Momentum
171 CBB 970 30
M1 Processor
User Guide

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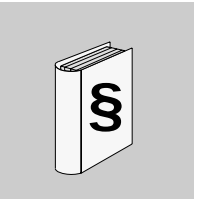
Safety Information



Important Information

NOTICE

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

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

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

⚠ DANGER

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

⚠ WARNING

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

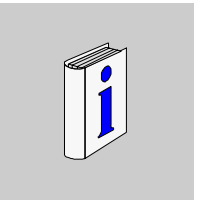
⚠ CAUTION

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

PLEASE NOTE

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

About the Book



At a Glance

Document Scope

This manual describes the 171 CBB 970 30 Momentum M1 processor. The processor contains 544 Kbytes of internal memory and can be programmed with either:

- Concept, version 2.6 (with service release 4, patch A) or greater
- ProWORX 32, version 2.1 or greater

The processor also contains a 4-port 10/100 Ethernet switch.

Validity Note

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

Related Documents

Title of Documentation	Reference Number
Momentum I/O Base User Guide	870 USE 002
Concept User Guide	840 USE 503
ProWORX 32 Programming Software for PLCs User Guide	372 SPU 780
Ladder Logic Block Library User Guide	870 USE 101
Momentum 170ENT11001/170ENT11002 Ethernet Communications Adapter User Guide	870 USE 114
Advantys STB Ethernet Modbus TCP/IP Network Interface Applications Guide	890 USE 177

Product Related Warnings

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

When controllers are used for applications with technical safety requirements, please follow the relevant instructions.

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

Failure to observe this product related warning can result in injury or equipment damage.

User Comments

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The Momentum 171 CBB 970 30 Processor

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At a Glance

Overview

The Momentum 171 CBB 970 30 processor, with its built-in 4-port Ethernet switch, provides programmable logic control to distributed communication networks, I/O, and other Modbus TCP/IP-compatible devices connected to an Ethernet network.

This chapter gives you an overview of the processor's features and capabilities. Installation and power wiring instructions are also provided.

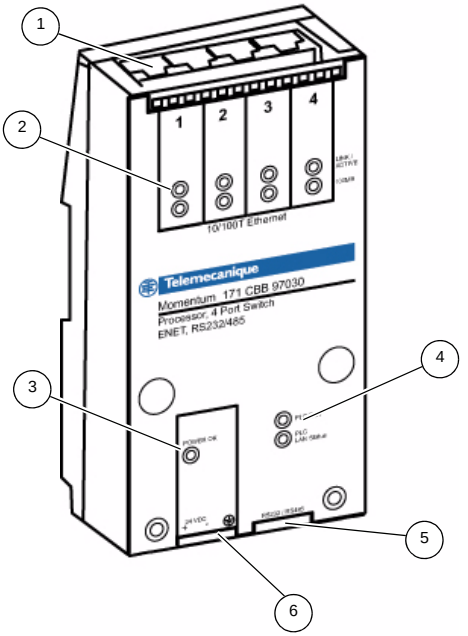
What's in this Chapter?

This chapter contains the following topics:

Physical Components of the 171 CBB 970 30 Processor

Front Panel View

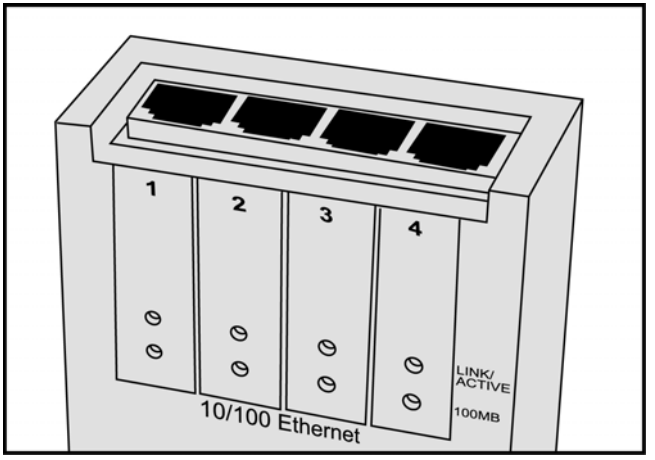
A front panel view of the Momentum 171 CBB 970 30 processor is shown below. The interfaces and LED indicators for the Ethernet switch are on the top half of the module. The interfaces and LED indicators for the M1 processor are on the bottom half of the module.



1 Connectors for each of the four Ethernet ports
2 LINK/ACTIVE and 100MB LED indicators for each of the four Ethernet ports
3 POWER OK LED
4 PLC Run and PLC LAN Status LEDs
5 R232/RS485 serial port connector
6 24 VDC power connector

Ethernet Switch Interfaces

The four RJ45 connectors on the top of the processor are for the four 10/100BASE-T ports provided by the built-in Ethernet switch. The connectors are labeled 1 to 4 from left to right.



You can connect up to four Ethernet 10/100BASE-T devices or network segments to these ports over twisted-pair or shielded twisted-pair cables. The network segments may be:

- distributed I/O modules
- other Momentum processors
- supervisory systems
- computers
- programming panels
- other Ethernet products

The functionality of the 4-port Ethernet switch is described in more detail later in this manual (see *p. 23*).

Note: The Ethernet connectors and the Modbus port connector at the bottom of the module are female RJ45 connectors with a similar look. Do not attempt to make a Modbus connection through an Ethernet connector.

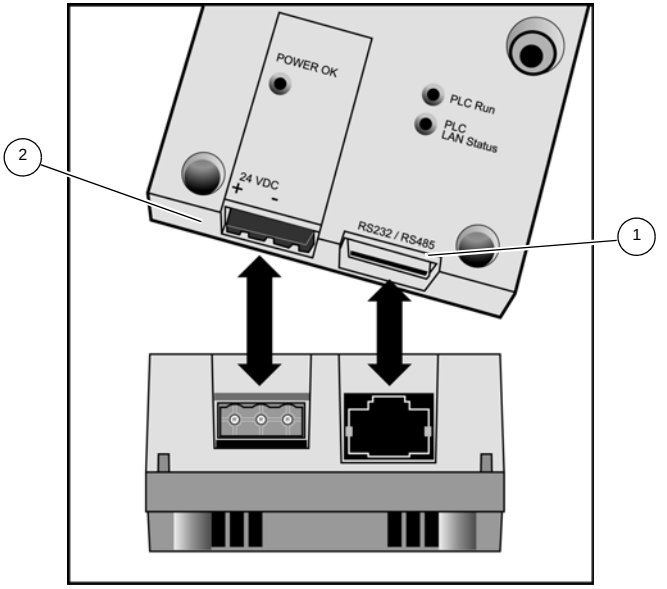
Ethernet Port LED Indicators

Each Ethernet port has two LED indicators, LINK/ACTIVE and 100MB. Their indications are described below.

LED	Pattern	Indication
LINK/ ACTIVE	On	A valid link is established on the associated Ethernet port
	Blink	A receive or transmit activity is occurring on the associated Ethernet port. If the 100MB LED is off, the activity is at a 10BASE-T speed. If the 100MB LED is on, the activity is at a 100BASE-T speed.
	Off	No valid link established on the associated Ethernet port
100MB	On	The link speed on the associated Ethernet port is 100BASE-T
	Off	If the LINK/ACTIVE LED is off, there is no link on the associated Ethernet port
		If the LINK/ACTIVE LED is on or blinking, the link speed on the associated Ethernet port is 10BASE-T

Processor Interfaces

Two connectors are located on the bottom of the module, a Modbus serial port connector and a 24 VDC power supply connector.



1 Modbus port
2 24 VDC power supply connector

The Modbus port is an RJ45 connector on the bottom right part of the module. It is a general-purpose asynchronous serial port with dedicated RS232/485 slave functionality. The port can also have master functionality when you use an XXMIT or XMIT programming function block.

A Modbus host device connected to the port, such as an HMI or PLC programming panel, can be used for:

- programming the M1 processor
- transferring data between the host device and the M1 processor
- uploading and downloading
- other host operations

The choice between RS232 and RS485 can be made with PLC programming software (see *p. 15*). RS232 is the default protocol.

Modbus communication capabilities are described in more detail later in this manual (see *p. 35*).

Note: The Modbus port connector and the Ethernet connectors at the top of the module are female RJ45 connectors with a similar look. Do not attempt to make an Ethernet connection through a Modbus connector.

The 171 CBB 970 30 processor requires 19.2 to 42.5 VDC of power to the unit from an external safety extra-low voltage (SELV) power source. The 3-pin power connector is located on the bottom left of the module. The connector's pin assignments are labeled on the front panel above the connector:

Pin Position	Description
Left	+ 24 VDC
Center	– VDC
Right	Protective earth (PE)

Note: The PE pin must be used at all times. Make sure that PE is attached before connecting or disconnecting any shielded cables to/from the Ethernet ports.

Power wiring considerations are described in more detail later in this manual (see *p. 19*).

M1 Processor LED Indicators

The processor has three LED indicators, Power OK, PLC Run and PLC LAN Status. Their functions are described in the table below.

LED	Pattern	Indication
POWER OK	On	Internal power supply is providing normal operating voltages to the switch circuits
	Off	Internal power supply is not at normal operating voltages
PLC Run	On	The PLC has received power and is solving logic
	Blink	Flashes an error pattern (see *p. 98*)
	Off	CPU is not powered up or is not solving logic
PLC LAN Status	On	The PLC is in a normal run condition
	Continuous Blink	Normal Ethernet initialization at power-up
	4 flashes	Duplicate IP address detected

Panel Software Options

Overview

The Momentum 171 CBB 970 30 processor can be programmed and configured with either:

- Concept, version 2.6 (with service release 4, patch A) or greater
- ProWORX 32, version 2.1 or greater

The processor can solve control logic written in an IEC programming language or in the 984 Ladder Logic programming language.

The processor is shipped with the IEC firmware installed. With the IEC firmware, you can immediately use Concept to configure the device and program your control application. Chapters 4 (see *p. 41*), 5 (see *p. 57*), 6 (see *p. 67*), and 7 (see *p. 71*) describe Concept's configuration procedures and capabilities in more detail.

ProWORX 32 users can download 984 Ladder Logic firmware from the Schneider Website, www.telemecanique.com. Chapter 8 (see *p. 81*) describes configuration procedures and capabilities of ProWORX 32 in more detail.

Memory Characteristics

Introduction

The Momentum 171 CBB 970 30 processor is equipped with internal memory and Flash RAM.

Internal Memory

Internal memory comprises user memory and state RAM.

User memory contains the control logic program and the system overhead (processor adapter configuration, I/O mapping, checksum, system diagnostics, etc.).

State RAM is the area in memory where all the input and output references for program and control operations are defined and returned.

You can change the processor's internal memory allocation using the **PLC Memory Partition** feature that is part of your panel software.

Flash RAM

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

You can store a copy of the application program and the state RAM values in Flash RAM.

When the Momentum 171 CBB 970 30 has successfully established communication with other devices, we recommend that you stop the processor and save the application program to Flash. This manual describes the procedures for saving-to-Flash with both Concept (see *p. 67*) and ProWORX 32 (see *p. 89*).

This procedure saves the processor's ARP cache, enabling you to rapidly restore communication if power is lost or removed. It is also useful when a new or substitute device is installed on the network or when the IP address of a network device is changed.

Installation

Mounting Options

The Momentum 171 CBB 970 30 processor can be installed on a DIN rail or mounted on a wall inside a panel enclosure.

Note: The processor is designated as open equipment per EN61131-2. You need to install open equipment in industry-standard enclosures with access restricted to authorized personnel.

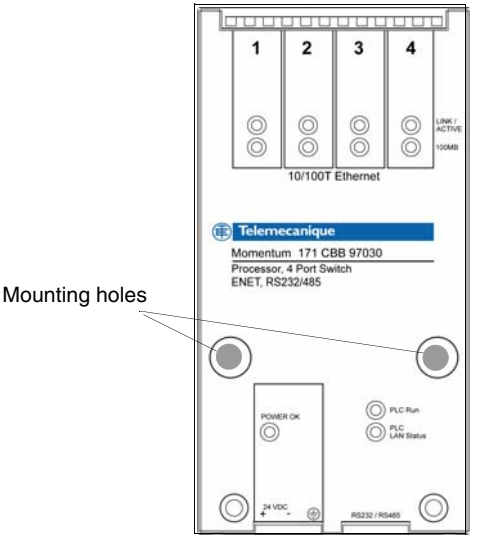
DIN Rail Mounting Procedure

Step	Action
1	Put the wire lock on the back of the processor is in the down position.
2	Align the mounting channel on the back of the processor to the DIN rail and press it onto the rail until it snaps into place.
3	Push the wire lock up to lock the processor onto the DIN rail.

Note: The contact springs on the back of the processor may be used as the functional ground if the DIN rail is grounded.

Panel Wall Mounting

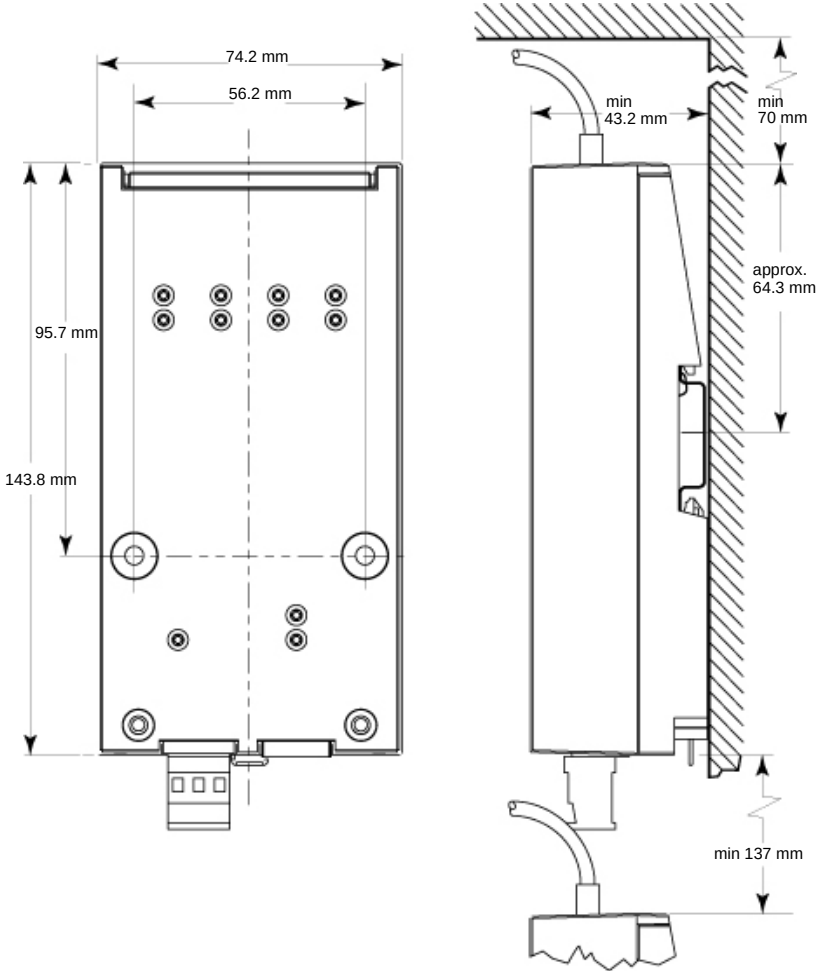
Two mounting holes are provided on the front of the 171 CBB 970 30 processor.



Securely fasten the processor to the wall with two metal mounting screws, 4 mm (0.16 in) in diameter and 25 mm (0.97 in) long with 8 mm (0.31 in) screw heads.

The metal mounting screws may be used as the functional ground if the panel is grounded.

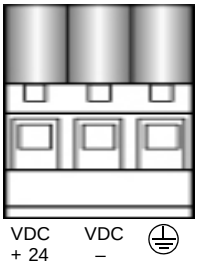
Mounting Dimensions



Power Wiring

Power Wiring

The 171 CBB 9730 processor requires 19.2 to 42.5 VDC of power from an external safety extra-low voltage (SELV) power source. The power connector is located on the bottom of the processor (see *p. 12*). It is a 3-pin connector with the following pin assignments:



Grounding Considerations

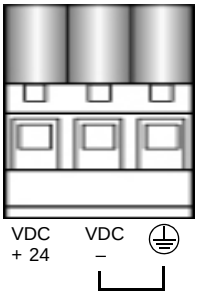
The grounding pin (the rightmost pin on the power connector) provides protective earth (PE).

Note: The grounding pin must be used at all times.

Make sure that PE ⏚ is attached before connecting or disconnecting any Ethernet shielded cables to the device.

Noise Immunity Considerations

If the processor is operating in a noisy environment, you may insert a jumper between the – VDC and ⏚ pins in your power cable:



If you are using a grounded power supply, the jumper is not required.

If any other devices in your system are connected to the same power supply as the 171 CBB 9730 processor, your power supply connection must not affect any of these other devices.

You must maintain a voltage of less than 44 VDC between the – VDC and ⏚ pins.

Note: Your electrical installation must meet local or nationally applicable safety standards and regulations.

Power Cable Recommen-dations

The PE ground must be capable of supporting 30 A of current for 2 minutes with no more than 50 mΩ of resistance. The recommended wire size is 3.2 to 0.87 mm^2 (12 to 18 AWG). (The maximum wire size must not be exceeded even if your wire contains the –VDC-to-PE jumper.)

The maximum allowable length of the cable at 18 AWG is 2 m.

Note: A single-point connection between the PE and –VDC is recommended in a +24 VDC power wiring system.

Lithium Battery

Introduction

Due to the characteristics of the lithium battery, the operating life cannot be accurately determined. Major factors reducing battery capacity are:

- storage temperature
- operating temperature
- time in storage
- battery use

If battery backup is required, Schneider Electric recommends configuring the battery-low coil in the PLC configuration, a setting that allows monitoring of the battery capacity level. A battery low condition exists when the configured battery low coil goes to 1.

The Momentum 171 CBB 970 30 processor contains a factory-installed lithium coin cell battery. It is shipped with the real-time clock disabled, and the SRAM is not battery backed. When the processor is powered on for the first time, it runs on the battery and the battery-backed SRAM is enabled.

You can set the time of day using either Concept (see *p. 53*) or ProWORX 32 (see *p. 87*). If you do not set the clock, it starts running with a factory-set date of 1 June 2006 at first power-up.

Battery Characteristics

- The back-up life of the lithium battery when it is supporting the processor's memory while the processor is powered off is typically 3 years after the real-time clock is set
- The back-up life of the lithium battery when the processor is powered up and running is typically 5 years

Battery-low Threshold Level

A circuit monitors the voltage of the lithium battery. you can set a battery monitoring coil in the configuration with Concept (see *p. 50*) or ProWORX 32 (see *p. 87*). When the battery voltage gets weak, this battery-low coil turns on—i.e., its value is 1. When the battery coil turns on, you have 30 days to replace the battery.

The 4-port 10/100BASE-T Ethernet Switch

2

At a Glance

Overview

This chapter explains the capabilities of the 10/100BASE-T Ethernet switch built into the Momentum 171 CBB 970 30 processor.

What's in this Chapter?

This chapter contains the following topics:

The Ethernet Switch

Introduction

The Ethernet switch built into the Momentum 171 CBB 970 30 processor allows you to connect the processor to an Ethernet network. Ethernet connectivity gives you:

- high-speed I/O servicing
- high-speed data transfer
- remote programming
- worldwide connectivity via the Internet
- interfaces with a wide array of Transparent Ready devices

Key Features

The Ethernet switch has four 10/100BASE -T ports that can operate independently at 100 Mb/s full-duplex or half-duplex, or at 10 Mb/s full-duplex or half-duplex. It supports switched Ethernet networks in accordance with IEEE standard 802.3 or 802.3u using copper technology.

The switch supports:

auto-negotiation The switch automatically negotiates speed (10BASE-T or 100BASE-T) and full- or half-duplex mode. Auto-negotiation is managed independently on each of the four switch ports.

auto-polarity The switch detects and compensates for an incorrectly wired cable, i.e., cable where the RX+ and RX- signal inputs need to be swapped. Auto-polarity is managed independently on each of the four switch ports.

auto-MDI/MDI/X The switch auto-switches the transmit (TX) and receive (RX) wire pairs as needed to establish communications with the end device. As a result, the processor is able to transparently interconnect with any other 10/100BASE-T Ethernet device with either straight-through or crossover cables. Auto-negotiation is managed independently on each of the four switch ports.

multi-addressing The switch learns the switching parameters for up to 1024 MAC addresses. The switch deletes inactive address entries (those exceeding 300 sec of inactivity).

tagging The switch transmits data packets unchanged with the VLAN tag, in accordance with IEEE 802.1q.

store-and-forward The switch stores all the data it receives, checks it for the proper packet length, and executes a CRC validity check. Packets meeting the criteria are forwarded to their destination. Packets that do not meet both criteria are discarded.

queuing An output port that is slow or congested never affects the transmission of frames to ports that are non-congested. Traffic will always be received on the input port.

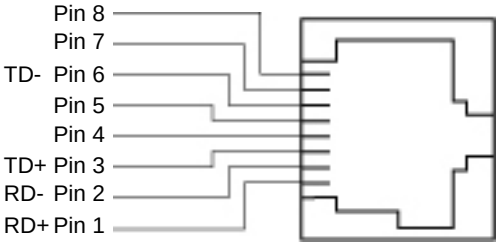
The Ethernet Port Connections

Introduction

The Momentum 171 CBB 970 30 processor contains four 10/100BASE-T ports. Four RJ45 connectors are provided on the top of the module for connectivity to each of the four ports (see *p. 11*).

Wiring

The following figure illustrates a standard pin assignment for the four Ethernet RJ45 connectors. Remember that the switch can automatically change the pin assignments as a function of its auto-MDI/MDI/X and auto-polarity features (see *p. 24*).



The TD+/- pair (pins 3 and 6) and the RD+/- pair (pins 1 and 2) are swapped when auto-MDI/MDI/X occurs. The switch automatically compensates for this swap.
The RD+ and RD- assignments on pins 1 and 2 are swapped when auto-polarity occurs. The switch automatically compensates for this swap.
Pins 4 and 5 are shorted together and terminated. This pin assignment is standard for Ethernet devices.
Pins 7 and 8 are shorted together and terminated. This pin assignment is standard for Ethernet devices.

Ethernet Cable Selection

Use Ethernet CAT5E or CAT6 grade cables with EIA568 pinouts to connect devices to the Ethernet ports on the 171 CBB 970 30 processor. The maximum cable length between devices is 100 m.

In high noise environments, shielded CAT5, CAT5E, or AT6 cables must be used.

Network Design Considerations

Introduction

In a distributed control environment, the Ethernet ports on a Momentum 171 CBB 970 30 processor can connect to:

- a network with distributed I/O and control devices
- a supervisory network
- a network that combines I/O and supervisory functions

The following discussion examines some network design considerations that can make communication between related devices as effective and deterministic as possible.

Concurrent Communication

A maximum of 96 devices can communicate with the Momentum 171 CBB 970 30 processor at any one time over Ethernet. The types of devices and the maximum number of each device type are as follows:

- 2 programming panels (one of which must be in monitor mode)
- 14 general-purpose Modbus server paths
- 16 MSTR elements (MSTR elements support Modbus Read, Modbus Write, and Modbus Read/Write commands)
- 64 cyclic configured data slave paths

Obtaining Network MAC and IP Addresses

When installed on a new network, the Momentum171 CBB 970 30 processor obtains the MAC addresses and IP addresses of the other Ethernet devices on the network. This process may require several minutes.

Operating without Battery Back-up

When the processor is successfully communicating with these devices and battery back-up is not present, we recommend that you stop the processor and save your program to Flash, using Concept (see *p. 67*) or ProWORX 32 (see *p. 89*). This saves the processor's ARP cache and enables it to restore the information rapidly if power is lost or removed. If you do not save to Flash, the processor must reacquire the ARP cache information from the network.

Note: Preserve your ARP cache information.

This procedure should also be followed whenever:

- a new or substitute device is installed on the network
- the IP address of a network device has been changed

Managing Distributed I/O over Ethernet

In an Ethernet I/O network, the Momentum171 CBB 970 30 processor controls distributed I/O modules equipped with Ethernet interfaces and other Transparent Ready Ethernet devices. Some examples include Advantys STB I/O islands and Momentum distributed I/O modules.

The Momentum171 CBB 970 30 processor provides isolation from both MIS data traffic and unrelated communication between other control devices. Traffic from MIS data networks can interrupt communication between control devices, causing your control application to behave unpredictably. The high message rates that may be generated between the Momentum 171 CBB 970 30 processor and I/O devices may bog down an MIS network, causing loss of productivity.

⚠ CAUTION

UNPREDICTABLE NETWORK BEHAVIOR

Use switches or separate networks to isolate the Momentum 171 CBB 970 30 processor and related devices from MIS data networks.

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

Supervisory Networks

In a supervisory architecture, several intelligent processing devices share system data. Many kinds of devices may be part of the network. Be aware of each device requirement for access to the network and of the impact each device can have on the timing of your network communications.

Network Security Firewalls

Overview

To restrict access to your Momentum 171 CBB 970 30 processor and to the I/O network, you may want to consider a firewall. A firewall is a gateway that controls access to your network. There are two types of firewalls:

- network-level firewalls
- application-level firewalls

Network-level Firewalls

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

Application-level Firewalls

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

Assigning Ethernet Address Parameters

IP and MAC Addresses

The Momentum 171 CBB 970 30 processor is shipped from the factory without an IP address assignment. At initial start-up, the processor attempts to obtain an IP address from a BOOTP or DHCP server.

A MAC address is set for every processor at the factory.

Ethernet IP address, default gateway, and subnetwork mask parameters can be assigned with one of following applications:

- Concept (see *p. 59*)
- ProWORX 32
- The BOOTP Lite software utility
- A DHCP server

Obtaining an IP Address

⚠ CAUTION

UNPREDICTABLE NETWORK OPERATIONS

Make sure that your Momentum 171 CBB 970 30 processor has a unique IP address on the Ethernet network.

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

⚠ CAUTION

COMMUNICATION ERRORS

After taking the Momentum 171 CBB 970 30 processor out of service, clear the program and IP address to prevent future conflicts.
To clear the IP address:

- Go to the **Ethernet I/O Scanner** dialog in Concept (see *p. 58*) or the **Configuration Extensions** dialog in ProWORX 32, and make sure that the IP address acquisition method is set to use a BOOTP server.
- With the BOOTP method selected, save the configuration to Flash.
- Then decommission the processor.

Before installing a replacement Momentum 171 CBB 970 30 processor on your network, verify that it contains the correct IP address and program for your application.

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

On start-up, an unconfigured processor attempts to obtain an IP address by issuing BOOTP requests. When a response from a BOOTP or DHCP server is obtained, that IP address is used.

Consult your system administrator to obtain a valid IP address and appropriate gateway and subnet mask, if required.

Each IP address on the Ethernet network must be unique. The 171 CBB 970 30 processor checks for duplicate IP addresses on the network before it actively starts network operations.

If for any reason two or more devices coexist on an Ethernet network with the same IP address, network operations are unpredictable.

BOOTP and DHCP Servers

A BOOTP or DHCP server is a program that manages the IP addresses assigned to devices on the network. Your system administrator can confirm whether a BOOTP or DHCP server exists on your network and can help you use the server to maintain the 171 CBB 970 30 processor's IP address.

Retaining The IP Address Setting

If the processor has lost its battery back-up capability and you want the IP address setting to be retained after power is removed from the module, save your program to Flash using Concept (see *p. 67*) or ProWORX 32 (see *p. 89*). IP address retention on restart differs depending on the way the processor is configured.

If a processor without battery back-up is configured to use the BOOTP server and an IP address was previously saved to Flash, the processor issues three BOOTP requests 5 sec apart.

- If a BOOTP response is received from the server, the new IP address is assigned but not automatically saved to Flash. To save the new IP address to Flash, you need to use your panel software. If a power cycle occurs on the processor, the IP address that is currently saved to Flash is used.
- If a BOOTP response is not received from the server, the processor uses the IP address that is saved in Flash. Three ARP broadcasts are made 5 sec apart to check for duplicate IP addresses. Three additional ARP broadcasts are made 2 sec apart with the station's MAC address and IP address.

If a processor without battery back-up is configured for *Specify an IP Address* and an IP address was previously saved to Flash, the processor listens for any BOOTP messages but does not issue any BOOTP requests. It uses the saved IP address. Three ARP broadcasts are made 5 sec apart to check for a duplicate IP address. Three additional ARP broadcasts are made 2 sec apart with the station's MAC address and IP address.

Using BOOTP Lite to Assign Address Parameters

The BOOTP LIte Alternative

Instead of a BOOTP or DHCP server, Schneider Electric's BOOTP Lite utility software can be used to provide the IP address, subnet mask, and default gateway to the processor.

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

Using the Correct MAC Address

⚠ CAUTION

UNINTENDED OPERATION

- Enter the parameters of the target controller (as described in the BOOTP Lite user manual). Otherwise, the controller runs on its old, or existing, configuration.
- Verify the MAC address of the target device before invoking the BOOTP Lite Server Software.

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

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

Specifying Addresses/ Stopping the Processor

A response from BOOTP Lite causes the processor to enter Stopped state on completion of power-up, if the processor has been set to **Specify IP Address** mode in Concept. This is useful when inappropriate outbound network traffic might result if the processor immediately transitioned into Run mode after power-up.

Refer to the BOOTP Lite user documentation for instructions.

Reading Ethernet Network Statistics

Overview

Ethernet network statistics are stored in the Momentum 171 CBB 970 30 processor. They can be viewed with the processor's on-board Web server.

Table of Statistics

Network statistics occupy words 0...37 in the Modbus status table:

Word	Data	Description
00 ... 02	MAC Address	
03	Board Status	
04, 05	Rx Interrupt	Number of frames received by this station. Only broadcast frames pertinent to this station and individual address match frames are received and counted.
06, 07	Tx Interrupt	Number of frames transmitted from this station. Includes all transmitted broadcast frames for ARP and BOOTP.
08, 09	Not used.	
10, 11	Total Collisions	This field should always be 0.
12, 13	Rx Missed Packet Errors	Receive frame was missed because no buffer space was available to store the frame. Indicates firmware unable to keep up with link. The only time this should increment is during a save-user-logic-to-Flash operation, when all interrupts are disabled for 10 sec.
14, 15	Not used.	
16, 17	Chip Restart Count	High Word: Not used, always 0.
		Low Word: Peak Collision Detector (should always be 0)
18, 19	Framing Errors (Giant Frame Error)	Counts the number of received frames addressed to this node that are longer than 320 bytes. Any such large frame has no relevance to the 171 CBB 970 30 processor and is skipped. This error should not occur.
20, 21	Overflow Errors	Increments whenever a received frame cannot be copied into the frame buffer because the frame buffer is full. This situation should never occur under legal Ethernet traffic.
22, 23	CRC Errors	Increments when a packet is received with any of the following: • CRC error • Extra data error • Runt error

24, 25	Receive Buffer Errors (Out of Server Paths)	Increments when a client attempts and fails to connect to an Ethernet port because there is no available server path. The Ethernet switch in the 171 CBB 970 30 processor will support 14 simultaneous data paths and 2 program paths before this counter increments. This error indicates a poor application architecture.
26, 27	Transmit Buffer Errors	Increments when the 171 CBB 970 30 processor cannot transmit an Ethernet response frame because all frame buffers are used. For example, if all of the processor's 16 PING buffers contain PING replies that are ready to be transmitted but the transmission is delayed because of collisions and back-off, any newly received PING requests are discarded and the counter is incremented. This error can occur for PING, ARP, and connection attempts to a server path. Although this error is theoretically possible, it is rare.
28, 29	Silo Underflow (TCP retries)	This field counts processor TCP/IP retries. All processor clients and servers use the TCP/IP protocol, which implements sequence numbers and time-outs. Whenever TCP/IP data is pushed from the processor, the processor must receive an acknowledgment of the receipt of data within the time-out period. If not, the processor issues a retry. Retries may result from any of the following conditions: • The original data frame was garbled, corrupted, and lost • The target TCP/IP stack is operating more slowly than the processor retry rate For Modbus 502 servers, the processor initiates retries after (1, 1, 2, 2, 4, 8) sec. For Modbus 502 clients, the processor retry rate is the larger of: • $^1/_4$ the health timeout for Ethernet I/O Scanner data • 4 times the previous measured TCP/IP round trip time for i/o Scanner MSTR block
30, 31	Late Collision	Increments when the transmit frame process is aborted because of a late collision detection (after the first 64 bytes of the frame were transmitted collision-free). This field should always be 0.
32, 33	Lost Carrier	Although this error is theoretically possible, it is rare. **Note** If you see a non-zero value, please report it to your Schneider Electric Service Representative.
34, 35	16 Collision Tx Failure	Transmit frame process aborted after 16 consecutive collisions. The frame was not successfully transmitted onto the Ethernet link. This error should never occur.
36, 37	IP Address	

Using the Modbus Port

3

At a Glance

Purpose

This chapter describes the Modbus port, its communication parameters, cabling guidelines and pinouts for R232/485 operations, and cable accessories.

What's in this Chapter?

This chapter contains the following topics:

Modbus Serial Port

Introduction

The Modbus port is an RS232/485 asynchronous serial port that permits a host computer to communicate with the processor for:

- programming
- data transfer
- upload/download
- other host operations

Modbus Port Parameters

Baud Rates:	50	300	3600
	75	600	4800
	110	1800	7200
	134	2000	9600
	150	2400	19.200
Parity Settings:	EVEN	ODD	NONE
Mode/Data Bits:	RTU (8-bit)	ASCII (7-bit)	
Stop Bit:	1		
Modbus Address:	In the range 1... 247		

The factory-set default communication parameters for the Modbus port are:

- RS232
- 9600 baud
- EVEN parity
- 8-bit RTU mode
- 1 stop bit
- Modbus address 1

The Modbus port cannot support more than 1 stop bit. If you change this default setting in the configuration software, the Momentum processor ignores the change.

All other port parameters can be modified in the configuration software.

Auto-Logout

If a programming panel is logged into the CPU via the serial port and its cable gets disconnected, the CPU automatically logs out of the port. With auto-logout a user does not accidentally lock other host stations out and stop them from logging in from other ports.

Modbus Port Connector

The Modbus port connector is a female RJ45 connector located on the bottom right of the processor (see *p. 12*).

Pinouts for Modbus Port

The pin assignments on the Modbus serial port differ depending on whether you are using RS232 or RS485 communications:

Pin	For RS232	For RS485
1	DTR	RXD -
2	DSR	RXD +
3	TXD	TXD +
4	RXD	Not used
5	signal common	signal common
6	RTS	TXD -
7	CTS	Not used
8	cable shield	cable shield

Cables and Adapters for a Modbus RS232 Connection

Overview

To connect a computer or other host device to the 171 CBB 970 30 processor's Modbus port, you need a cable with an RJ45 connector on one end and a connector suitable for host device on the other end. Schneider Electric provides pre-made Modbus cables in three lengths and two types of SUB-D adapters that can be used for an RS232 connection to most computers.

Modbus Port Cables

Schneider Electric's three pre-made Modbus cables are standard eight-position, foil-shielded, flat telephone cables with male RJ45 connectors on each end. One RJ45 connector plugs into the Modbus serial port, and the other plugs into a female SUB-D adapter that fits onto the programming station.

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

Permanently connected cables must be less than 3 m long. Temporary cables must be less than 100 m long.

If you are making you own Modbus cable, the maximum cable length is 9.5 m.

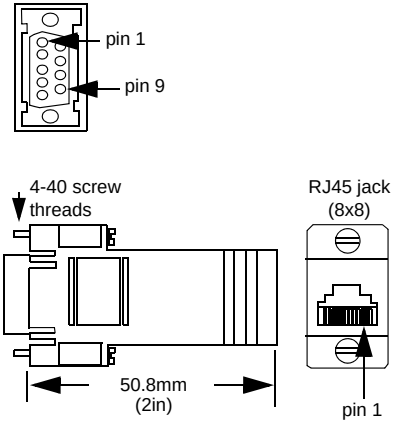
Modbus Cable Adapters

Two SUB-D adapters are available from Schneider Electric that can be used with a Modbus cable to enable a host device to connect to the Modbus port:

- A 110 XCA 203 00 9-pin adapter for 9-pin serial ports
- A 110 XCA 204 00 25-pin adapter for 25-pin serial ports

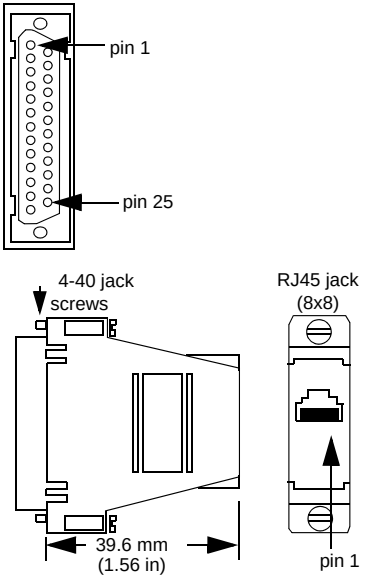
These adapters have an RJ45 jack on one end that allows them to clip into your Modbus cable.

Here is the pinout for the 110 XCA 203 00 9-pin adapter:



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

Here is the pinout for the 110 XCA 204 00 25-pin adapter:



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

RS485 Communication Capabilities

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

Details on cabling and accessories for RS485 networks are described in an appendix (see *p. 103*).

Configuring the Controller in Concept

4

At a Glance

Overview

This chapter describes how to configure the CPU functions of the Momentum 171 CBB 970 30 processor using Concept. Configuring this processor requires Concept version 2.6 (with service release 4, patch A) or greater.

Note: For a full description of Concept capabilities, refer to your Concept user manuals and the Help system.

What's in this Chapter?

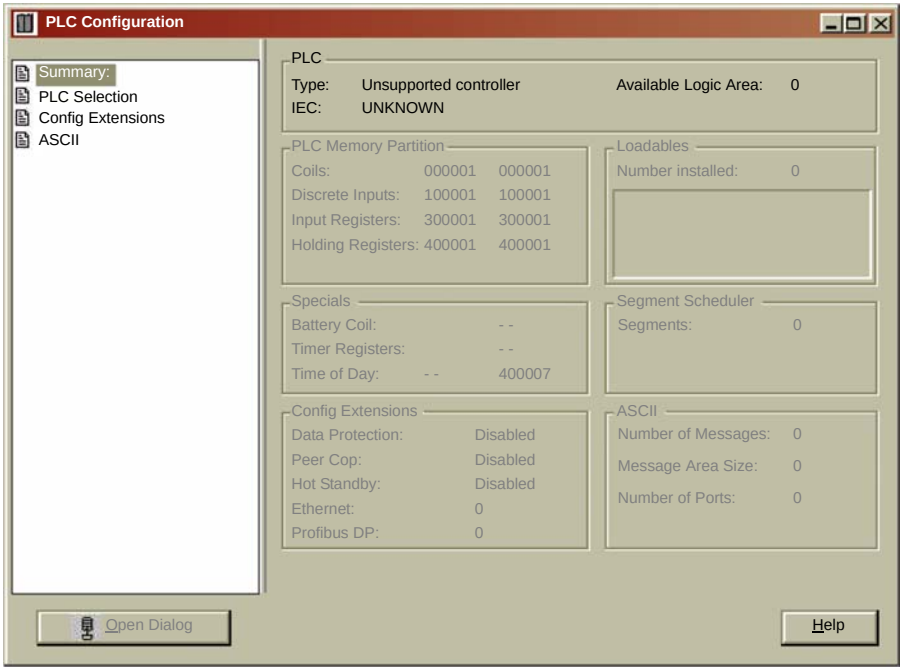
This chapter contains the following topics:

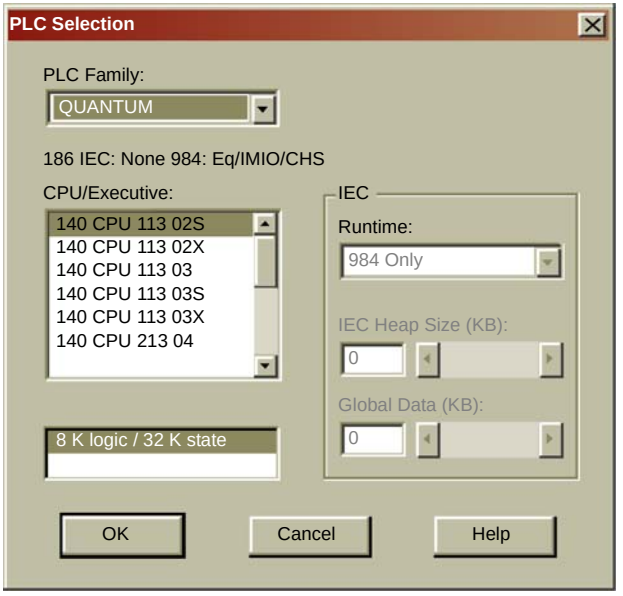
Selecting the Momentum 171 CBB 970 30 Processor

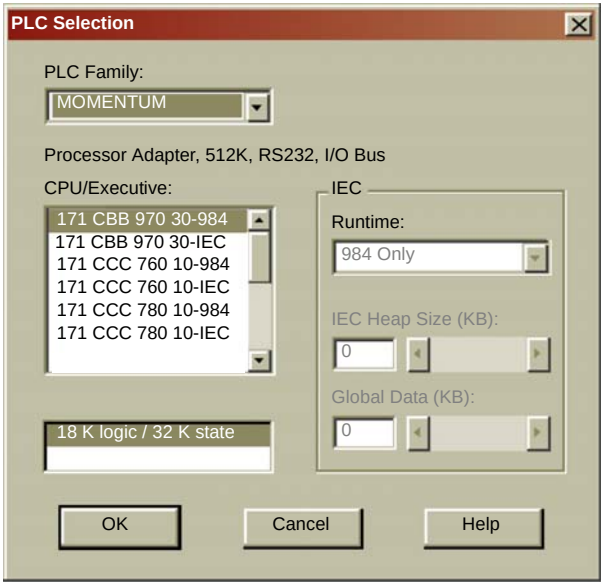
Introduction

The following procedure describes how to select a Momentum 171 CBB 970 30 processor in Concept when you are starting a new project.

Selecting a Processor

Step	Action
1	From the File menu, select **New Project**. A new project is opened and the file name [untitled] appears over the menu bar.
2	Double-click **PLC Selection** in the left pane. The **PLC Configuration** screen appears. 

Step	Action
3	Double click the **PLC Selection** folder. The **PLC Selection** dialog box appears. The default **PLC Family** selection in the dialog is QUANTUM. 

Step	Action
4	From the **PLC Family** drop-down list, select MOMENTUM. The CPU Executive menu changes to display the Momentum PLC choices 
5	From the **CPU/Executive** menu, click **171 CBB 970 30-984** or **171 CBB 970 30-IEC** to select the Momentum 171 CBB 970 30 processor.The remaining fields fill with corresponding values.
6	Click the **OK** button. Your PLC type and default configuration parameters are displayed in the PLC Configuration screen.

Accessing Default Configuration Parameters

The Default Parameters

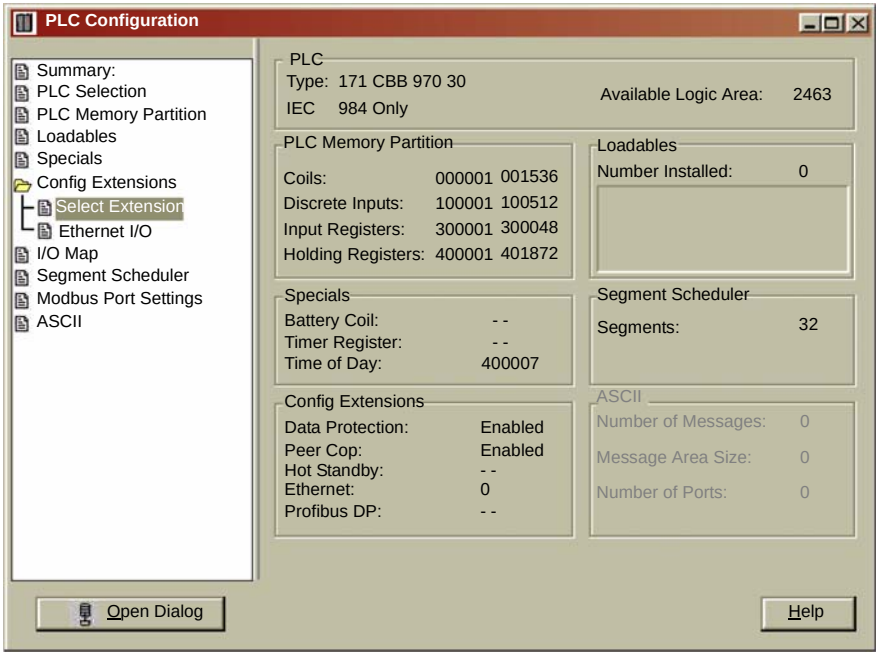
The default configuration parameters for the 171 CBB 970 30 processor are:

- 1536 coils in state RAM
- 512 discrete inputs in state RAM
- 48 input registers in state RAM
- 1872 output registers in state RAM
- 17649 nodes in the full logic area
- 144 words of user memory for the I/O Map
- No memory allocated for configuration extension

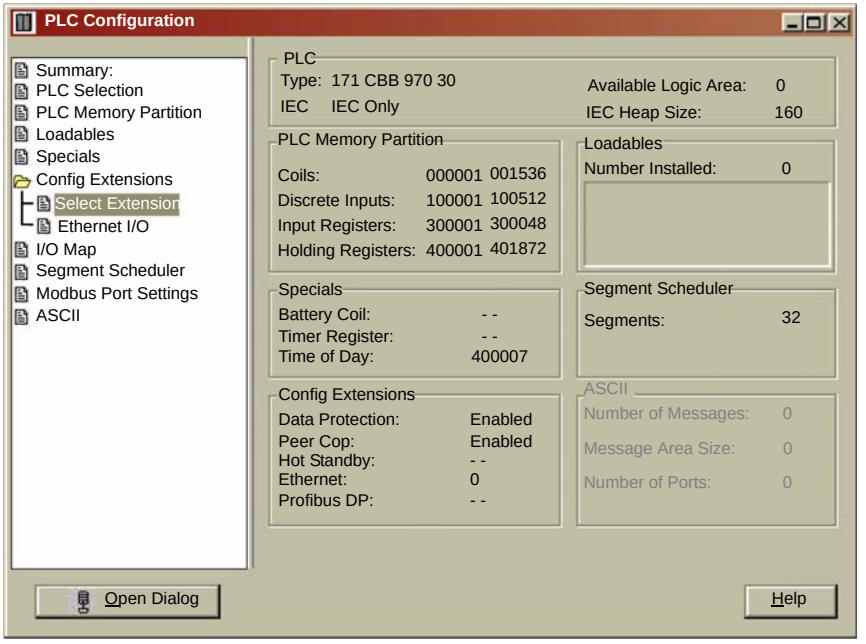
Accessing the Configuration Parameters in Concept

From the **Config Extensions** menu, select **Select Extension**.

If your configuration is **IEC: 984 Only**, the following **PLC Configuration** screen appears:



If your configuration is **IEC: IEC Only**, the following **PLC Configuration** screen appears



Changing the Size of the Full Logic Area

Introduction

The number displayed in the **Available Logic Area** field in the **PLC Configuration** screen indicates the amount of memory available for application logic. You cannot directly enter this field to modify the value. You can, however, change the amount of memory available by manipulating the sizes in 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. The **Available Logic Area** automatically increases by 256 words from 1198 to 1454.

Example 2

If you allocate some number of words to Peer Cop expansion, you reduce the **Available Logic Area** by the number of words allocated for Peer Cop.

Changing the Range of Discrete and Register References

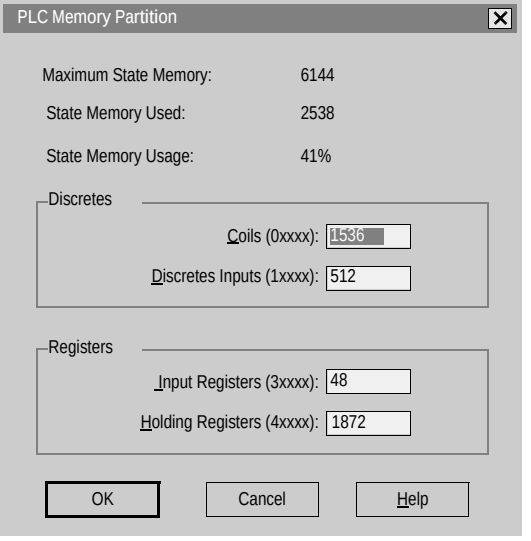
Guidelines

If you are changing the range of discrete and register references in Concept, here are some key guidelines:

- Adjust the range of discretes in increments of 16. Sixteen discretes consume one word.
- Adjust the range of registers in increments of 1. A 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 discrete outputs, 16 discrete inputs, one input register, and one output register is required.

Procedure

Use the **PLC Configuration** screen to change the range of discrete and register references, and follow the procedure below.

Step	Action
1	From the **Configure** menu, select **Memory Partitions**. The **PLC Memory Partition** dialog box appears, showing the maximum memory size and the register allocation for the processor. 
2	Modify the range of your discrete and register references by changing the value in the variable boxes, according to the guidelines above.
3	Click the **OK** button.

Understanding the Number of Segments

The number of segments specified in the **Configuration Overview** screen determines the number of I/O drops you can set up for your processor. The default number of segments is 32.

Reserving and Monitoring a Battery Coil

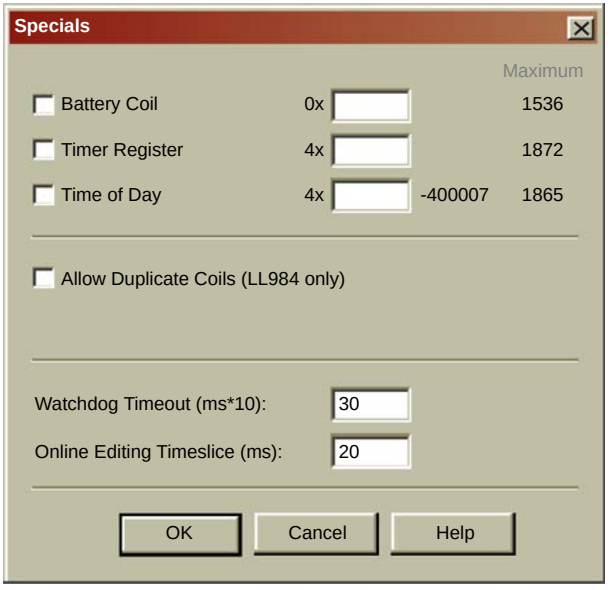
Introduction

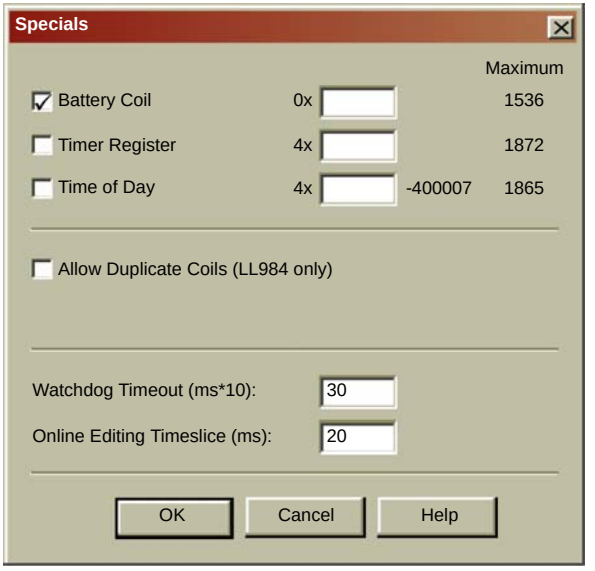
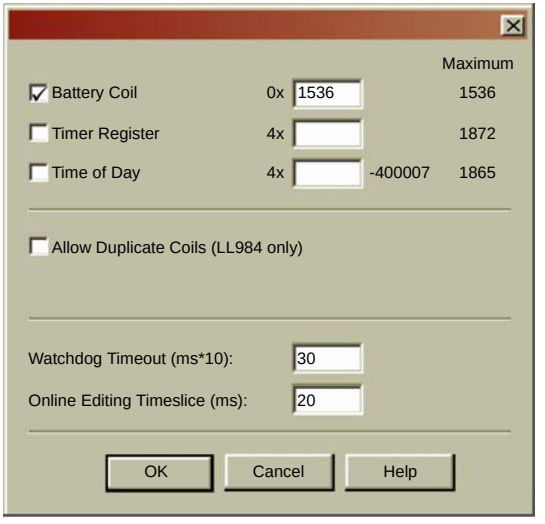
The Momentum 171 CBB 970 30 processor does not have an LED to indicate the battery's health, we recommend that you reserve a 0*x* reference to monitor the health of the battery.

Note: For a full description of and instructions for using Concept, refer to the set of manuals shipped with the software. Your version of Concept may vary from the sample screens shown here.

Reserving a Battery Coil

The following procedure describes how to reserve and monitor a battery coil, using the **Specials...** dialog box in Concept.

Step	Action
1	From the **Configure** menu, select **Specials...**. The **Specials** dialog box appears. 

Step	Action
2	Check the **Battery Coil** box at the top left of the dialog. 
3	Type a number in the range of available 0*x* references in the **0x** box. In the example below, the number 1536 is used. 
4	Click the **OK** button. The dialog box closes and the register you have specified is displayed on the **PLC Configuration** screen.

Monitoring the Battery Coil

You can monitor the battery coil in ladder logic or tie it to a lamp or alarm that turns on to indicate that the battery should be changed.

The state of the battery coil is either 0 or 1, where:

- 0 indicates that the battery is healthy
- 1 indicates that the battery should be changed

Configuring the Time-of-day Clock

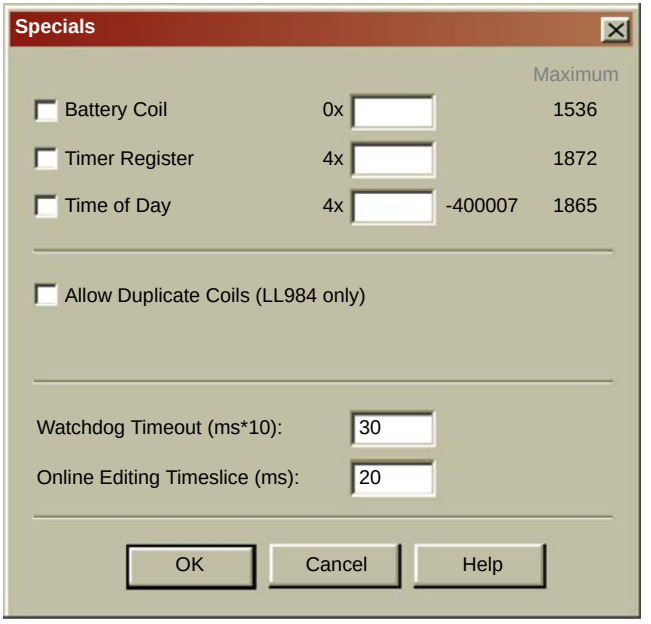
Time-of-day Values

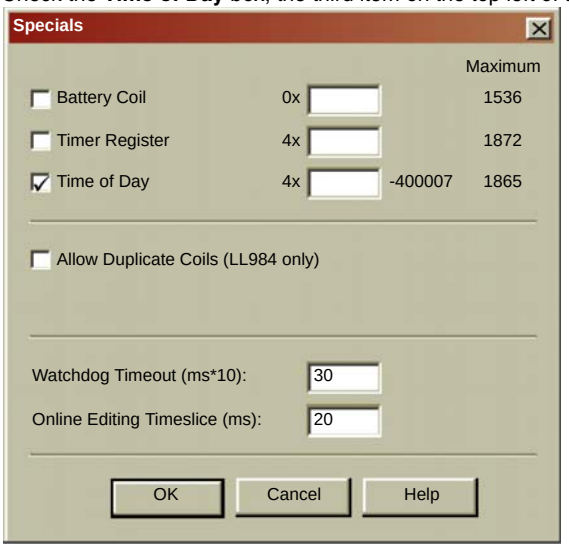
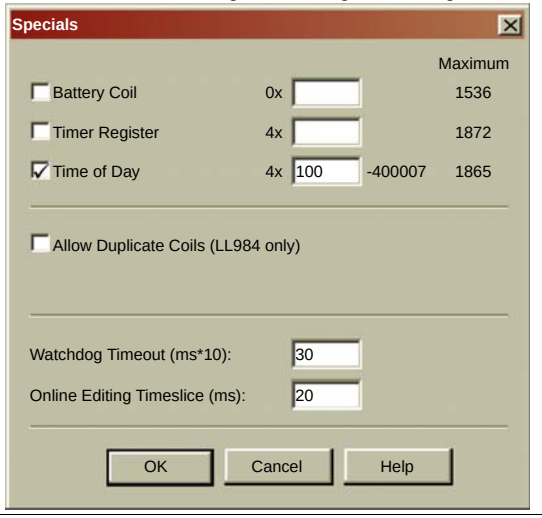
The Momentum 171 CBB 970 30 processor has a time-of-day (TOD) clock. To use this feature, reserve a block of eight contiguous 4*x* registers

Reserving Registers for the TOD Clock

Use the following procedure to reserve these eight TOD registers:

Step	Action
1	From the **Configure** menu, select **Specials...**. The **Specials** dialog box appears



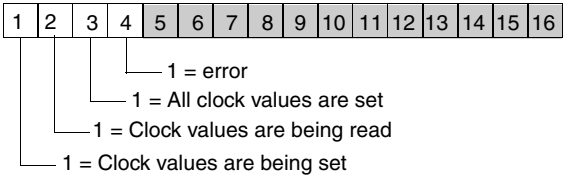
Step	Action
2	Check the **Time of Day** box, the third item on the top left of the dialog. 
3	Type the number of the first 4*x* register in the series of eight. The number must be in the range of available 4*x* references, and there must be at least seven more contiguous registers after it in the available range. In the example below, a value of 100 is entered, indicating that the eight TOD registers will be 40100 ... 40107. 
4	Click the **OK** button. The registers you have specified are displayed on the PLC Configuration screen.

The TOD Registers

After you have reserved the block of TOD registers, you need to set the correct time. With Concept, go online and set the register bits individually, as indicated in the table below. The CPU must be running.

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

The first TOD register is the control register. Its four most significant bits report TOD clock status.



Reading the Time-of-Day Clock

Example

If you reserve registers 400100...400107 as your eight TOD clock registers and set the clock at 9:25:30 A.M. on Thursday, July 16, 1998, the register values are as follows:

Register	Reading (in decimal)	Indication
400100	0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0	All clock values are set and are being read
400101	5	Thursday
400102	7	July
400103	16	16
400104	98	1998
400105	9	9 A.M.
40010 6	25	25 min
40010 7	30	30 sec

Configuring Ethernet Address Parameters and I/O Scanner with Concept

5

At a Glance

Overview

This chapter describes how to configure the Ethernet address parameters of the Momentum 171 CBB 970 30 processor and how to set I/O scanner parameters with Concept. Configuring this processor requires Concept version 2.6 (with service release 4, patch A) or greater.

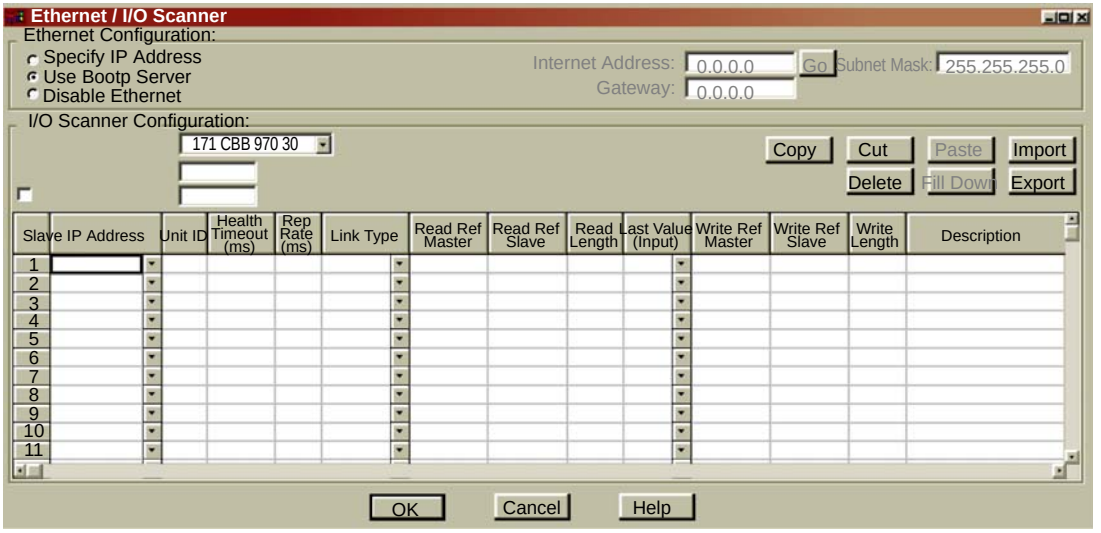
Note: For a full description of Concept capabilities, refer to your Concept user manuals and the Help system.

What's in this Chapter?

This chapter contains the following topics:

Accessing the Ethernet I/O Configuration

To access and edit the processor's Ethernet IP address and I/O scanning parameters, select the **Config Extensions** → **Ethernet I/O** menu in Concept. The **Ethernet I/O Scanner** dialog box appears. If you have not modified any of the Ethernet port parameter settings, this dialog box appears the default parameters, as shown in the example below.



If you have previously modified any communication port parameters, the configured values appear in this dialog box.

Setting the IP Address Parameters

Introduction

The following Ethernet IP address parameters can be set for your controller using Concept:

- Use Bootp Server (default)
- Specify IP Address
- Disable Ethernet

⚠ WARNING

UNINTENDED OPERATION - DUPLICATE IP ADDRESS

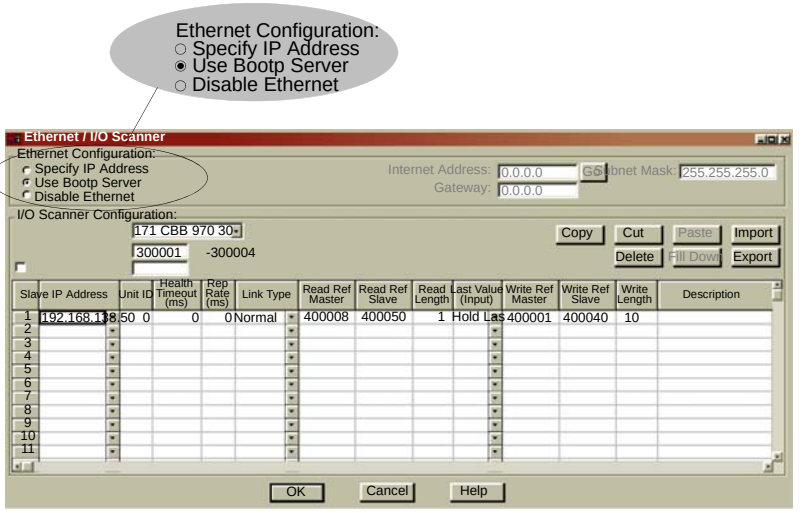
Having two or more devices with the same IP address can cause unpredictable operation of your network.

- Obtain a valid IP address from your system administrator to avoid duplication.
- Ensure that this device will receive a unique IP address.

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

Note: The IP address parameters need to be set in the **Ethernet I/O Scanner** screen before you can continue on to set I/O scanner parameters.

Make the IP address parameter selection by pushing one of the three radio buttons in the top left corner of the **Ethernet I/O Scanner** screen:



Getting an IP Address from the BOOTP Sever

The default configuration setting is for the processor to get its IP address is from a BOOTP server. The **Use Bootp Server** button should be auto-selected, as shown above; if it is not and you want to use the BOOTP option, click on this radio button.

The Specify IP Address Option

The **Specify IP Address** option allows you to type in an IP address, gateway, and subnet mask of your choice. If you choose to **Specify IP Address**, you need to enter parameter data in the **Internet Address**, **Gateway**, and **Subnet Mask** fields on the top right side of the screen.

Note: Consult your system administrator to determine the appropriate gateway and subnet mask numbers.

Disabling Ethernet

If you choose the **Disable Ethernet** option, you will no longer be able to communicate with the processor over any of the Ethernet ports. Your programming and communications functions must be conducted via RS232 or RS485 over the Modbus serial port (see *p. 36*).

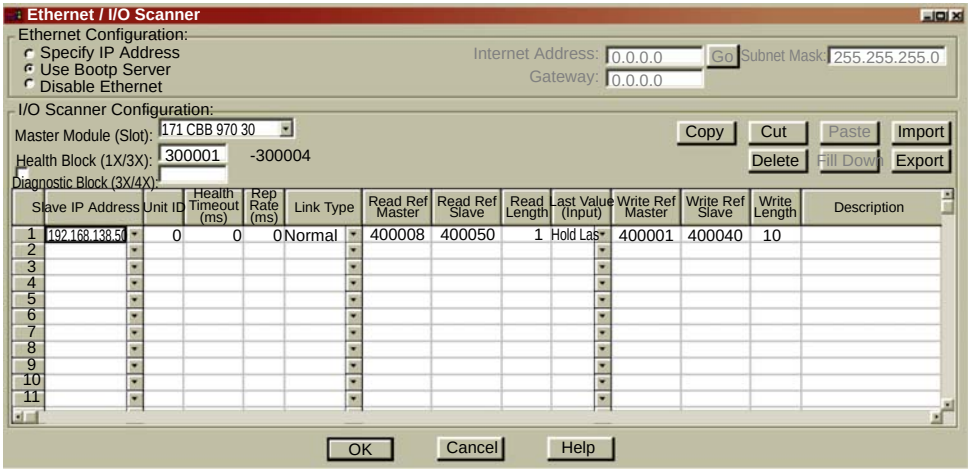
Completing the Ethernet I/O Configuration

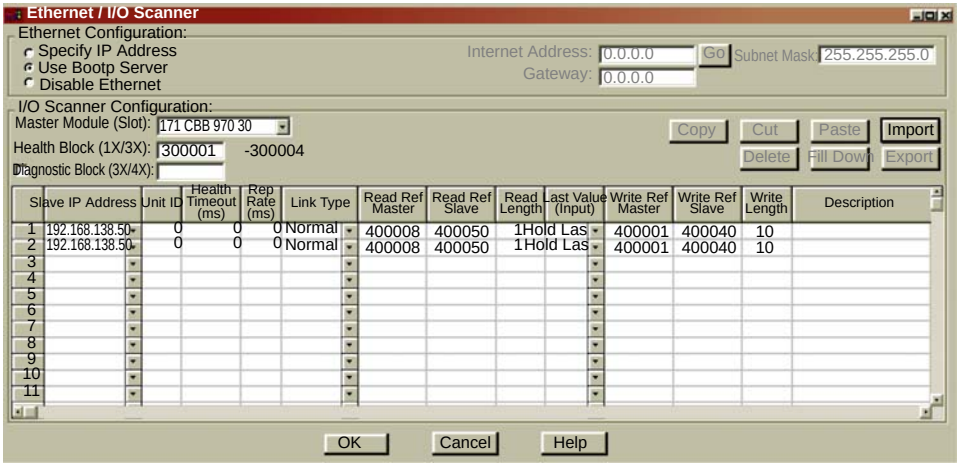
Introduction

You can use the **Copy**, **Cut**, **Paste**, **Delete**, **Sort**, and **Fill Down** buttons to complete your Ethernet I/O configuration.

Copy and Paste

To save time when typing similar read and write commands, you can copy and paste entire rows within your configuration. Follow the steps in the procedure below:

Step	Action
1	Select the row you want to copy by clicking on the row number in the leftmost column: 
2	Click the **Copy** button above the I/O configuration list.
3	Select the row where you would like to paste the data (by clicking on a new row number in the leftmost column).

Step	Action
4	Click the **Paste** button above the I/O configuration list. 
5	Click the **<OK>** button when finished. Your updated Bootp parameters are displayed in the Ethernet / I/O Scanner screen.

Cut and Paste

To move a row within the configuration list, follow the procedure above, using the **Cut** button instead of the **Copy** button.

Delete

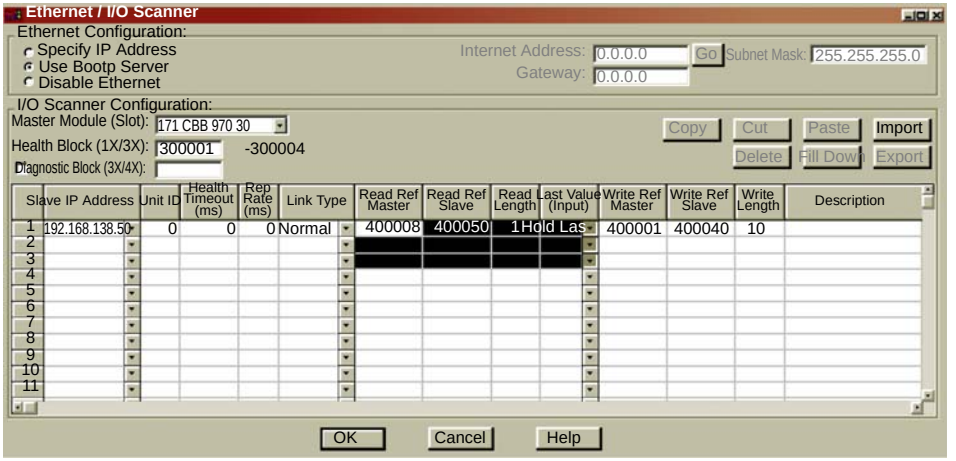
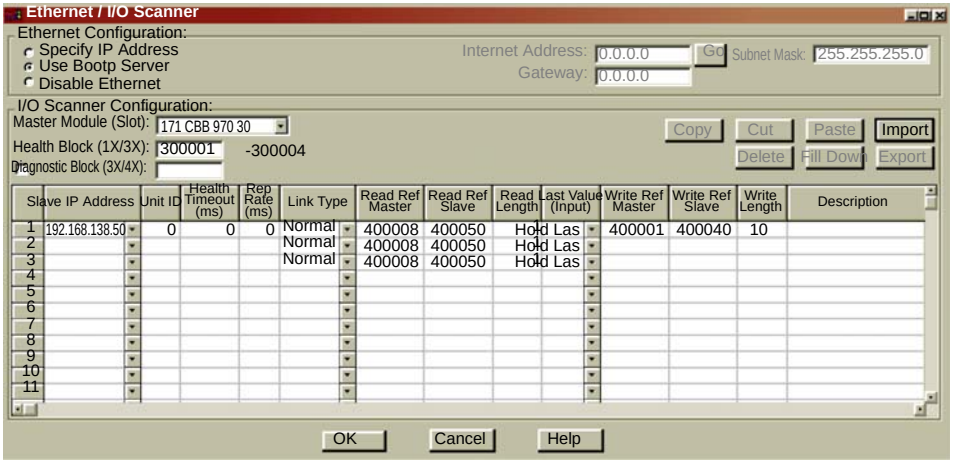
To delete a row from the configuration list, select the row by clicking on the row number in the leftmost column and clicking the **Delete** button.

Sort

To sort the I/O configuration list numerically or alphabetically, select a column by clicking on the column heading you want to sort and click the **Sort** button.

Fill Down

To copy part of any row to the next row or to a series of adjoining rows, use the **Fill Down** button, following the steps in the procedure below:

Step	Action
1	With your mouse, select the data you want to copy and the cells where you want the data to go. You must select a block of contiguous cells, with the data to be copied in the first row. You cannot select two separate blocks. 
2	Click the **Fill Down** button. The data from the first row is copied to the selected cells. 
3	Click the **OK** button. Your updated BOOTP parameters are displayed in the **Ethernet / I/O Scanner** dialog.

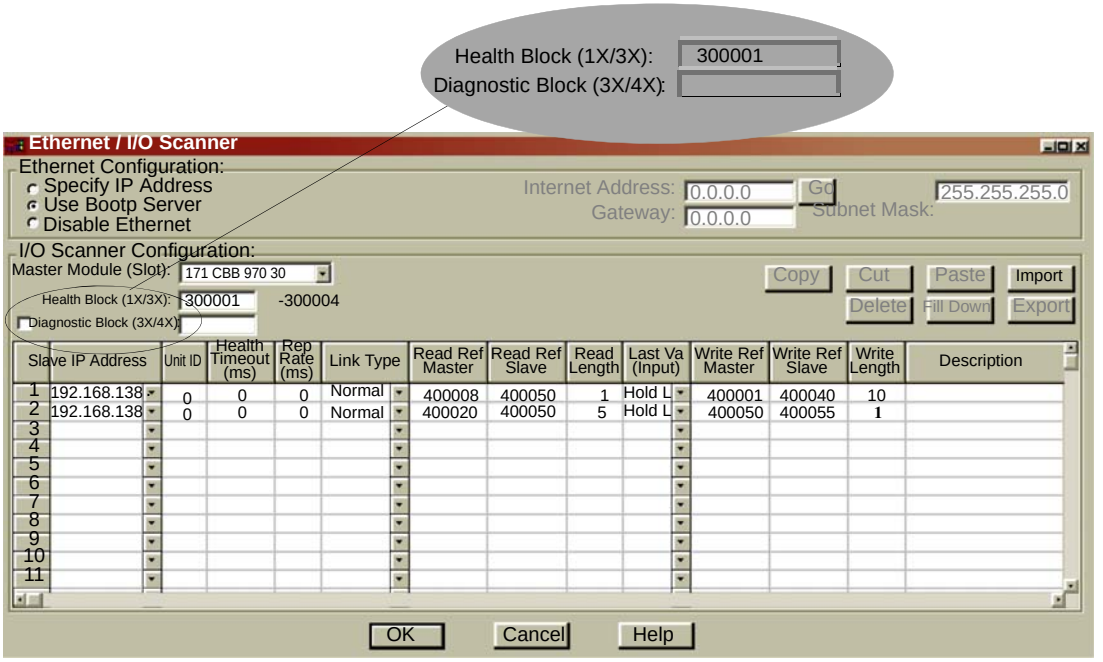
Configuring Ethernet I/O

Overview

Once the Ethernet port address parameters have been set, you can configure the remaining parameters in the **Ethernet / I/O Scanner**l dialog.

Health Block

Enter a starting reference in the window to the right of the **Health Block (1x/3x)** entry. The health block contains a health bit for each of the IO Scanner transactions that you intend to configure. The reference may be either a 3*x* register or a 1*x* discrete input reference.



If you designate a 3*x* register (as shown in the example above), the health bits for 64 transactions (maximum) are stored in 4 contiguous registers starting at the address you specify.

If you designate a 1*x* discrete input reference, the health bits are stored in 64 contiguous registers, using 1 bit/register.

A health bit is set only if the associated transaction completes successfully within the last health time-out period for that transaction (see below). When the PLC is started, the health bit for each configured transaction is preset to 1. If a transaction subsequently fails, its health bit is cleared after the programmed health time-out period expires.

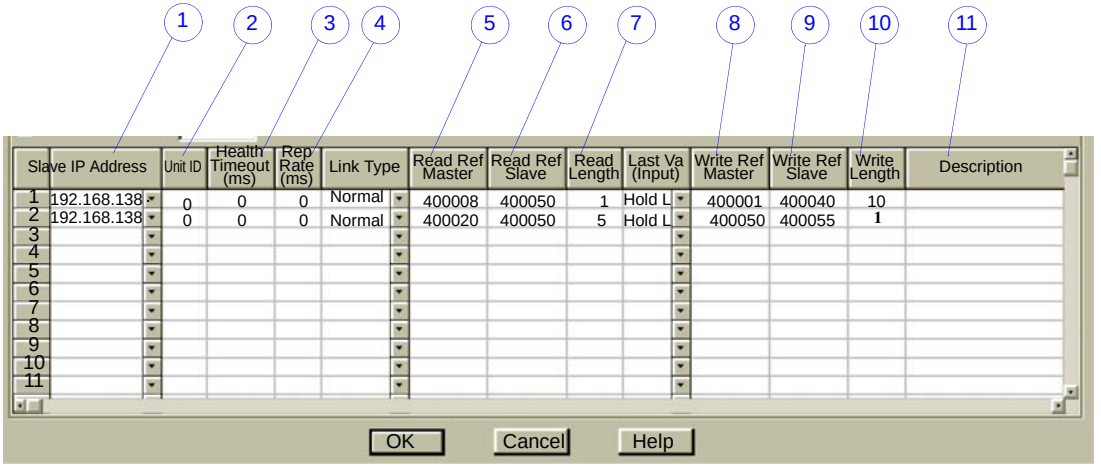
Diagnostic Block

If an you want to display Ethernet diagnostic information on your I/O scanner transactions, check the box next to the **Diagnostic Block (3x/4x)** entry (just below the **Health Block (3x/4x)** entry, and enter a starting reference in the window. The reference may be either a 3x or a 4x register. The system automatically reserves 64 contiguous registers starting with the reference value you enter.

When the box is checked, a new column called **Diag Code** appears in the **Ethernet I/O Scanner** dialog. Whenever a diagnostic error is detected, a hexadecimal integer code appears in this **Diag Code** column. The meanings of these diagnostic codes are described in an appendix (see *p. 100*).

IP Address

Type the IP address of the slave module in the **IP Address** column (item 1 below). This address is stored in a pull-down menu so that you can use it in another row by clicking on the down arrow and selecting it:



Unit ID

If the slave module is an I/O device attached to the specified slave module, use the **Unit ID** column (item 2 above) to indicate the device number.

Health Timeout

Use the **Health Timeout** column (item 3 above) to specify in ms how long to try a transaction before timing out. Valid values are 0 ... 65,000 ms (1 min). To avoid timing out, specify 0.

Rep Rate

Use the **Rep Rate** column (item 4 above) to specify how often in ms to repeat the transaction. Valid values are 0 ... 65,000 ms (1 min). To repeat the transaction continually, specify 0.

Read	Use a Read function to read data from the slave to the master. The **Read Ref Slave** column (item 6 above) specifies the first address to be read. The **Read Length** column (item 7 above) specifies the number of registers to read. The **Read Ref Master** column (item 5 above) specifies the first address to read to.
Write	Use a Write function to write data from the master to the slave. The **Write Ref Master** column (item 8 above) specifies the first address to write. The **Write Length** column (item 10 above) specifies the number of registers to write. The **Write Ref Slave** column (item 9 above) specifies the first address to write to.
Read and Write	You may include read and write commands on the same line.
Description	You can type a brief description (up to 32 characters) of the transaction in the **Description** column (item 11 above).

Saving to Flash in Concept

6

Saving to Flash in Concept

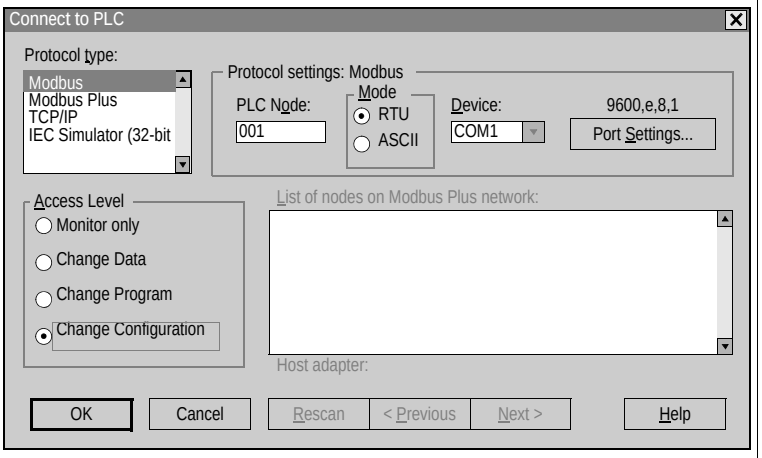
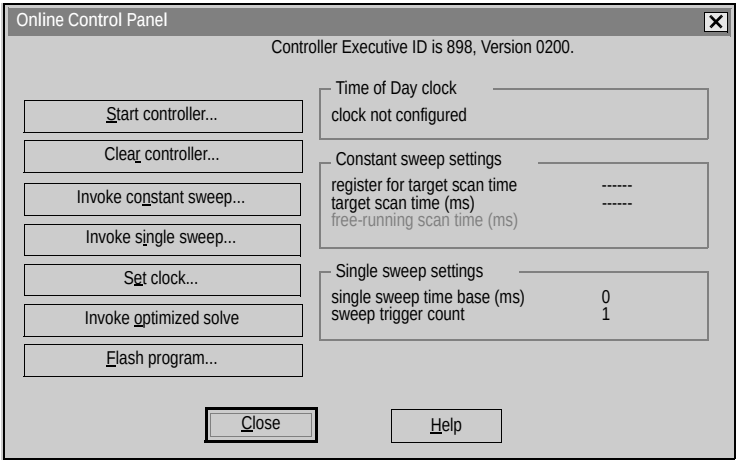
You save flash so that in the event of an unexpected loss of power the application logic state RAM values are preserved.

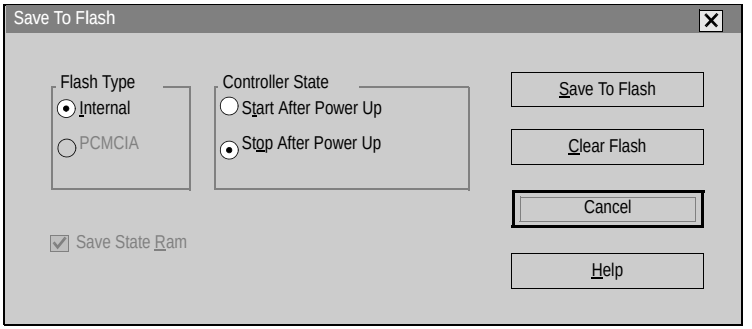
Note: The following conditions apply for saving to Flash:

- All Momentum programs using the 984LL Exec. have the option of saving to Flash.
- The contents of memory may be retained using batteries, which are contained in the Momentum processor.
- The 171 CBB 970 30 can use either an IEC or a 984LL Exec. The minimum 984LL Exec. version that can be used is 1V.1.06. Both IEC and 984LL Execs. allow the option of saving to Flash.

Note: The 171 CBB 970 30 require Concept 2.6 with service release 4, patch A.

Saving to Flash

Step	Action
1	From the **Online** menu on the main menu bar, select **Connect**. The **Connect to PLC** dialog box appears. 
2	Configure the parameters you want to use with your PLC.
3	In the **Access Level** field, select the **Change to Configuration** radio button and click **OK**.The **Connect to PLC** dialog box disappears and Concept connects to your PLC.
4	From the **Online** menu on the main menu bar, select **Online Control Panel**.The following screen appears. 

Step	Action
5	Click the **Flash program...** button. The **Save to Flash** dialog box appears. 
6	Select the appropriate parameters in the dialog box and click **Save To Flash**. A confirmation screen appears.
7	Click **Yes** to confirm the save-to-Flash operation. When Concept completes the operation, a message appears on the screen confirming completion.

Configuring the Modbus Port Parameters in Concept

7

At a Glance

Overview

This chapter describes how to access the **Modbus Port Settings** dialog box and edit the default parameters for the delay, protocol, and address. The communication parameters on the Modbus port are set at the factory.

What's in this Chapter?

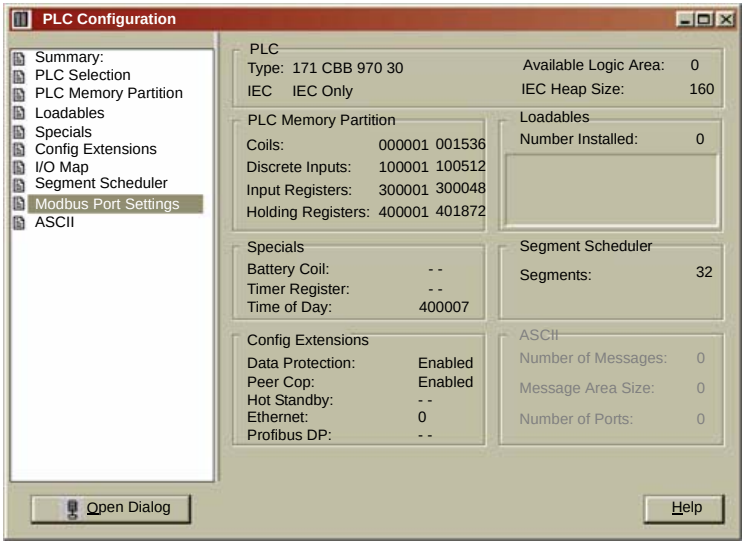
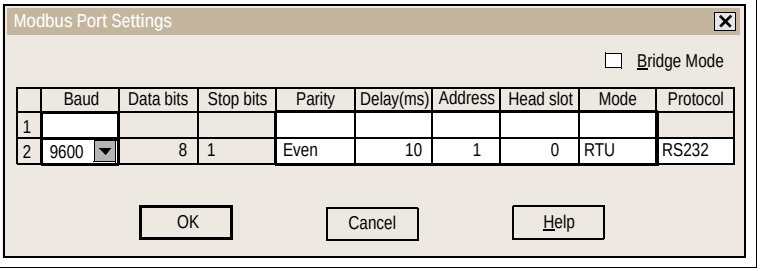
This chapter contains the following topics:

Accessing the Modbus Port Settings Dialog Box

Introduction

Modbus port parameters can be modified using the **Modbus Port Settings** dialog box in Concept.

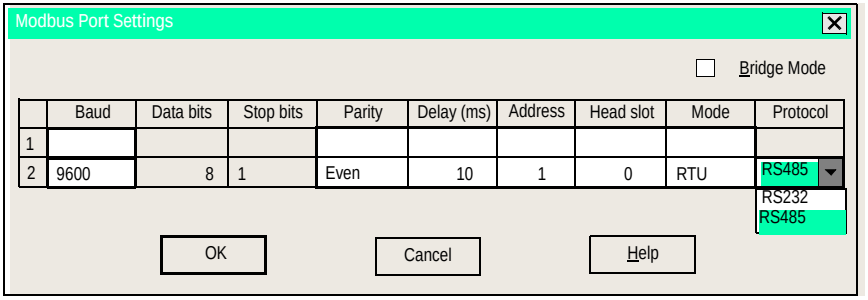
Accessing the Modbus Port Setting Dialog

Step	Action
1	From the **PLC Configuration** menu, select **Modbus Port Settings**. 
2	If you have not previously modified any port parameters, the default Modbus port settings appear. If you have modified any communication port parameters, the new values display in the dialog box. 

Changing the Modbus Communication Protocol

The Modbus port on the Momentum 171 CBB 970 30 processor can operate using either the RS232 or RS485 communication protocol (see *p. 36*). The default setting is **RS232**.

You can change the setting to RS485 in the **Modbus Port Settings** dialog. In the **Protocol** column (the rightmost column in the dialog box), click the down arrow and choose **RS485**.



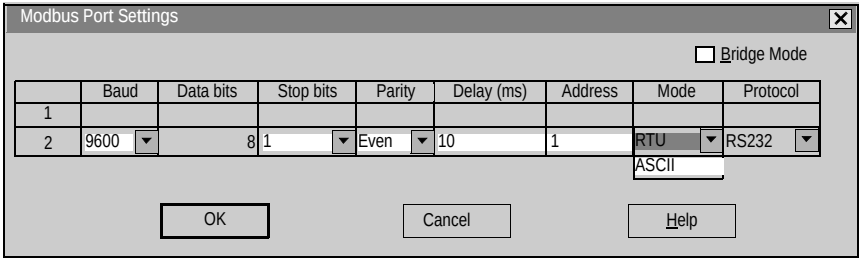
Changing Mode and Data Bits on Modbus Port

From the **Modbus Port Settings** dialog box, you can configure the port to operate in RTU or ASCII mode.

- In RTU mode, the number of data bits is 8
- In ASCII mode, the number of data bits is 7

The default mode is RTU.

To change the mode and data bit parameters from the default settings, click the down arrow in the **Mode** column and select **ASCII**.

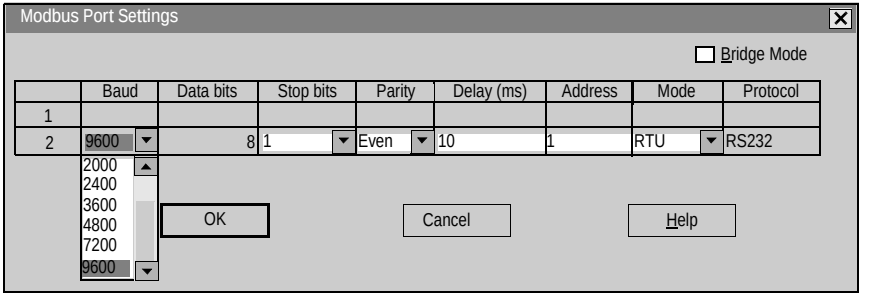


The **Modbus Port Settings** dialog updates the mode type, and the value in the **Data bits** column automatically changes from 8 to 7.

Changing the Modbus Port's Baud Rate

The Modbus serial port can be configured for one of 16 possible baud rates in the range 50 ... 19,200 (see *p. 36*). The default is 9600 baud.

To change the baud rate, click the down arrow in the **Baud** column and select the desired rate from the list.



Stop Bit Should Not Be Changed

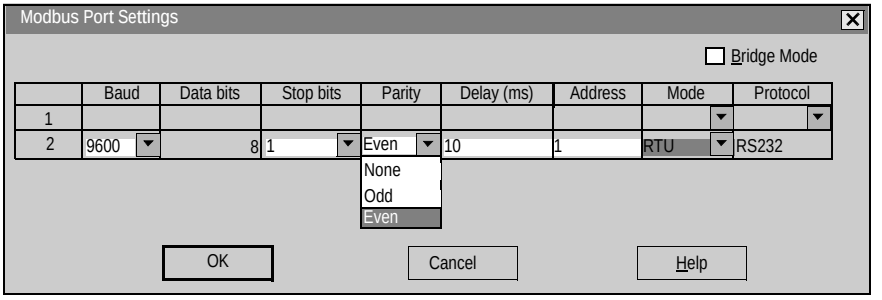
The stop bit default is 1. Do not change.

Changing Parity on the Modbus Port

Introduction

From the **Modbus Port Settings** dialog, you can configure the Modbus serial port for even, odd, or no parity checking. The default is even.

To change the parity parameter, click the down arrow in the **Parity** column ad select either **Odd** or **None**.



Changing the Delay on the Modbus Port

Introduction

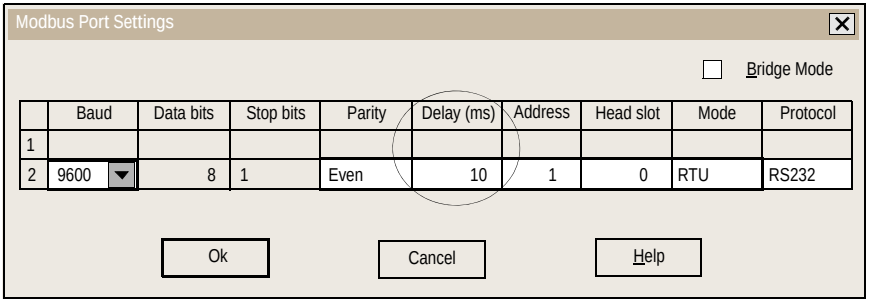
The **Delay** parameter is set to 10 ms and should be left at this value for most applications. Do not change this parameter unless your application demands it.

This parameter can be any value from 10 ... 1000 ms, in 10 ms increments.

If your baud setting (see *p. 75*) is lower than 4800 for delay timing, adjust the delay timing as indicated:

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

Click in the entry field of the **Delay** column. The default value, 10, is displayed. To change it, enter a new value in the range 20 ... 1000, in increments of 10.

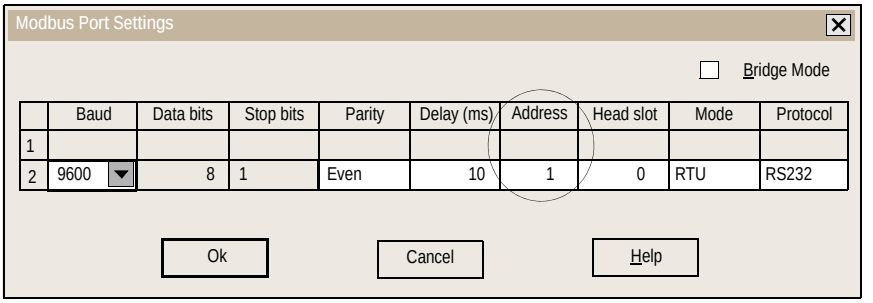


Changing the Modbus Network Address of the Modbus Port

Introduction

The Modbus serial port has Modbus network address in the range 1 ... 247. That address must be unique with respect to all other device addresses on the same Modbus network. The default Modbus network address is 1.

To change the Modbus address; go to the field in the **Address** column in the **Modbus Port Settings** dialog. The default value 1 appears. Type a new value in the range 2 ... 247.



Configuring Momentum Processor with ProWORX 32

8

At a Glance

Overview

This chapter explains how to configure the Momentum 171 CBB 970 30 processor using ProWORX 32. Configuring this processor requires ProWORX 32 version 2.1 or greater.

Note: For a full description of ProWORX 32 capabilities, refer to the Help system in the software.

What's in this Chapter?

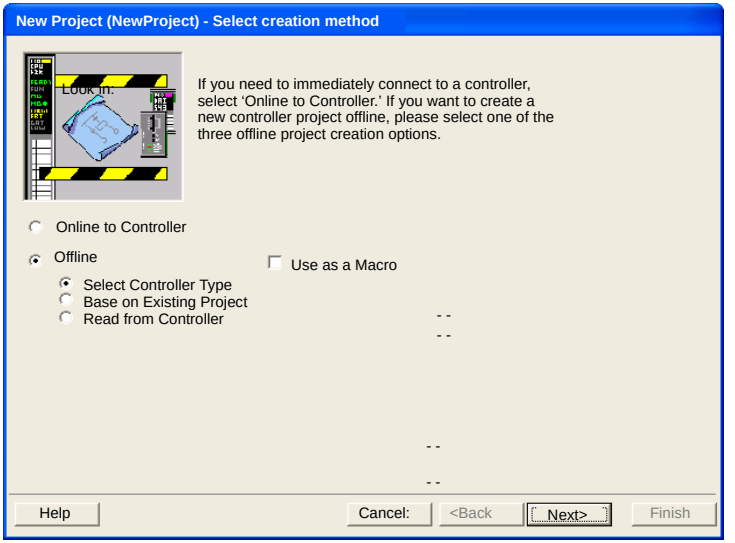
This chapter contains the following topics:

Configuring an Momentum Processor with ProWORX 32

Introduction

Use the ProWORX 32 Configuration wizard to configure the Momentum 171 CBB 970 30 processor. The Configuration wizard walks you through the steps for creating a new project or modifying an existing one. Each screen in the wizard has a caption indicating the step you are currently working on and a diagram with a description detailing what the current step involves.

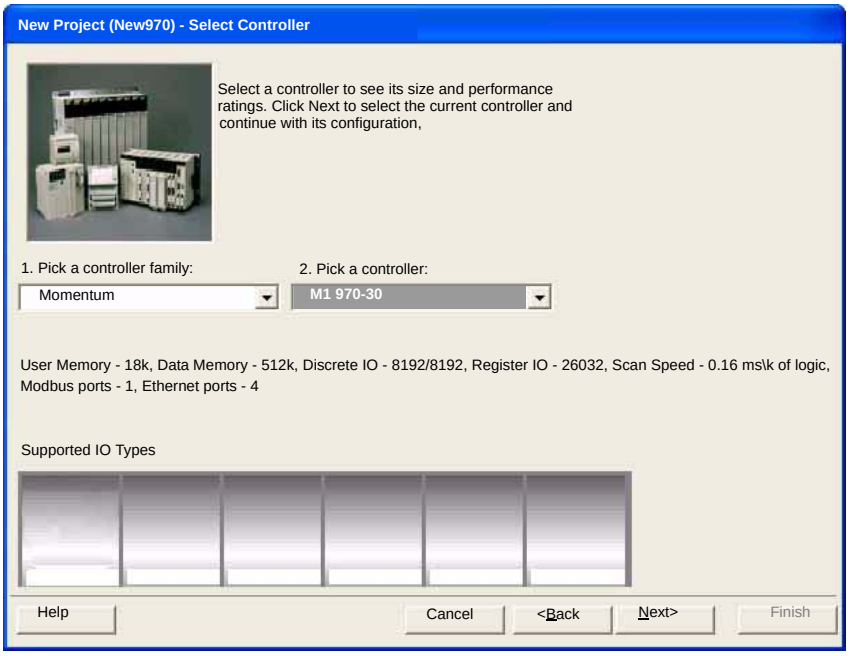
Creating a New Project

Step	Action
1	Start ProWORX 32.
2	Select **File** → **New Project...**. The **New Project - Select creation method** dialog appears: 
3	Select **Offline** → **Select Controller Type**, and click **Next**. Other options are available, but Schneider Electric recommends selecting the default.

Selecting the Controller Family and the Controller

In the **Select Controller** dialog, go to item 1, **Pick a controller family**, and select **Momentum**.

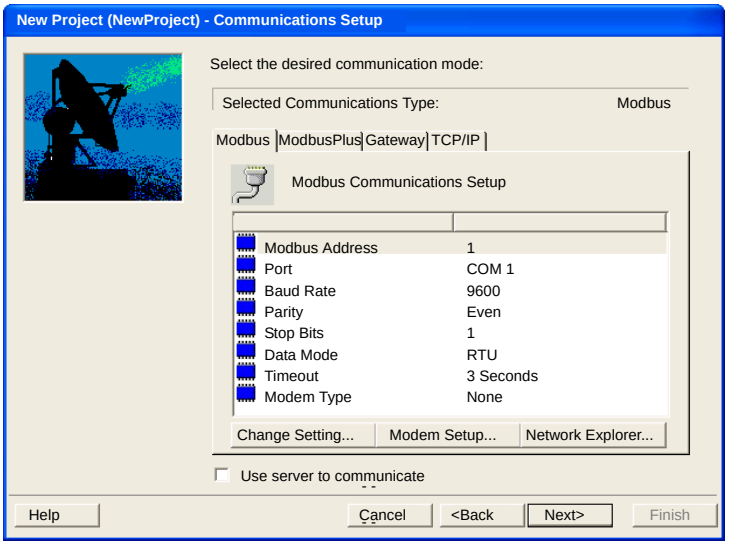
Then from item 2, **Pick a controller**, select **171 CBB 970 30**



Modbus Communication Settings

The possible communication modes for a controller type can be accessed in the **Communications Setup** dialog. The dialog has four tabs—**Modbus**, **Modbus Plus**, **Gateway**, or **TCP/IP**.

In the case of the 171 CBB 970 30 processor, select the **Modbus** tab. The following information appears in the dialog:



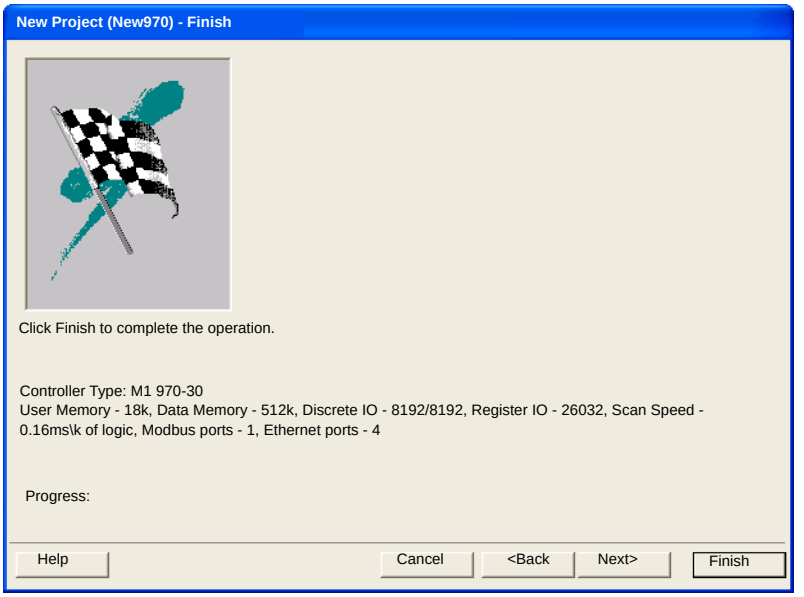
If you want to change a port parameter setting, select it with your mouse and click the **Change Setting...** button. A dialog appears, allowing you to enter any valid value associated with the selected parameter. The software supports range checking at this level, and it does not allow you to apply invalid values to the selected parameters.

Once you have changed all the settings to meet your configuration needs, click the **Next >** button.

Note: Make sure that the **Modbus** tab is still selected when you click the **Next >** button.

Finishing the Configuration

After you have finished viewing and changing the configuration settings displayed by the Configuration wizard, you can close the wizard and save any changes you have made via the **Finish** dialog.



This dialog confirms the controller type and user memory settings. If you need to make more changes, click the **< Back** button and make your changes.

Once your project and communication settings are complete, click the **Finish** button. The newly created project appears in the project navigation tree in the **Projects** panel.

Configuring an I/O Map

Introduction

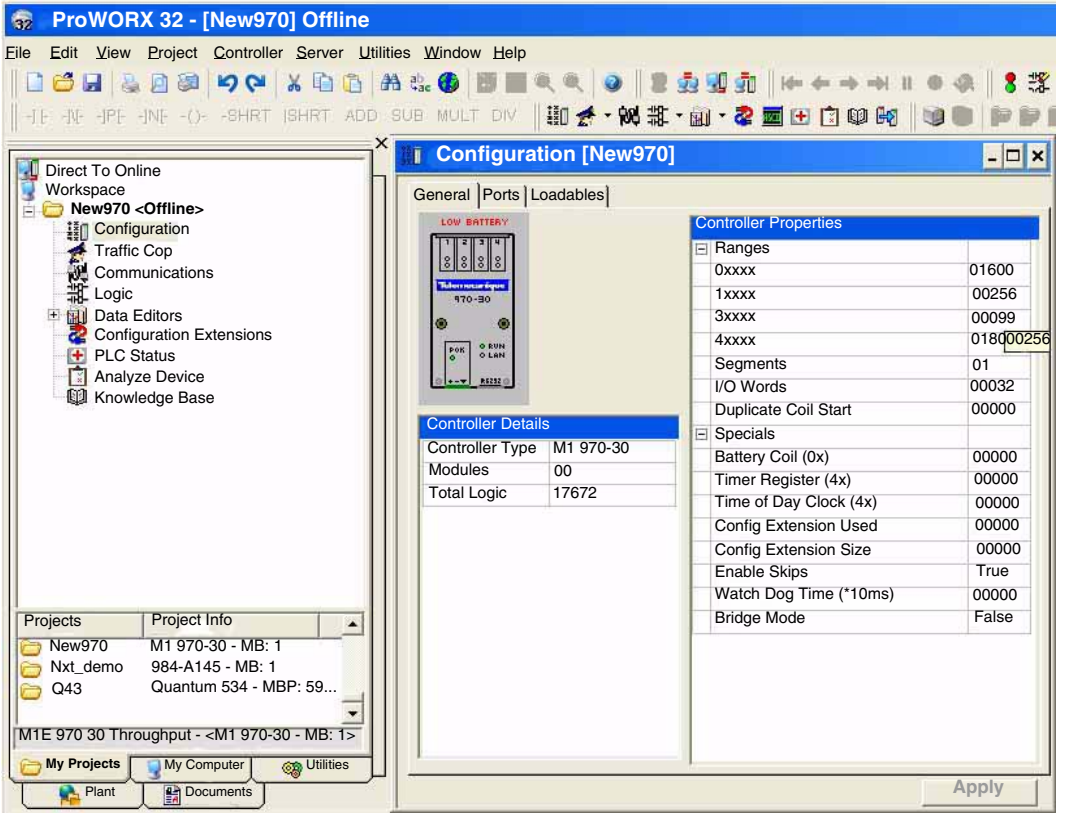
As part of the configuration process, you need to set the controller properties for the Momentum 171 CBB 970 30 processor. The controller properties set the appropriate range and type of reference values (0*x*, 1*x*, 3*x*, or 4*x*) for the CPU's state RAM.

Use the ProWORX 32 configuration tool to edit or view your project's current configuration.

Using the Configuration Tool

To use the Configuration tool, you need to open a project. For the examples used below, the name of the project is *New970*.

In the following screen, the icon for the Configuration tool is selected in the tree hierarchy of the **Projects** tab, and the **Configuration [New970]** panel appears to the right of the Projects tab.



Configuration Extensions

To access the Configuration Extensions tool, you must allocate memory. Enter the amount of memory required in the **Config Extension Size** field. If you do not enter a value in this field, the Configuration Extensions tool does not open.

Monitoring Battery Coils

To monitor the battery coil, you must enter an address in the Battery Coil (0x) field.

Configuring a Time-of-day Clock

To set the time-of-day (TOD) clock, you must have the necessary rights and you must configure that a starting register in the **Configuration** panel.

Step	Action
1	Put the controller in an **Online** and **Running** state.
2	In the **Configuration** panel, select the **Time of Day Clock (4x)** field and enter a value into that field.
3	Close the **Configuration** panel.
4	Select the **Logic** icon in the hierarchy tree of the **Projects** tab. The **Logic** panel with the **Network Navigator** tree appears.
5	Right-click the **Network Navigator** tree. **Result**: A shortcut menu appears.
6	Select **Hardware Clock** from the shortcut menu. **Result**: The **Hardware Clock** dialog box appears.
7	The **First Day of Week** field contains a drop-down list box. In the list box, select the day, Sunday through Saturday, that the controller will use as the first day of the week.

Setting the Time

The time-of-day clock requires that you reserve eight contiguous 4*x* registers in your processor.

Register	Content	
4*x*	Controller Information, from left to right	Bit 1: Set Clock Values
		Bit 2: Read Clock Values
		Bit 3: Done
		Bit 4: Errors
4*x* + 1		Day of week (from 1 to 7)
4*x* + 2		Month
4*x* + 3		Day
4*x* + 4		Year
4*x* + 5		Hour (in 24-hour format)
4*x* + 6		Minutes
4*x* + 7		Seconds

You can set the date and time automatically (using **Auto Set**) or manually by entering the correct values in the TOD registers.

Monitoring the Health of the System

Configuring Parameters – Health Block

Once you have established communication with the controller, you may assign parameters for I/O scanning (see *p. 64*).

Specify the starting register of the register block which will contain the health bits for each of the I/O Scanner transactions that you intend to configure.

If you designate a 3x register, the health bits for 64 transactions (maximum) will be stored in 4 contiguous registers starting at the address you specify.

If you designate a 1x register, the health bits will be stored in 64 contiguous discrete registers.

A health bit is set only if the associated transaction has completed successfully within the last health timeout period for that transaction. When the PLC is started, all configured transactions have their respective health bit preset to 1. If the transaction subsequently fails, then the health bit is cleared after the programmed health timeout period has expired.

Additional health bits can be viewed by clicking on the **PLC Status** icon located in the project tree.

Saving to Flash with ProWORX32

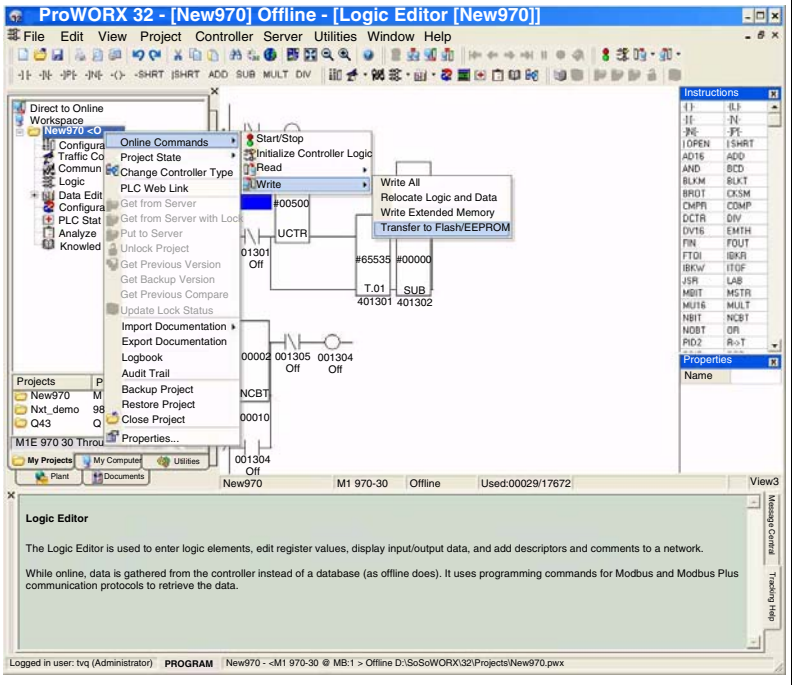
Overview

You save to Flash so that in the event of an unexpected loss of power the application logic and state RAM values are preserved.

This topic describes how to save the application logic and state RAM values to Flash using ProWORX32.

Procedure for Saving to Flash

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

Step	Action
1	Go to the **Projects** tab in the left panel. • Right click the project icon; a sub menu appears. • Select **Online Commands I Write I Transfer to Flash/EEPROM**. 
2	Select **Transfer** when the **Transfer to Flash** option appears.

Appendices

At a Glance

Purpose

These appendixes provides Momentum 171 CBB 970 30 processor specifications, LED flash patterns and error codes, and information about RS485 cabling accessories.

What's in this Appendix?

The appendix contains the following chapters:

Momentum 171 CBB 970 30 Processor Specifications

A

Specifications

General Specifications

Memory	Internal Memory	544 Kbytes
	User Memory	18 Kwords 984LL Exec
		200 kwords IEC Exec
	Flash RAM	1 Mbyte
	Clock Speed	50 MHz
984LL Input and Output References	Registers	26048
	Discretes	8192 0*x* references 8192 1*x* references
IEC Input and Output References	Registers	11200
	Discretes	4096 0*x* references
		4096 1*x* references
I/O Servicing	Watchdog Timeout	335 ms
	Logic Solve Time	See the scan time formula below for the 984LL Exec

Scan Time Formula for 984LL Exec

The following formula applies to a Momentum 171 CBB 970 30 processor using the 984LL exec.

scan time = (0.25 ms/Ethernet device + 0.002 ms/word) + 0.13 ms/K of logic + 0.40 ms

Note: Modbus messages add from 1 to 2 ms per scan, depending on the length of the message.

Note: The formula above presumes that all MSTR blocks and all configured connections are set to go as fast as possible. When these conditions are true, the Momentum processor attempts to exchange data with each device once per scan.

Note: If several devices are configured to communicate on a timed basis that is substantially larger than the scan time calculated, then the communications to those devices will be spread out over several scans.

Example

You have 3 drops of Ethernet I/O modules connected to one 171 CBB 970 30 processor. The processor has a configured time of 50 ms each, and a total of 4k user logic. The scan time for all modules configured as fast as possible is

75 ms + 0.12 ms + 0.52 ms = 1.79 ms.

Ethernet Ports

Communications ports	4 ports
	10/100BASE-T
	Half/full duplex, auto-negotiated
	RJ45 connectors
10/100BASE-T ports	Shielded RJ45
Ethernet protocols supported	All applicable IEEE 802.3 standards
Auto-crossover (auto-MDI/MDI-X)	Yes
Auto-negotiating	10/100BASE-T or 100BASE-TX
Ethernet Port Status LEDs	100MB; LINK/ACTIVE
Processor Status LEDs	POWER OK, PLC Run, PLC LAN Status
Ethernet isolation	1500 VRMS for 1 min
Cable recommended	Twisted pair (CAT5 or better)
	Shielding recommended for noisy environments
Maximum cable distance	100 m
	Environmental protection (IP20)

Serial Port

Serial port types	1 port
	RJ45 connector
	RS232/RS485 (selectable)
	RS232 (default)
Communication rates	50...19.2k baud
{Protocol	Modbus
Shock	+/-15 g peak, 11ms, half sine wave
	Ref. IEC 68-2-27 EA
RFI Susceptibility/Immunity	Meets CE mark requirements for open equipment. Open equipment should be installed in an industry-standard enclosure, with access restricted to qualified service personnel.

Mechanical

Weight	232 g (7.5 oz
Dimensions (HxDxW)	143.8 x 43.2 x 7.42 mm (5.6 x 1.7 x 2.9 in)
Enclosures/Bezel Material	Lexan

Performance Specifications

Operating Conditions	Temperature	-25 ... 70 degrees C
	Chemical Interactions	Enclosures and bezels are made of Lexan, a polycarbonate that can be damaged by strong alkaline solutions.
	Altitude, Full Operation	2000 m (6500ft.)
	Vibration	10 ... 57 Hz @ 0.075 mm displacement amplitude 57 ... 150 Hz @ 1g Ref. IEC 68-2-6 FC
	Shock	+/-15 g peak, 11 ms, half sine wave Ref. IEC 68-2-27 EA
	RFI Susceptibility/ Immunity	Meets CE mark requirements for open equipment. Open equipment should be installed in an industry-standard enclosure, with access restricted to qualified service personnel.
Storage Conditions	Temperature	-40 ... +85 degrees C
	Humidity	5 ... 95% (noncondensing)

Safety Parameters	Degree of Protection	Unintentional access (UL 508 Type 1, NEMA250 Type 1, IP20 conforming to IEC529)
	Di-electric Strength	Ethernet is isolated from logic common 500 VDC
	Ground Continuity	30 A test on the exposed metal connector
	Agency Approvals	UL 508, CSA, CUL, CE

Electrical

Power Range	19.2 to 42.5 VDC input from a safety extra-low voltage (SELV) source
Operating Input Current (Typical)	0.1 A at 24 VDC
	0.12 A at 19.2 VDC
Maximum Inrush Current	50 A (for less than 2 ms)
Overload Current Protection	Non-replaceable fuse

LED Flash Patterns, Error Codes, and Diagnostic Messages

B

At a Glance

Overview

This appendix describes Run LED flash patterns and error codes on the Momentum 171 CBB 970 30 processor and the Ethernet diagnostic messages that can be viewed when you enable the Diagnostic block in the **Ethernet I/O Scanner** dialog (see *p. 64*).

What's in this Chapter?

This chapter contains the following topics:

Run LED Flash Pattern and Error Codes

Error Codes Table

The following table lists the flash pattern of the **PLC Run** LED on 171 CBB 970 30 Momentum processor and the associated codes (in hex format).

Number of Blinks	Code (hex)	Error
Continuous	0000	Requested Kernel mode
2	080B	RAM error during sizing
	080C	run output active failed
	082E	MB command handler stack error
	0835	Main loop broken
	0836	Power down / Power holdup
	0837	Power down reset absent
3	072B	master config write bad
4	0607	modbus cmd-buffer overflow
	0608	modbus cmd-length is zero
	0609	modbus abort command error
	0614	mbp bus interface error
	0615	bad mbp response opcode
	0616	timeout waiting for mbp
	0617	mbp out of synchronization
	0618	mbp invalid path
	0619	page 0 not paragraph aligned
	061E	bad external uart hardware
	061F	bad external uart interrupt
	0620	bad receive comm state
	0621	bad transmit comm state
	0622	bad comm state trn_asc
	0623	bad comm state trn_rtu
	0624	bad comm state rcv_rtu
	0625	bad comm state rcv_asc
	0626	bad modbus state tmr0_evt
	0627	bad modbus state trn-int
	0628	bad modbus state rcv-int
	0631	bad interrupt

5	0503	ram address test error
	052D	P.O.S.T BAD MPU ERROR
6	0402	ram data test error
7	0300	EXEC not loaded
	0301	EXEC Checksum
8	8001	Kernal prom checksum error
	8003	unexpected exec return
	8005	Flash program / erase error
	8007	Watchdog timeout event

Diagnostic Message Codes

TCP/IP Diagnostic Messages

The following table describes the diagnostic messages associated with the hex numbers displayed in the **Diag code** column of the **Ethernet I/O Scanner** dialog when the **Diagnostic Block** is selected in Concept (see *p. 64*).

Diagnostic Code (in hex)	Description	
1001	User has disabled the row in the **Ethernet I/O Scanner** dialog.	
2001	not applicable	
2002	not applicable	
2003	Invalid value in a length field of the row in the **Ethernet I/O Scanner** dialog.	
2004	Invalid value in a Ref. field of the row in the **Ethernet I/O Scanner** dialog.	
2005	Invalid values in the length and Ref. fields of the **Ethernet I/O Scanner** dialog.	
2006	Invalid slave device data area.	
2008	not applicable	
3000	not applicable	
30ss*	Modbus slave exception response:	3001 =Slave device does not support the requested operation.
		3002 = Nonexistent slave device registers requested.
		3003 = Invalid data value requested.
		3004 is reserved
		3005 = Slave has accepted long-duration program command.
		3006 = Function cannot be performed now; a long-duration command is in effect.
		3007 =Slave rejected long-duration program command.
4001	Inconsistent MODBUS slave response.	
F001	Optional module not responding	
F002	Module not fully initialized	
5004	interrupted system call	
5005	I/O error	
5006	no such address	
5009	socket descriptor is invalid	
500C	not enough memory	
500D	permission denied	
5011	entry exists	
5016	an argument is invalid	

Diagnostic Code (in hex)	Description
5017	an internal table has run out of space
5020	connection is broken
5028	destination address required
5029	protocol wrong type for socket
502A	protocol not available
502B	protocol not supported
502C	socket type not supported
502D	operation not supported on a socket
502E	protocol family not supported
502F	address family not supported
5030	address already in use
5031	cannot assign requested address
5032	socket operation on a non-socket
5033	network is unreachable
5034	network dropped connection on reset
5035	network caused connection abort
5036	connection reset by peer
5037	no buffer space available
5038	socket is already connected
5039	socket is not connected
503A	cannot send after socket shutdown
503B	too many references, cannot splice
503C	connection timed-out (see note, below.)
503D	connection refused
503E	network is down
503F	text file busy
5040	too many levels of links
5041	no route to host
5042	block device required
5043	host is down
5044	operation now in progress
5045	operation already in progress
5046	operation would block
5047	function not implemented

Diagnostic Code (in hex)	Description
5048	hardware length is invalid
5049	route specified cannot be found
504A	collision in select call: these conditions have already been selected by another task.
504B	task ID is invalid
5050	no network resource
5051	length error
5052	addressing error
5053	application error
5054	client in bad state for request
5055	no remote resource; may indicate no path to remote device (See note, below.)
5056	nonoperational TCP connection
5057	incoherent configuration
Note: Error 5055 can occur before a 503C error. No remote device takes precedence over a timeout.	

RS485 Accessories for the Modbus Serial Port

C

At a Glance

Overview

When you are using RS485 communication on the Modbus serial port, four-wire and two-wire cabling networks are supported.

What's in this Chapter?

This chapter contains the following topics:

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

Introduction

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

Length

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

Number of Devices

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

Termination

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) Color code: red	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) Color code: blue	170 XTS 021 00

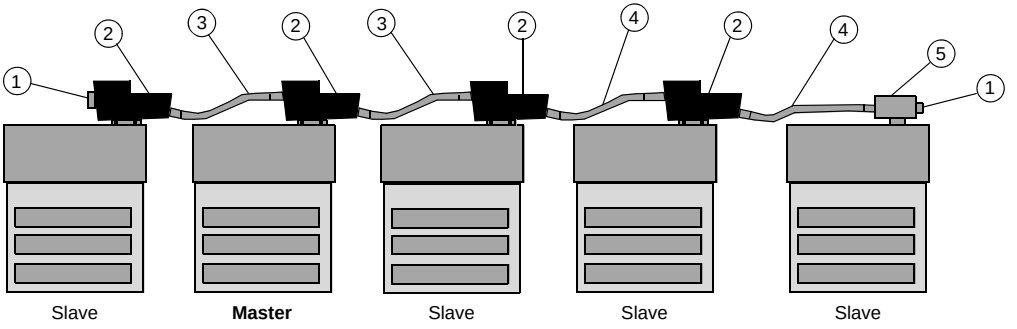
Slave Cabling

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 Color code: black	170 MCI 020 10

Single Master/ Slave Option 1

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



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

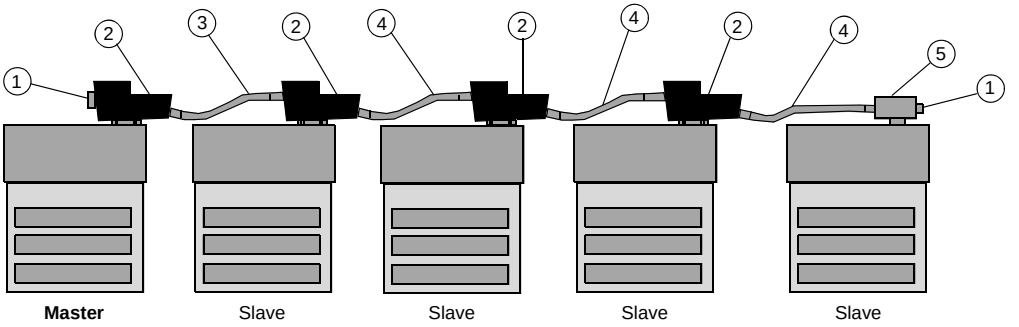
Legend:

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

Single Master/ Slave Option 2

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

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



Legend:

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

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

Introduction

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

⚠ CAUTION

POTENTIAL FOR MULTIMASTER CONFLICTS

Conflicting messages to a slave module can cause problems.

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

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

Length

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

Number of Devices

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

Termination

One end of the cable run must be terminated with a terminating resistor (color code is red).

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

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

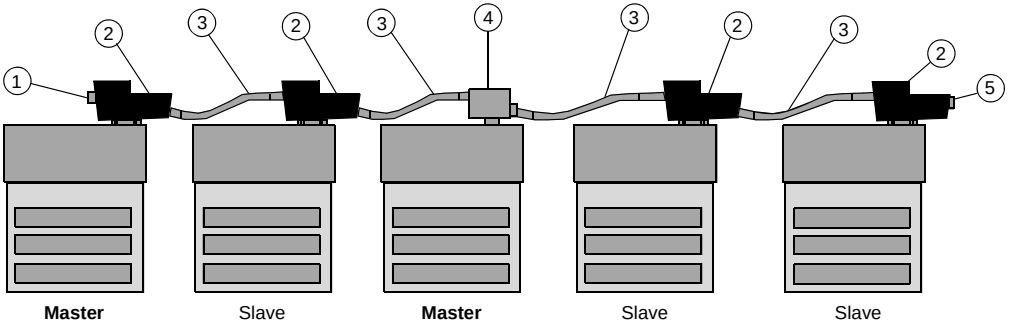
Cable

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

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

Multimaster/ Slave Cabling

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



Legend:

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

Cable for Modbus RS485 Networks Connecting Momentum Components

Overview

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

Master Communication Cable

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

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

Interconnect Cables

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

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

Description	Part Number	Illustration
Modbus Plus or Modbus RS485 30 ft. interconnect cable Cannot be used for Ethernet	170 MCI 020 80	

Other Premade Cable

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

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

Custom Cable

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

Custom Cable Vendors

Vendors include:

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

Crimping Tool

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

Connectors for Modbus RS485 Networks Connecting Momentum Components

Overview

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

RJ45 Connector "T"

This connector is used with the RS485 port:

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

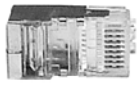
DB9 Connector "T"

This connector is used with the RS485 port:

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

Connectors for Custom Cabling

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

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

Terminating Devices for Modbus RS485 Networks Connecting Momentum Components

Overview

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

Terminating Resistor Plugs

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

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

Shunt Plugs

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

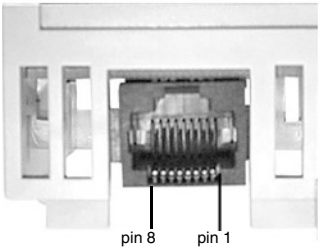
Description	Part Number	Illustration
Modbus RS485 terminating RJ45 shunt plugs Color code: blue	170 XTS 042 00	

Pinouts for Modbus RS485 Networks Connecting Momentum Components

Overview

The pinouts for wiring an RS485 network to a Momentum 171 CBB 970 30 processor are described below.

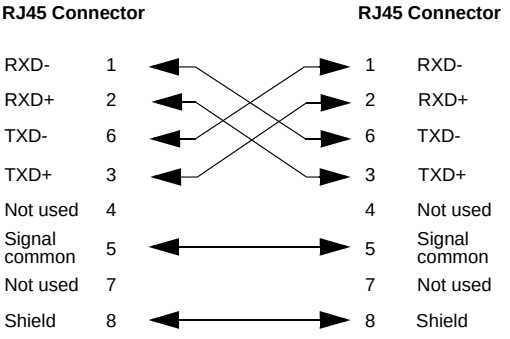
RJ45 Pinout



pin 1 RXD -
pin 2 RXD +
pin 3 TXD +
pin 4 reserved
pin 5 signal common
pin 6 TXD -
pin 7 reserved
pin 8 shield

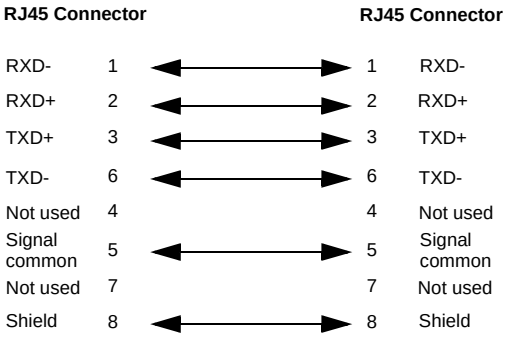
Master Communication Cable

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



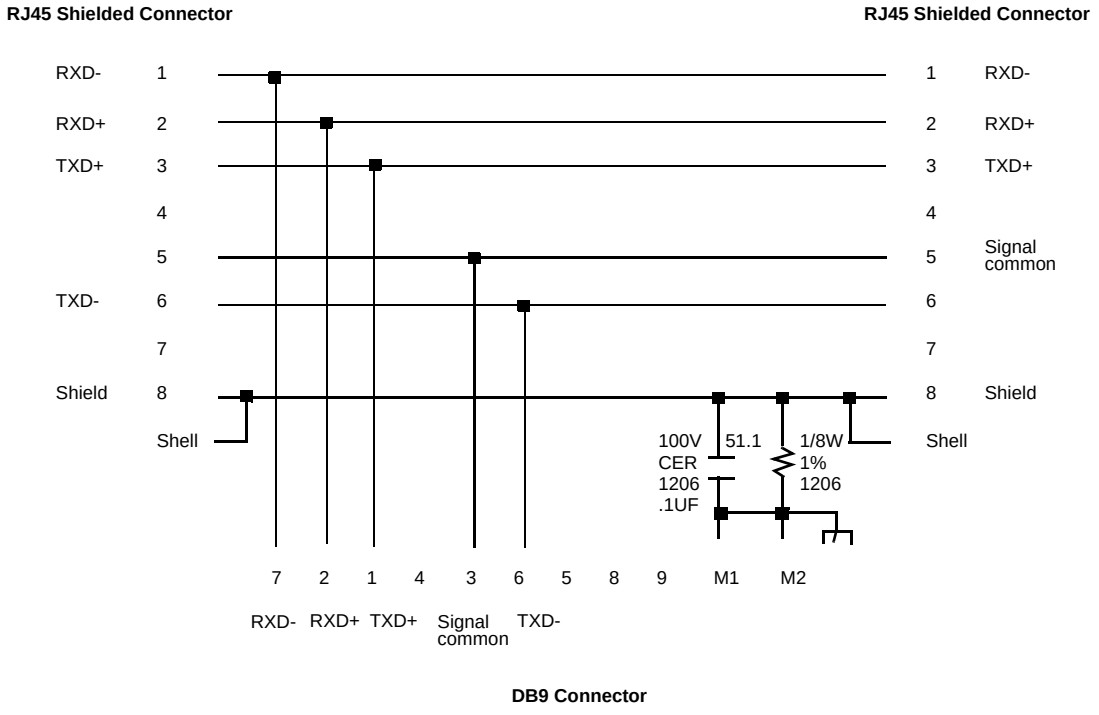
Interconnect Cables

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



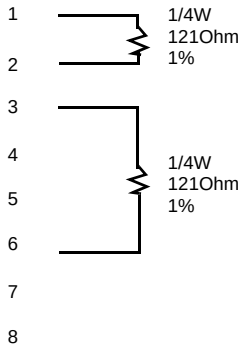
Modbus RS485 Connector "T" (DB9 Base)

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



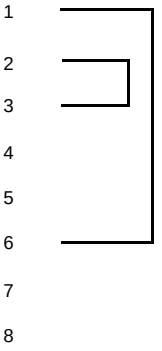
Terminating RJ45 Resistor Plugs

RJ45 Connector



Terminating RJ45 Shunt Plugs

RJ45 Connector



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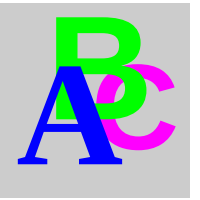

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