bad interrupt
	0637	Bad I/OBus transmit state
	0638	Bad I/OBus receive state
5	0503	ram address test error
	052D	P.O.S.T BAD MPU ERROR
6	0402	ram data test error
7	0300	EXEC not loaded
	0301	EXEC Checksum
8	8001	Kernal prom checksum error
	8003	unexpected exec return
	8005	Flash program / erase error
	8007	Watchdog timeout event

Battery Life Information for Alkaline Batteries

C

Lithium Battery Life in a Momentum Processor

Introduction

Due to the characteristics of the lithium battery, the operating life cannot be accurately determined. Major factors reducing battery capacity are:
- storage temperature
- operating temperature
- time in storage
- battery use

If battery backup is required, Schneider Electric recommends configuring the *battery low* coil in the PLC configuration, a setting that allows monitoring of the battery capacity level. A battery low condition exists when the configured battery low coil goes to 1.

What Units are Affected

Any of the following M1/M1E processors is affected when it is connected to an option adapter requiring battery backup of memory:.

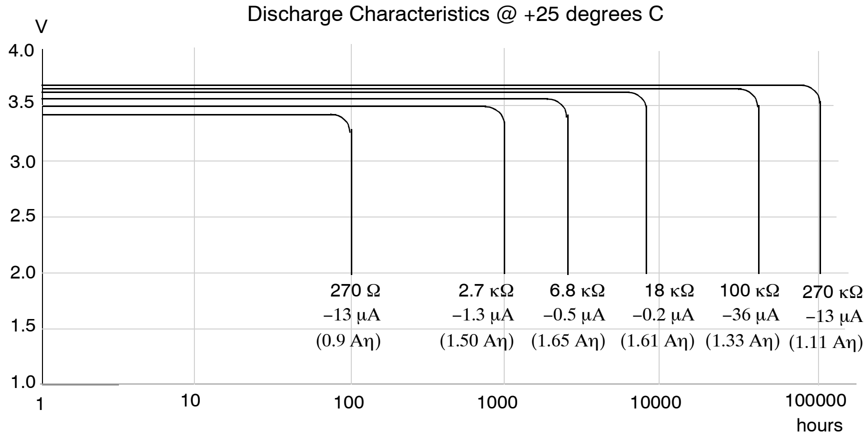
M1/M1E Processor		Option Adapter
171CCS70000	171CCC78010	172JNN21032
171CCS70010	171CCC96020	172PNN21022
171CCS76000	171CCC98020	172PNN26022
171CCS78000	171CCC96030	
171CCC76010	171CCC98030	

Lithium Battery Characteristics

At an applied light duty load of 5 μA, the 1ACU009817 lithium battery can be expected to outlast AAA alkaline batteries by a conservative factor of 2:1, given any cutoff point or temperature.

- The back-up life of the lithium battery when it is supporting the processor's memory while the processor is powered off is typically 3 years
- The back-up life of the lithium battery when the processor is powered up and running is typically 5 years

The capacity load lines showing lithium service life in the chart below are relatively flat to EOL where alkaline capacity/voltage depletion starts at time zero.



At higher temperatures, alkaline aging accelerates well ahead of lithium. The 3.6 V rating of this lithium battery is well above the 2.68 V battery-low threshold, further supporting the improved and extended service life over the AAA alkalines.

Option Adapter Battery Low Threshold Level

A circuit monitors the voltage of the installed battery on the following modules:

- 172JNN21032 (Modbus) option adapter
- 172PNN21022 (Modbus Plus) option adapter
- 172PNN26022 (Modbus Plus) option adapter

This circuit sets the Battery Low Threshold level at 2.68 V. When the battery voltage goes below this threshold level, the *battery low* indicator (if selected in the PLC configuration) will come on (1). When the indicator comes on (1), you have 30 days to replace the battery.

Power Cycling an M1/M1E in a Battery Low Condition

If an earlier version of a *Momentum Processor IEC or 984LL Exec.* is being used, the power cycle of a configured processor will force the processor to come up in a *Not Configured* state if

- the battery voltage is below the battery-low threshold level and
- the program is not saved in Flash memory

Therefore, with earlier versions, the program must be reloaded to put the processor back into Run mode.

Both IEC and 984LL Execs were updated to correct this issue of coming up *Not Configured*. Therefore, now, when a battery-low threshold level is reached, the processor will indicate only that the battery should be replaced within 30 days and not force the processor into a *Not Configured* state.

Refer to the *Exec. Resolution* for further details.

The following table lists the Exec versions that resolve this issue of coming up *Not Configured*:

Processor	Exec	Version
171CCS76000 171CCC78010 171CCC76010	M1 IEC	2.06
171CCS70000 171CCS70010 171CCS76000 171CCC76010 171CCC78000 171CCC78010	M1 984LL	2.05
171CCC96030 171CCC98030	M1E IEC	1.21
171CCC96020 171CCC96030 171CCC98020 171CCC98030	M1E 984LL	1.07

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Numerics

S

T

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