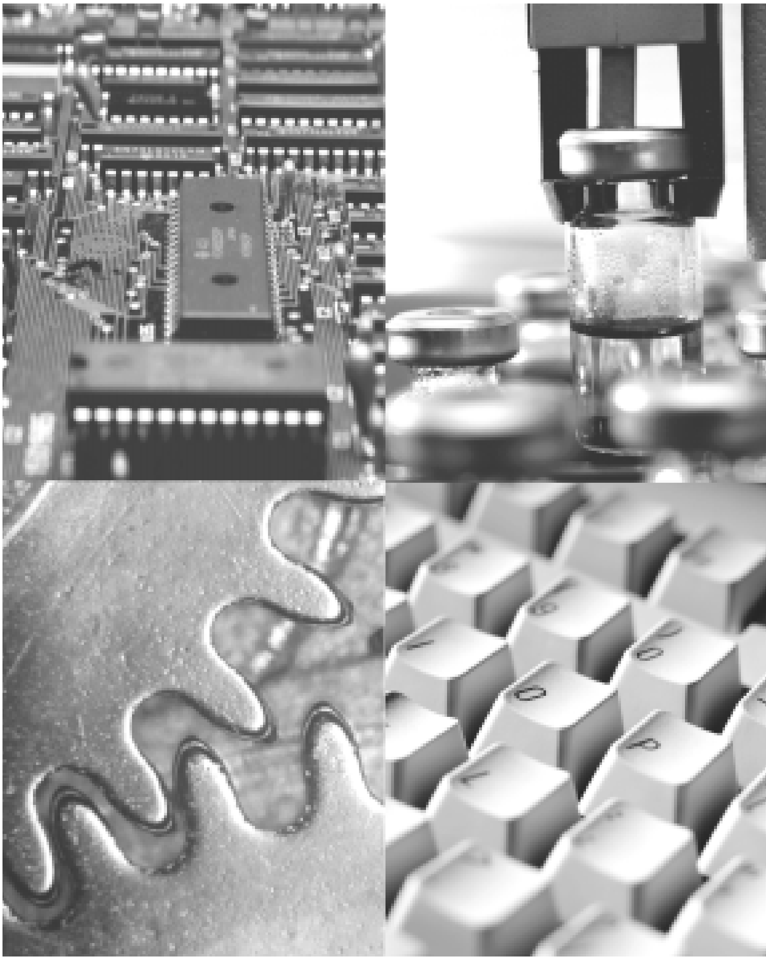
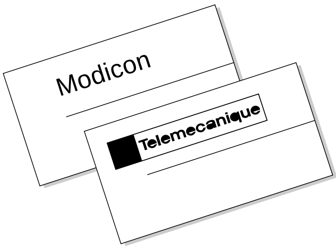
TSX Momentum

M1 Processor Adapter and Option Adapter User Guide

870 USE 101 00   Version 2.2





GROUPE SCHNEIDER

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TSX Momentum
M1 Processor Adapter and Option Adapter User Guide

870 USE 101 00 Version 2.2

December 1998

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Document Set

TSX Momentum I/O Bases User Guide
870 USE 002 00

TSX Momentum Interbus Communication Adapter User Manual
870 USE 003 00

TSX Momentum FIPIO Communication Adapter User Manual
870 USE 005 00

170 PNT Series Modbus Plus Communication Adapters for TSX Momentum User Guide
870 USE 103 00

170 NEF Series Modbus Plus Communication Adapters for TSX Momentum User Guide
870 USE 111 00

Contents

About This Book

Revision History

This is version 2.2 of this manual. The following information has been added or changed:

Version	Change
2.2	New pinout diagram for Modbus RS485 Connector “T” (RJ45 base)
2.2	New pinout diagram for I/OBus cable.
2.1	New pinout diagram for Modbus RS485 Connector “T” (DB9 base)
2.1	Corrected part number for Modbus RS485/Modbus Plus 10 ft Interconnect Cable (170 MCI 021 80) and added part number for Modbus Plus 10 ft Drop Cable (170 MCI 021 20)
2.0	Descriptions of two new Processor Adapters, the 171 CCC 760 10 and 171 CCC 780 10
2.0	Details about Modbus RS485 networks for Momentum
2.0	Details about new Modbus Plus features for Momentum
2.0	Instructions for configuring an M1 CPU with Concept
2.0	Description of the 170 CPS 110 00 TIO Power Supply module

To find out about any changes to the manual after this version was published, consult our web site at www.modicon.com.

Document Scope

This manual contains complete information about the TSX Momentum M1 Processor Adapters and Option Adapters. It does not contain information about TSX Momentum I/O bases or Communication Adapters.

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Validity Note

This manual is valid for Modsoft 2.6 and Concept 2.1.

Related Documentation

You may find the following other manuals useful:

Title	Part Number
Momentum I/O Bases User Guide	870 USE 002 00
Momentum Modbus Plus PNT Series Communication Adapters User Guide	870 USE 103 00
Momentum Modbus Plus NEF Series Communication Adapters User Guide	870 USE 111 00

User Comments

We welcome your comments about this document. You can reach us by e-mail at techcomm@modicon.com.

Getting Started

I

At a Glance

Purpose

This part describes the M1 Processor Adapters and Option Adapters and explains how to assemble them.

In This Chapter

This part contains the following chapters:

Overview of TSX Momentum M1 Processor Adapters

1

At a Glance

Purpose

A TSX 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 six M1 Processor Adapters.

In This Chapter

This chapter contains the following sections:

Section 1.1
Introducing the M1 Processor Adapters

Overview

Purpose

A TSX 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.

In This Section

This section contains the following topics:

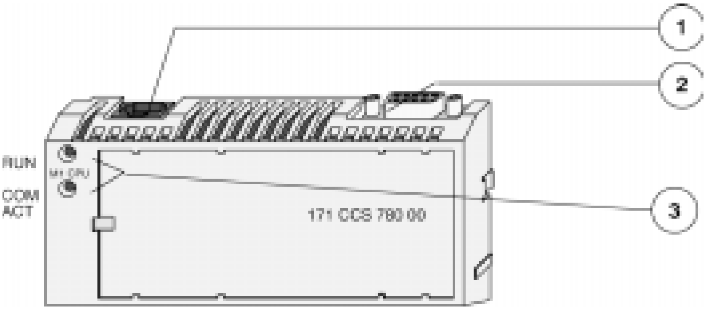
Front Panel Diagram

Introduction

This section provides a diagram of a typical M1 Processor Adapter.

Diagram

A typical Processor Adapter is shown in the following diagram:



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

Overview of Ports

Introduction

Each Processor Adapter is equipped with at least one Modbus 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

Ports Per Processor Adapter

The following table indicates which ports are available with each Processor Adapter:

Processor Adapter	Modbus Port 1	Modbus Port 2	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	

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/OBus 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

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 (ie., a Processor Adapter without an Option Adapter).

Continued on next page

Memory and Performance Characteristics, Continued

Memory Size and Clock Speed

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

Processor Adapter	Internal Memory	User Memory*	Flash RAM	Clock Speed
171 CCS 700 00	64K bytes	2.4K words	256K bytes	20MHz
171 CCS 700 10	64K bytes	2.4K words	256K bytes	32MHz
171 CCS 760 00	256K bytes	12K words	256K bytes	20MHz
171 CCC 760 10	512K bytes	18K words	512K bytes	32MHz
171 CCS 780 00	64K bytes	2.4K words	256K bytes	20MHz
171 CCC 780 10	512K bytes	18K words	512K bytes	32MHz
* In a default configuration. The amount of user memory may be increased or decreased by adjusting other parameters.				

Input and Output References

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

Processor Adapter	Registers	Discretes
171 CCS 700 00	2048	2048*
171 CCS 700 10	2048	2048*
171 CCS 760 00	4096	2048*
171 CCC 760 10	26032	8192 0*x* references 8192 1*x* references
171 CCS 780 00	2048	2048*
171 CCC 780 10	26032	8192 0*x* references 8192 1*x* references
*This total may include any combination of 0*x* and 1*x* references.		

Power Supply

Supplied by Base

A Processor Adapter requires 5 V, which is supplied by its I/O base.

Section 1.2
Features of Each Processor Adapter

Overview

Purpose

This section provides a photograph and specifications for each Processor Adapter.

In This Section

This section contains the following topics.

171 CCS 700 00

Overview

This section describes the 171 CCS 700 00 Processor Adapter, including key features, a diagram and specifications.

Key Features

The key features of this Processor Adapter are:

- Modbus Port 1
- 64K bytes of internal memory
- 20 MHz clock speed

Diagram

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

Label	Description
1	Modbus Port 1 connector
2	LED indicators

Continued on next page

171 CCS 700 00, Continued

LED Indicators

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

LED	Status	Function
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 Run LED Flash Patterns and Error Codes)
	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 TSX 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 0*x* and 1*x* references)
I/O Servicing	
Local I/O	Services all the points on any host Momentum I/O base
Watchdog timer	419 ms
Logic solve time	0.25 ms/k ladder logic instructions

Continued on next page

171 CCS 700 00, Continued

Specifications, Continued

Mechanical	
Weight	42.5 g (1.5 oz)
Dimensions (HxDxW)	25.9x61.02x125mm (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	2000m (6500ft)
Vibration	10 ... 57Hz @ 0.075mm displacement amplitude 57...150Hz @ 1g Ref. IEC 68-2-6 FC
Shock	+/-15g 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. Ref. IEC 801-3: 80 ... 1000 MHz, 10 V/m Ref. IEC 1000-4-3, EN 50140 Criteria A
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 is non-isolated from logic common
Agency Approvals	• UL 508, CSA, CUL, CE • FM class1, div2 pending

171 CCS 700 10

Overview

This section describes the 171 CCS 700 10 Processor Adapter, including key features, a diagram and specifications.

Key Features

The key features of this Processor Adapter are:

- Modbus Port 1
- 64K bytes of internal memory
- 32 MHz clock speed

Diagram

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

Label	Description
1	Modbus Port 1 connector
2	LED indicators

Continued on next page

171 CCS 700 10, Continued

LED Indicators

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

LED	Status	Function
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 Run LED Flash Patterns and Error Codes)
	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 TSX 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 0*x* and 1*x* references)
I/O Servicing	
Local I/O	Services all the points on any host Momentum I/O base
Watchdog timer	262 ms
Logic solve time	0.16 ms/k ladder logic instructions

Continued on next page

171 CCS 700 10, Continued

Specifications, Continued

Mechanical	
Weight	42.5 g (1.5 oz)
Dimensions (HxDxW)	25.9x61.02x125mm (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	2000m (6500ft)
Vibration	10 ... 57Hz @ 0.075mm displacement amplitude 57...150Hz @ 1g Ref. IEC 68-2-6 FC
Shock	+/-15g 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. Ref. IEC 801-3: 80 ... 1000 MHz, 10 V/m Ref. IEC 1000-4-3, EN 50140 Criteria A
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 is non-isolated from logic common
Agency Approvals	• UL 508, CSA, CUL, CE • FM class1, div2 pending

171 CCS 760 00

Overview

This section describes the 171 CCS 760 00 Processor Adapter, including key features, a diagram and specifications.

Key Features

The key features of this Processor Adapter are:

- Modbus Port 1
- I/OBus port
- 256K bytes of internal memory
- 20 MHz clock speed

Diagram

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

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

Continued on next page

171 CCS 760 00, Continued

LED Indicators

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

LED	Status	Function
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 Run LED Flash Patterns and Error Codes)
	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 TSX 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 0*x* and 1*x* references)
I/O Servicing	
Local I/O	Services all the points on any host Momentum I/O base
Watchdog timer	419 ms
Logic solve time	0.25 ms/k ladder logic instructions

Continued on next page

171 CCS 760 00, Continued

Specifications, Continued

Mechanical	
Weight	42.5 g (1.5 oz)
Dimensions (HxDxW)	25.9x61.02x125mm (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	2000m (6500ft)
Vibration	10 ... 57Hz @ 0.075mm displacement amplitude 57...150Hz @ 1g Ref. IEC 68-2-6 FC
Shock	+/-15g 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. Ref. IEC 801-3: 80 ... 1000 MHz, 10 V/m Ref. IEC 1000-4-3, EN 50140 Criteria A
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 pending

171 CCC 760 10

Overview

This section describes the 171 CCC 760 10 Processor Adapter, including key features, a diagram and specifications.

Key Features

The key features of this Processor Adapter are:

- Modbus Port 1
- I/OBus port
- 512K bytes of internal memory
- 32 MHz clock speed

Diagram

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

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

Continued on next page

171 CCC 760 10, Continued

LED Indicators

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

LED	Status	Function
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 Run LED Flash Patterns and Error Codes)
	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 TSX 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 0*x* references 8192 1*x* references
I/O Servicing	
Local I/O	Services all the points on any host Momentum I/O base
Watchdog timer	262 ms
Logic solve time	0.16 ms/k ladder logic instructions

Continued on next page

171 CCC 760 10, Continued

Specifications, Continued

Mechanical	
Weight	42.5 g (1.5 oz)
Dimensions (HxDxW)	25.9x61.02x125mm (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	2000m (6500ft)
Vibration	10 ... 57Hz @ 0.075mm displacement amplitude 57...150Hz @ 1g Ref. IEC 68-2-6 FC
Shock	+/-15g 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. Ref. IEC 801-3: 80 ... 1000 MHz, 10 V/m Ref. IEC 1000-4-3, EN 50140 Criteria A
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 pending

171 CCS 780 00

Overview

This section describes the 171 CCS 780 00 Processor Adapter, including key features, a diagram and specifications.

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

Diagram

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

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

Continued on next page

171 CCS 780 00, Continued

LED Indicators

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

LED	Status	Function
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 Run LED Flash Patterns and Error Codes)
	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 TSX 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 0*x* and 1*x* references)
I/O Servicing	
Local I/O	Services all the points on any host Momentum I/O base
Watchdog timer	419 ms
Logic solve time	0.25 ms/k ladder logic instructions

Continued on next page

171 CCS 780 00, Continued

Specifications, Continued

Mechanical	
Weight	42.5 g (1.5 oz)
Dimensions (HxDxW)	25.9x61.02x125mm (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	2000m (6500ft)
Vibration	10 ... 57Hz @ 0.075mm displacement amplitude 57...150Hz @ 1g Ref. IEC 68-2-6 FC
Shock	+/-15g 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. Ref. IEC 801-3: 80 ... 1000 MHz, 10 V/m Ref. IEC 1000-4-3, EN 50140 Criteria A
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 RS485 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 pending

171 CCC 780 10

Overview

This section describes the 171 CCC 780 10 Processor Adapter, including key features, a diagram and specifications.

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

Diagram

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

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

Continued on next page

171 CCC 780 10, Continued

LED Indicators

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

LED	Status	Function
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 Run LED Flash Patterns and Error Codes)
	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 TSX 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 0*x* references 8192 1*x* references
I/O Servicing	
Local I/O	Services all the points on any host Momentum I/O base
Watchdog timer	262 ms
Logic solve time	0.16 ms/k ladder logic instructions

Continued on next page

171 CCC 780 10, Continued

Specifications, Continued

Mechanical	
Weight	42.5 g (1.5 oz)
Dimensions (HxDxW)	25.9x61.02x125mm (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	2000m (6500ft)
Vibration	10 ... 57Hz @ 0.075mm displacement amplitude 57...150Hz @ 1g Ref. IEC 68-2-6 FC
Shock	+/-15g 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. Ref. IEC 801-3: 80 ... 1000 MHz, 10 V/m Ref. IEC 1000-4-3, EN 50140 Criteria A
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 RS485 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 pending

Overview of TSX 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 TSX Momentum Option Adapters.

In This Chapter

This chapter contains the following sections:

Section 2.1
Introducing the TSX Momentum Option Adapters

Basic Features of Option Adapters

Introduction

This section describes the basic features of all Option Adapters:

- Batteries
- A time-of-day (TOD) clock
- Communication port(s)

Batteries

The batteries used to back up the CPU's user program and state RAM.

Time-of-Day Clock

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

Communication Ports

The three TSX 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

Section 2.2
Serial Option Adapter

Overview

Purpose

This section describes the 172 JNN 210 32 Serial Option Adapter, including the front panel components and specifications.

In This Section

This section includes the following topics:

Front Panel Components

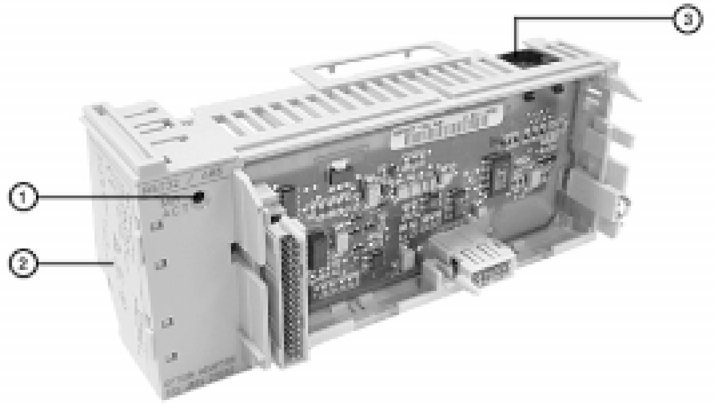
Overview

The front panel includes:

- An LED indicator
- Battery compartment
- Modbus Port 2 connector

Diagram

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



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

Continued on next page

Front Panel Components, Continued

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.

Continued on next page

Front Panel Components, Continued

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

Specifications

This section provides the specifications for the 172 JNN 210 32 TSX Momentum Serial Option Adapter:

Mechanical	
Weight	85.05 g (3 oz)
Dimensions (HxDxW)	58.3 (on battery side) x 60.6 x 143.1mm
	(2.27 x 2.36 x 5.57 in)
Material (Enclosures/bezels)	Lexan
Time-of-Day Clock	
Accuracy	+/- 13 s/day
Batteries	
Type	AAA alkaline, two required two included with Option Adapter (in separate package)
Service life	< 30 days from the time a battery-low indication is received to actual battery failure @ 40degrees 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	2000m (6500ft)
Vibration	10 ... 57Hz @ 0.075mm displacement amplitude 57...150Hz @ 1g Ref. IEC 68-2-6 FC
Shock	+/-15g peak, 11ms, half sine wave Ref. IEC 68-2-27 EA

Continued on next page

Specifications, Continued

Specifications, Continued

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. Ref. IEC 801-3: 80 ... 1000 MHz, 10 V/m Ref. IEC 1000-4-3, EN 50140 Criteria A
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
Agency Approvals	• UL 508, CSA, CUL, CE • FM class1, div2 pending

Section 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.

In This Section

This section contains the following topics:

Front Panel Components

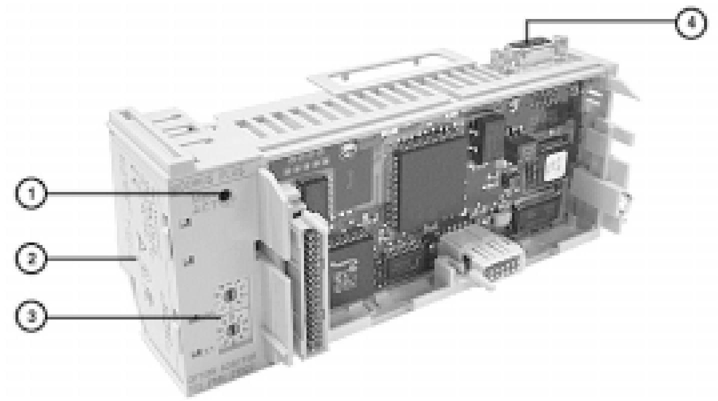
Overview

The front panel includes:

- An LED indicator
- Battery compartment
- Address switches
- 9-pin D-shell connector for Modbus Plus communications

Diagram

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



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

Continued on next page

Front Panel Components, Continued

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.

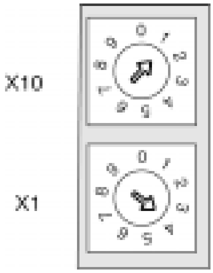
Continued on next page

Front Panel Components, Continued

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 diagram. Their usage is described in detail in Modbus Plus Addresses on page 132.

The switches in this diagram are set to address 14.



Specifications

Specifications

This section provides the specifications for the 172 PNN 210 22 TSX Momentum Serial Option Adapter:

Mechanical	
Weight	85.05 g (3 oz)
Dimensions (HxDxW)	58.3 (on battery side) x 60.6 x 143.1mm
	(2.27 x 2.36 x 5.57 in)
Material (Enclosures/bezels)	Lexan
Time-of-Day Clock	
Accuracy	+/- 13 s/day
Batteries	
Type	AAA alkaline, two required. Two included with Option Adapter (in separate package).
Service life	< 30 days from the time a battery-low indication is received to actual battery failure @ 40degrees 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	2000m (6500ft)
Vibration	10 ... 57Hz @ 0.075mm displacement amplitude 57...150Hz @ 1g Ref. IEC 68-2-6 FC
Shock	+/-15g peak, 11ms, half sine wave Ref. IEC 68-2-27 EA

Continued on next page

Specifications, Continued

Specifications, Continued

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. Ref. IEC 801-3: 80 ... 1000 MHz, 10 V/m Ref. IEC 1000-4-3, EN 50140 Criteria A
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	500 V
Ground continuity	30 A test on the exposed metal connector
Agency Approvals	• UL 508, CSA, CUL, CE • FM class1, div2 pending

Section 2.4
Redundant Modbus Plus Option Adapter

Overview

Purpose

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

In This Section

This section contains the following topics:

Front Panel Components

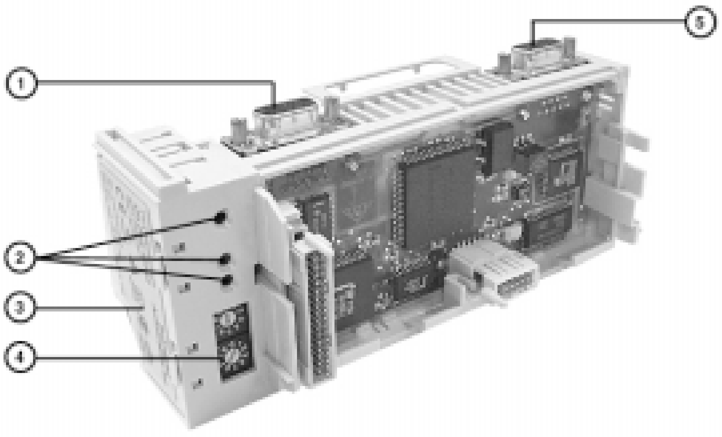
Overview

The front panel includes:

- Two 9-pin D-shell connectors for Modbus Plus communications
- Three LED indicators
- Battery compartment
- Address switches

Diagram

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



Label	Description
1	9-pin D-shell connector for Modbus Plus port A
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 B

Continued on next page

Front Panel Components, Continued

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.		

Continued on next page

Front Panel Components, Continued

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.

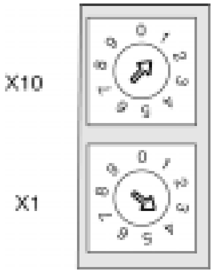
Continued on next page

Front Panel Components, Continued

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 diagram. Their usage is described in detail in Modbus Plus Addresses on page 132.

The switches in this diagram 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

Specifications

This section provides the specifications for the 172 PNN 260 22 TSX Momentum Serial Option Adapter:

Mechanical	
Weight	85.05 g (3 oz)
Dimensions (HxDxW)	58.3 (on battery side) x 60.6 x 143.1mm
	(2.27 x 2.36 x 5.57 in)
Material (Enclosures/bezels)	Lexan
Time-of-Day Clock	
Accuracy	+/- 13 s/day
Batteries	
Type	AAA alkaline, two required. Two included with Option Adapter (in separate package).
Service life	< 30 days from the time a battery-low indication is received to actual battery failure @ 40degrees 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	2000m (6500ft)
Vibration	10 ... 57Hz @ 0.075mm displacement amplitude 57...150Hz @ 1g Ref. IEC 68-2-6 FC
Shock	+/-15g peak, 11ms, half sine wave Ref. IEC 68-2-27 EA

Continued on next page

Specifications, Continued

Specifications, Continued

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. Ref. IEC 801-3: 80 ... 1000 MHz, 10 V/m Ref. IEC 1000-4-3, EN 50140 Criteria A
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	500 V
Ground continuity	30 A test on the exposed metal connectors
Agency Approvals	• UL 508, CSA, CUL, CE • FM class1, div2 pending

Assembling TSX Momentum Components

3

At a Glance

Purpose

This chapter describes how to assemble and disassemble a TSX Momentum M1 CPU, using the following components:

- Processor Adapter
- I/O Base
- Option Adapter
- Label

It also describes how to install batteries in the Option Adapter.

In This Chapter

This chapter contains the following sections:

Section 3.1
Assembling a CPU

Overview

Purpose

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

In This Section

This section contains the following topics:

Assembling a Processor Adapter and I/O Base

Overview

A Processor 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 M1 unit fit into the two slots on the sides of the I/O base
- The 12-pin ATI connectors on the two units mate together

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

This section contains safety precautions for handling components and a procedure for assembling a Processor Adapter and an I/O base.

CAUTION

ADAPTER MAY BE DAMAGED BY STATIC ELECTRICITY

Use proper ESD procedures when handling the adapter, and do not touch the internal elements. The adapter's electrical elements are sensitive to static electricity.

Failure to observe this precaution can result in equipment damage.

CAUTION

ELECTRICAL CIRCUITRY MAY BE EXPOSED

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

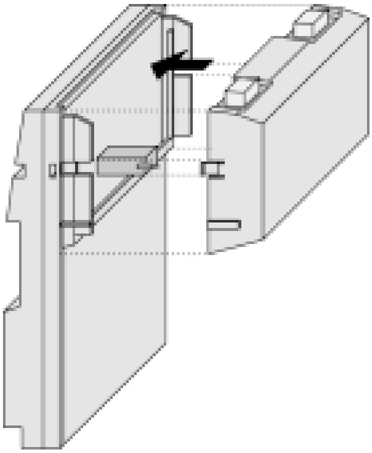
Failure to observe this precaution can result in injury or equipment damage and will void the product warranty.

Continued on next page

Assembling a Processor Adapter and I/O Base, Continued

Procedure: Assembling a Processor Adapter and an I/O Base

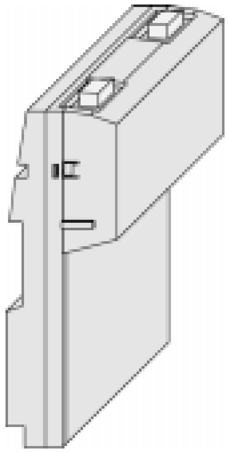
Follow the steps in the table below to assemble a Processor Adapter and an I/O base.

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 Processor Adapter with the slots on the sides of the I/O base. The 12-pin ATI connectors will automatically line up when the units are in this position. The two devices should be oriented such that their communication ports are facing out on the back side of the assembly. 

Continued on next page

Assembling a Processor Adapter and I/O Base, Continued

Procedure: Assembling a Processor Adapter and an I/O Base, Continued

Step	Action
4	Push the Processor Adapter onto the base, gently pressing the locking tabs inward. **Result:** The locking tabs on each side of the Processor Adapter slide inside the I/O base and out through the locking slot. The 12-pin ATI connectors on the two units are mated to each other in the process. 

Next Step

Once the Processor Adapter has been assembled, it can be mounted on a DIN rail or surface mounted inside a panel enclosure. A TSX Momentum M1 CPU assembly is classified as open equipment, i.e., electrical circuitry on the unit may be exposed. Open equipment should be installed in an industry-standard enclosure, and direct access must be restricted to qualified service personnel.

For a detailed description of installation procedures and grounding considerations, refer to the *TSX Momentum I/O Bases User Manual* (870 USE 002 00).

Disassembling a Processor Adapter from an I/O Base

Overview

This section contains safety precautions and a procedure for disassembling a Processor Adapter from an I/O base.

CAUTION

ELECTRICAL CIRCUITRY MAY BE EXPOSED

Before removing an adapter from the base, disconnect the wiring connectors. Make sure that the I/O base is not under power when it does not have a Momentum adapter mounted on it.

Failure to observe this precaution can result in injury or equipment damage and will void the product warranty.

Tools Required

A flat-head screw driver.

Procedure: Disassembling an Adapter from an I/O Base

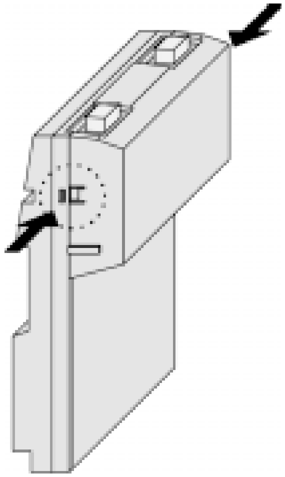
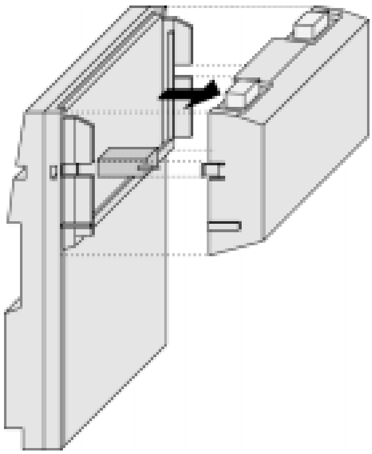
Follow the steps in the table below to remove a Processor Adapter from an I/O base.

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.

Continued on next page

Disassembling a Processor Adapter from an I/O Base, Continued

Procedure: Disassembling an Adapter from an I/O Base, Continued

Step	Action
3	Use a screwdriver to push the clips on both sides of the Processor Adapter inward, as shown in the illustration below. 
4	Lift off the adapter. 

Section 3.2
Assembling a CPU with an 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 TSX Momentum module and how to remove an Option Adapter from the assembled module.

In This Section

This section contains the following topics:

Assembling a Processor Adapter and an Option Adapter

Overview

If a TSX 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 precautions 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 M1Processor 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 ATI 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

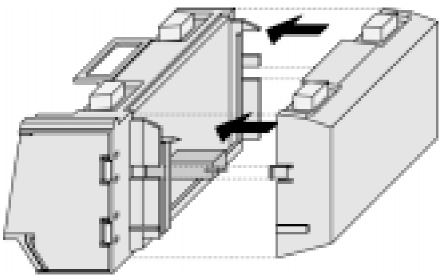
The components can be snapped together by hand; no assembly tools are required. A flat-head screw driver is required to disassemble the unit.

Continued on next page

Assembling a Processor Adapter and an Option Adapter, Continued

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 ATI 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. Do not connect one side and try to rotate the M1 onto the option adapter. **Failure to observe this precaution can result in 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 ATI connectors on the two units are mated to each other in the process.

Continued on next page

Assembling a Processor Adapter and an Option Adapter, Continued

Next Step

Follow the directions in the next section to mount the assembled adapters on the I/O base.

Mounting the Assembled Adapters on the I/O Base

Overview

This section gives guidelines, safety precautions 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 ATI 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

ELECTRICAL CIRCUITRY MAY BE EXPOSED

Electrical circuitry on the I/O base may be exposed when an adapter is not mounted. Make sure that the I/O base is not under power whenever it does not have a Momentum 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. When more than one connector is on the I/O base, remove all connectors to prevent the unit from receiving power from an unexpected source.

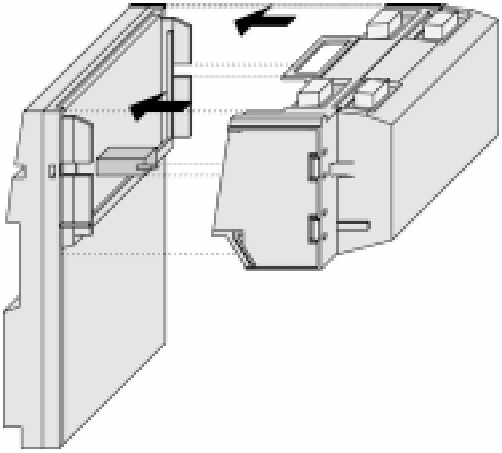
Failure to observe this precaution can result in injury or equipment damage and will void the product warranty.

Continued on next page

Mounting the Assembled Adapters on the I/O Base, Continued

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

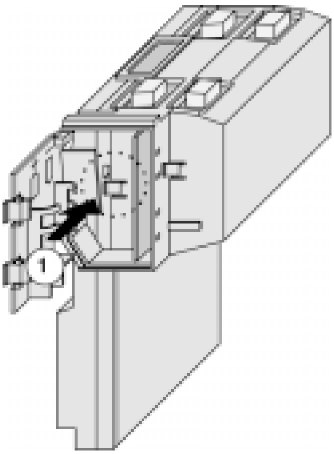
Follow the steps in the table below to mount the assembly on an I/O base.

Step	Action
1	Make 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 ATI 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. 

Continued on next page

Mounting the Assembled Adapters on the I/O Base, Continued

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

Step	Action
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.  **Result:** 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 ATI connectors on the two units are mated to each other in the process.
4	Apply slight pressure to the top of the stirrup on the back of the Option Adapter so that it snaps into place on the bottom of the I/O base.

Disassembling a 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

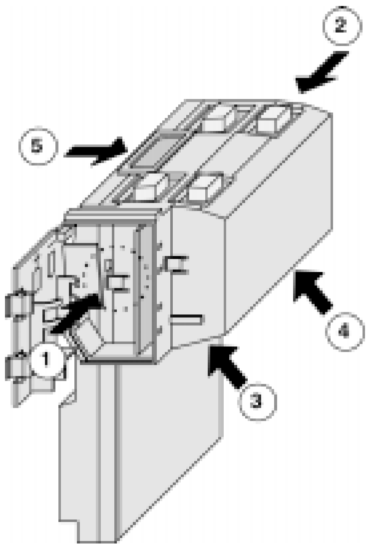
Flat-head screwdriver.

Continued on next page

Disassembling a Module with an Option Adapter, Continued

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

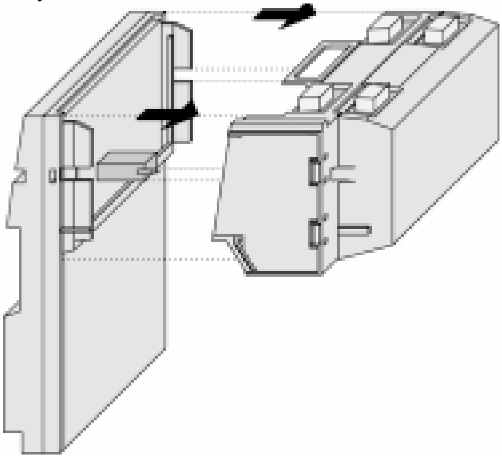
Follow the steps in the table below to remove the assembled Option Adapter and M1 Processor Adapter from the I/O base.

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** Use care when you insert a screwdriver in the battery compartment so that you do not scratch any exposed elements. **Failure to observe this precaution can result in equipment damage.**
3	Open the battery door and use a flat-head screwdriver to release snaps 1 and 2 as shown in the illustration below. 

Continued on next page

Disassembling a Module with an Option Adapter, Continued

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

Step	Action
4	Once snaps 1 and 2 have been disengaged, use the screwdriver to release snaps 3 and 4 on the front of the assembly.
5	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. 

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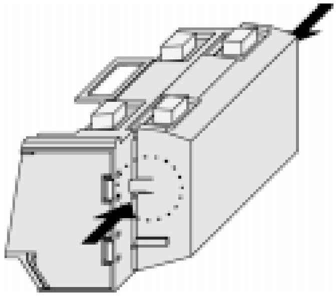
Disassembling a Module with an Option Adapter, Continued

Procedure: Disassembling an Option Adapter and M1 Processor

Follow the steps in the table below to remove the Option Adapter from the M1 processor.

Step	Action
1	Use a screwdriver to push the clips on both sides of the adapter inward. 
2	Lift off the adapter.

Section 3.3
Installing Batteries in an Option Adapter

Installation Guidelines

Why Install Batteries?

If you are using a Momentum Option Adapter in your CPU assembly, you have a battery-backup capability. The batteries will maintain user logic, state RAM values and the time-of-day clock in the event that the CPU loses power.

What Kind of Batteries?

Two AAA alkaline batteries can be installed in the compartment on the side of the Option Adapter. A set of batteries is supplied with the module (not installed).

CAUTION

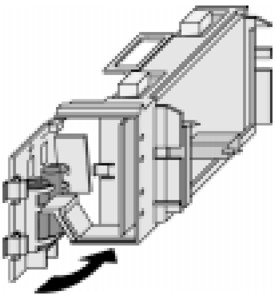
ELECTRONIC CIRCUITRY EXPOSED

When the battery door is open, electronic circuitry is exposed. Follow proper ESD measures while handling the equipment during battery maintenance.

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

Installing Batteries

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



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Installation Guidelines, Continued

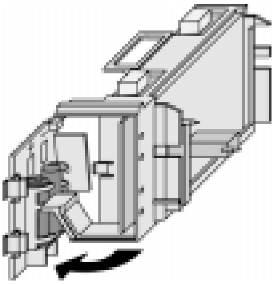
Leave Power On When Changing Batteries

Once your CPU has been commissioned and is running, maintain power to the module whenever you change the batteries.

If you change the batteries while the power is OFF, you will have to reload your user logic program (either from the application you have stored in Flash or from the original files).

Removing and Replacing Batteries

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



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 Modsoft 2.6 or Concept 2.1 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 for Modsoft or Reserving and Monitoring a Battery Coil for Concept).

Section 3.4
Labeling the CPU

Guidelines for Labeling the CPU

Overview

A fill-in label is shipped with each I/O base. This label should be placed on the M1 Processor Adapter that you mount on that base.

This section describes the label and provides an illustrated example.

Fill-In Label

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.

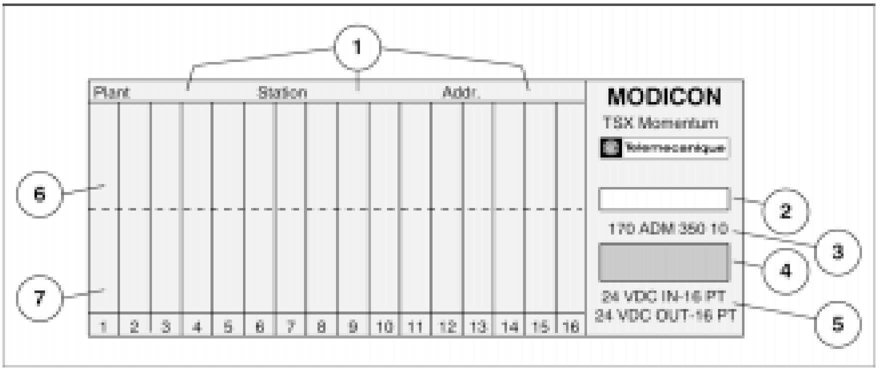
☞ **Note:** An Option Adapter may also be used in the assembled module. You will find its model number printed in the upper left corner of Option Adapter housing.

Continued on next page

Guidelines for Labeling the CPU, Continued

Example of a Fill-In Label

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



No.	Description
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

II

At a Glance

Purpose

This part describes the communication ports available with TSX Momentum Processor Adapters and Option Adapters.

In This Chapter

This part contains the following chapters:

Using the Modbus Ports

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.

In This Chapter

This chapter contains the following sections:

Section 4.1
Modbus Port 1

Overview

Purpose

Modbus Port 1 is standard on most TSX Momentum M1 Processor Adapters. This section describes the port and recommended cable accessories.

In This Section

This section contains the following topics:

Modbus Port 1

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

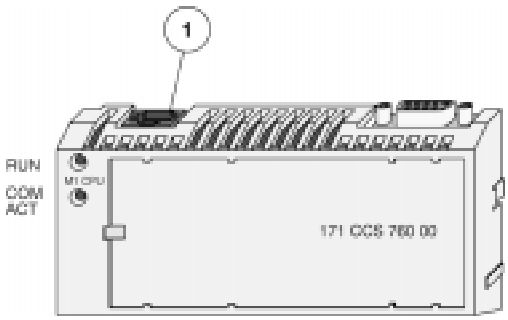
This section describes the port.

Connector Type

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

Diagram

The following diagram shows the position of Modbus Port 1 on a Processor Adapter:



Label	Description
1	Modbus Port 1

Continued on next page

Modbus Port 1, Continued

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	
	2	
Modbus Address	In the range 1 ... 247	

Continued on next page

Modbus Port 1, Continued

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

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 Automation:

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 programming station.

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 PC-AT type stations
- A 110 XCA 204 00 25-pin adapter for PC-XT type stations

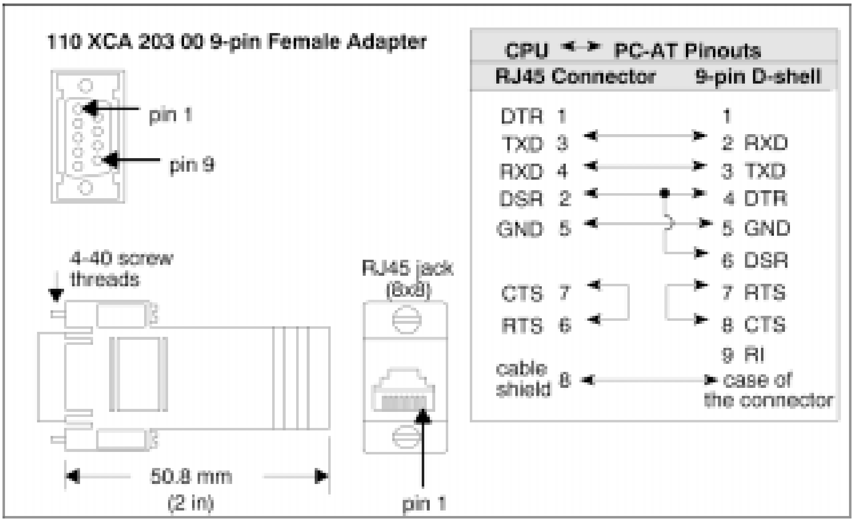
These adapters have an RJ45 jack on one end that allows them to clip directly onto a cable assembly.

Continued on next page

Cable Accessories for Modbus Port 1, Continued

110 XCA 203 00 Pinout

The pinout for this adapter is shown in the diagram below:



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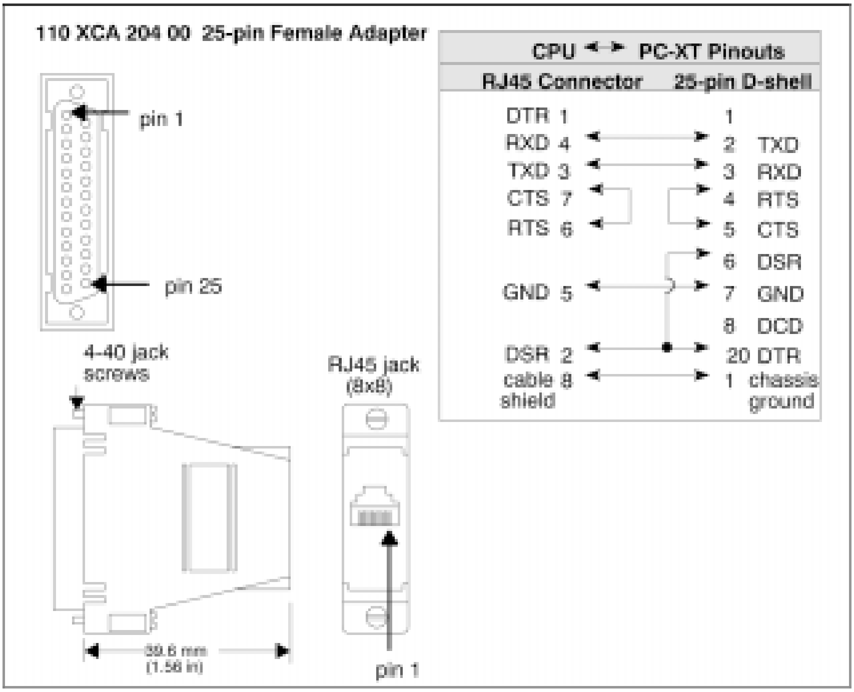
Cable Accessories for Modbus Port 1, Continued

110 XCA 204 00 Pinout

The pinout for this adapter is shown in the diagram below:



Section 4.2
Modbus Port 2

Overview

Purpose

Three Momentum components offer this port:

- 171 CCS 780 00 Processor Adapter
- 171 CCC 780 10 Processor Adapter
- 172 JNN 210 32 Serial Option Adapter

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

In This Section

This section contains the following topics:

Modbus Port 2

Two Types of Port

Modbus Port 2 is available in two types:

Component	Type of Port	Type of Connector
171 CCS 780 00 and 171 CCC 780 10 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 00or 171 CCC 780 10 Processor Adapter, the Modbus port on the Option Adapter will be disabled.		

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 172 JNN 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.)

Continued on next page

Modbus Port 2, Continued

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	

Continued on next page

Modbus Port 2, Continued

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 protocol must be changed from RS232 to RS485 for the 171 CCS 780 00and 171 CCC 780 10 Processor Adapters or the port will not function.

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

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 2000 ft (609 m).

Number of Devices

The maximum number of devices in a network is 64 if all are TSX 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

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

Continued on next page

Four-Wire Cabling Schemes for Modbus RS485 Networks, Continued

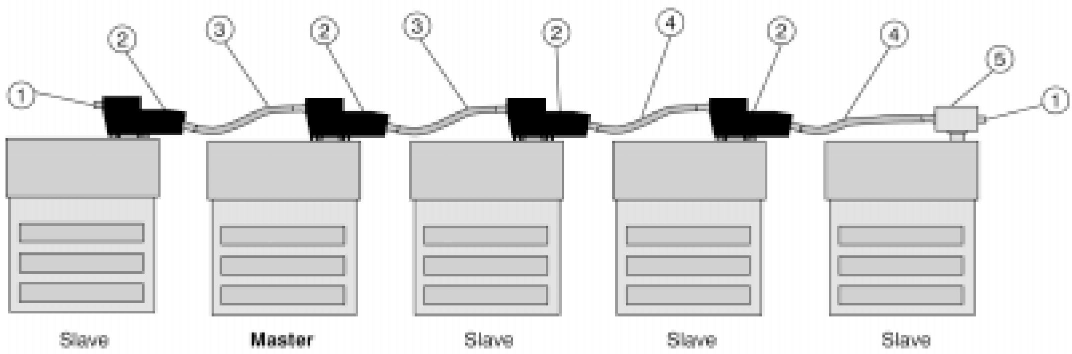
Slave Cabling

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

Single Master/ Slave Option 1

The following diagram 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.



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

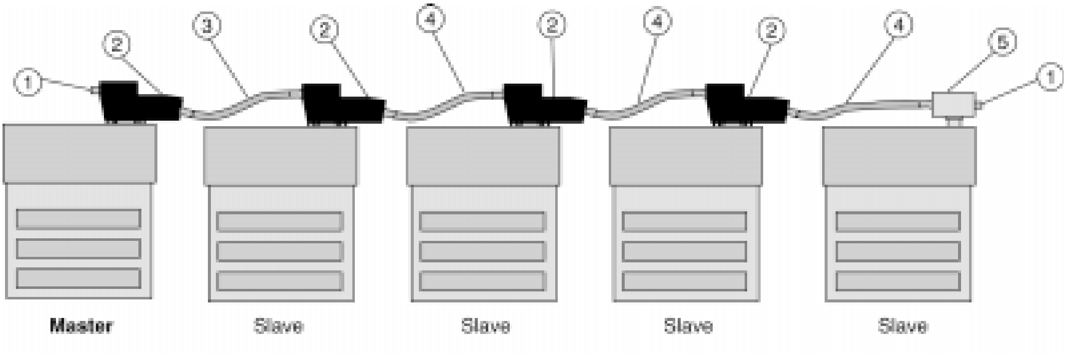
Continued on next page

Four-Wire Cabling Schemes for Modbus RS485 Networks, Continued

Single Master/ Slave Option 2

The following diagram 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.



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

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

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

Failure to observe this precaution 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 TSX Momentum devices. Otherwise, the maximum is 32.

Termination

One end of the cable run must be terminated with a terminating resistor.

The other end of the cable must be terminated with a terminating shunt, which connects the transmit pair to the receiver pair.

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

Continued on next page

Two-Wire Cabling Schemes for Modbus RS485 Networks, Continued

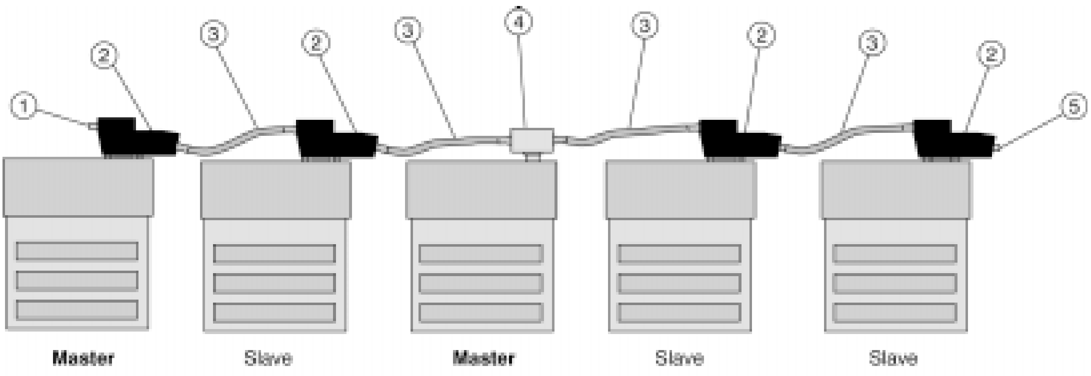
Cable

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	170 MCI 020 10

Multimaster/ Slave Cabling

The following diagram shows components used in a multimaster/slave network. Each Momentum module must include a Processor Adapter or Option Adapter with a Modbus RS485 port.



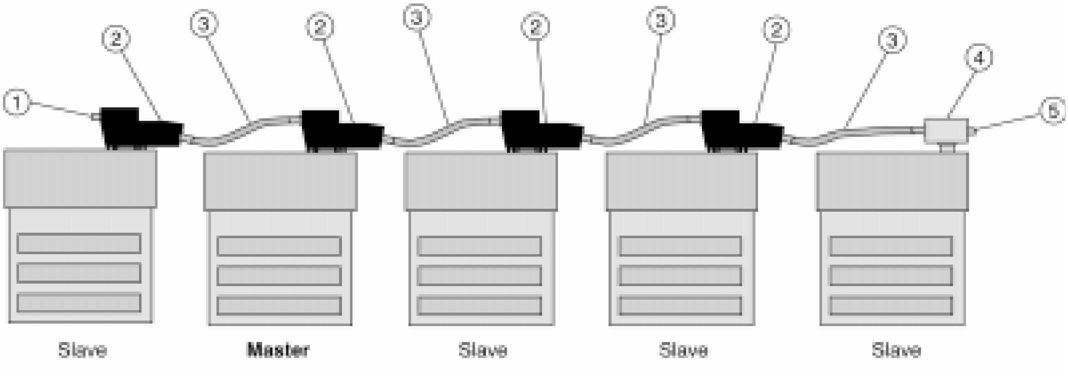
Label	Description	Part Number
1	Terminating resistor plug	170 XTS 021 00
2	Modbus RS485 connector “T” (DB9 base)	170 XTS 040 00
3	Modbus Plus / Modbus RS485 Short Interconnect Cable	170 MCI 020 10
4	Modbus RS485 connector “T” (RJ45 base)	170 XTS 041 00
5	Terminating shunt plug	170 XTS 042 00

Continued on next page

Two-Wire Cabling Schemes for Modbus RS485 Networks, Continued

Single Master/ Slave Cabling

The following diagram shows components used for single master/slave communications in a two-wire cabling scheme. Each Momentum module must include a Processor Adapter or Option Adapter with a Modbus RS485 port.



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 Plus / Modbus RS485 Short Interconnect Cable	170 MCI 020 10
4	Modbus RS485 connector “T” (RJ45 base)	170 XTS 041 00
5	Terminating shunt plug	170 XTS 042 00

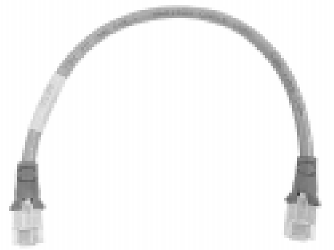
Cable for Modbus RS485 Networks

Overview

This section describes the cables which should be used in constructing an RS485 network for TSX 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	Photo
Modbus RS485 (RJ45/RJ45) Master Communication Cable	170 MCI 041 10	

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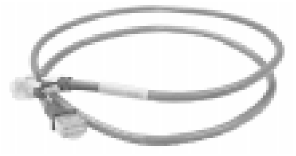
Cable for Modbus RS485 Networks, Continued

Interconnect Cables

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

Description	Part Number	Photo
Modbus Plus or Modbus RS485 Short Interconnect Cable (10")	170 MCI 020 10	
Modbus Plus or Modbus RS485 3 ft. Interconnect Cable	170 MCI 020 36	
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	

Continued on next page

Cable for Modbus RS485 Networks, Continued

Other Premade Cable

Interconnect cable in various lengths 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#24. It may be shielded or unshielded. Shielded cable is recommended for long runs and for noisy environments. You may use stranded or unstranded cable. Keep in mind that stranded cable is more flexible.

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.

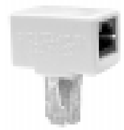
Connectors for Modbus RS485 Networks

Overview

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

RJ45 Connector "T"

This connector is used with the RS485 port on the 172 JNN 210 32 Option Adapter.

Description	Part Number	Photo
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	Photo
Modbus RS485 Connector "T" (DB9 base)	170 XTS 040 00	

Continued on next page

Connectors for Modbus RS485 Networks, Continued

Connectors for Custom Cabling

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

Description	Part Number	Photo
RJ45 Connector (pack of 25)	170 XTS 022 00	

Terminating Devices for Modbus RS485 Networks

Overview

This section describes terminating devices which should be used in constructing Modbus RS485 networks for TSX 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. The plug is red.

Description	Part Number	Photo
Modbus Plus or Modbus RS485 Terminating RJ45 Resistor Plugs (pack of 2)	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. The plug is blue.

Description	Part Number	Photo
Modbus RS485 Terminating RJ45 Shunt Plugs	170 XTS 042 00	

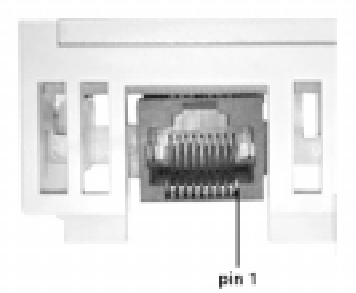
Pinouts for Modbus RS485 Networks

Overview

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

RJ45 Pinout

Here are the pinouts for wiring an RJ45 connector for RS485:



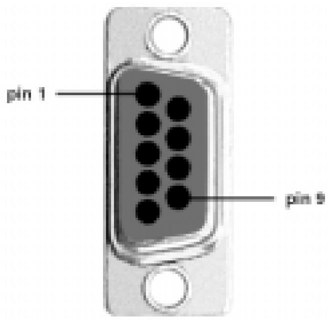
Pin	Function
1	RXD -
2	RXD +
3	TXD +
4	
5	Signal common
6	TXD -
7	
8	Shield

Continued on next page

Pinouts for Modbus RS485 Networks, Continued

9-Pin D-Shell Pinout

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



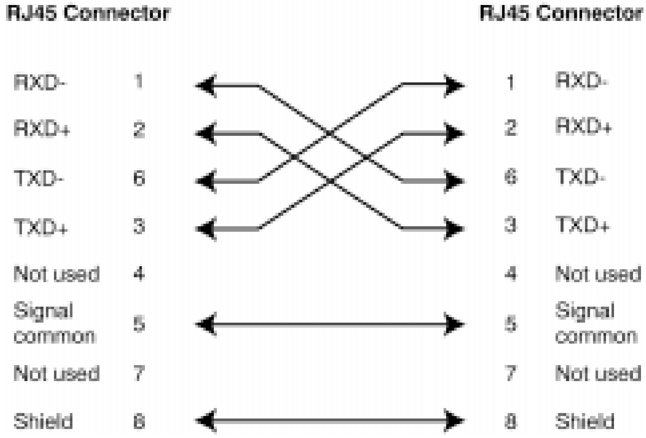
Pin	Function
1	TXD +
2	RXD +
3	Signal common
4	
5	
6	TXD -
7	RXD -

Continued on next page

Pinouts for Modbus RS485 Networks, Continued

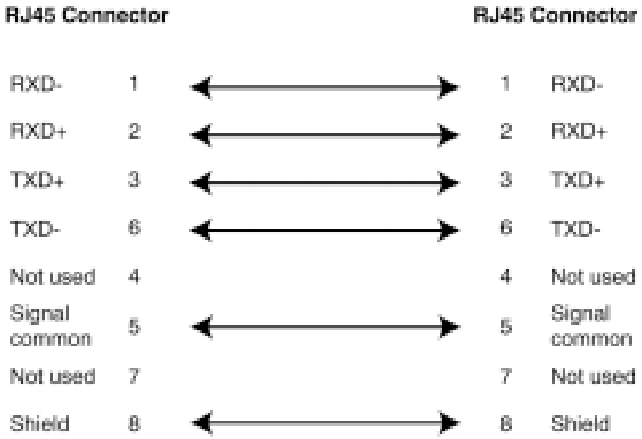
Master Communication Cable

Here is the pinout for the 170 MCI 041 10 Modbus RS485 (RJ45/RJ45) Master Communication Cable:



Interconnect Cables

Here is the pinout for the 170 MCI 02x xx Modbus Plus or Modbus RS485 Interconnect Cables (10 in, 3 ft, 10 ft and 30 ft):



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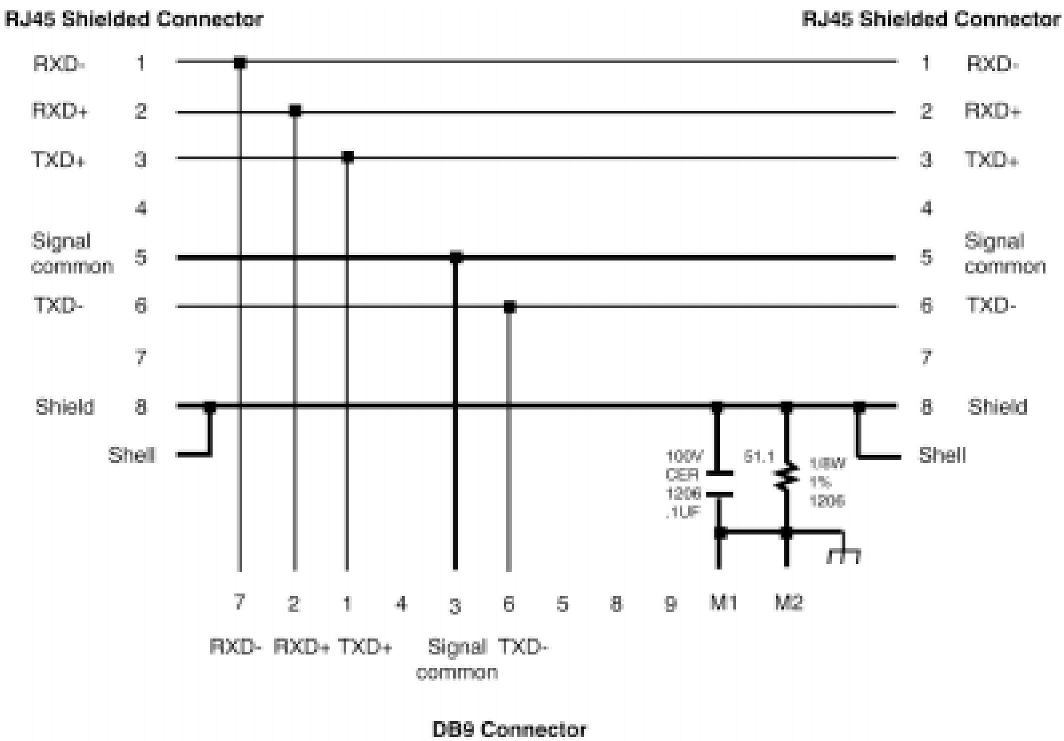
Pinouts for Modbus RS485 Networks, Continued

Modbus RS485 Connector "T" (DB9 Base)

Here is the pinout for the Modbus RS485 Connector "T" (DB9 base):



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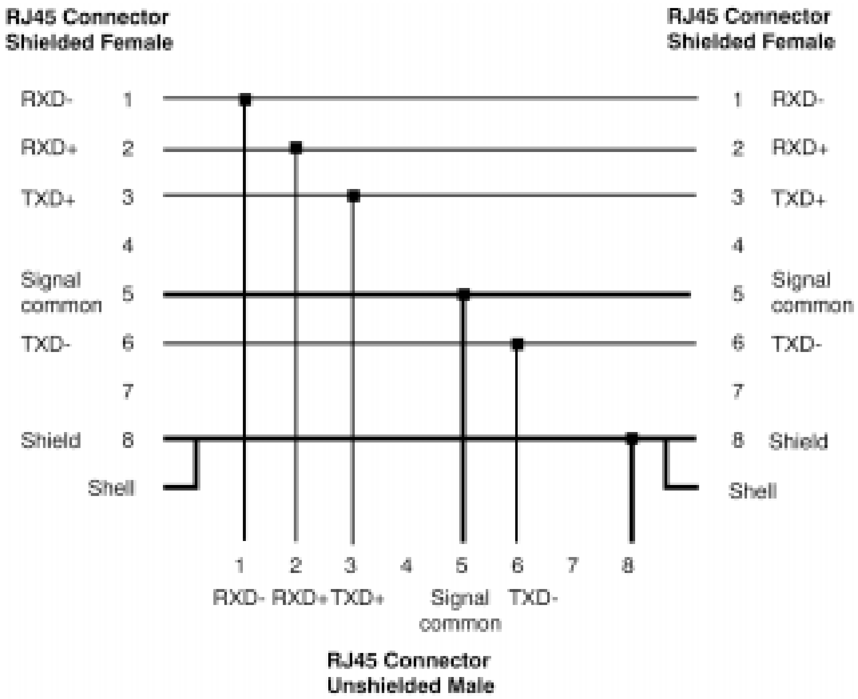
Pinouts for Modbus RS485 Networks, Continued

Modbus RS485 Connector "T" (RJ45 Base)

Here is the pinout for the Modbus RS485 Connector "T" (RJ45 base):



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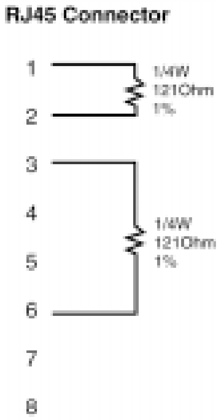
Pinouts for Modbus RS485 Networks, Continued

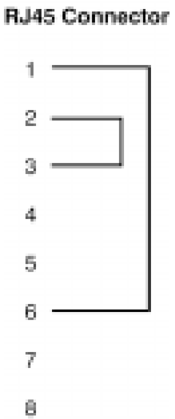
Terminating Resistor Plugs

Here is the pinout for the Modbus Plus or Modbus RS485 Terminating RJ45 Resistor Plugs:



Terminating Shunt Plugs

Here is the pinout for the Modbus RS485 Terminating RJ45 Shunt Plugs:



Using the I/OBus Port

5

At a Glance

Purpose

Two TSX Momentum components offer I/OBus master capabilities:

- 171 CCS 760 00 Processor Adapter
- 171 CCC 760 10 Processor Adapter

This section explains how I/OBus works, provides guidelines for creating I/OBus networks with TSX Momentum components, and describes recommended cable accessories.

In This Chapter

This chapter contains the following topics:

How I/OBus Works

Introduction

I/OBus allows a Momentum CPU to assume bus master capabilities over as many as 256 slave devices over an Interbus cable.

How Signals Are Passed

I/OBus 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/OBus 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. As a slave handles the stream data, it extracts the portion that is assigned to it and adds any output data to the stream.

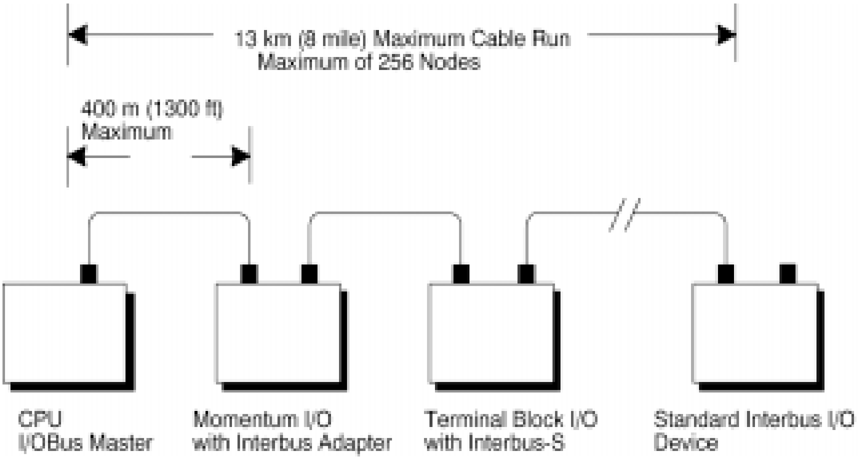
Guidelines for I/OBus Networks

Overview

This section gives guidelines for creating an I/OBus network using TSX Momentum components.

Network Scheme

Physically, the bus looks like a tree with the master at the head and the slaves distributed along a trunk (see below).



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

I/OBus Restrictions

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

Continued on next page

Guidelines for I/OBus Networks, Continued

I/OBus Specifications

The table below provides I/OBus specifications.

Number of distributed slave stations supported		256 maximum (subject to hardware/ software limitations)
Cable spacing between nodes		400 m (1300ft) maximum
Maximum distance between master and furthest slave		13 km (8 mi)
Transmission speed		500 kbits/s
Number of 16-bit words	**Input words**	256 maximum
	Output words	256 maximum

I/OBus Accessories

Overview

Modicon provides several cabling solutions for I/OBus:

- Low profile cables in two lengths
- A 1m cable for connecting devices on different DIN rails in a cabinet
- A connector kit for building custom-length Interbus cables

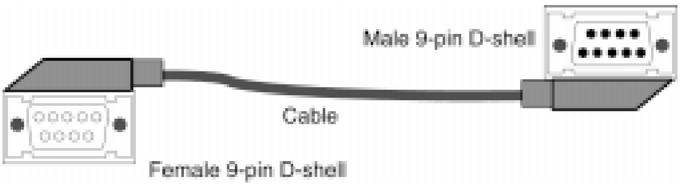
This section describes those solutions.

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/OBus 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.



1 m Cable

A 1m (39 in) Interbus cable (170 MCI 100 00) is also available to allow you to connect modules on separate DIN rails.

Note: The connectors on the 170 MCI 100 00 cable are not low profile.

Continued on next page

I/OBus Accessories, Continued

Interbus Cable Connector Kit

I/OBus 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.

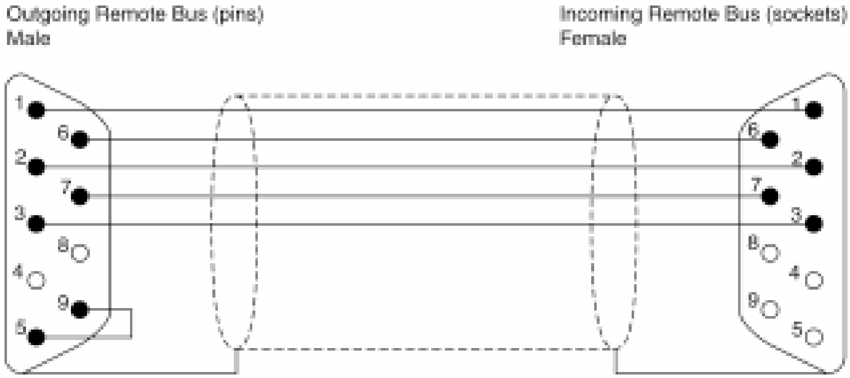
Note: The connectors in the 170 XTS 009 00 Kit are not low profile.

Continued on next page

I/OBus Accessories, Continued

Interbus Cable Pinouts

The following diagram shows how to wire the connectors of the remote bus cable:



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

Using the Modbus Plus Ports

6

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 TSX 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.

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

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

Design your Modbus Plus architecture to meet the needs of your network. Modbus Plus can offer deterministic I/O servicing or non-deterministic supervisory servicing of programming, user interface, and third party ModConnect devices. Do not use a supervisory network to service critical I/O.

Failure to observe this precaution 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.

Continued on next page

Two Types of Modbus Plus Networks, Continued

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/OBus 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 to 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

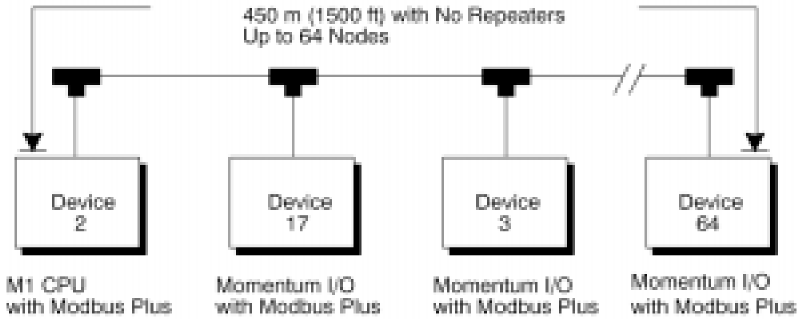
You must terminate both ends of the network. If your network consists of two or more sections separated by a repeater, each section must be terminated at both ends.

Continued on next page

Standard Cabling Schemes, Continued

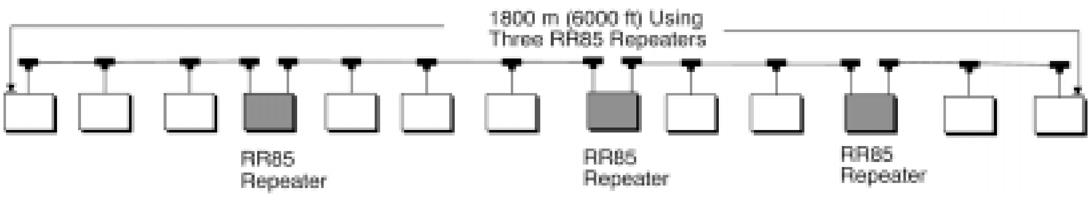
Momentum Network

This diagram 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 diagram 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).

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.

Continued on next page

Cluster Mode Cabling Schemes, Continued

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 10 ft (3 m).

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 diagrams on 128.

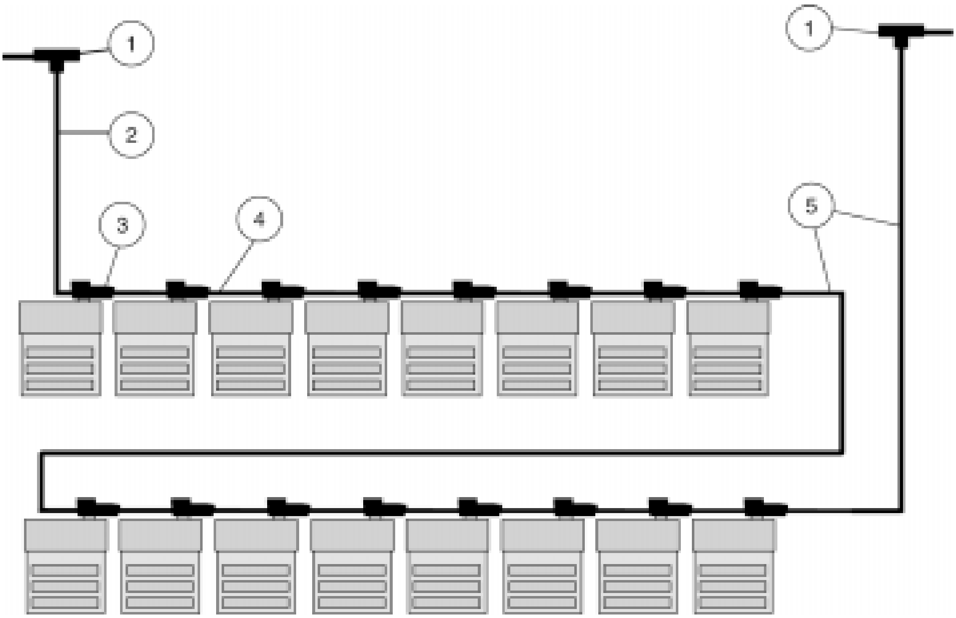
Description	Part Number
Modbus Plus 10 ft. Drop Cable	170 MCI 021 20
Modbus Plus or Modbus RS485 30 ft. Interconnect Cable	170 MCI 020 80

Continued on next page

Cluster Mode Cabling Schemes, Continued

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.



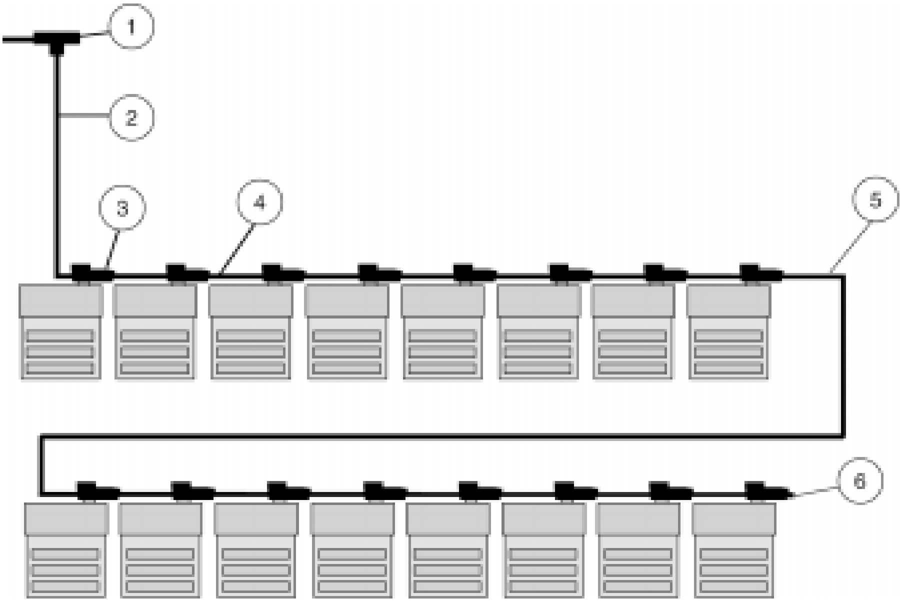
Label	Description	Part Number
1	Modbus Plus Tap	990 NAD 230 00
2	Modbus Plus 10 ft Drop Cable	170 MCI 021 20
3	Modbus Plus Connector “T” (DB9 base)	170 XTS 020 00
4	Modbus Plus / Modbus RS485 Short Interconnect Cable OR Modbus Plus / Modbus RS485 3 ft Interconnect Cable	170 MCI 020 10 170 MCI 020 36
5	Modbus Plus / Modbus RS485 30 ft Interconnect Cable	170 MCI 020 80

Continued on next page

Cluster Mode Cabling Schemes, Continued

Cluster Scheme #2

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



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

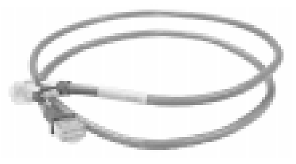
Cable Accessories for Modbus Plus Networks

Overview

This section describes the cables, connector and terminating device which should be used in constructing a Modbus Plus network for TSX 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	Photo
Modbus Plus or Modbus RS485 Short Interconnect Cable (10”)	170 MCI 020 10	
Modbus Plus or Modbus RS485 3 ft. Interconnect Cable	170 MCI 020 36	

Continued on next page

Cable Accessories for Modbus Plus Networks, Continued

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	Photo
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	

Continued on next page

Cable Accessories for Modbus Plus Networks, Continued

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.

Description	Part Number	Photo
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	Photo
Modbus Plus or Modbus RS485 Terminating RJ45 Resistor Plugs (pack of 2)	170 XTS 021 00	

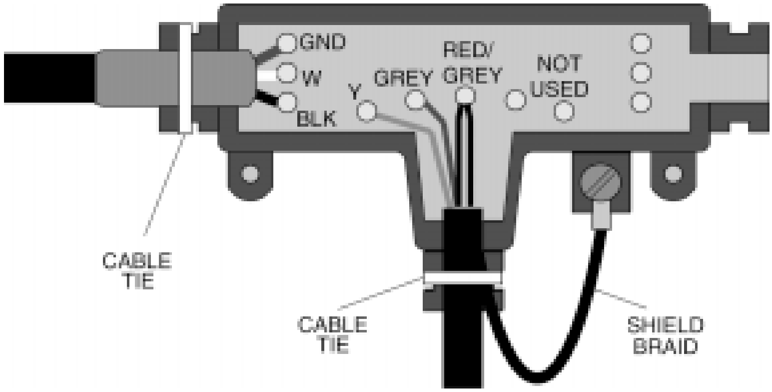
Pinouts and Wiring Diagrams for Modbus Plus Networks

Overview

This section contains pinouts and wiring diagrams for constructing an Modbus Plus network for TSX Momentum components.

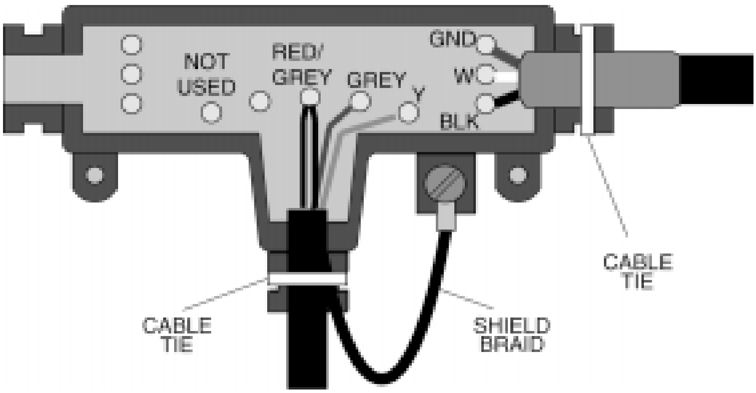
Drop Cable from Tap to Cluster

Here is the diagram for wiring an interconnect cable (with one RJ45 connector removed) from a Modbus Plus tap to a cluster:



Drop Cable from Cluster to Tap

Here is the diagram for wiring an interconnect cable (with one RJ45 connector removed) from a cluster to a Modbus Plus tap:



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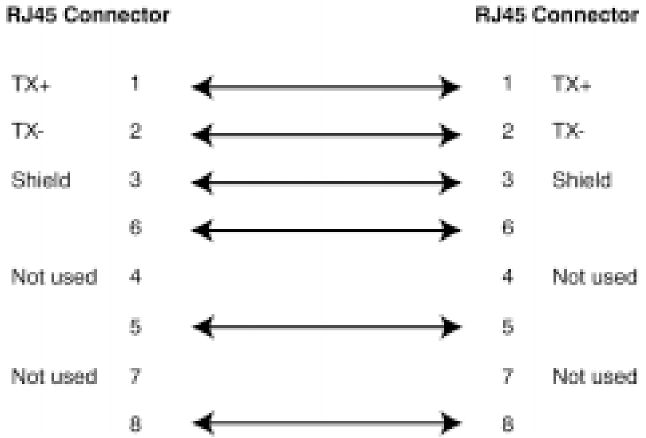
Pinouts and Wiring Diagrams for Modbus Plus Networks, Continued

Interconnect Cables

Here is the pinout for the 170 MCI 02x xx Modbus Plus or Modbus RS485 Interconnect Cables (10 in, 3 ft, 10 ft and 30 ft):

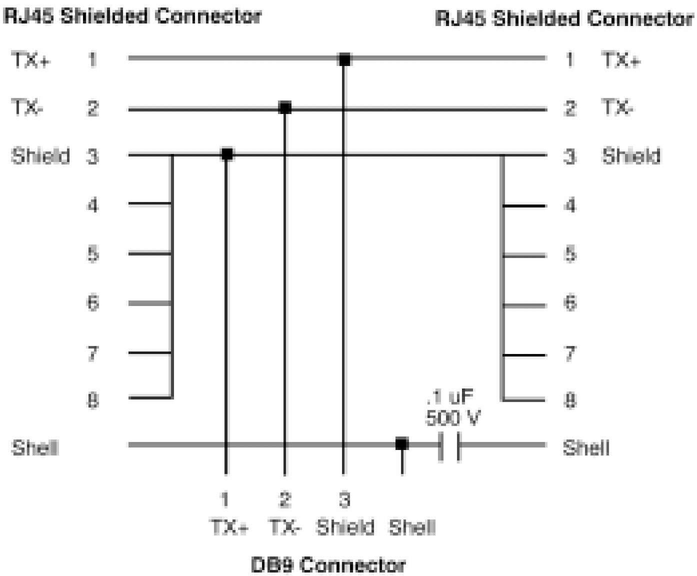


Continued on next page

Pinouts and Wiring Diagrams for Modbus Plus Networks, Continued

Modbus Plus Connector "T" (DB9 Base)

Here is the pinout for the Modbus Plus Connector "T" (DB9 base):

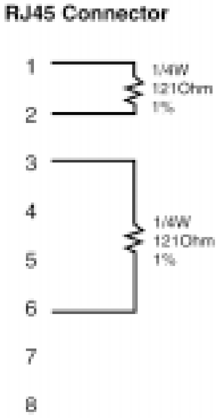


Continued on next page

Pinouts and Wiring Diagrams for Modbus Plus Networks, Continued

Terminating Resistor Plugs

Here is the pinout for the Modbus Plus or Modbus RS485 Terminating RJ45 Resistor Plugs:



Modbus Plus Addresses

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

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 observe this precaution 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.

Continued on next page

Modbus Plus Addresses, Continued

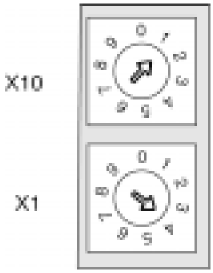
Setting Modbus Plus Addresses

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

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.

Continued on next page

Peer Cop, Continued

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 those 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.

Modsoft

III

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 Modsoft 2.6.

In This Chapter

This part contains the following chapters:

Configuring an M1 CPU with Modsoft

7

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.

In This Chapter

The chapter contains the following topics.

Section 7.1
Configuring the Processor Adapter

Overview

Purpose

This section describes how to configure a TSX Momentum M1 Processor Adapter using Modsoft 2.6.

In This Section

This section contains the following topics:

Selecting an M1 Processor Adapter

Introduction

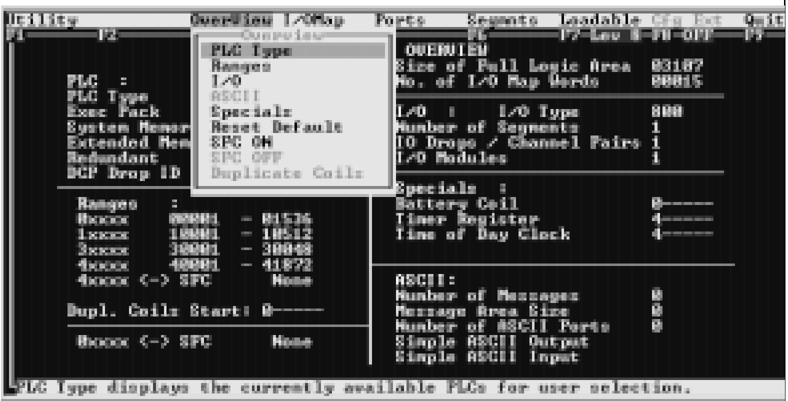
This section describes how to select an M1 Processor Adapter with Modsoft 2.6, starting from the Configuration Overview editor.

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.

Step	Action
1	With a new Configuration Overview editor on the screen, move the cursor onto the **OverView** selection on the top menu bar. **Result:** A pulldown list of options appears.



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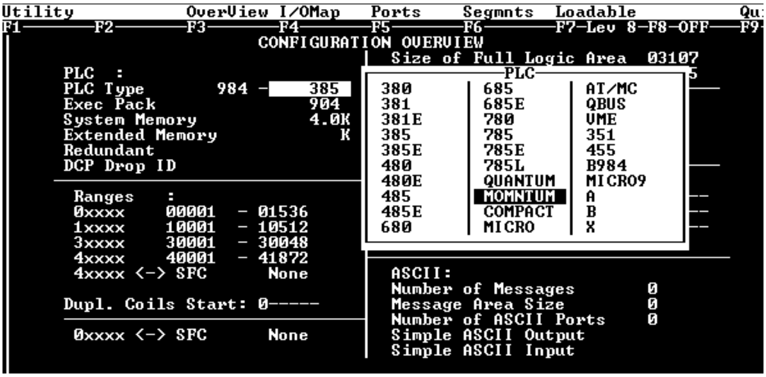
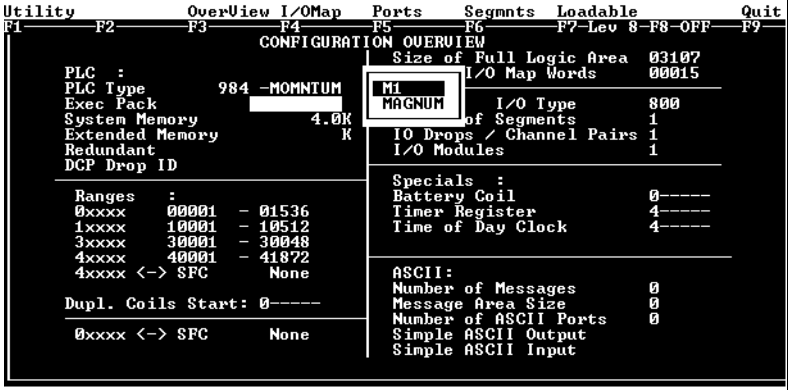
Selecting an M1 Processor Adapter, Continued

Procedure, Continued

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>2</td><td>Move the cursor onto PLC Type in the pulldown list and push <Enter>.

Result: The following list of PLC types appears on the screen:

</td></tr>
<tr><td>3</td><td>Move the cursor onto MOMNTUM and push <Enter>.

Result: You will be prompted to select between the M1 Processor type and the Magnum.

</td></tr>
<tr><td>4</td><td>Place the cursor on M1 and push <Enter>.</td></tr>
</table>

Continued on next page

Selecting an M1 Processor Adapter, Continued

Next Step

You are now ready to specify the type of TSX M1 Momentum Processor Adapter for configuration.

Specifying an M1 Processor Type

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/OBus network (as described in I/O Mapping an I/OBus Network with Modsoft).

Continued on next page

Specifying an M1 Processor Type, Continued

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>

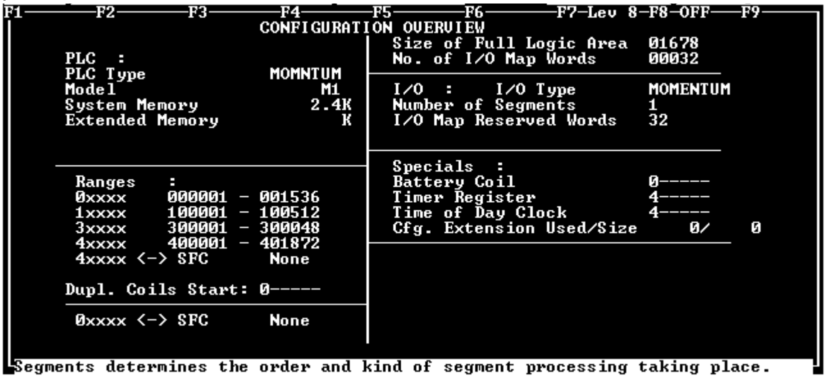
Default Configuration Parameters

Overview

This section describes the default configuration parameters.

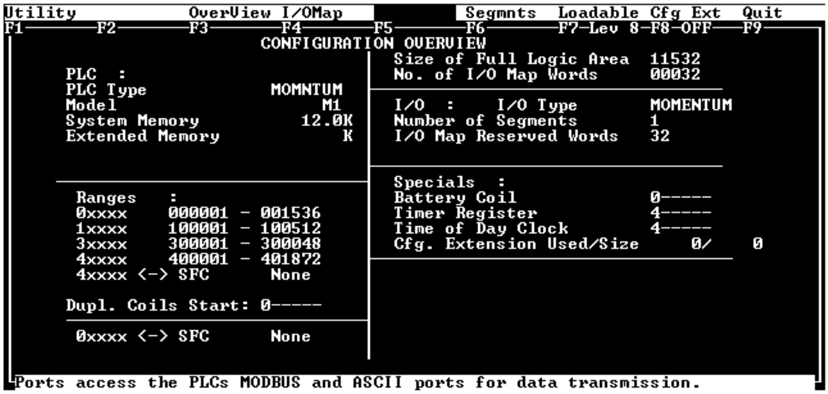
Defaults for a 2.4K Adapter

This sample Configuration Overview screen shows the default configuration parameters.



Defaults for a 12.0K Adapter

This sample Configuration Overview screen shows the default configuration parameters:

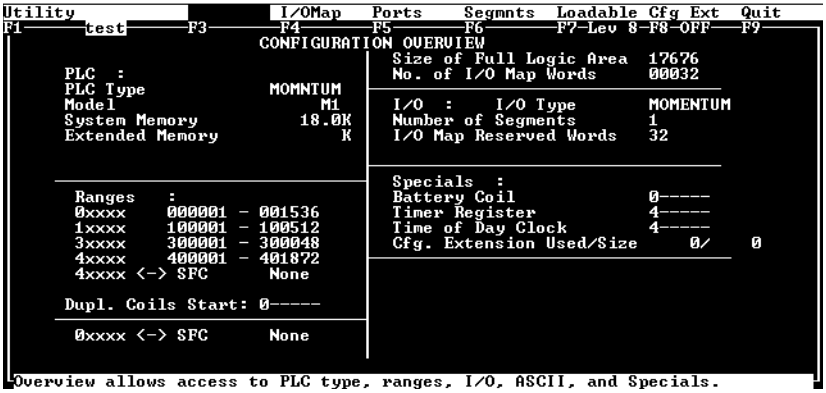


Continued on next page

Default Configuration Parameters, Continued

Defaults for an 18.0 Adapter

This sample Configuration Overview screen shows the default configuration parameters:



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Default Configuration Parameters, Continued

Default Values

Here are the default parameters:

Parameter	**2.4K Adapter**	**12.0K Adapter**	**18.0K Adapter**
Coils in state RAM	1536 (0*x*)	1536 (0*x*)	1536 (0*x*)
Discrete inputs in state RAM	512 (1*x*)	512 (1*x*)	512 (1*x*)
Input registers in state RAM	48 (3*x*)	48 (3*x*)	48 (3*x*)
Output registers in state RAM	1872 (4*x*)	1872 (4*x*)	1872 (4*x*)
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

Introduction

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

Guidelines

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

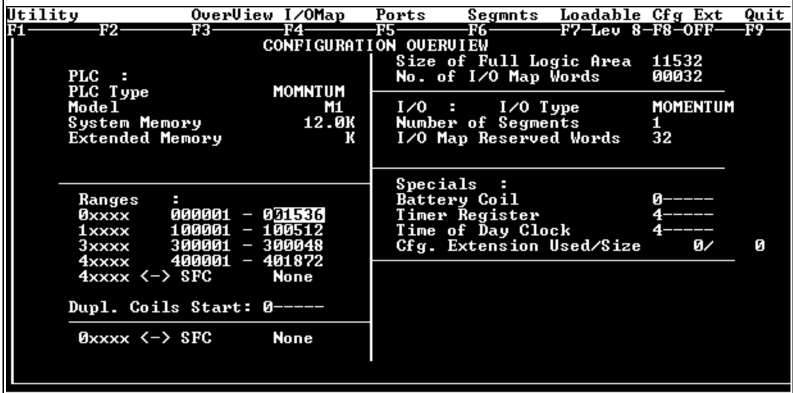
- Adjust the range of discretes in increments of 16. Sixteen discretes consume one word.
- Adjust the range of registers in increments of 1. Each register consumes one word.
- The total number of register and discrete references cannot exceed 3k words.
- A minimum configuration of 16 0*x* discretes,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

Continued on next page

Changing the Range of Discrete and Register References, Continued

Procedure

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

Step	Action
1	From the Overview menu, select **Ranges**. **Result:** The cursor will appear in the Ranges field of the editor on the high range 0*x* value. 
2	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.

Changing the Size of Your Application Logic Space

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

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/OBus 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/OBus 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.

Continued on next page

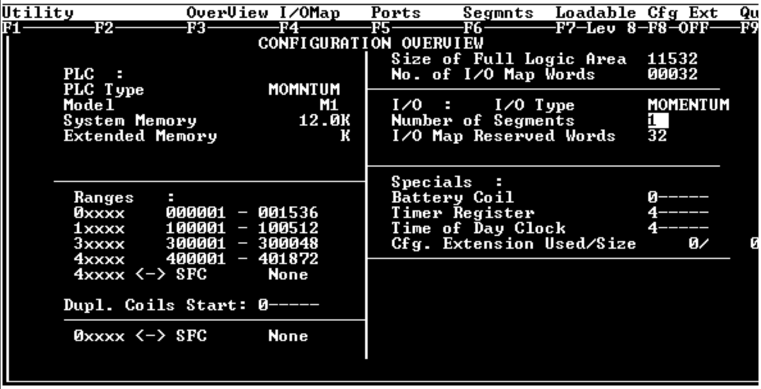
Changing the Number of Segments, Continued

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

Introduction

The default size of the I/O Map and your options vary, depending on whether or not your Processor Adapter supports an I/OBus network.

Processors For I/O Bus Networks

With I/OBus, 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 TSX 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, in order to increase the size of the full logic area.

Default	32 words
Minimum	17 words

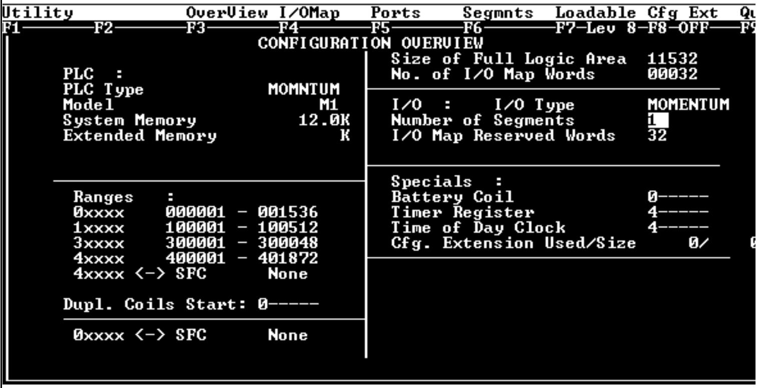
Continued on next page

Changing the Size of the I/O Map, Continued

Procedure

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

<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>Push <Enter>.

Result: The cursor moves to the I/O Map Reserved Words field.</td></tr>
<tr><td>3</td><td>Modify the I/O Map size by typing a new number in this field.</td></tr>
<tr><td>4</td><td>Push <Enter>.</td></tr>
</table>

Establishing Configuration Extension Memory

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` pulldown 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>**.

Section 7.2
Configuring Option Adapter Features

Overview

Purpose

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

In This Section

This section contains the following topics:

Reserving and Monitoring a Battery Coil

Introduction

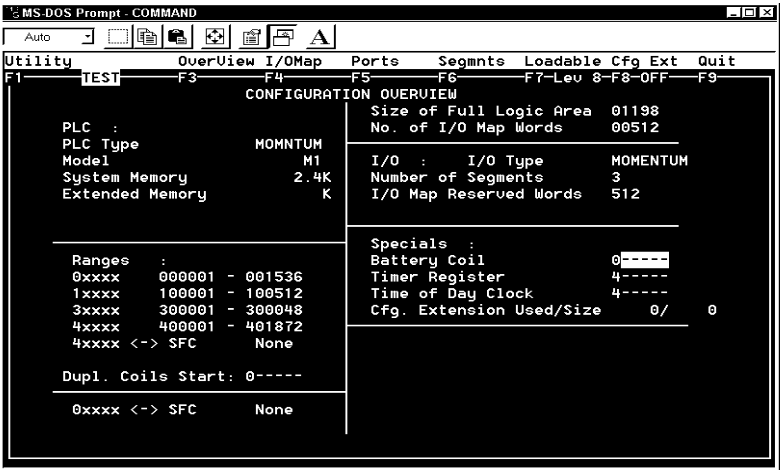
Since the Option Adapter does not have an LED to indicate when the battery is low, we recommend that you reserve a 0*x* reference to monitor the health of the battery.

This section describes how to reserve and monitor a battery coil, 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.

Step	Action
1	From the Overview menu, select **Specials**. **Result:** The cursor moves into the Battery Coil field on the Configuration Overview screen.



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

Continued on next page

Reserving and Monitoring a Battery Coil, Continued

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

Overview

Each Option Adapter has a time-of-day clock. To use this feature, you must reserve a block of eight 4*x* registers.

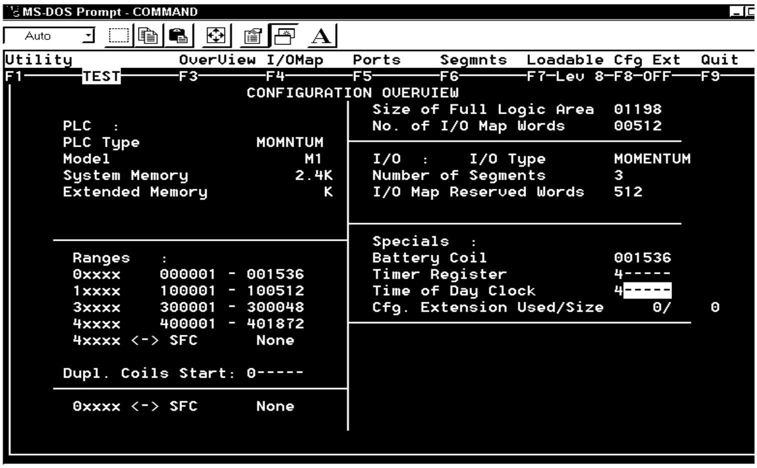
This section describes how to reserve those registers, using Modsoft 2.6.

Reserving Registers for the TOD Clock

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

<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>Push the down arrow key twice to move the cursor into the Time of Day Clock field.



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

Continued on next page

Setting up the Time-of-Day Clock, Continued

Reserving Registers for the TOD Clock, Continued

Step	Action
3	Enter a number (the first in a series of eight) in the range of available 4*xxxx* 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.

Setting the Time

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**. **Result:** 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>**.

Continued on next page

Setting the Time, Continued

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 (4*x*) uses its four most significant bits to report status:

<table>
<tr><th colspan="16">Control Register</th></tr>
<tr><td>15</td><td>14</td><td>13</td><td>12</td><td>11</td><td>10</td><td>9</td><td>8</td><td>7</td><td>6</td><td>5</td><td>4</td><td>3</td><td>2</td><td>1</td><td>0</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 4*x* is the first register in the block reserved for the clock:

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

Continued on next page

Setting the Time, Continued

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 4*x* + 1 through 4*x* + 7. Example: To set the clock for Thursday, April 9, 1998 at 4:17:00, set the following values in the registers: ● 4*x* + 1 5 ● 4*x* + 2 4 ● 4*x* + 3 9 ● 4*x* + 4 98 ● 4*x* + 5 4 ● 4*x* + 6 17 ● 4*x* + 7 00
2	Load the value **8000H** in register 4*x* to write the data to the clock.

Reading the Time-of-Day Clock

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

Section 7.3
Modifying Communication Port Parameters

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.

In This Section

This section contains the following topics.

Accessing the Port Editor Screen

Introduction

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

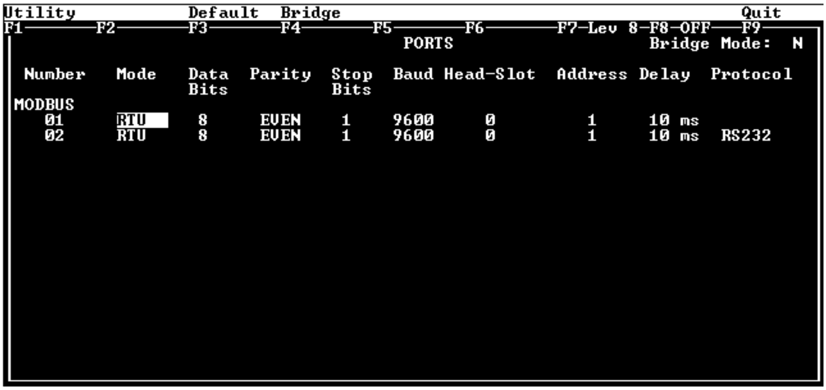
How To Get There

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.

Parameters 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 TSX Momentum M1 CPUs.

Changing the Mode and Data Bits

Introduction

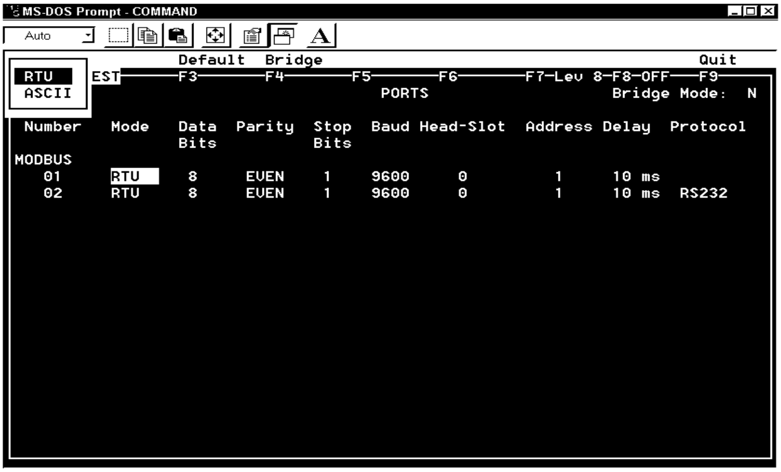
From the Port editor screen, each port can be configured to operate in one of two possible modes – RTU or ASCII.

- 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: 

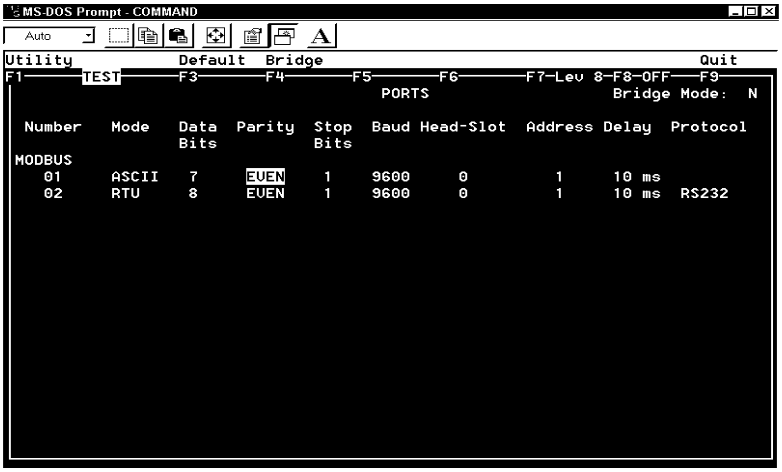
Continued on next page

Changing the Mode and Data Bits, Continued

Procedure, Continued

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



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

Changing Parity

Introduction

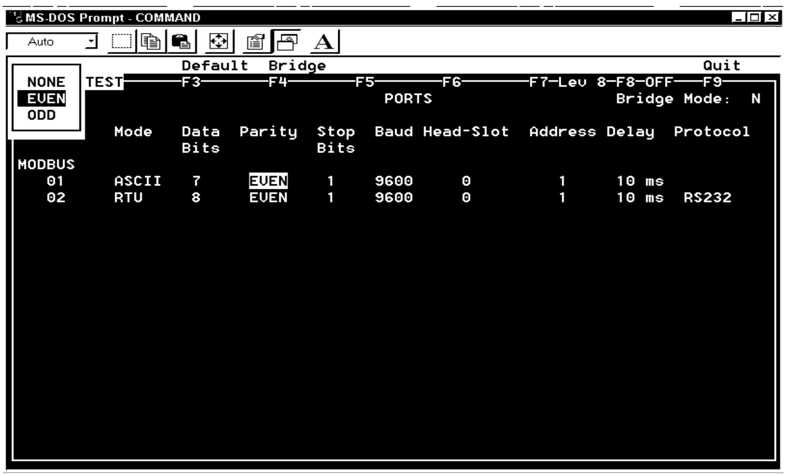
From the Port editor screen, a port can be configured for even, odd, or no parity checking. The factory-set default is EVEN parity.

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

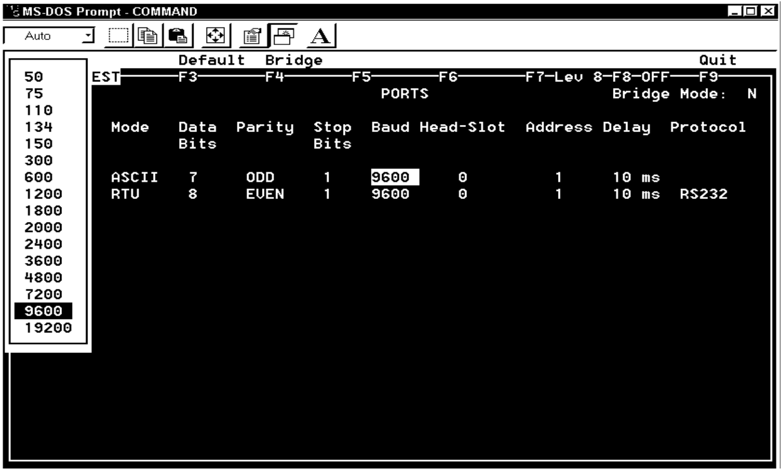
Overview

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.

Procedure

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

Step	Action
1	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: 
2	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.

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 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

Overview

The default value for the delay parameter is 10 ms. This value is appropriate for most TSX 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 Msec)
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

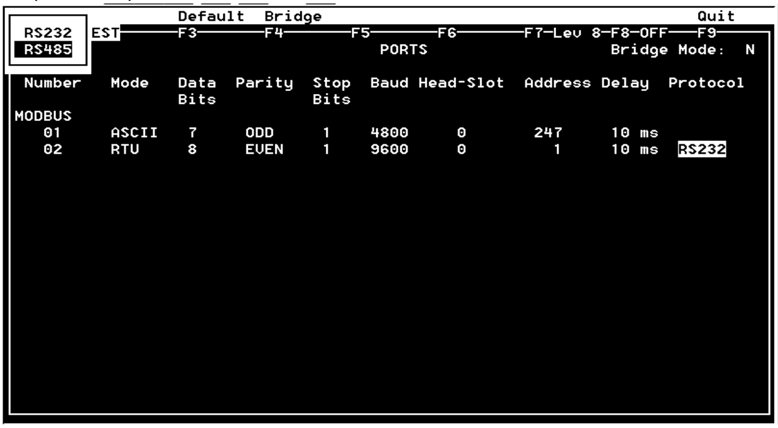
Overview

If your TSX 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.

Step	Action
1	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: 
2	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.

Section 7.4
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 (0*x*, 1*x*, 3*x*, or 4*x*) 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>.

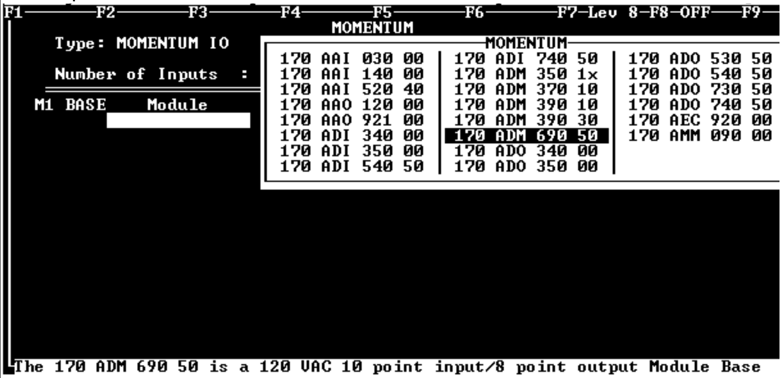
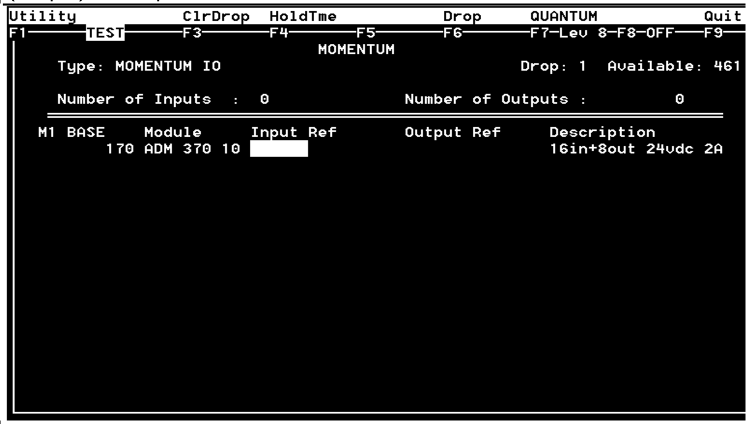
Result: An I/O Map screen appears with the cursor placed in the Module field. The label in the top left corner of the screen identifies it as Type: MOMENTUM I/O.

Continued on next page

Accessing and Editing the I/O Map, Continued

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. 
2	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: 

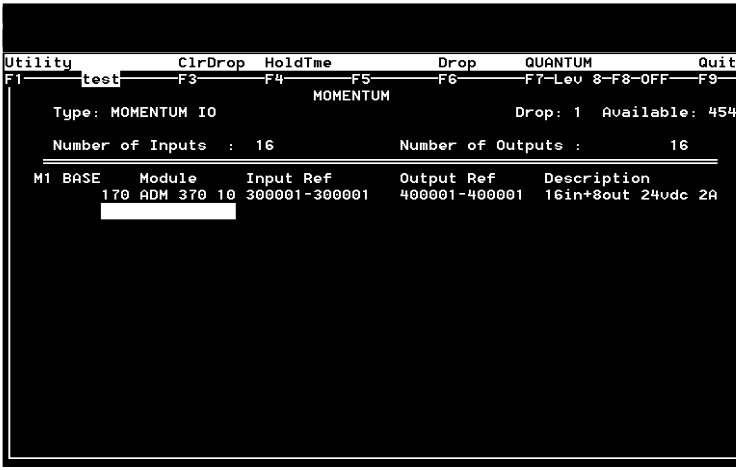
Continued on next page

Accessing and Editing the I/O Map, Continued

Editing the Local I/O Map

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>3</td><td>Assign the appropriate state RAM reference(s) to the unit.

Example: In the screen below, one 3*x* register (300001) has been assigned for the input points and one 4*x* 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>

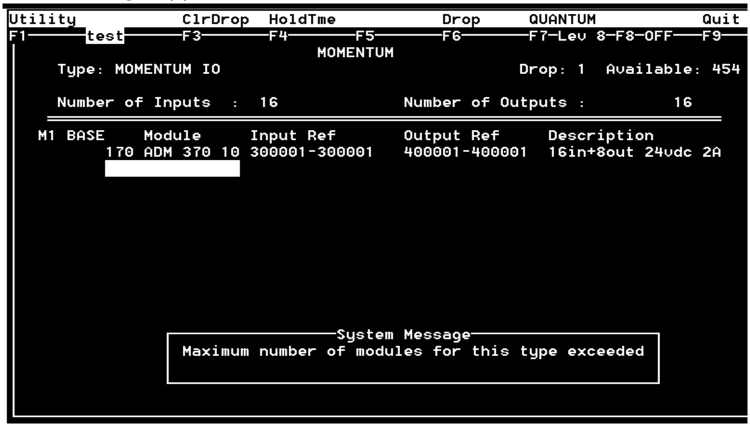
Continued on next page

Accessing and Editing the I/O Map, Continued

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/OBus communication stations, you will need to go to a separate I/O Map screen for Drop 2. That process is described in I/O Mapping an I/OBus Network with Modsoft .

I/O Mapping an I/OBus Network with Modsoft

8

At a Glance

Purpose

This chapter describes how to I/O Map an I/OBus network using Modsoft 2.6.

Topics

This chapter contains the following topics:

Supporting an I/O Map for an I/OBus Network

Introduction

The 171 CCS 760 00 and 171 CCC 760 10 Processor Adapters have an I/OBus communication port that enables them to control and communicate with network slave I/O.

If you are using I/OBus 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/OBus.

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/OBus 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

Make 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 have made sure that your Configuration Overview parameters are set properly, you can access a second I/O Map screen for the I/OBus network.

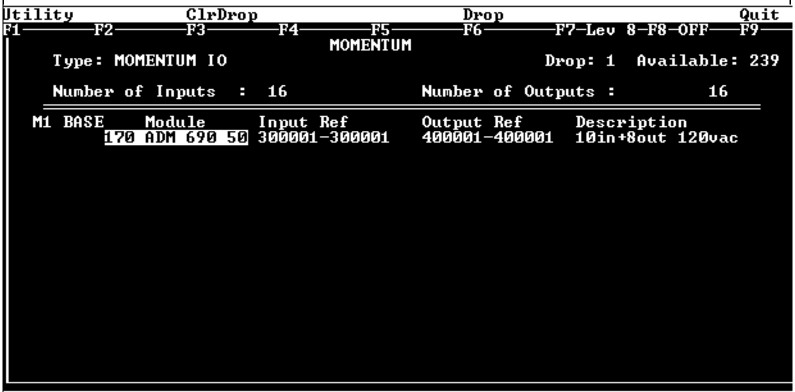
Accessing an I/O Map Screen for an I/OBus Network

Overview

This section describes how to access an I/O Map screen for an I/OBus network.

Procedure

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

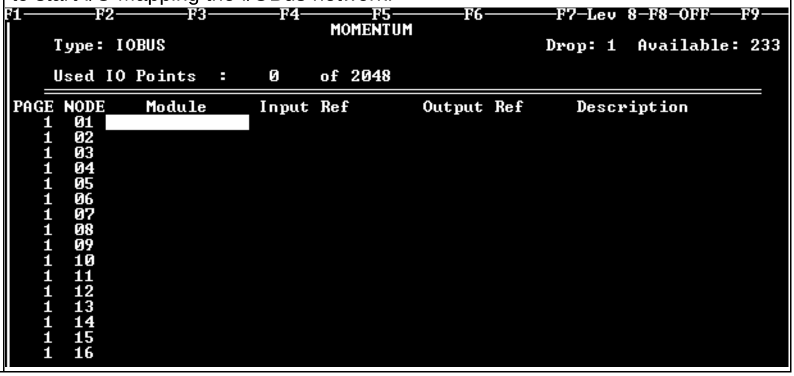
Step	Action
1	From the Configuration Overview screen, move the cursor onto the **I/OMap** command on the top menu and push **<Enter>**. **Result:** The Type: MOMENTUM I/O screen for the local I/O base appears. 

Continued on next page

Accessing an I/O Map Screen for an I/OBus Network, Continued

Procedure, Continued

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>2</td><td>
Select Drop from the top menu bar of this I/O Map screen.
Result: A pulldown menu appears.


</td></tr>
<tr><td>3</td><td>
Select Add Drop (or Next Drop if you have already established the drop) from the pulldown 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/OBus network.


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

Next Step

Editing the I/OBus I/O Map.

Editing the I/OBus I/O Map

Overview

The maximum number of modules which can be I/O Mapped on the I/OBus network depends on your Processor Adapter:

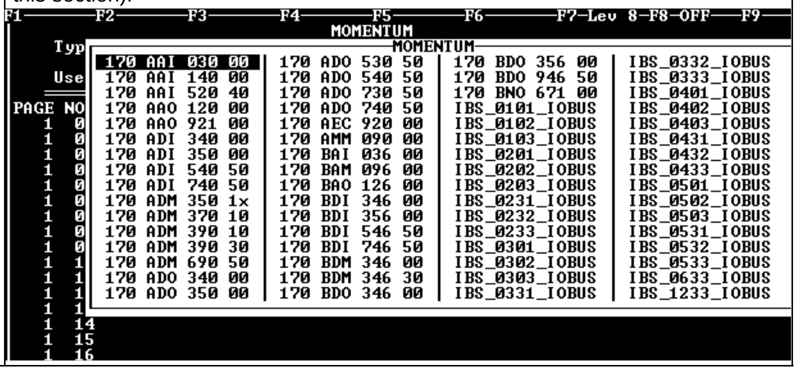
Processor Adapter	Max. Modules	Max. I/O Bits
171 CCS 760 00	128	2048
171 CCC 760 10	256	4096

You may use up to 16 IOBUS screens to map your I/OBus 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

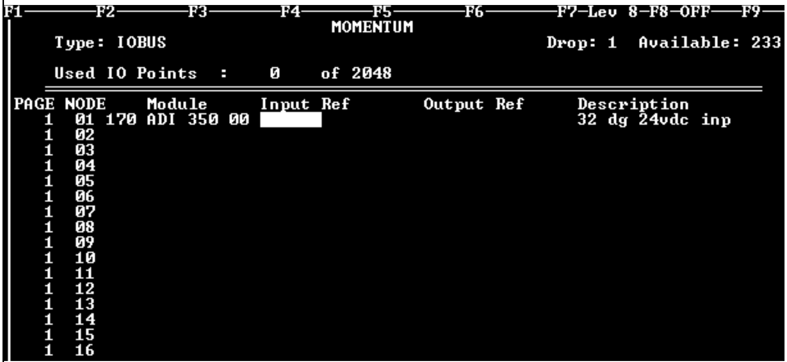
To enter I/O bases or Interbus I/O modules in the I/OBus I/O Map, perform the steps in the following table.

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 list at the end of this section). 

Continued on next page

Editing the I/OBus I/O Map, Continued

Procedure, Continued

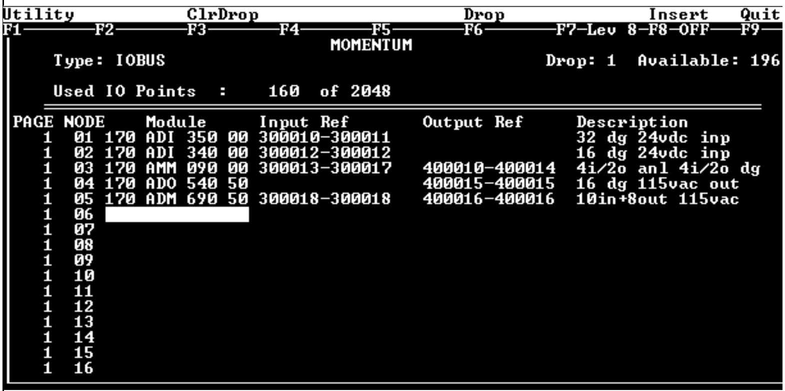
Step	Action
2	Move the cursor onto the desired model number and push **<Enter>**. **Result:** The module type and its description are displayed on the I/O Map screen. The cursor is positioned so that you can assign the appropriate state RAM reference(s) to the unit. **Example:** If you select a 170 ADI 350 00 32-point input base, the screen will look like this: 
3	Enter the desired reference number–in this case a 3*x* register (300020), which will be the first of two contiguous input registers for the 32-bit input base. The second register is automatically assigned.
4	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.

Continued on next page

Editing the I/OBus I/O Map, Continued

Procedure, Continued

Step	Action
5	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.



Continued on next page

Editing the I/OBus I/O Map, Continued

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/OBus 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

Continued on next page

Editing the I/OBus I/O Map, Continued

Generic InterBus Module Identifier Codes, Continued

Identifier Code	**I/O Type**
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

9

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.

In This Chapter

This chapter contains the following sections:

Section 9.1
Getting Started

Overview

Purpose

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

In This Section

This section contains the following topics:

Accessing the Peer Cop Configuration Extension Screen

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 pulldown 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.

Continued on next page

Accessing the Peer Cop Configuration Extension Screen, Continued

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

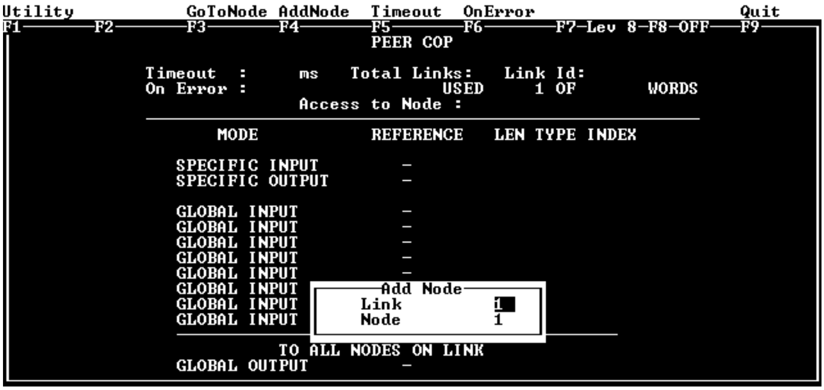
The Default Peer Cop Screen

Overview

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

Diagram

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.

Continued on next page

The Default Peer Cop Screen, Continued

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.

Section 9.2
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.

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.

The Network Devices

The following table lists the Modbus Plus address and components of each TSX 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

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.

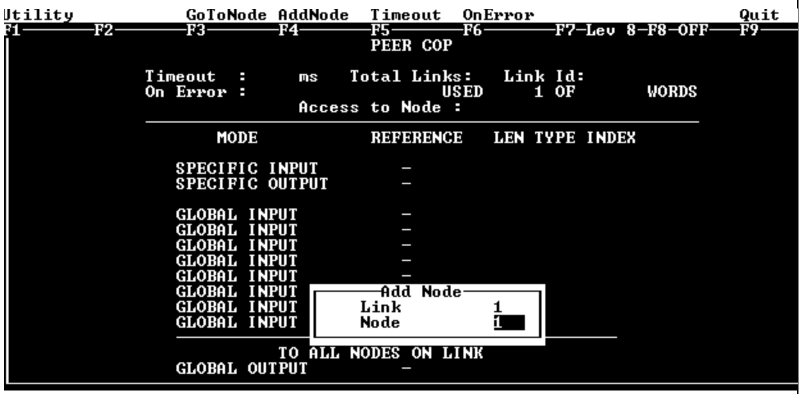
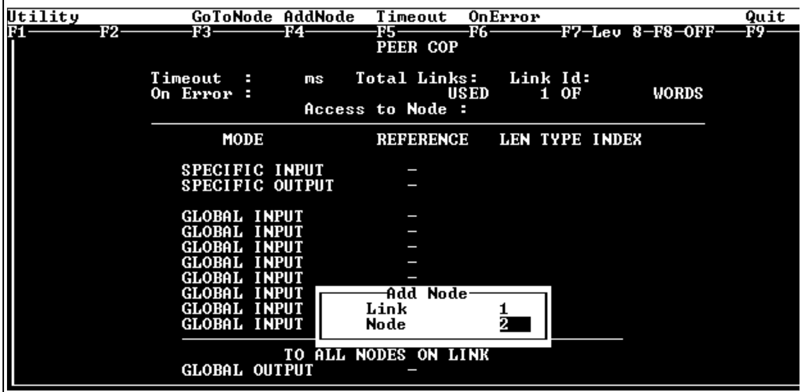
☞ **Note:** Address 1, the network address of the CPU itself, is not a valid node to access since the CPU does not need to access itself over the network.

Continued on next page

Defining the Link and Accessing a Node, Continued

Procedure

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

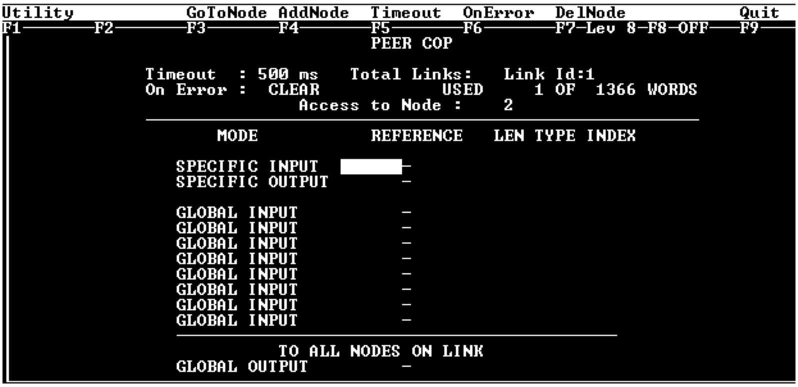
Step	Action
1	With the cursor flashing in the Link value field, make sure that the Link value in the popup is 1. Push **<Enter>**. **Result:** The Link value is set to 1, and the cursor moves to the Node field. 
2	Enter the value **2** in the Node field. 

Continued on next page

Defining the Link and Accessing a Node, Continued

Procedure,
Continued

<table>
<tr><th>Step</th><th>Action</th></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.

Confirming the Peer Cop Summary Information

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 ... 2000ms, and it must be specified as an increment of 20ms.

For our example, we will change the timeout value to 240ms.

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 the setting to `HOLD`.

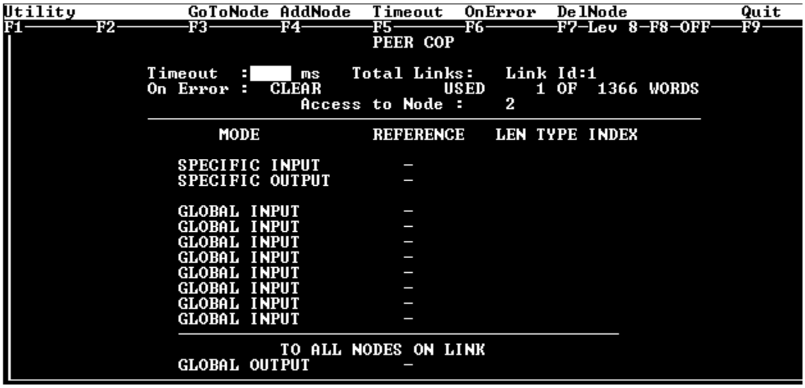
Continued on next page

Confirming the Peer Cop Summary Information, Continued

Procedure

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

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Push <Tab> to move the cursor to the menu bar at the top of the Peer Cop screen.</td></tr>
<tr><td>2</td><td>Move the cursor onto the Timeout command. Push <Enter>.

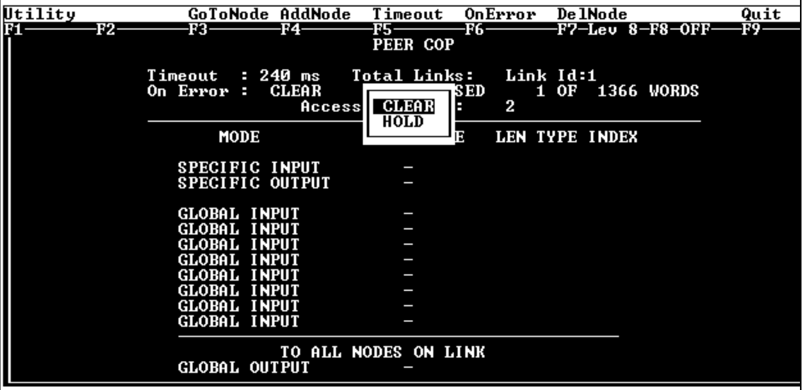
Result: The cursor moves into the Timeout field in the Peer Cop summary information region, and the default value, 500, is cleared.

</td></tr>
<tr><td>3</td><td>Type the number 240, then push <Enter>.</td></tr>
</table>

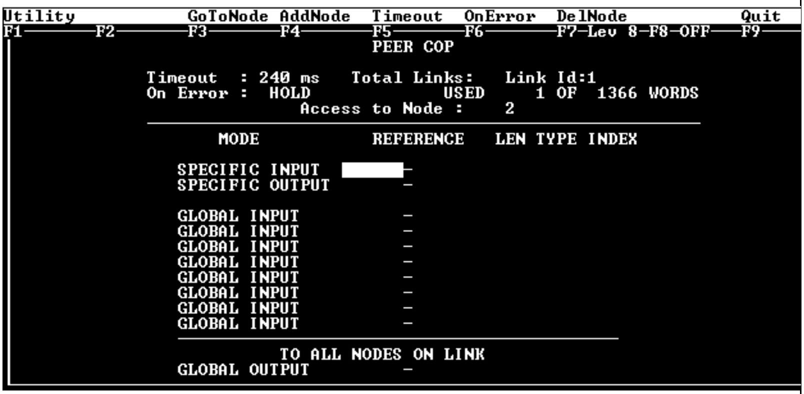
Continued on next page

Confirming the Peer Cop Summary Information, Continued

Procedure,
Continued

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>4</td><td>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.

</td></tr>
<tr><td>5</td><td>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:

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

Continued on next page

Confirming the Peer Cop Summary Information, Continued

Next Step Specifying references for input data.

Specifying References for Input Data

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.

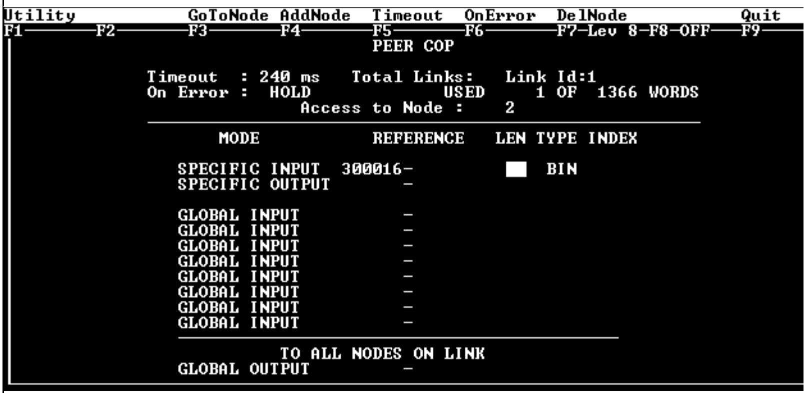
We will assign a 3*x* register (300016) as a specific input to the CPU. When the the 170 ADI 340 00 sends input data to the CPU, it will be sent to this register.

Continued on next page

Specifying References for Input Data, Continued

Procedure

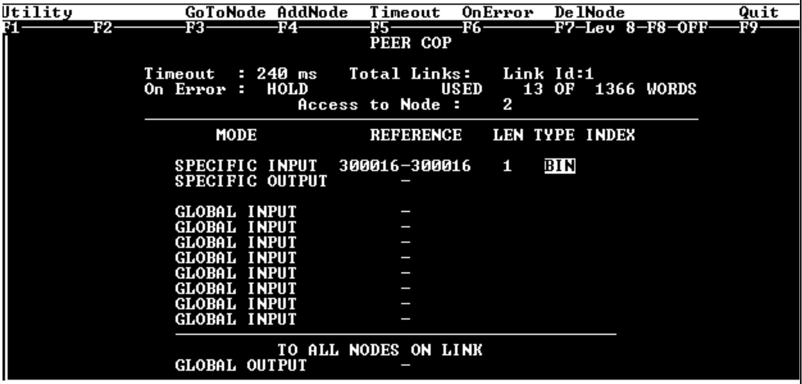
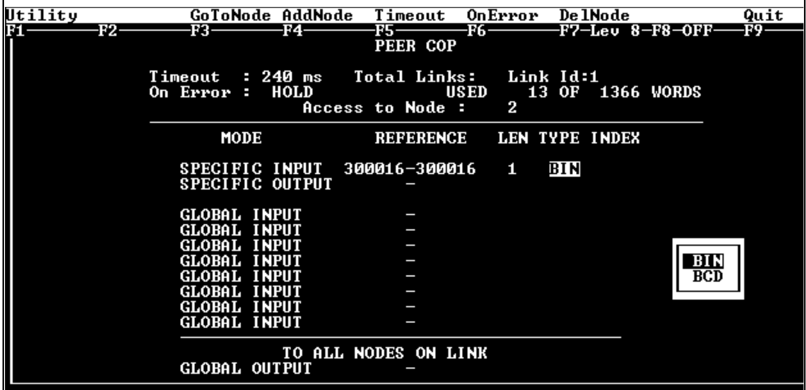
Follow the steps in the table below to define the specific input in Peer Cop.

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. 

Continued on next page

Specifying References for Input Data, Continued

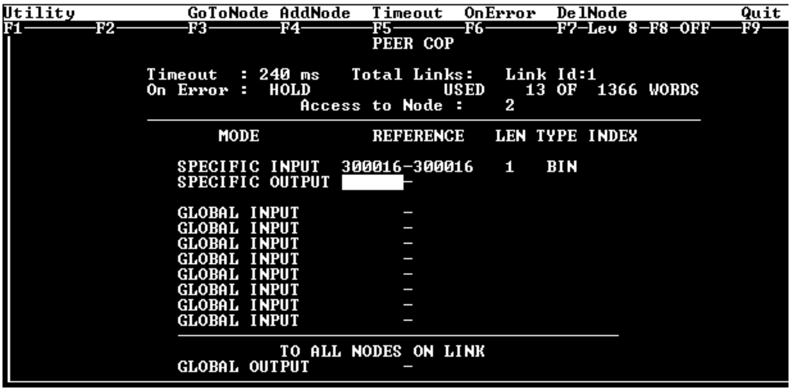
Procedure, Continued

Step	Action
3	Type the value **1** in the LEN column of the SPECIFIC INPUT field, indicating that the 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. 
4	Push **<Enter>**. **Result:** A popup menu appears. You can choose between leaving the data type as binary or changing it to BCD. 

Continued on next page

Specifying References for Input Data, Continued

Procedure, Continued

Step	Action
5	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 like this: 

Next Step Accessing the remaining devices.

Accessing the Remaining Devices

Introduction

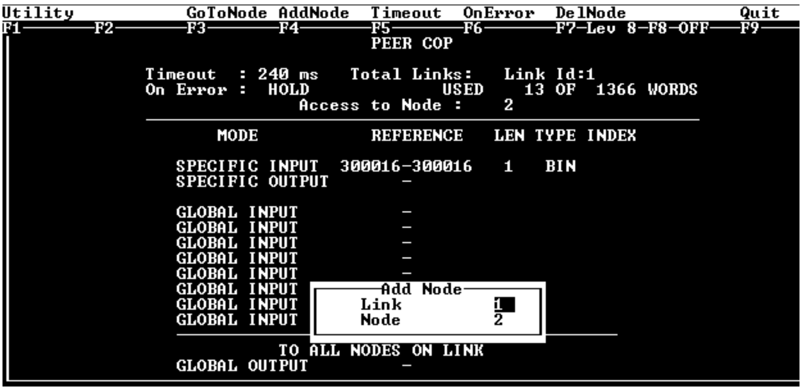
The I/O modules at Modbus Plus addresses 3 ... 5 can be configured individually in a manner similar to that used for the 170 ADI 340 00 module at address 2.

Procedure

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

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Push <Tab> to move the cursor to the menu at the top of the Peer Cop screen.</td></tr>
<tr><td>2</td><td>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.



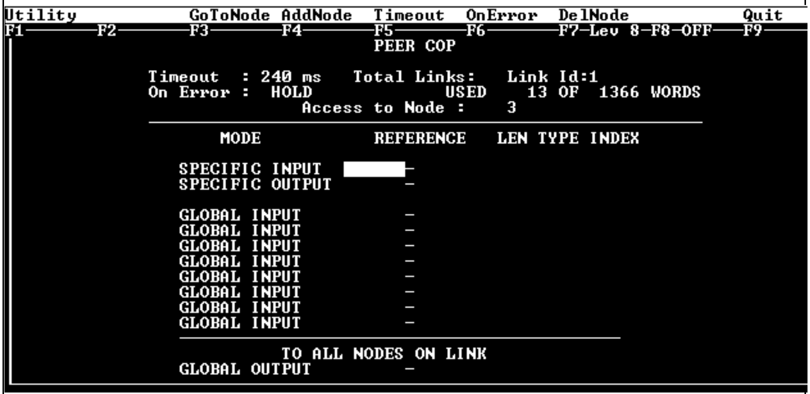
</td></tr>
<tr><td>3</td><td>Make sure that the Link value in the Add Node popup is 1. Push <Enter>.

Result: The Link value is set to 1, and the cursor moves to the Node value field of the Add Node popup.</td></tr>
</table>

Continued on next page

Accessing the Remaining Devices, Continued

Procedure, Continued

Step	Action
4	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: 

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.

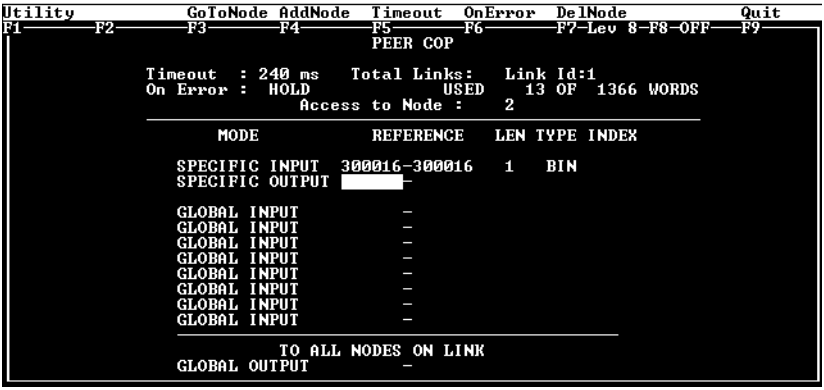
Register Assignments

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:

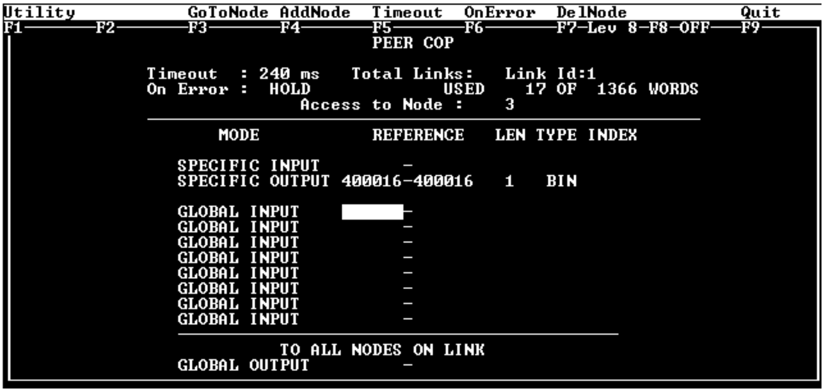


Continued on next page

Completing the I/O Device Configuration in Peer Cop, Continued

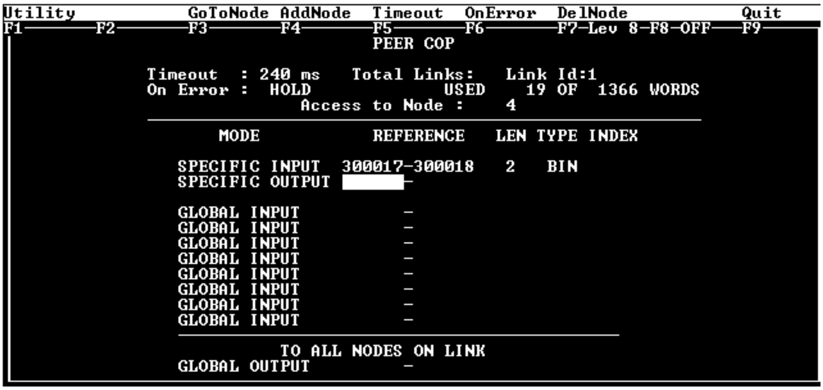
Completed Screen: Node 3

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:



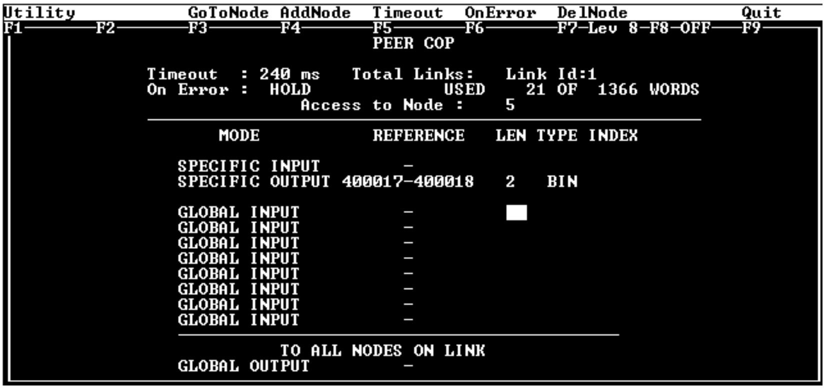
Note: The lengths (LEN) for the 32-bit I/O devices at addresses 4 and 5 need to be specified as 2 words (32 bits).

Continued on next page

Completing the I/O Device Configuration in Peer Cop, Continued

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).

Section 9.3
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.

In This Section

This section contains the following topics:

Devices on the 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 AT984 host-based PLC card	Receives specific input data and sends global outputs
2	171 CCS 760 00 TSX 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 TSX 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

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.

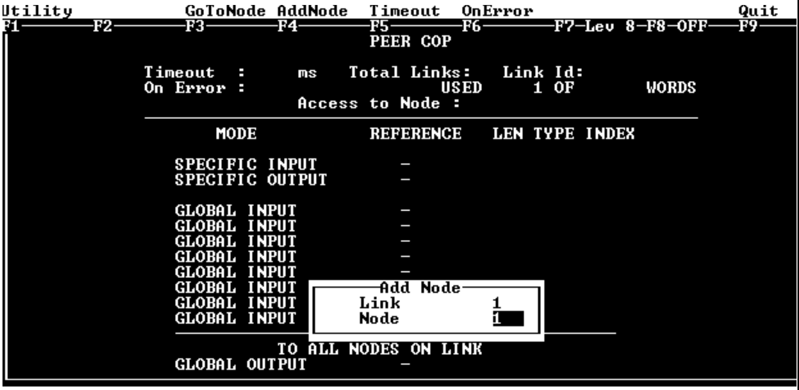
For our example, we will first access the AT984 supervisory PLC at Modbus Plus address 1.

Continued on next page

Configuring a Node to Exchange Data, Continued

Procedure

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

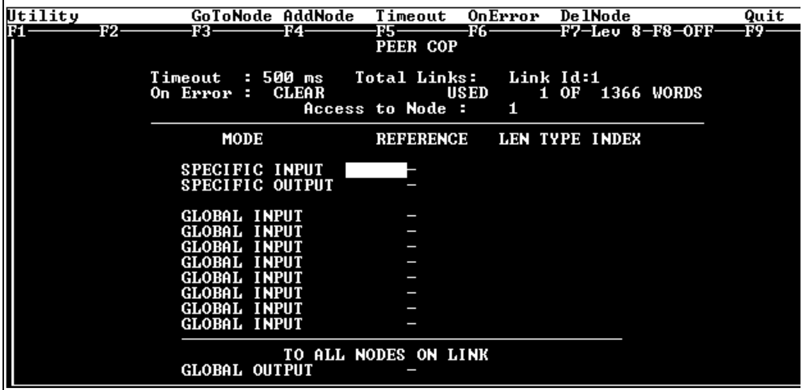
Step	Action
1	With the cursor flashing in the Link value field of the Add Node popup, make sure that the Link value in the popup is 1. Push **<Enter>**. **Result:** The Link value is set to 1, and the cursor moves to the Node value field of the Add Node popup. 

Continued on next page

Configuring a Node to Exchange Data, Continued

Procedure, Continued

<table>
<tr><th>Step</th><th>Action</th></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.

Confirming the Peer Cop Summary Information

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.

Specifying References for Input and Output Data

Overview

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

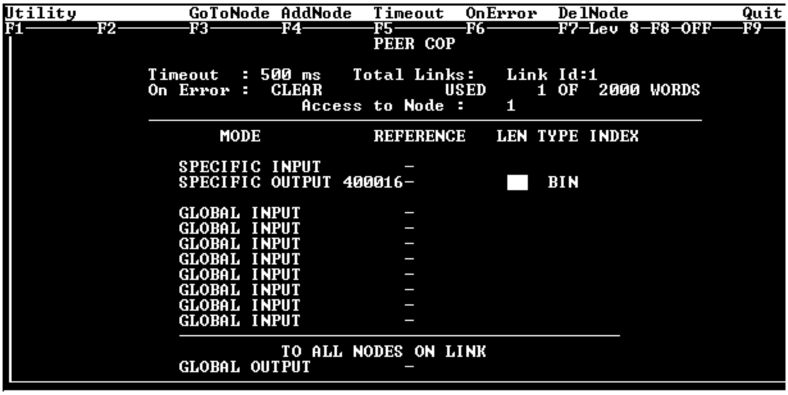
- send eight 4*x* registers of specific output to the supervisory computer at Modbus Plus address 1.
- receive five 4*x* registers of global input from the supervisory computer. These registers are the first five registers in a 10-register block broadcast by the supervisor.

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>.

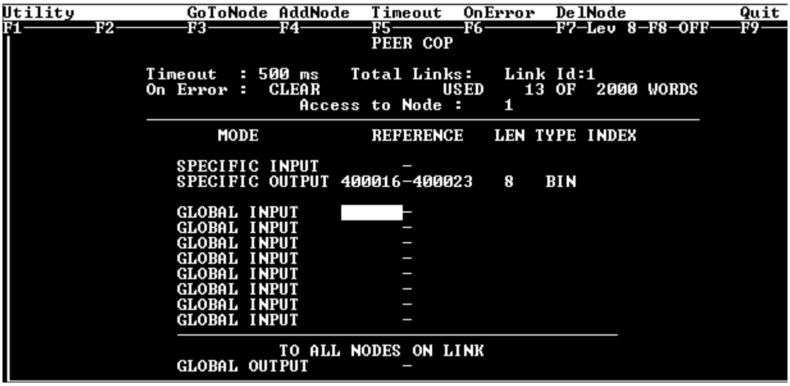
Result: The cursor moves into the LEN column of the SPECIFIC OUTPUT field.


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

Continued on next page

Specifying References for Input and Output Data, Continued

Defining the Specific Output, Continued

Step	Action
3	In the LEN column of the SPECIFIC OUTPUT field, type the value **8**, indicating that the 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: 

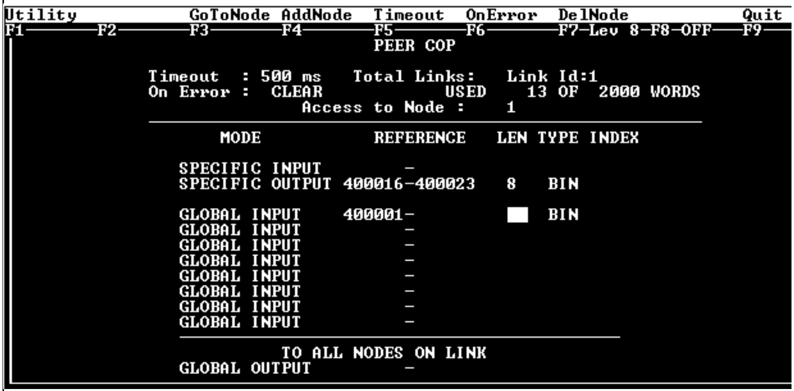
Continued on next page

Specifying References for Input and Output Data, Continued

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.

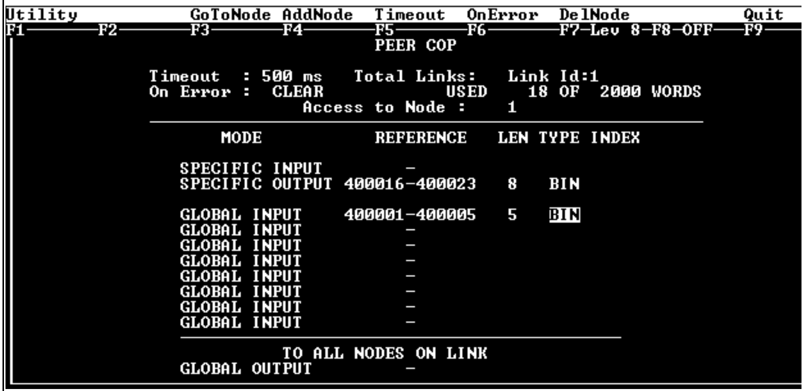
Step	Action
1	In the REFERENCE column on the first line of the GLOBAL INPUT field, type the value **400001**, the first register in which the CPU will store data. Push **<Enter>**. **Result:** The cursor moves into the LEN column of the GLOBAL INPUT field.



Continued on next page

Specifying References for Input and Output Data, Continued

Defining the Global Inputs, Continued

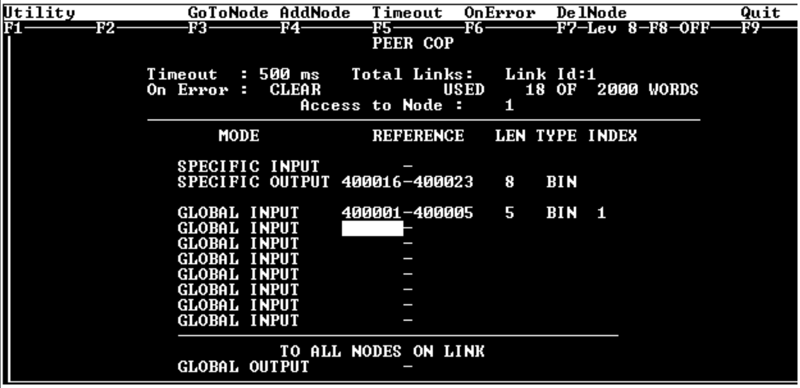
Step	Action
2	Type the value **5** in the LEN column of the GLOBAL INPUT field, indicating that the CPU will receive five words of global data from the supervisory computer. Push **<Enter>**. **Result:** The cursor moves into the TYPE column of the GLOBAL INPUT field. 
3	The default data format for these 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.

Continued on next page

Specifying References for Input and Output Data, Continued

Defining the Global Inputs, Continued

Step	Action
4	Type the value **1** in the INDEX column of the GLOBAL INPUT field, indicating that the 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:



Next Step

Defining the references for the next node.

Defining the References for the Next Node

Overview

We now want to attach the Modsoft 2.6 programming panel to the 171 CCS 760 00 TSX 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:

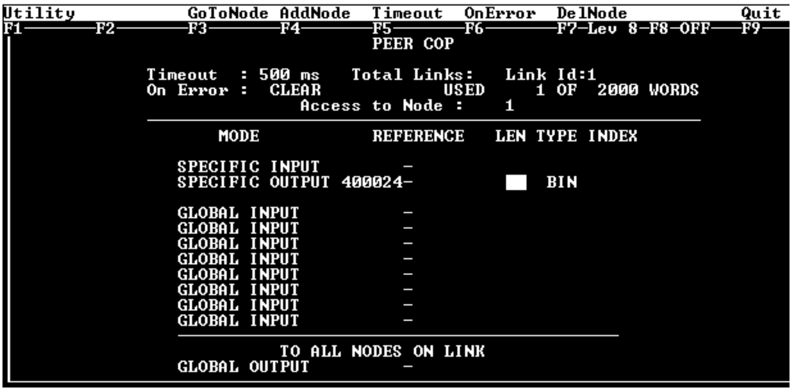
- to send 16 words of specific output to the supervisor.
- to receive the last seven words of global input from the supervisor. (Remember that the supervisor will be transmitting a total of 10 contiguous words of global data over the network.)

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>.


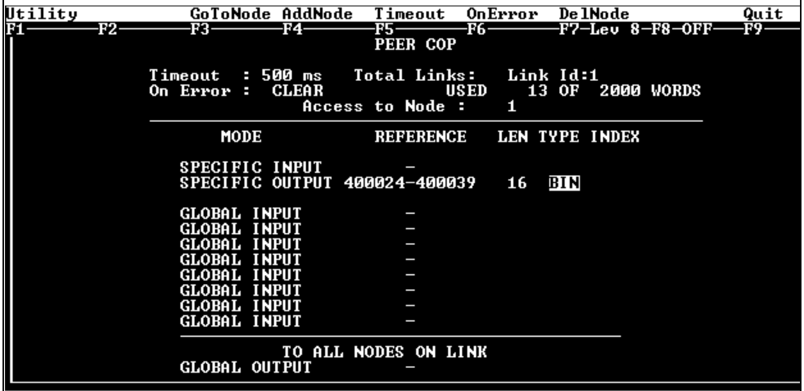
</td></tr>
</table>

Continued on next page

Defining the References for the Next Node, Continued

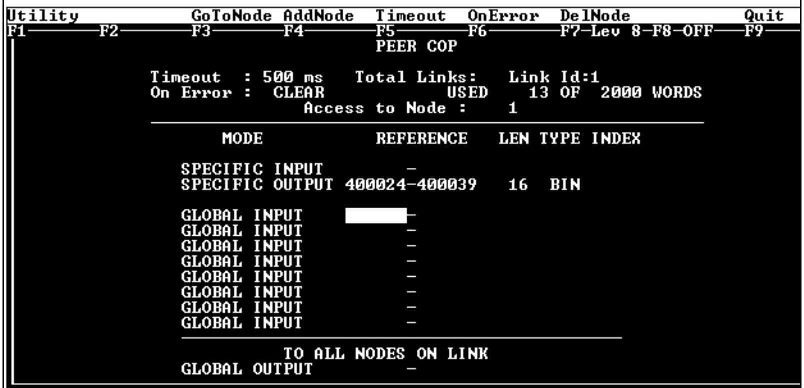
Defining Specific Outputs, Continued

<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>With the TYPE column of the SPECIFIC OUTPUT filed set to BIN, push <Enter> twice.

Result: The Peer Cop screen should like this:



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

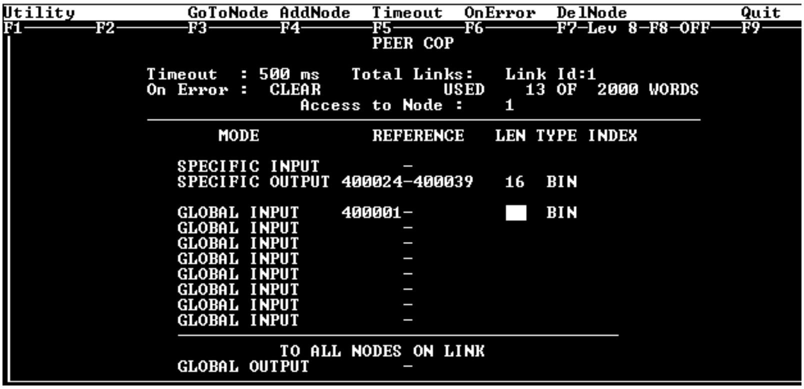
Continued on next page

Defining the References for the Next Node, Continued

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.

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

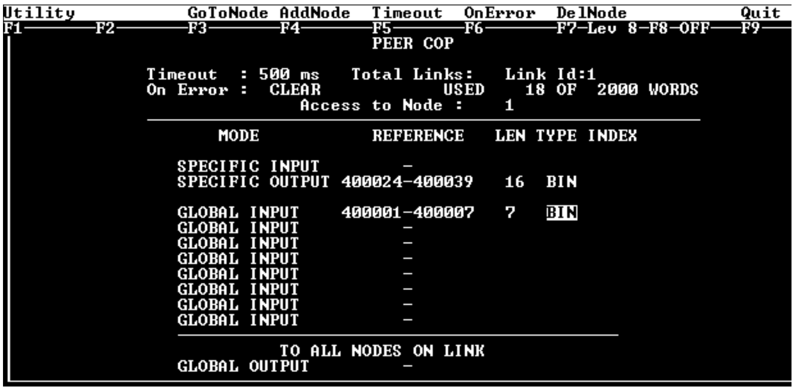
Result: The cursor moves to the LEN column.


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

Continued on next page

Defining the References for the Next Node, Continued

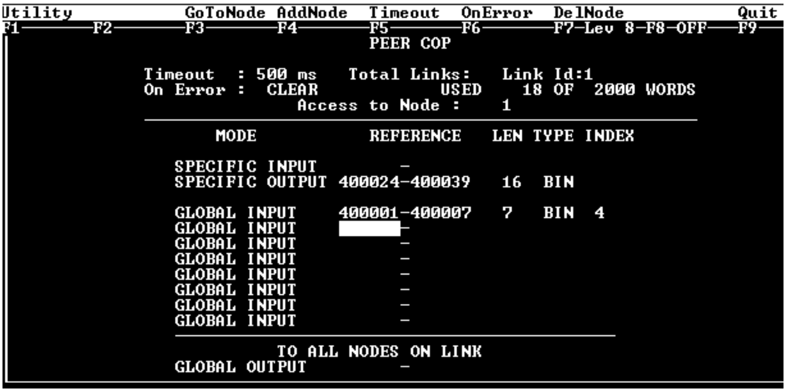
Defining Global Inputs, Continued

Step	Action
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.

Continued on next page

Defining the References for the Next Node, Continued

Defining Global Inputs, Continued

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.

Defining References for the Supervisory Computer

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.

Continued on next page

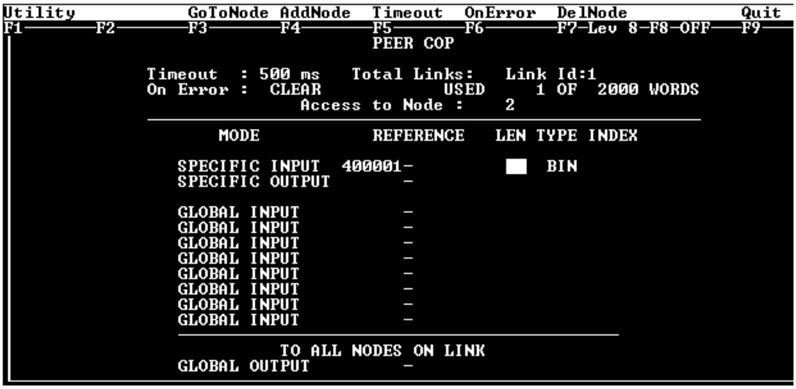
Defining References for the Supervisory Computer, Continued

Specifying References for Node 2

We know that this M1 CPU sends eight words of specific output to the supervisor and receive 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.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>In the REFERENCE column of the SPECIFIC INPUT field, type the value 400001, the first register which will receive the input. Push <Enter>.

Result: The cursor moves to the LEN column.

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

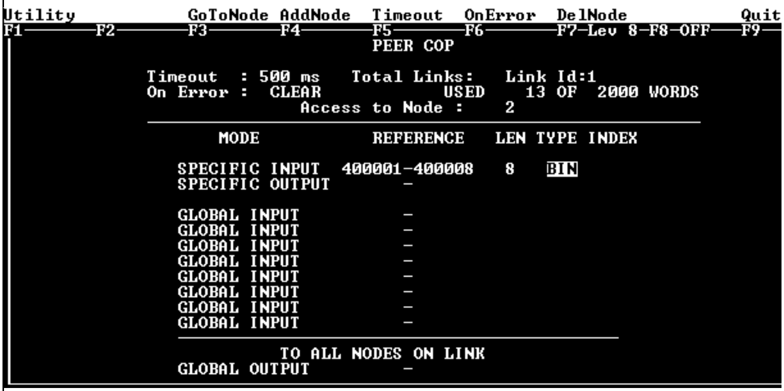
Continued on next page

Defining References for the Supervisory Computer, Continued

Specifying References for Node 2, Continued

<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>.

Result: 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>
</table>

Continued on next page

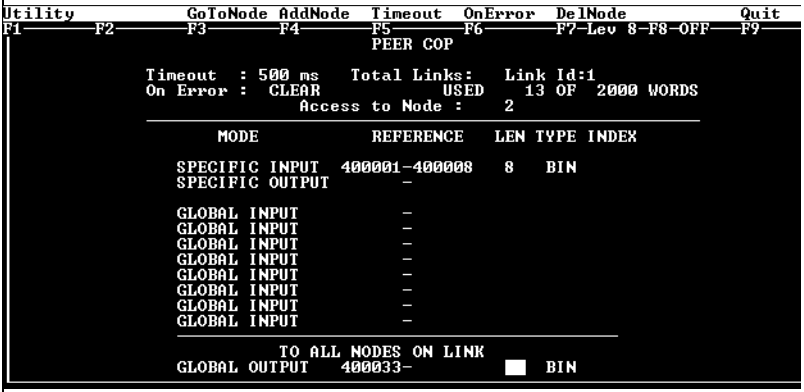
Defining References for the Supervisory Computer, Continued

Specifying References for Node 2, Continued

<table>
<tr><th>Step</th><th>Action</th></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>**.

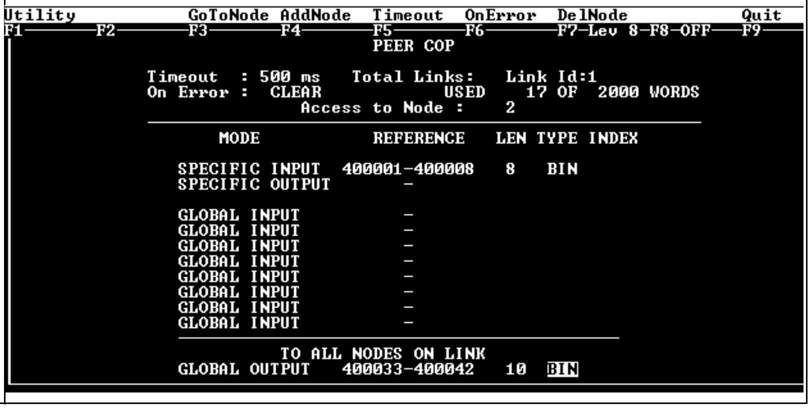
Result: The cursor moves to the LEN column.



</td></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>**.

Result: The REFERENCE field is completed automatically and the cursor moves to the TYPE column.

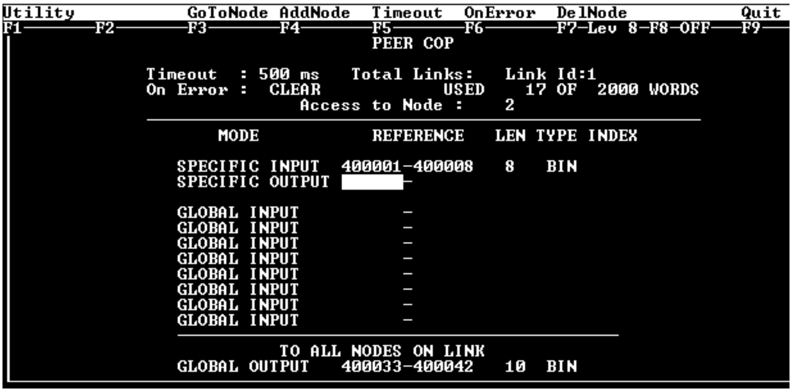


</td></tr>
</table>

Continued on next page

Defining References for the Supervisory Computer, Continued

Specifying References for Node 2, Continued

Step	Action
6	With the TYPE column of the GLOBAL OUTPUT filed set to BIN, push **<Enter>** twice. **Result:** The Peer Cop screen should like this: 

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

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.

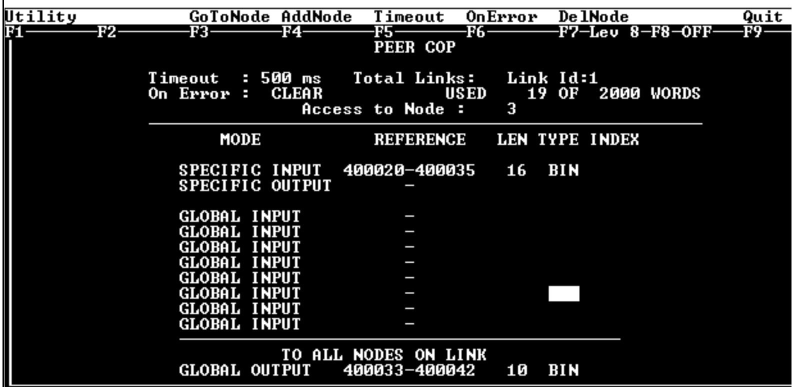
Accessing Node 3

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:



Saving to Flash in Modsoft

10

At a Glance

Purpose

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 Modsoft 2.6.

In This Chapter

This chapter contains the following topics:

Preparing to Save to Flash

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 Q2 = N	Comes back in the state it was in (Running or Stopped) before power was lost
Q1 = N Q2 = Y	Comes back Running when power is restored
Q1 = N Q2 = N	Comes back Stopped when power is restored

Saving to Flash

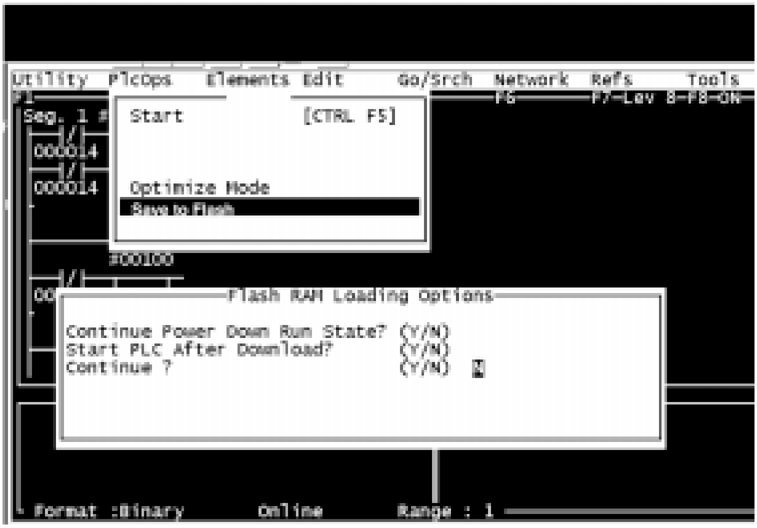
Conditions for Saving to Flash

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.

Step	Action
1	With the PLC online, go to the Ladder Diagram editor or the Segment Status Display.
2	From the PlcOps pulldown on the top menu, select **Save to Flash**. **Result:** If the PLC is stopped when you select **Save to Flash**, the following screen appears: 
3	Answer the first two questions to specify the way you want the PLC to restart after a power-down.

Continued on next page

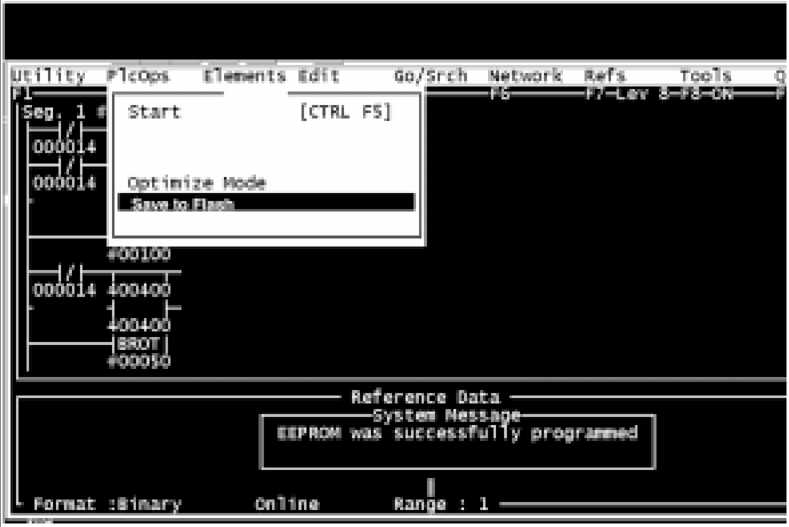
Saving to Flash, Continued

Save-to-Flash Procedure, Continued

<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

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 2.1.

In This Chapter

This part contains the following chapters:

Configuring an M1 CPU with Concept

11

At a Glance

Purpose

This chapter explains how to configure a CPU using Concept 2.1.

Note: Concept 2.1 does not support the following Processor Adapters: the 171 CCC 760 10 and the 171 CCC 780 10. These Processor Adapters will be supported in Concept 2.2.

In This Chapter

This chapter contains the following sections:

Section 11.1
Configuring the Processor Adapter

Overview

Purpose

This section describes how to configure a TSX Momentum M1 Processor Adapter using Concept 2.1.

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 2.1.

☞ **Note:** For a full description of Concept, refer to the set of manuals shipped with the software.

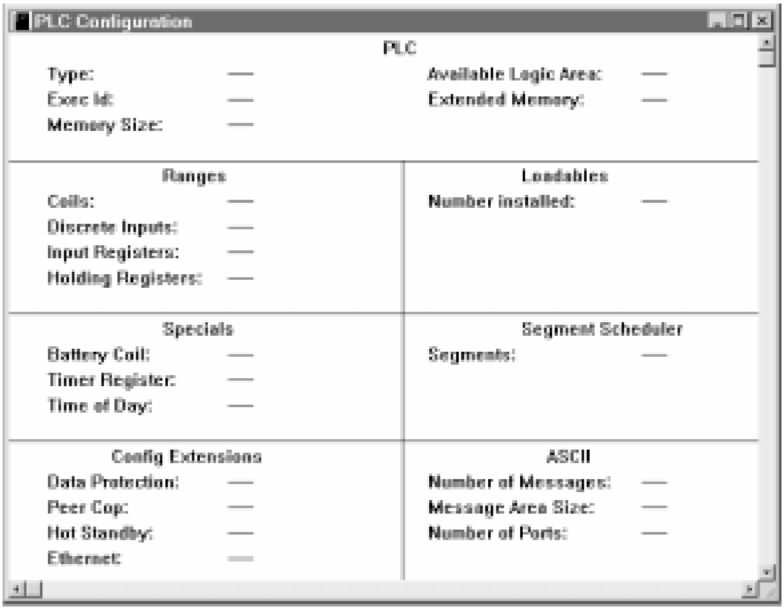
☞ **Note:** Concept 2.1 does not support the following Processor Adapters: the 171 CCC 760 10and the 171 CCC 780 10. These Processor Adapters will be supported in Concept 2.2.

Continued on next page

Selecting an M1 Processor Adapter, Continued

Procedure

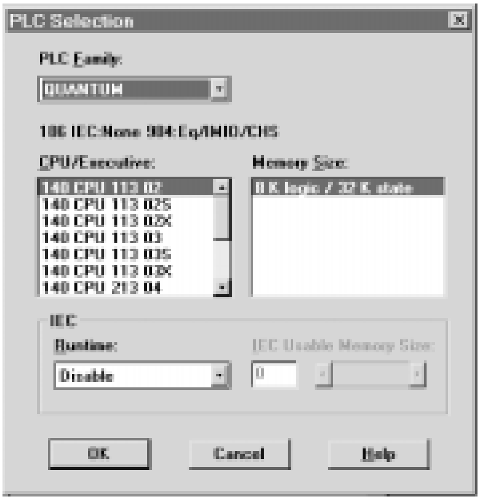
Follow the steps below to select an M1 Processor Adapter for a new project.

Step	Action
1	From the File menu, select **New Project**. **Result:** A new project is opened and the file name `[untitled]` appears over the menu bar.
2	From the Project menu, select **Configurator**. **Result:** The PLC Configuration screen appears. 

Continued on next page

Selecting an M1 Processor Adapter, Continued

Procedure, Continued

Step	Action
3	From the Configure menu, select **PLC Type** OR double-click on the **Type** field in the dialog box. **Result:** The PLC Selection dialog box appears. The default selection is Quantum. 

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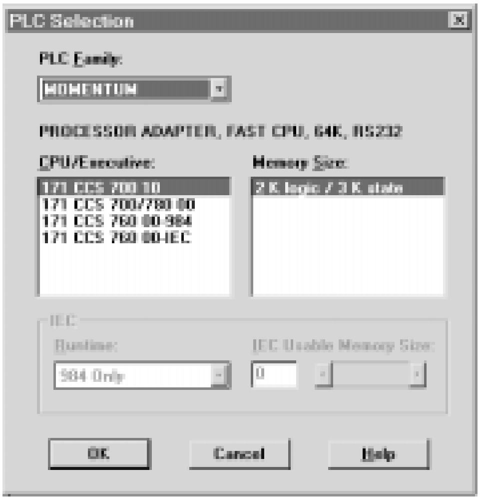
Selecting an M1 Processor Adapter, Continued

Procedure,
Continued

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>4</td><td>

From the PLC Family dropdown menu, select **MOMENTUM**.

Result: The CPU/Executive menu changes to reflect the choices available for Momentum.



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

Continued on next page

Selecting an M1 Processor Adapter, Continued

Procedure, Continued

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>5</td><td>Choose your PLC type from the CPU/Executive menu.

Result: 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>

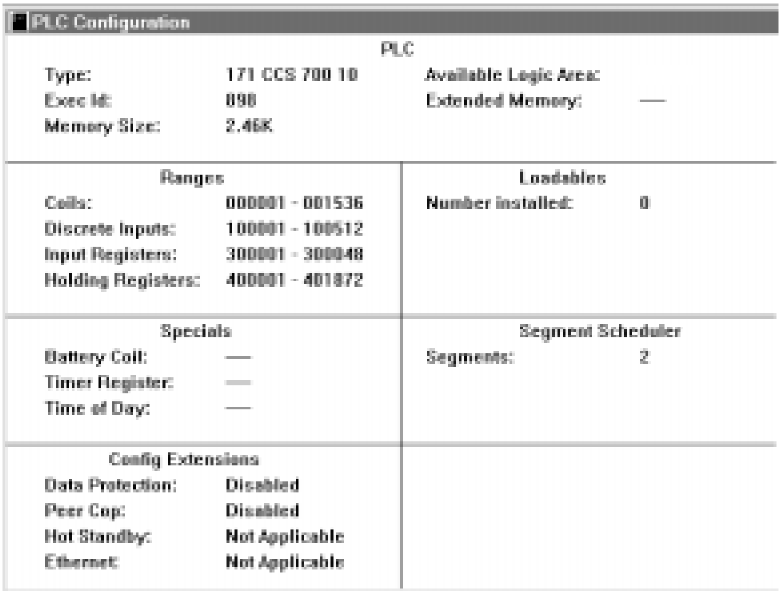
Default Configuration Parameters

Overview

This section describes the default configuration parameters.

Defaults for a 2.4K Machine

This sample PLC Configuration screen shows the default configuration parameters.

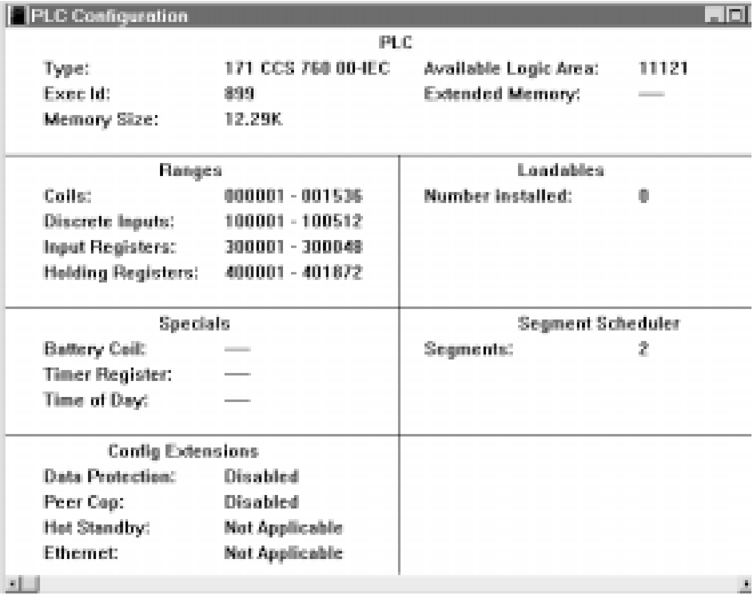


Continued on next page

Default Configuration Parameters, Continued

Defaults for a 12.2K Machine

This sample PLC Configuration screen shows the default configuration parameters.



Default Values

Here are the default parameters:

Parameter	For a 2.4K Machine	For a 12.2K Machine
Coils in state RAM	1536 (0*x*)	1536 (0*x*)
Discrete inputs in state RAM	512 (1*x*)	512 (1*x*)
Input registers in state RAM	48 (3*x*)	48 (3*x*)
Output registers in state RAM	1872 (4*x*)	1872 (4*x*)
Full logic area (in bytes)	1678	11532
Words of user memory space for the I/O Map	144	144
I/O logic segments	2	2
Memory allocated for configuration extension	None	None

Changing the Range of Discrete and Register References

Introduction

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

Guidelines

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

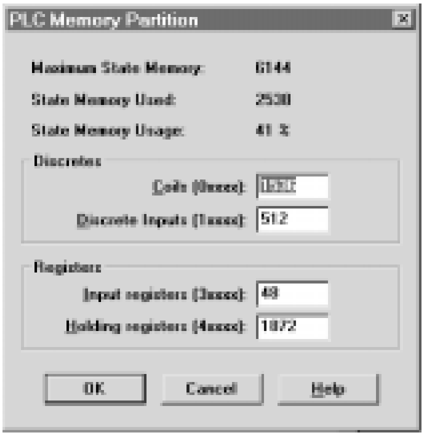
- Adjust the range of discretes in increments of 16. Sixteen discretes consume one word.
- Adjust the range of registers in increments of 1. Each register consumes one word.
- The total number of register and discrete references cannot exceed the maximum of state memory displayed at the top of the dialog.
- A minimum configuration of 16 0*x* discretes, 16 1*x* discretes, one 3*x* register, and one 4*x* register is required.

Continued on next page

Changing the Range of Discrete and Register References, Continued

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 Ranges section of the dialog box. **Result:** The PLC Memory Partition dialog box appears. 
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

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. The default number of segments is 2.

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/OBus I/O mapping or other subroutines.

Changing the Size of the I/O Map

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/OBus network or to increase the size of the full logic area.

Processors for I/OBus Networks

With I/OBus, 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

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 TSX 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

Continued on next page

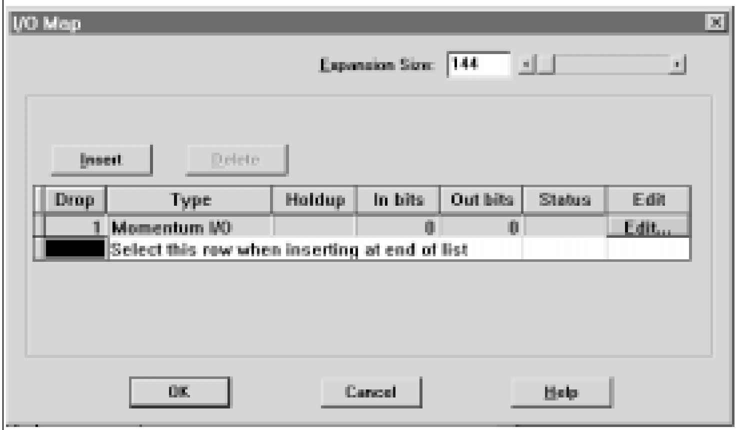
Changing the Size of the I/O Map, Continued

Procedure

From the PLC Configuration screen, follow the steps below to change the size of the I/O Map:

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>From the Configure menu, select I/O Map.

Result: The I/O Map dialog box appears.


</td></tr>
<tr><td>2</td><td>Modify the size of the I/O Map by typing a new value in the Expansion Size field OR by adjusting the sliding scale.</td></tr>
<tr><td>3</td><td>Click the <OK> button.</td></tr>
</table>

Establishing Configuration Extension Memory for Peer Cop

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

Continued on next page

Establishing Configuration Extension Memory for Peer Cop, Continued

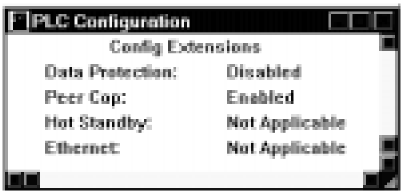
Procedure

From the PLC Configuration screen, follow the steps below to enable Peer Cop and adjust the amount of Configuration Extension memory:

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>From the Configure menu, select Config extensions OR double-click anywhere in the Config Extensions region of the screen.

Result: The Configuration Extension dialog box appears.

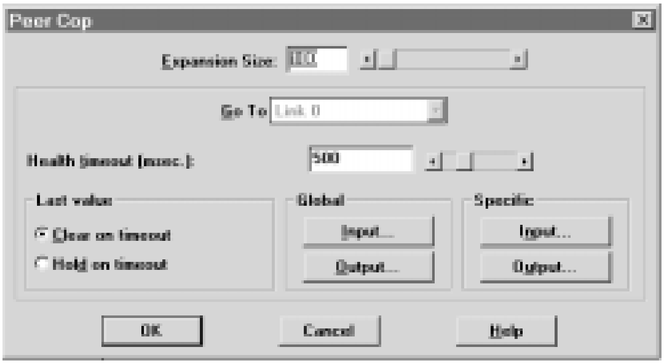
</td></tr>
<tr><td>2</td><td>Click the check box next to Peer Cop, then click OK.

Result: Peer Cop status changes from Disabled to Enabled in the PLC Configuration screen.

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

Continued on next page

Establishing Configuration Extension Memory for Peer Cop, Continued

Procedure, Continued

Step	Action
3	From the Configure menu, select **Peer Cop**. Result: The Peer Cop dialog box appears. 
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.

Section 11.2 Configuring Option Adapter Features

Overview

Purpose

This section describes how to implement the battery backup and time-of-day (TOD) clock features of the TSX Momentum Option Adapters using Concept 2.1.

In This Section

This section contains the following topics:

Reserving and Monitoring a Battery Coil

Introduction

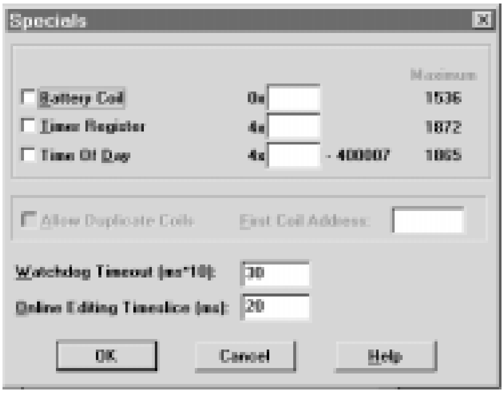
Since the Option Adapter does not have an LED to indicate when the battery is low, we recommend that you reserve a 0*x* reference to monitor the health of the battery.

This section describes how to reserve and monitor a battery coil, using the Specials dialog box in Concept 2.1.

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.


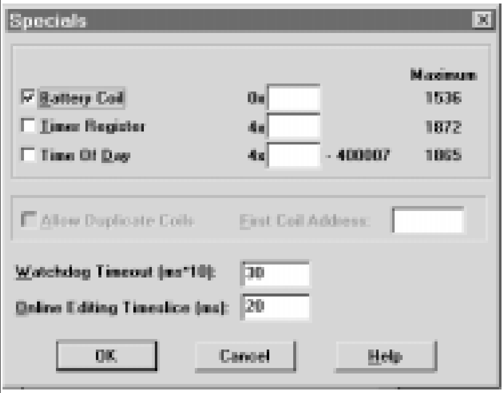
</td></tr>
</table>

Continued on next page

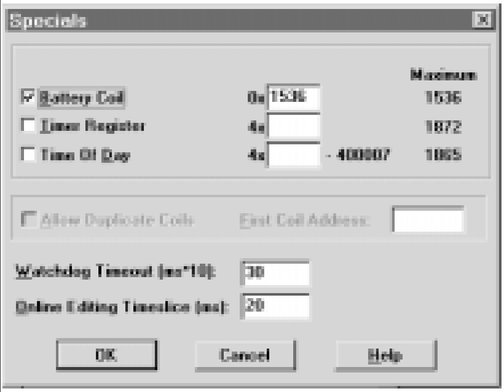
Reserving and Monitoring a Battery Coil, Continued

Reserving a Battery Coil, Continued

<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.

Result: The dialog box closes and the register you have specified is displayed on the PLC Configuration screen.</td></tr>
</table>

Continued on next page

Reserving and Monitoring a Battery Coil, Continued

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

Overview

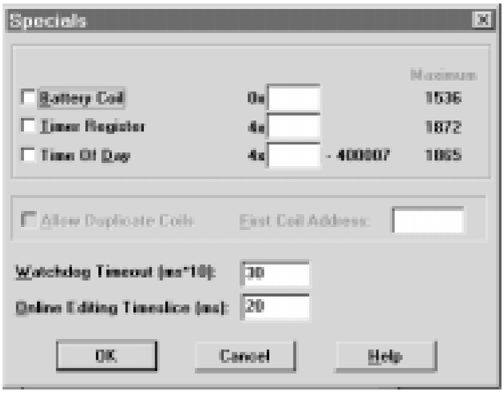
Each Option Adapter has a time-of-day clock. To use this feature, you must reserve a block of eight 4*x* registers.

This section describes how to reserve those registers, using Concept 2.1.

Reserving Registers for the TOD Clock

To reserve registers for the TOD clock, perform the steps in the following table.

<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>

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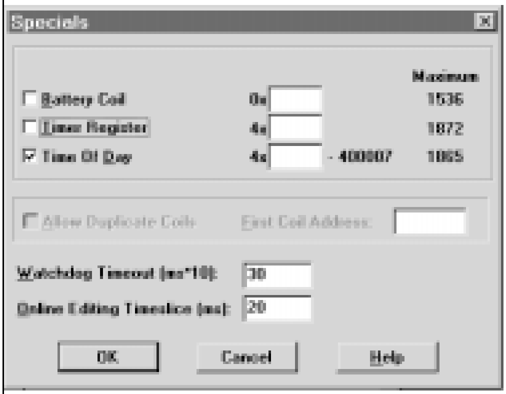
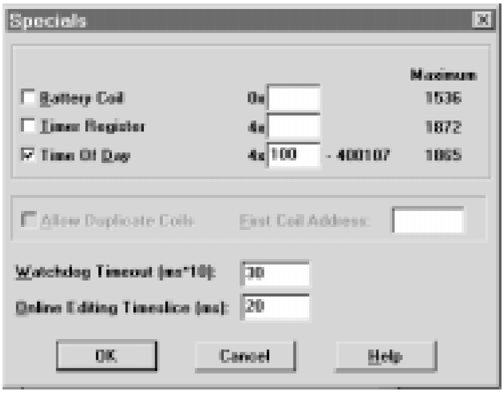
Setting up the Time-of-Day Clock, Continued

Reserving Registers for the TOD Clock, Continued

Step	Action
2	Click the check box next to Time Of Day. 
3	Type a number (the first in a series of eight) from the range of available 4*xxxx* references in the corresponding field. Observe the maximum register value. **Example**: If you want registers 400100 ... 400107 reserved for the TOD clock, type **100**. 
4	Click the **<OK>** button. **Result:** The registers you have specified are displayed on the PLC Configuration screen.

Continued on next page

Setting up the Time-of-Day Clock, Continued

Next Step

Setting the time.

Setting the Time

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.

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

Setting the Status Bits

The control register (4*x*) 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 4*x* is the first register in the block reserved for the clock:

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

Reading the Time-of-Day Clock

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

Section 11.3
Modifying Communication 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.

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 2.1.

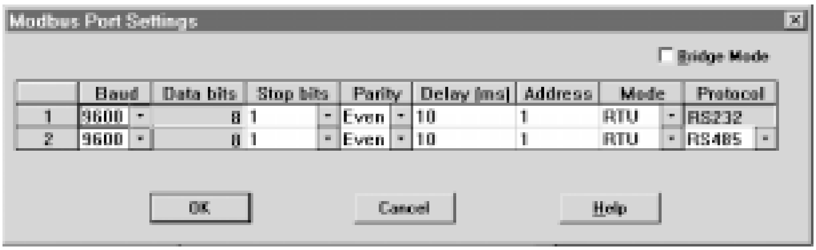
How to Get There

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 you have previously modified any communication port parameters, the new values will appear in the dialog box.



Two Sets of Parameters

This dialog box 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.

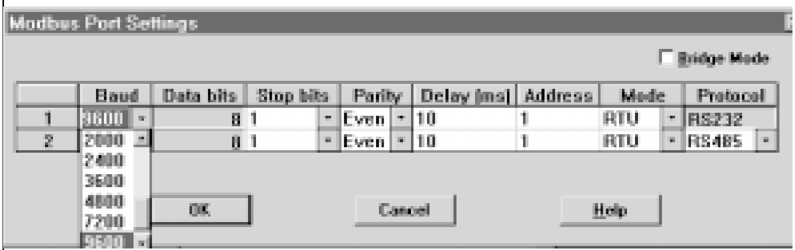
Changing the Baud Rate

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

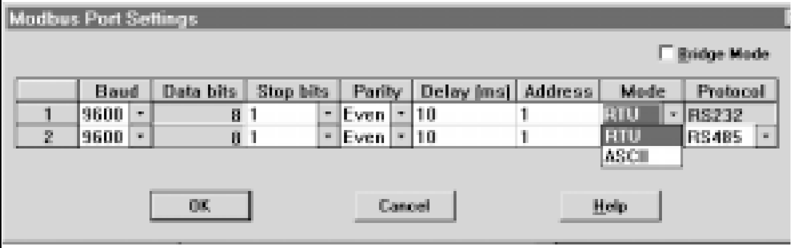
From the Modbus Port Settings dialog box, each port can be configured to operate in one of two possible modes – RTU or ASCII.

- 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.

Step	Action
1	Click on the down arrow under Mode. **Result:** A menu appears displaying your two Mode options. 
2	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.

Stop Bit Should Not Be Changed

One Stop Bit

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

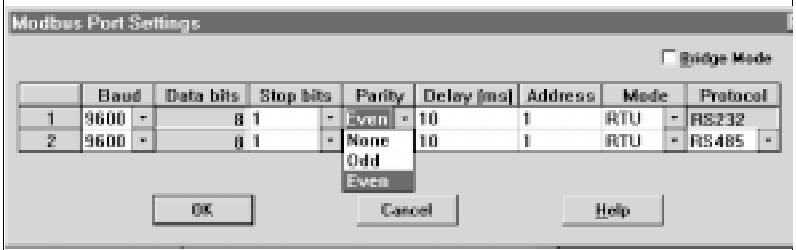
Changing Parity

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

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.

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

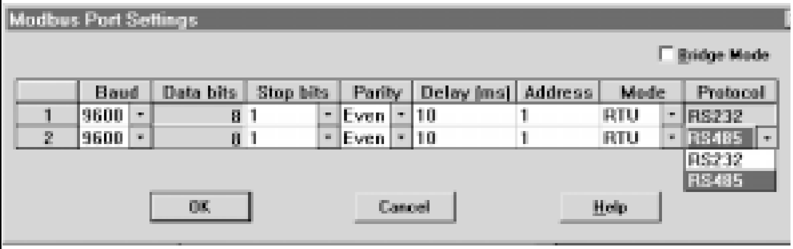
Overview

If your TSX 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.

Note: If you are using the Modbus Port 2 provided on the 171 CCS 780 00 Processor Adapter, the port is hardwired as a dedicated RS485 protocol. You must change the default setting on the Port editor screen from RS232 to RS485, or the port will not function correctly.

Procedure

From the Modbus Port Settings dialog box, perform the steps in the following table to change the Protocol on Modbus Port 2.

Step	Action
1	Click on the down arrow under the Protocol heading. **Result:** A menu appears with the two protocol options. 
2	Click on **RS232** or **RS485**. **Result:** The Modbus Port Settings dialog box is updated with the protocol you have specified.

Section 11.4
I/O Mapping the Local I/O Points

Accessing and Editing the I/O Map

Introduction

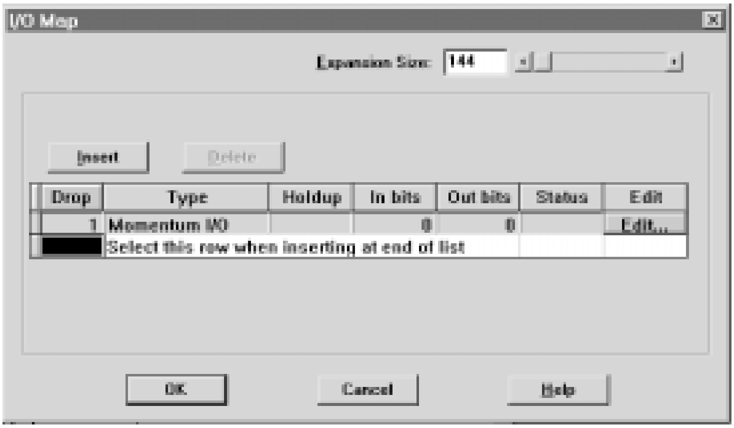
Every M1 Processor Adapter is assembled on an I/O base. The I/O points on the base are the local I/O for that processor.

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 (0*x*, 1*x*, 3*x*, or 4*x*) 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 PLC Configuration screen, select **I/O map...** from the **Configure** menu.

Result: The I/O Map dialog box appears.



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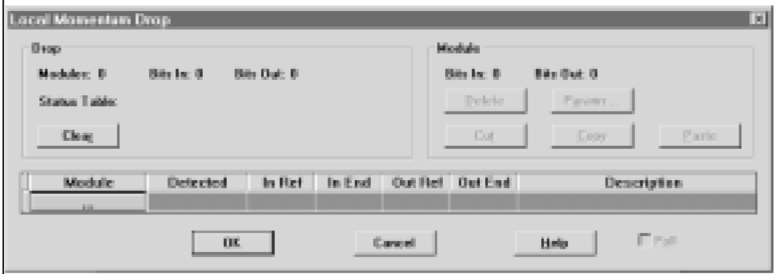
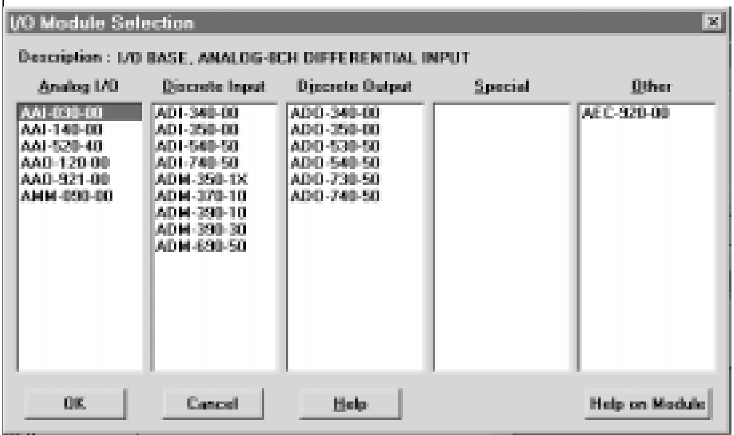
Accessing and Editing the I/O Map, Continued

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 dropdown menu. 

Continued on next page

Accessing and Editing the I/O Map, Continued

Editing the Local I/O Map, Continued

Step	Action
3	Double-click on your selection or click the **<OK>** button. **Result**: 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/OBus communication stations, you will need to go to a separate I/O Map screen for Drop 2. That process is described in I/O Mapping an I/OBus Network with Concept.

I/O Mapping an I/OBus Network with Concept

12

At a Glance

Purpose

This chapter describes how to I/O Map an I/OBus network using Concept 2.1.

Topics

This chapter contains the following topics:

Supporting an I/O Map for an I/OBus Network

Introduction

The 171 CCS 760 00 Processor Adapter has an I/OBus communication port that enables it to control and communicate with other network slave I/O.

If you are using I/OBus 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/OBus.

☞ **Note:** Concept 2.1 does not support the 171 CCC 760 10 Processor Adapter. This Processor Adapter will be supported in Concept 2.2.

I/O Map Reserved Words

Make sure that you have reserved enough words for I/O mapping to support your I/OBus 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

Make sure that the number of segments is set to 2, the default setting. If you have changed this setting to 1, you will not be able to support an I/OBus network.

Next Step

Once you have made sure that your Configuration Overview parameters are set properly, you can access an I/O Map screen for an I/OBus network.

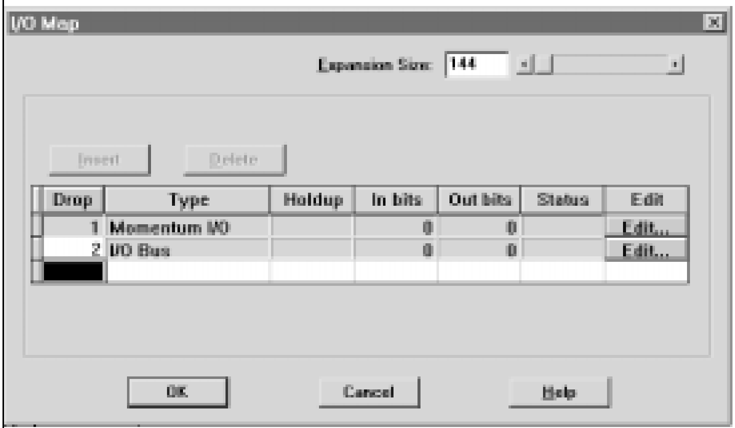
Accessing an I/O Map Screen for an I/OBus Network

Overview

This section describes how to access an I/O Map screen for an I/OBus network using Concept 2.1.

Procedure

To access the I/O Map screen for your I/OBus 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. 

Continued on next page

Accessing an I/O Map Screen for an I/OBus Network, Continued

Procedure, Continued

Step	Action
3	Click the **Edit...** button on the I/OBus line of the I/O Map dialog. **Result:** The Remote I/O Bus Drop dialog appears. 

Next Step

Editing the I/OBus I/O map.

Editing the I/OBus I/O Map

Overview

The maximum number of modules which can be I/O Mapped on the I/OBus network depends on your Processor Adapter and its executive:

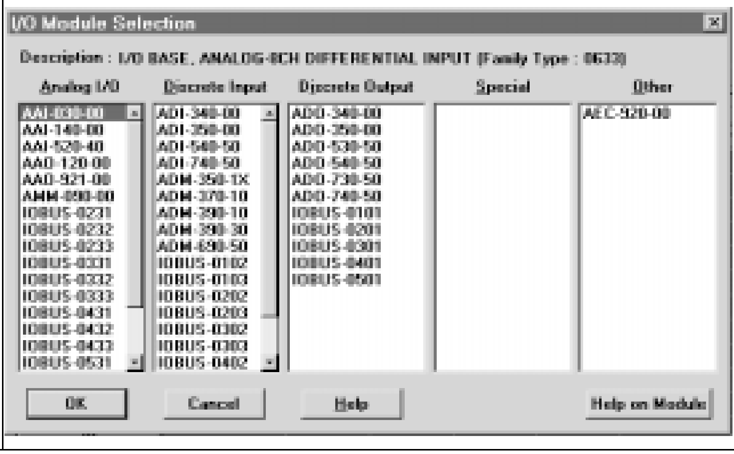
Processor Adapter	Executive	Max. Modules	Max. I/O Bits
171 CCS 760 00	984	128	2048
171 CCS 760 00	IEC	44	1408

Note: Concept 2.1 does not support the 171 CCC 760 10 Processor Adapter. This Processor Adapter will be supported in Concept 2.2.

Procedure

To enter I/O bases or Interbus I/O modules using the Remote I/OBus Drop dialog, perform the steps in the following table.

Step	Action
1	Click on the button under the Module heading. **Result:** 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):



Continued on next page

Editing the I/OBus I/O Map, Continued

Procedure, Continued

Step	Action
2	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.
3	Enter the desired reference number. Where there is more than one register the balance is automatically assigned.
4	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.

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/OBus 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
IOBUS-0101	One-word discrete output
IOBUS-0102	One-word discrete input
IOBUS-0103	One-word bidirectional
IOBUS-0201	Two-word discrete output
IOBUS-0202	Two-word input
IOBUS-0203	Two-word bidirectional
IOBUS-0231	Two-word analog output
IOBUS-0232	Two-word analog input
IOBUS-0233	Two-word analog bidirectional

Continued on next page

Editing the I/OBus I/O Map, Continued

Generic InterBus Module Identifier Codes, Continued

Identifier Code	**I/O Type**
IOBUS-0301	Three-word discrete output
IOBUS-0302	Three- word input
IOBUS-0303	Three-word bidirectional
IOBUS-0331	Three-word analog output
IOBUS-0332	Three-word analog input
IOBUS-0333	Three-word analog bidirectional
IOBUS-0401	Four-word discrete output
IOBUS-0402	Four-word input
IOBUS-0403	Four-word bidirectional
IOBUS-0431	Four-word analog output
IOBUS-0432	Four-word analog input
IOBUS-0433	Four-word analog bidirectional
IOBUS-0501	Five-word discrete output
IOBUS-0502	Five-word input
IOBUS-0503	Five-word bidirectional
IOBUS-0531	Five-word analog output
IOBUS-0532	Five-word analog input
IOBUS-0533	Five-word analog bidirectional
IOBUS-0633	Eight-word analog bidirectional
IOBUS-1233	16-word analog bidirectional

Configuring a Modbus Plus Network in Concept with Peer Cop

13

At a Glance

Purpose

Communication transactions over Modbus Plus are defined in Concept 2.1 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.

In This Chapter

This chapter contains the following sections:

Section 13.1
Getting Started

Overview

Purpose

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

In This Section

This section contains the following topics:

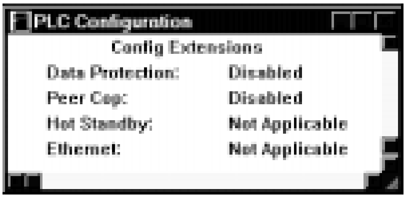
Accessing the Peer Cop Dialog Box

Introduction

This section describes how to access the Peer Cop dialog box in Concept 2.1.

Accessing the Screen

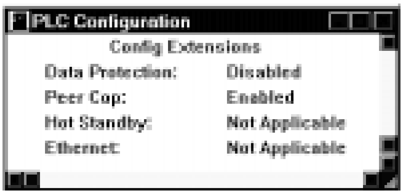
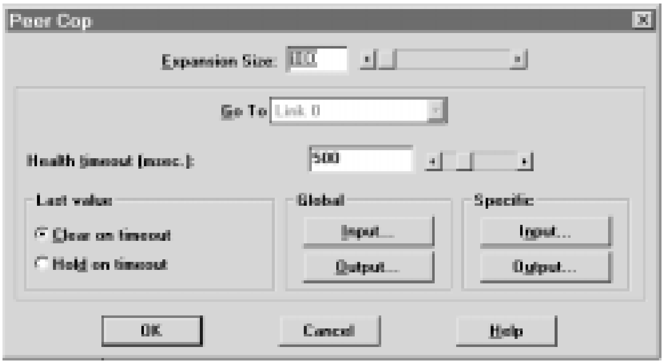
Follow the steps below to access the Peer Cop from the PLC Configuration Screen.

Step	Action
1	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: 
2	Double-click on the Peer Cop field. **Result:** The Configuration Extension dialog box appears. 

Continued on next page

Accessing the Peer Cop Dialog Box, Continued

Accessing the Screen, Continued

Step	**Action**
3	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. 
4	Select **Peer Cop** from the Configure menu. **Result:** The Peer Cop dialog box appears. 

Adjusting the Amount of Extension Memory

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.

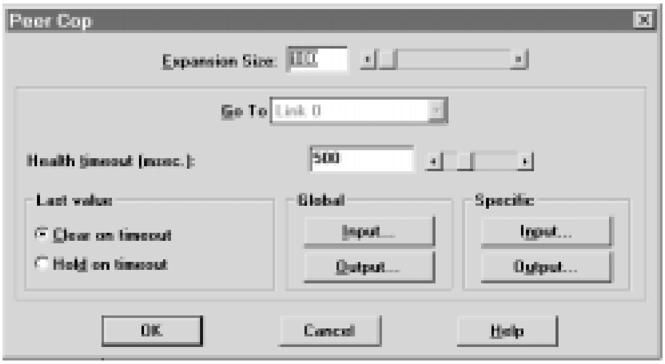
Other Default Settings in the Peer Cop Dialog Box

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.

Continued on next page

Other Default Settings in the Peer Cop Dialog Box, Continued

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.

Section 13.2
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.

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.

The Network Devices

The following table lists the Modbus Plus address and components of each TSX 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.

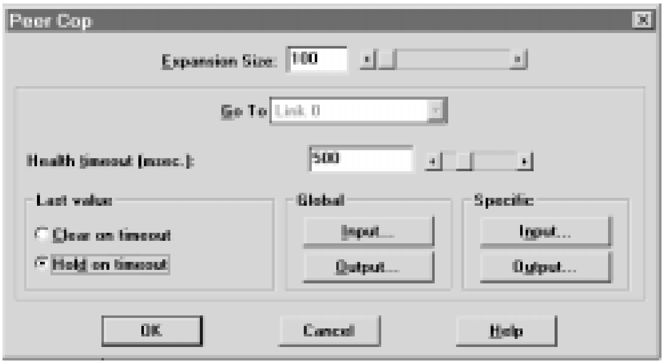
Changing the Peer Cop Summary Information

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.

Step	Action
1	Click the **Hold on Timeout** radio button. **Result:** The Hold on Timeout option is selected and the Clear on Timeout option is deselected. 

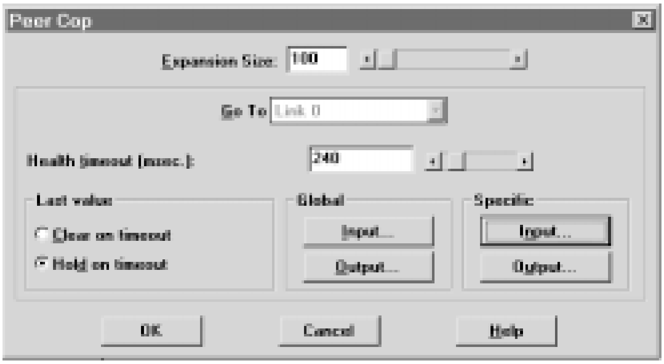
Continued on next page

Changing the Peer Cop Summary Information, Continued

Procedure, Continued

<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>
</table>

Next Step

Specifying references for input data.

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.

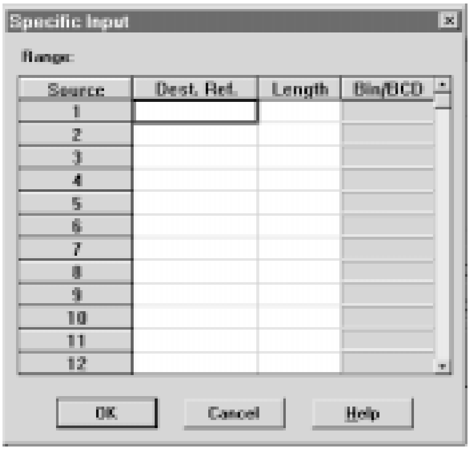
We will assign a 3*x* register (300016) as a specific input to the CPU. When the the 170 ADI 340 00 sends input data to the CPU, it will be sent to this register.

Continued on next page

Specifying References for Input Data, Continued

Procedure

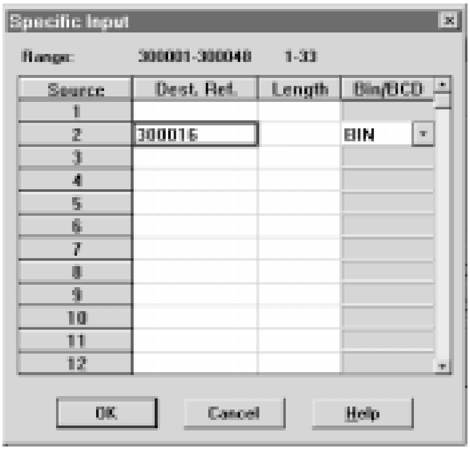
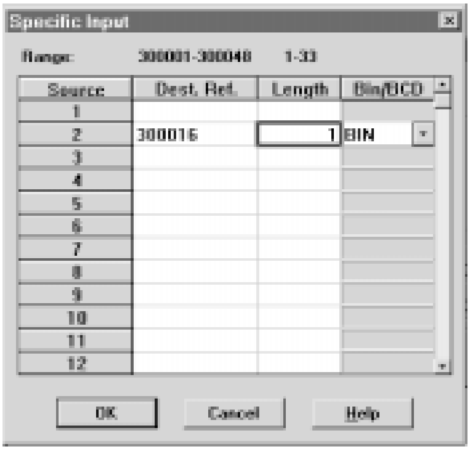
Follow the steps in the table below to define the specific input, starting from the Peer Cop dialog box.

Step	Action
1	Click on the Specific **Input...** button. **Result:** The Specific Input dialog box appears. 

Continued on next page

Specifying References for Input Data, Continued

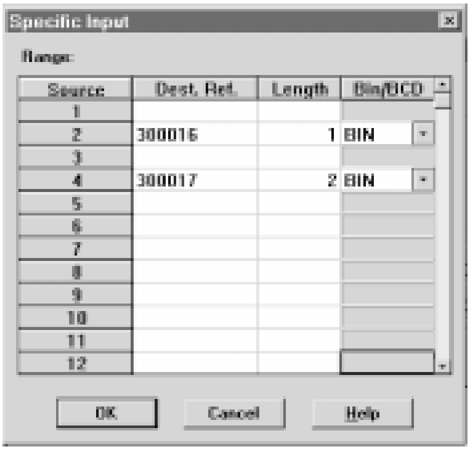
Procedure, Continued

Step	Action
2	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. 
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. 

Continued on next page

Specifying References for Input Data, Continued

Procedure, Continued

Step	Action
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.

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.

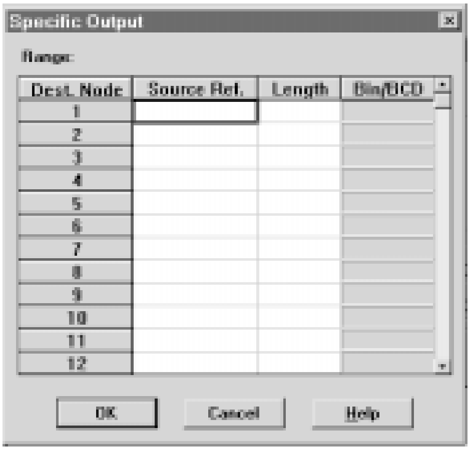
Device Requirements

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 4*x* 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

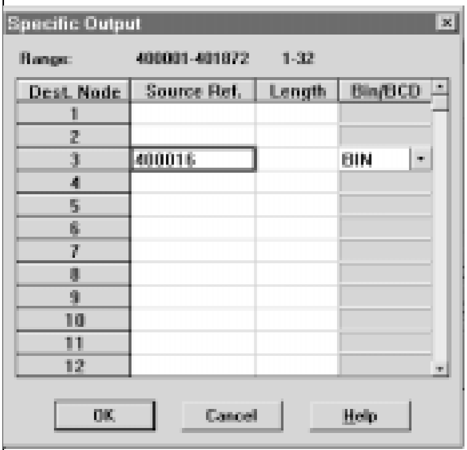
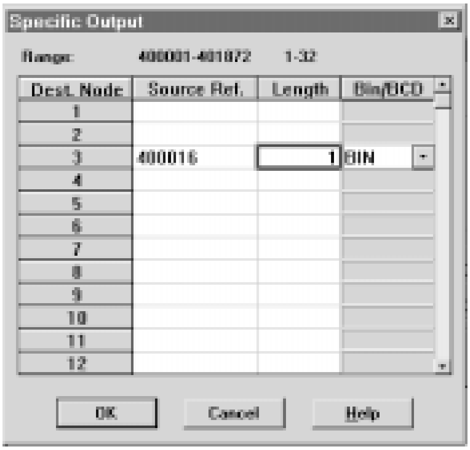
Follow the steps in the table below to define the specific output.

Step	Action
1	Click on the Specific **Output...** button in the Peer Cop dialog box. **Result:** The Specific Output dialog box appears. 

Continued on next page

Specifying References for Output Data, Continued

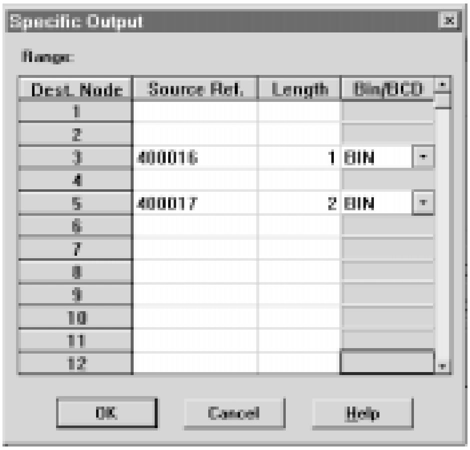
Procedure, Continued

Step	**Action**
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. 
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. 

Continued on next page

Specifying References for Output Data, Continued

Procedure, Continued

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>4</td><td>Repeat steps 2 and 3 for the device at address 5, using the settings in the figure below. Then click **<OK>**.


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

Section 13.3
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 will need to have its own Peer Cop configuration.

In This Section

This section contains the following topics:

Devices on the 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 TSX Momentum M1 Processor Adapter with 172 PNN 210 22 Modbus Plus Option Adapter	Controls I/OBus network and exchanges data with ATRIUM supervisor
3	171 CCS 760 00 TSX Momentum M1 Processor Adapter with 172 PNN 210 22 Modbus Plus Option Adapter	Controls I/OBus 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 TSX Momentum M1 CPU at Modbus Plus address 2 to:

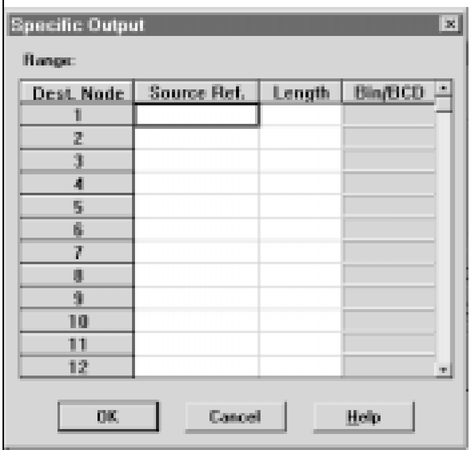
- send eight 4*x* registers of specific output to the supervisory computer at Modbus Plus address 1.
- receive five 4*x* registers of global input data from the ATRIUM supervisor. These registers are the first five registers in a 10-register block of global outputs broadcast by the supervisory controller.

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.

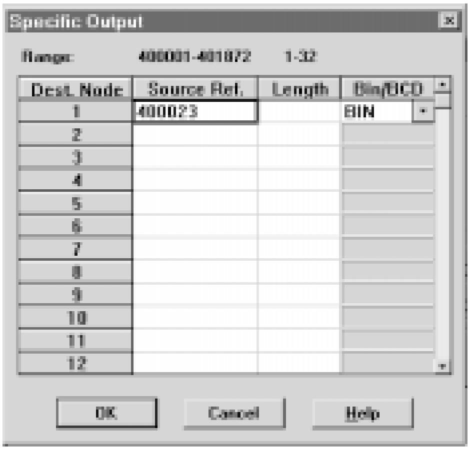
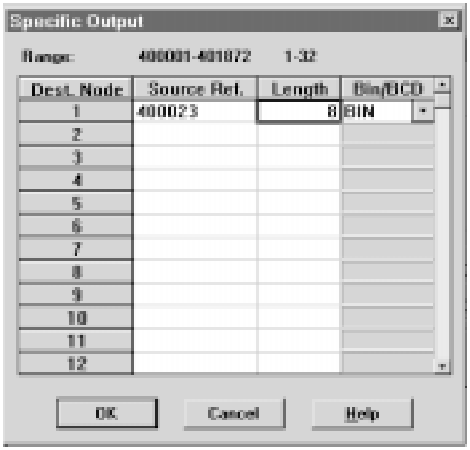
<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Click on the Specific Output... button.

Result: The Specific Output dialog box appears.

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

Continued on next page

Specifying References for Input and Output Data, Continued

Defining the Specific Output, Continued

Step	Action
2	Since you are addressing the device at address 1, you will use the line for Source 1. Type the value **400023** on that line in the Dest. Ref. column. 
3	Type the value **8** in the Length column, indicating that 8 words of data will be exchanged. In this case, we will leave the default BIN setting. Click **<OK>**. 

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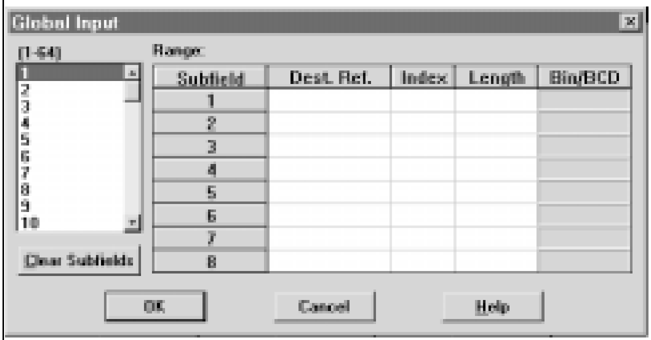
Specifying References for Input and Output Data, Continued

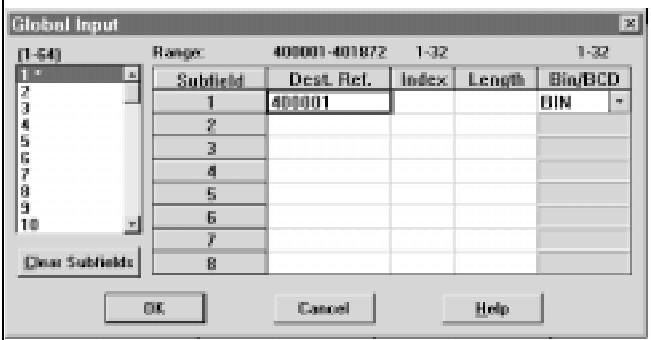
Defining the Global Inputs

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.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>1</td><td>Click on the Global Input... button.

Result: The Global Input dialog box appears.


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

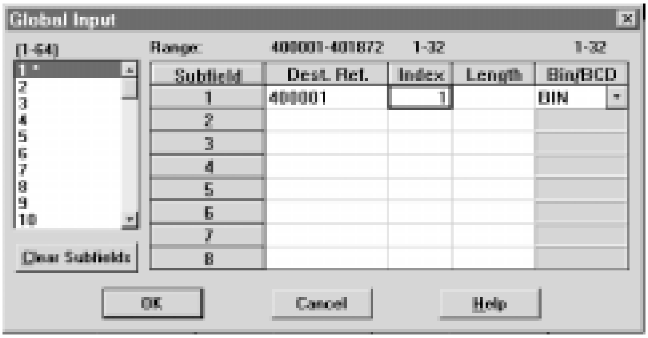

</td></tr>
</table>

Continued on next page

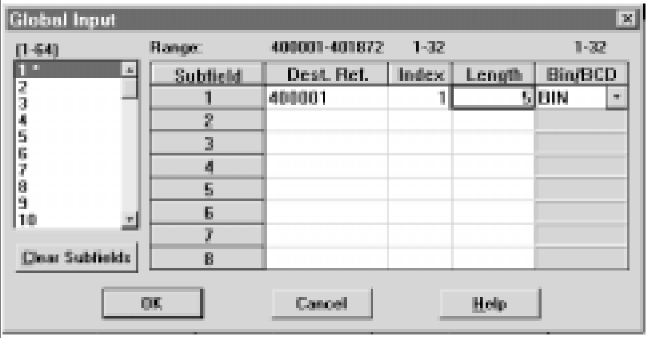
Specifying References for Input and Output Data, Continued

Defining the Global Inputs, Continued

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>3</td><td>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.



</td></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 <code>BIN</code> setting.



</td></tr>
<tr><td>5</td><td>Click <OK>.</td></tr>
</table>

Next Step

Defining the references for the next node.

Defining the References for the Next Node

Overview

We now want to attach the Concept 2.1 programming panel to the 171 CCS 760 00 TSX 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.)

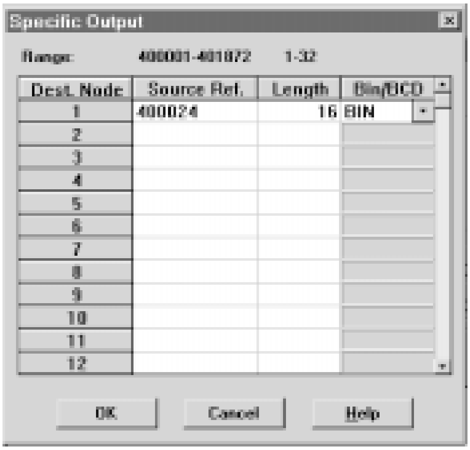
Continued on next page

Defining the References for the Next Node, Continued

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>Click on the Specific Output... button.

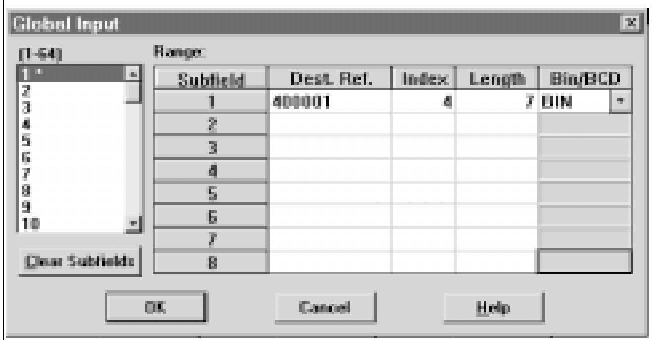
Result: The Specific Output dialog box appears.</td></tr>
<tr><td>2</td><td>Since you are addressing the device at address 1, you will use the line for Source 1. Type the value 400024 on that line in the Dest. Ref. column.</td></tr>
<tr><td>3</td><td>Type the value 16 in the Length column, indicating that 16 words of data will be exchanged. In this case, we will leave the default BIN setting.

</td></tr>
<tr><td>4</td><td>Click <OK>.</td></tr>
</table>

Continued on next page

Defining the References for the Next Node, Continued

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.

Defining References for the Supervisory PLC

Overview

At this point, we will attach the Concept 2.1 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.

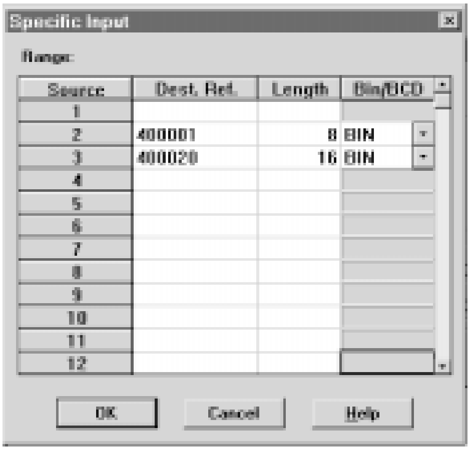
We know that the M1 at Modbus Plus address 2 is sending eight words of specific output to the supervisor and that the M1 at Modbus Plus address 3 is sending 16 words of specific output to the supervisor. The supervisor will receive this data as specific inputs.

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.

<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>Enter the references for each CPU on the appropriate source line, as shown below. Then click <OK>.

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

Continued on next page

Defining References for the Supervisory PLC, Continued

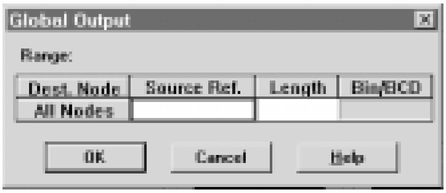
Defining the Global Outputs

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>

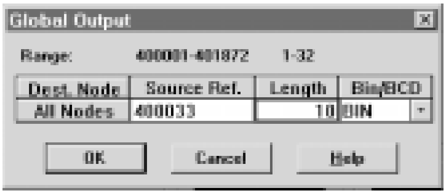
Click on the Global **Output...** button.

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 with Concept

14

Saving to Flash

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 Concept 2.1.

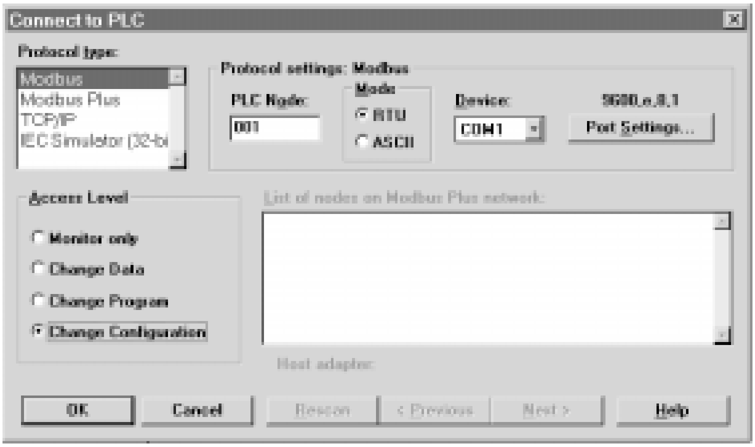
☞ **Note:** You may only save to Flash if you are using the Concept 984 executive. You cannot save to Flash if you are using the Concept IEC executive.

Continued on next page

Saving to Flash, Continued

Procedure

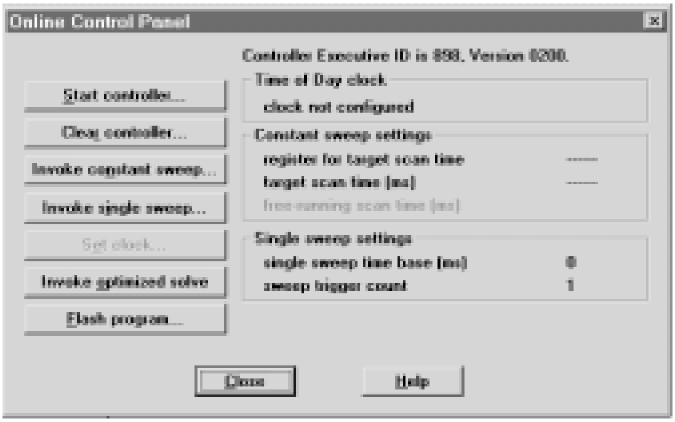
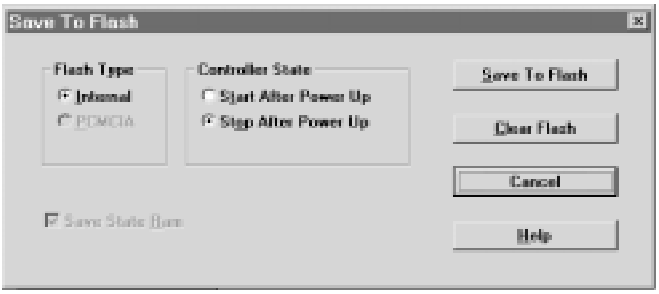
Follow the steps in the table below to save to Flash:

Step	Action
1	From the Online menu on the main menu bar, select **Connect**. **Result:** The Connect to PLC dialog box appears. 
2	Select the correct parameters to connect with your PLC. Under Access Level, select the radio button to **Change Configuration**.
3	Click **<OK>**. **Result:** The Connect to PLC dialog box disappears and Concept connects to your PLC.

Continued on next page

Saving to Flash, Continued

Procedure,
Continued

Step	Action
4	From the Online menu on the main menu bar, select **Online control panel**. **Result:** The Online Control Panel appears. 
5	Click the **Flash program...** button. **Result:** The Save to Flash dialog box appears. 

Continued on next page

Saving to Flash, Continued

Procedure, Continued

Step	Action
6	Select the appropriate parameters in the dialog box and click the **Save to Flash** button. **Result:** A dialog box will appear asking if you really want to save to Flash.
7	Click the **Yes** button. **Result:** Concept completes the save to Flash and a message appears on the screen confirming the completed save.

Appendices

At a Glance

Purpose

This part provides supplemental information on Ladder Logic elements and instructions, LED flash patterns and error codes, and the TIO Power Supply module.

In This Chapter

This part contains the following chapters:

For Information On ...	See Appendix...
Ladder Logic Elements and Instructions	A
Run LED Flash Patterns and Error Codes	B
TIO Power Supply Module	C

Ladder Logic Elements and Instructions

A

At a Glance

Overview

The executive firmware for the TSX 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).

In This Appendix

This appendix contains the following topics:

Standard Ladder Logic Elements

Introduction

This section provides a glossary of standard ladder logic symbols and instructions.

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
	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

Continued on next page

Standard Ladder Logic Elements, Continued

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

Continued on next page

Standard Ladder Logic Elements, Continued

Standard Ladder Logic Instructions, Continued

Symbol	Meaning	Nodes Consumed
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
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

Continued on next page

Standard Ladder Logic Elements, Continued

Standard Ladder Logic Instructions, Continued

Symbol	**Meaning**	**Nodes Consumed**
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

DX Loadable Support

Introduction

The M1 CPUs can use DX loadable instructions, which support optional software products that can be purchased for special applications. DX loadables provide the user with special ladder logic functions.

Loaded on Page 0

The code for DX loadables gets loaded into the Page 0 area. Thus, for every word of DX loadable that is loaded, one word of Page 0 becomes unavailable for other use (such as application logic).

Limited Functionality

DX loadables are limited in the functionality they can provide because they do not provide storage for variables and are limited in their size.

M1 Support

M1 supports only loadables targeted for 80x86 microprocessors running in 16-bit real mode that have not made any hard-coded hardware assumptions (e.g., the address and format of the TOD clock). Obviously, there must be enough available memory to fit the loadable.

Saved to Flash

Since DX loadables are stored in Page 0 memory, they are saved whenever a save-to-Flash operation is initiated.

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/OBus 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.

Continued on next page

A Special STAT Instruction, Continued

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.

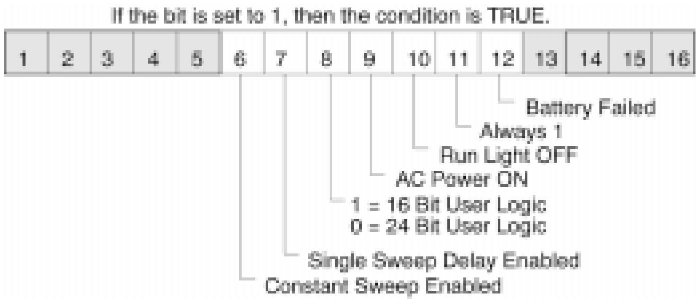
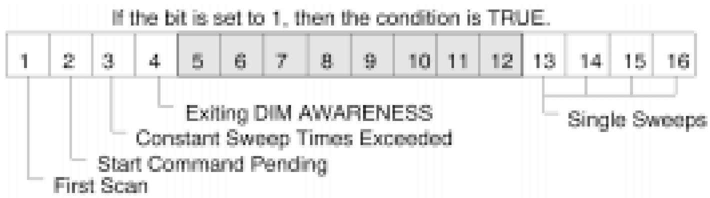
The length–i.e., number of words–in the status table will vary depending on whether or not I/OBus I/O is being supported:

- Without I/OBus, the STAT instruction is 12 words long.
- With I/OBus, the instruction is 20 words long.

A Special STAT Instruction, Continued

Words 1...12

The first 12 words describe the CPU status and are detailed in the following table:

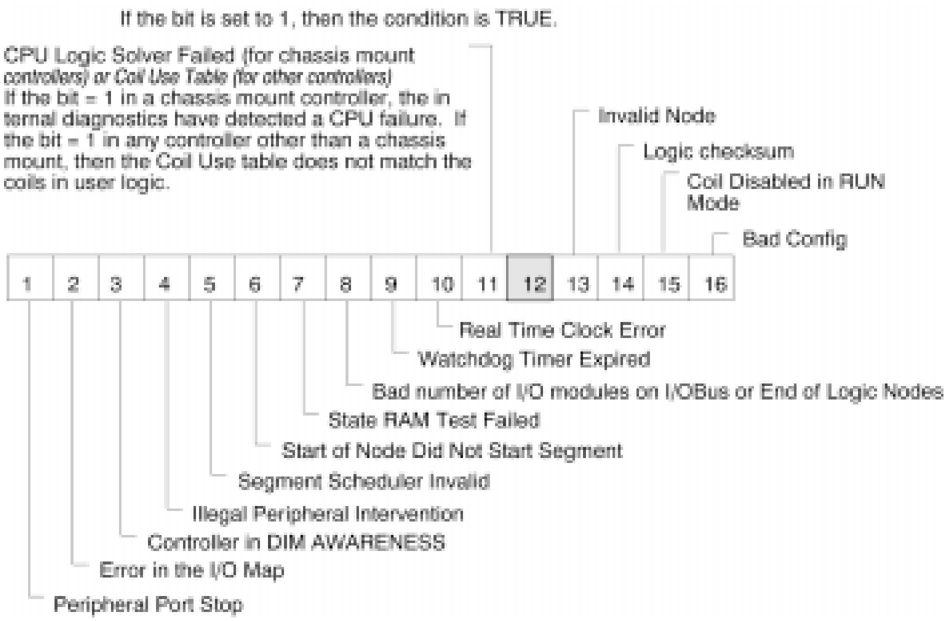
Word	Description
1	Displays the following aspects of the PLC's status: 
2	Reserved for internal use.
3	Displays more aspects of the controller status: 
4	Not used.

Continued on next page

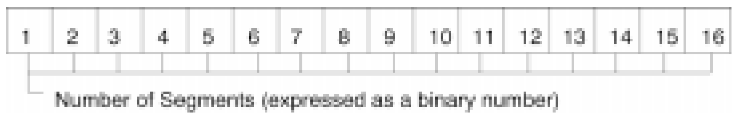
A Special STAT Instruction, Continued

Words 1...12, Continued

<table>
<tr><th>Word</th><th>Description</th></tr>
<tr><td>5</td><td>Displays the PLC's stop state conditions:



</td></tr>
<tr><td>6</td><td>Displays the number of segments in ladder logic; a binary number is shown:

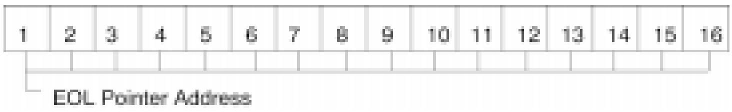
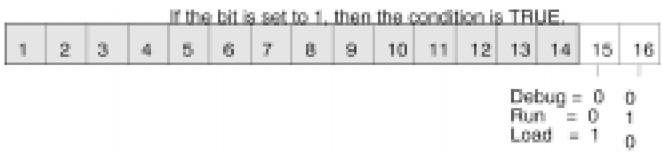


</td></tr>
</table>

Continued on next page

A Special STAT Instruction, Continued

Words 1...12,
Continued

Word	Description
7	Displays the address of the end-of-logic (EOL) pointer: 
8 and 9	Not used.
10	Uses its two least significant bits to display RUN/LOAD/DEBUG status: 
11	Not used.
12	Indicates the health of the ATI module: 

Continued on next page

A Special STAT Instruction, Continued

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/OBus 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

The following table lists the flash pattern of the Run LED on the TSX 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

Continued on next page

Run LED Flash Pattern and Error Codes, Continued

Number of Blinks	Code (hex)	Error
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

Continued on next page

Run LED Flash Pattern and Error Codes, Continued

Number of Blinks	Code (hex)	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

TIO Power Supply Module

C

At a Glance

Purpose

This appendix describes the 170 CPS 110 00 TIO Power Supply module. The module provides a regulated output voltage with protection against overload and overvoltage. It can be used to power TSX Momentum I/O bases.

In This Appendix

This appendix contains the following sections:

For This Topic...	See Section...
Module Overview	1
Wiring	2

Section C.1
Module Overview

Introduction

Purpose

This section describes the front panel components of the 170 CPS 111 00 TIO Power Supply module and provides specifications.

In This Section

This section contains the following topics:

Topics
Front Panel Components
Specifications

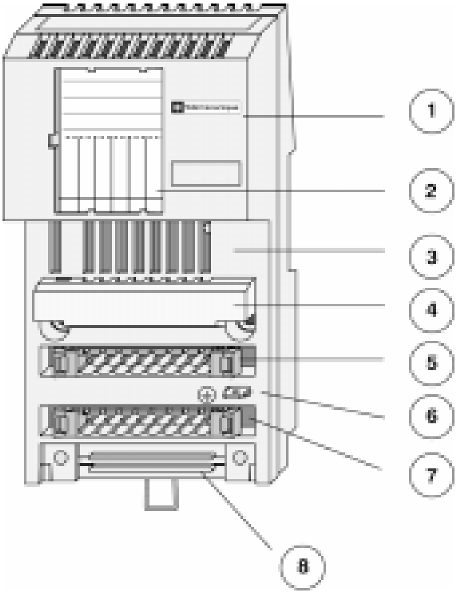
Front Panel Components

Overview

This section contains a diagram of the front panel of the 170 CPS 111 00 TIO Power Supply module and a description of the LEDs.

Front Panel Diagram

The front panel of the power supply module is shown in the diagram below:



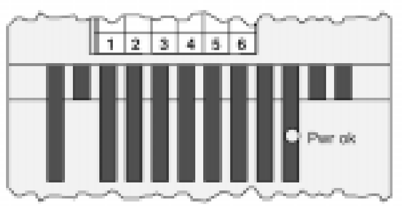
Label	Description
1	Module identifier
2	Identification label
3	LED status display
4	Protective cover
5	Input voltage (AC) terminal strip connector mounting slot
6	PE spade-lug connector
7	Output voltage (DC) terminal strip connector mounting slot
8	Grounding busbar connector mounting slot

Continued on next page

Front Panel Components, Continued

LED Diagram

This module has one LED, which is shown in the diagram below:



LED Description

The Pwr OK LED is described in the table below:

Indicator	Condition	Message
Pwr ok	Green	Power supply module is ready.
	Off	Power supply module is not ready.

Specifications

Overview

This section contains specifications for the 170 CPS 110 00 TIO Power Supply module.

General Specifications

The following table contains general specifications for the power supply module.

Nominal Input Voltage	230 VAC or 120 VAC (jumper selectable)
Nominal Output Voltage	24 VDC
Maximum Output Current (isolated)	0.7 A
Protective Circuitry	
Inputs	Self-restoring fuse
Outputs	Overvoltage protection: limited by a transzorb diode (type: SM6T30A)
	Overload protection: by thermal current limiting (should the thermal current limiting respond, the input voltage must be switched -- off/on for reactivation).
Frequency	
Input voltage	50/60 Hz + 5%
Internal chopper frequency	90 ... 110 kHz
Power	
Efficiency	Typically 0.76 for IA = 0.7 A
Apparent power	Typically 32 VA for IA = 0.7 A
Effective power	Typically 21 W for IA = 0.7 A
Isolation	
Input/output voltage‘	L, N, PE isolated from UB, M
Fusing	
Input	Internal self-restoring fuse
	Min external F1: for 230 VAC, 0.315 A, slow-blow Min external F1: for 120 VAC, 0.63 A, slow-blow

Continued on next page

Specifications, Continued

General Specifications, Continued

Fault Information	
Inputs	None
Outputs	Green status LED for output voltage ok
Environmental Conditions	
Regulations	VDE 0160, UL 508
Permissable operating and ambient temperatures	GUF (-40 ... +60 deg. C) adhering to DIN 40040, refer to the derating curve for uninhibited convection, operation orientation is vertical
Permissable storage temperature	-40 ... +85 deg. C
Internal power dissipation	Roughly 1.2 + 5 x IA (in W, IA in A)
Noise immunity	EN 55011 (DIN VDE 0875) class A
Safety classification	Class 1 (VDE 0160, IEC 1131)

Continued on next page

Specifications, Continued

AC Input Voltage

This section contains specifications for AC input voltage, selectable by jumper.

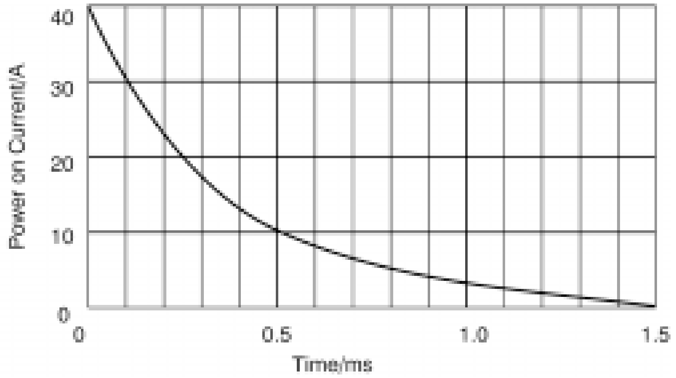
Input Voltage	
EX - EY not jumpered	L/N = 230 VAC
EX - EY jumpered	L/N = 120 VAC
Limiting Values	
With jumper	100 Veff -15% to 120 Veff +10%
Without jumper	230 Veff -15% to 240 Veff +10%
Power Failure	
Half wave loss at	100 Veff -15%
Min. of a half wave at	>= 100 Veff
Min. of a half wave at	230 Veff -15%
Input Current	
For 85 Veff	Typically 0.366 Aeff, IA = 0.7 A
For 170 Veff	Typically 0.188 Aeff, IA = 0.7 A
For 230 Veff	Typically 0.188 Aeff, IA = 0.7 A
Power on Current	
I^2T	0.3 A^2s
IT	0.02 As

Continued on next page

Specifications, Continued

Power on Surge Current Curve

The following chart shows power on surge current for 120 VAC + 10% or 240 VAC + 10%.



DC Output Voltage

This section contains specifications for DC output voltage:

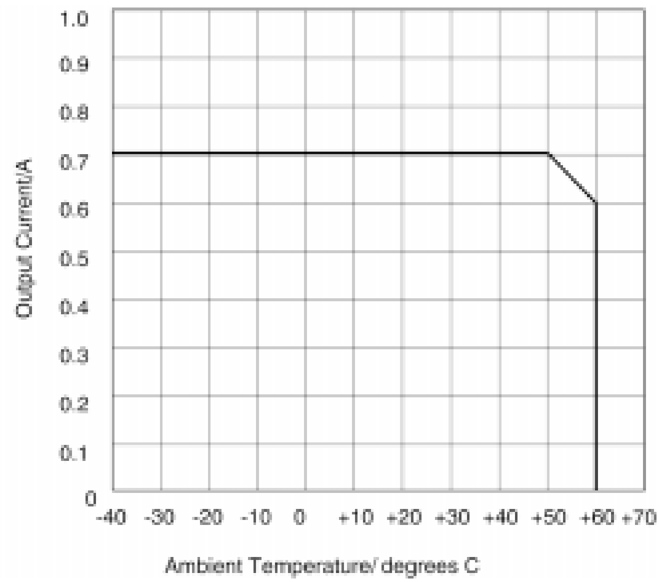
Number	1 x UB = 24 VDC, max. 0.7 A, isolated
Limiting Values	
UBmin	21 VDC
UBmax	30 VDC
Output Current	
IA	0 ... 0.7 A
Output Ripple	
Typical	150 mV/p-p (max. 20 MHz)
Max.	250 mV/p-p (max. 20 MHz) - measured with a 0.1 microF capacitor
Voltage Regulation	Typically +500 mV for 0.7A after 0.35 A Typically -500 mV for 0.35A after 0.7 A

Continued on next page

Specifications, Continued

Output Current Chart

The following chart shows output current (derating) for uninhibited vertical convection:



Section C.2 Wiring

Overview

Purpose

This section describes the types of terminal connectors available, how to code terminal connectors and how to mount them. It also describes external operating voltage connections.

In This Section

This section contains the following topics:

Topics
Choosing a Terminal Connector
Terminal Connector Coding
Mounting the Terminal Connectors
External Operating Voltage Connections

Choosing a Terminal Connector

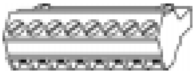
Introduction

Power is supplied to the module through an 8-pole terminal connector. Two types of terminal connectors are available:

- screw-in
- spring-clip

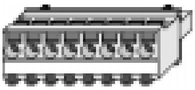
Screw-In Version

Screw-in terminals can be used with cable with a diameter of up to 12 AWG (2.5 mm^2). They come in sets of three. The part number is 170 XTS 011 00.



Spring-Clip Version

Spring-clip terminals can be used with cable with a diameter of up to 14 AWG (1.5 mm^2). They come in sets of three. The part number is 170 XTS 012 00.



Terminal Connector Coding

Safety Requirement

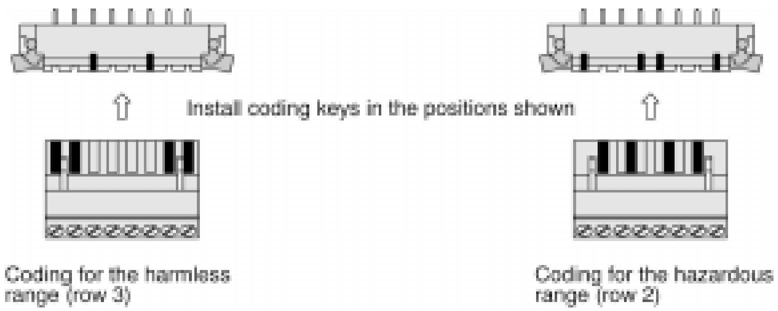
This module is used in hazardous and harmless voltage ranges. For safety, code the terminal connectors and the power supply module to prevent inadvertent exchanges of terminal blocks.

Coding Set

To complete the coding described below, order the 170 XCP 200 00 coding set. This set contains coding keys and combs.

Coding Diagram

Install coding keys in the positions shown in the following diagram:



Mounting the Terminal Connectors

Introduction

This section describes how to mount terminal connectors and how to remove them, including safety considerations.

CAUTION

ELECTRICAL HAZARD

Only mount and remove terminal connectors when the module is not under power.

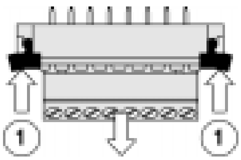
Failure to observe this precaution can result in injury or equipment damage.

Mounting

To mount a terminal connector, press it into the module's pin connector.

Removal

To remove a terminal connector, press both extractors, as shown in the diagram below:



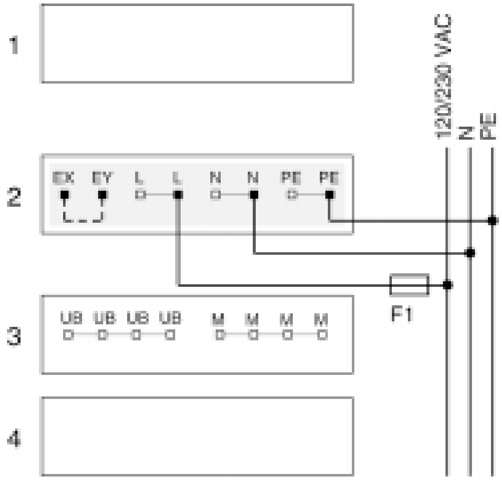
External Operating Voltage Connections

Overview

This section contains a diagram of the external operating voltage connections and explanatory notes.

Diagram

The following diagram shows the external operating voltage connections for the 170 CPS 11 00 TIO Power Supply module:



Row	Terminal	Connection	Function
2	1	EX	Jumper connection
2	2	EY	Jumper connection
2	3, 4	L	AC input voltage, line
2	5, 6	N	AC input voltage, neutral
2	7, 8	PE	Earth ground
3	1, 2, 3, 4	UB	DC output voltage
3	5, 6, 7, 8	M	DC output voltage return

Continued on next page

External Operating Voltage Connections, Continued

Grounding

The spade-lug connector on the front of the module provides a short, secure PE grounding surface.

Electrical safety

Power supply modules may not be operated in parallel. Physically separate input cabling from output cabling.

Fusing

Dimension the F1 fuse to match the operative load, observing the minimum values in the following table:

Voltage	Jumper Placement	External Fusing (min. F1)
120 VAC	Mounted	0.63 A slow-blow
230 VAC	Removed	0.315 A slow-blow

Index

Numerics

O

P

S

Modicon, Square D and Telemecanique are PLC brand names from Schneider. These products are sold in the US by Square D; in Canada, Latin America, Europe, Africa, Asia/Pacific and Middle East by Schneider; in Germany by AEG Schneider Automation; in China and Persian Gulf by Schneider Automation; in South Africa by ASA Systems Automation; in Austria by Online.

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