

Modicon Quantum with Unity

Ethernet Network Modules User Manual

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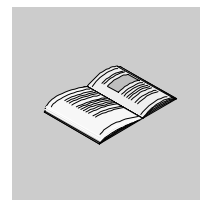
Document Set

Presentation

This user manual is part of Schneider Electric's five-volume Quantum Unity documentation set that is available under part number UNYUSE10010. It includes:

- *Modicon Quantum with Unity Ethernet Network Modules User Manual* (this book)
 - *Quantum and Premium Communication Architecture Reference Manual*
 - *Quantum TCP/IP Configuration User Manual*
 - *Quantum Modbus Plus Network Modules*
 - *140 ESI 062 10 Quantum ASCII Interface Module User Manual*
-

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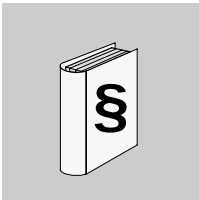
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Safety Information



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

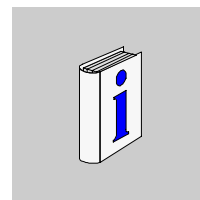
CAUTION indicates a potentially hazardous situation, which, if not avoided, **can result** in injury or equipment damage.

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.

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About the Book



At a Glance

Document Scope This documentation is for users who want their Quantum PLC to communicate with devices over an Ethernet network. It assumes that you have some knowledge of PLC systems and a working knowledge of Modsoft, Concept, ProWORX, or Unity Pro programming tools. You also need to understand the use of Ethernet networks and TCP/IP.

This documentation describes the functionality of the Modicon Quantum Ethernet modules, the NOE 771 xx and 140 NWM 100 00 and the Ethernet port of the 140 CPU 651 x0 modules.

Model Number	Module Type
140 NOE 771 00	Ethernet Option Adapter
140 NOE 771 01	Ethernet Option Adapter
140 NOE 771 10	FactoryCast Ethernet Option Adapter
140 NOE 771 11	FactoryCast Ethernet Option Adapter
140 NWM 100 00	FactoryCast HMI Option Adapter
140 CPU 651 50	CPU with embedded Ethernet port
140 CPU 651 60	CPU with embedded Ethernet port

This documentation describes how to install, set up, and use Ethernet-enabled modules in a Modicon Quantum control system. These modules allow the Quantum system to communicate with devices over an Ethernet network. Topics addressed in this manual include:

- the hardware architecture of a Modicon Quantum Ethernet TCP/IP module; this module is designed to fit into a single slot on the standard Modicon Quantum backplane
- capabilities and installation of the 140 NOE 771 xx and 140 NWM 100 00 modules in a Modicon Quantum system
- capabilities of the Ethernet port on the 140 CPU 651 x0 CPU modules

This documentation describes the procedures for:

- setting up the modules to transfer data using either the Global Data modules (the 140 NOE 771 01, 140 NOE 771 11, or 140 CPU 651 x0) or I/O scanner utility (in the 140 NOE 771 00/-01/-11 and the 140 CPU 651 50/-60)
- using an embedded Web server to access diagnostics and online configurations for the module and its associated controller
- using the FactoryCast Web server to customize your configuration via embedded Web pages (in the 140 NOE 771 10/-11 and the 140 NWM 100 00)
- using an NOE module in a hot standby solution for fault tolerant remote I/O and communications

Nomenclature

The following table describes the naming scheme for various groups of modules:

The Name ...	Refers to the ...
140 NOE 771 xx	140 NOE 771 00, 140 NOE 771 01, 140 NOE 771 10 and 140 NOE 771 11 modules
140 NOE 771 x0	140 NOE 771 00 and 140 NOE 771 10 modules
140 NOE 771 x1	140 NOE 771 01 and 140 NOE 771 11 modules
140 NOE 771 0x	140 NOE 771 00 and 140 NOE 771 01 modules
140 NOE 771 1x	140 NOE 771 10 and 140 NOE 771 11 modules
140 CPU 651 x0	140 CPU 651 50 and 140 CPU 651 60 modules

Note: Before adding a node to an existing corporate network, consult with your information technology (IT) department about any possible consequences.

Validity Note

This documentation is valid for Unity Pro version 2.0 and higher.

The data and illustrations found in this documentation 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
Quantum with Unity Ethernet Network Modules	UNY USE 100 10
Quantum Hardware Reference Manual	UNY USE 100 10
Quantum Discrete and Analog I/O Reference Manual	UNY USE 100 10
Quantum Experts and Communication Reference Manual	UNY USE 100 10

Title of Documentation	Reference Number
Grounding and Electromagnetic Compatibility of PLC Systems User Manual	UNY USE 100 10
Quantum and Premium Communication Architecture Reference Manual	Part of this package
Schneider Automation BOOTP Lite Ethernet IP Address Download Utility for Schneider Automation Ethernet Products Instruction Sheet	31002087
FactoryCast for Quantum, Premium and Micro User Guide	31001229
Modicon Quantum Hot Standby with Unity User Manual	UNY USE 107 10
Modbus Protocol Reference Guide	PI-MBUS-300
Open Modbus Specification	http:// www.modbus.org/
FactoryCast HMI 140 NWM 100 00 User Guide	890 USE 152

Note: Some of these documents may be available only in online form at this time.

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.

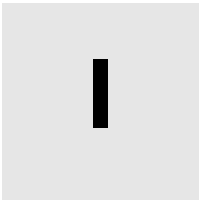
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Modicon Quantum with Unity Ethernet Products



At a Glance

Purpose This part introduces the Modicon Quantum with Unity products used for Ethernet communication.

What's in this Part? This part contains the following chapters:

Chapter	Chapter Name	Page
1	Product Description	19
2	Ethernet Communication Services	79

Product Description

1

At a Glance

Overview

This chapter includes product overviews for:

- the 140 NOE 771 xx modules
- the 140 NWM 100 00 module
- the built-in Ethernet port of the 140 CPU 651 x0 modules

When inserted in the backplane, these modules allow your Quantum PLC to communicate over Ethernet networks.

What's in this Chapter?

This chapter contains the following sections:

Section	Topic	Page
1.1	Module Description 140 CPU 651 x0	21
1.2	Module Description 140 NOE 771 xx and 140 NWM 100 00	43
1.3	Installing the Module	54
1.4	Customer Support	75

1.1 Module Description 140 CPU 651 x0

Introduction

Overview This is a discussion of the the Modicon Quantum High-End CPU (HE CPU) (140 CPU 651 x0).

What's in this Section? This section contains the following topics:

Topic	Page
140 CPU 651 x0 Product Overview	22
Physical presentation and mounting of standard High End modules	23
Controls and Displays	25
Indicators	29
Using the LCD Display Screens	31

140 CPU 651 x0 Product Overview

General Description

The Quantum-140 CPU 651 x0 module (see *p. 23*) is among the newest in a series of Quantum processor modules. It combines standard PLC functions with the diagnostic possibilities of a Web server. The 140 CPU 651 x0 communicates using an RJ-45 connection.

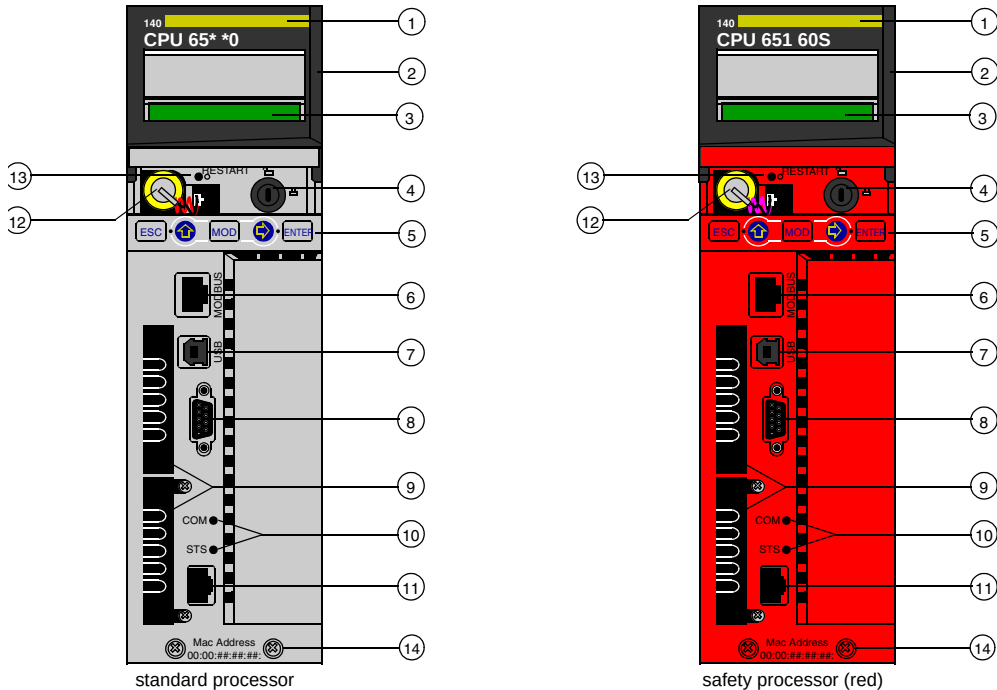
The 140 CPU 651 x0 module is in a double-width standard Quantum housing, which requires 2 sequential slots in a Quantum rack. Its server functions are diagnostic only, so use software to configure services.

The table shows the key Ethernet services that are implemented:

Service	140 CPU 651 x0
HTTP Server (see <i>Embedded Web Pages—HTTP Server, Web Configuration and Diagnostics, p. 95</i>)	x
FTP Server (see <i>FTP Server, p. 94</i>)	x
Flash File System (see <i>Flash File System, p. 97</i>)	x
BOOTP Client (see <i>Using BOOTP Lite to Assign Address Parameters, p. 74</i>)	x
Address Server (see <i>Address Server, p. 82</i>)	x
SNMP V2 Agent (Network Management Service) (see <i>SNMP and Schneider Private MIB Overview, p. 84</i>)	x
Modbus Messaging (see <i>Modbus Messaging, p. 85</i>)	x
I/O Scanner (see <i>I/O Scanner, p. 87</i>)	x
Hot Standby	
Global Data (Publish/Subscribe) (see <i>Global Data, p. 89</i>)	x
Bandwidth Monitoring (see <i>Bandwidth Monitoring, p. 92</i>)	x
Faulty Device Replacement (Server) (see <i>Address Server Configuration/ Faulty Device Replacement, p. 213</i>)	x
Enhanced Web Diagnosis (see <i>Embedded Web Pages—HTTP Server, Web Configuration and Diagnostics, p. 95</i>)	x
Schneider Private MIB (see <i>SNMP and Schneider Private MIB Overview, p. 84</i>)	x
FactoryCast Application (see <i>FactoryCast and User Customizable Web Pages, p. 97</i>)	
User-programmed Web pages	
RJ-45 Connection, see Modbus port in the Quantum Platform manual .	x
Fiber Optic Connection	
Time Synchronization Service (see <i>Time Synchronization Service, p. 90</i>)	
Electronic Mail Notification Service (see <i>Electronic Mail Notification Service, p. 91</i>)	X

Physical presentation and mounting of standard High End modules

Illustration The figure shows a standard High End module and its components.

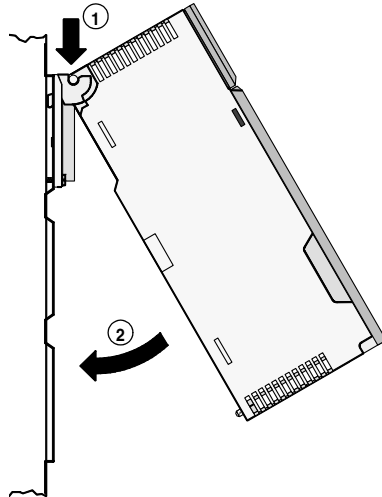


- 1 model number, module description, color code
- 2 lens cover (open)
- 3 LCD display (here covered by the lens cover)
- 4 key switch
- 5 keypad (with 2 red LED indicators)
- 6 modbus port (RS-232) (RS-485)
- 7 USB port
- 8 Modbus Plus port
- 9 PCMCIA slots (A and B)
- 10 LED indicators (yellow) for Ethernet communication
- 11 Ethernet port
- 12 battery (user installed)
- 13 reset button
- 14 2 screws

Note: Quantum High End processors are equipped with two receptacles (A and B) in which to install Schneider PCMCIA cards (other cards are not accepted).

Mounting

Mounting the module onto the central back plane:



- 1 Hang the module.
 - 2 Screw the module to the back plane.
-

Controls and Displays

Lens Cover

The protective lens cover can be opened by sliding upwards.

With the lens cover open you have access to the following items:

- key switch
- battery
- reset button

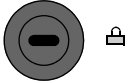
Key Switch

The key switch is a security feature and a memory protection switch. The key switch has two positions: locked and unlocked. The key switch is only read and deciphered by the PLC OS (executive) portion of the firmware and not by the OS loader portion.

The Quantum High End processor has a set of system menus that enable the operator to:

- perform PLC operations (i.e., start PLC, stop PLC)
- display module parameters (i.e., communications parameters)
- switch to the maintenance mode (Safety processors)

The effect of the key position is shown below:

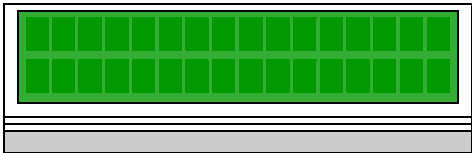
Key Position	PLC Operation
unlocked: 	• System menu operations can be invoked and changeable module parameters can be modified by the operator with the LCD and keypad. • Memory protection is OFF. • You can switch to Maintenance mode (Safety processors).
locked: 	• No system menu operations can be invoked and module parameters are read-only. • Memory protection is ON. • Safe mode forced (Safety processors).
Switching the key switch position from locked to unlocked or vice versa turns on the LCD's backlight.	

Reset Button

When pressed, this button forces a cold start of the PLC.

LCD Display

The high-end CPU with Unity has a standard 2-line by 16-character liquid crystal display (LCD) with changeable backlight state and contrast:



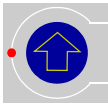
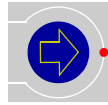
The backlight handling is entirely automated to save the life of the LCDs. The backlight turns on when one of the following occurs:

- a key is pressed
- the key switch state is changed
- an error message is displayed on the LCD

The backlight will stay on for error messages as long as the error message is displayed otherwise, the backlight automatically turns off after five minutes.

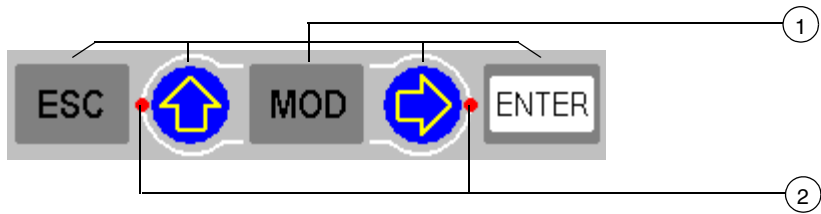
Adjusting the Contrast

The contrast is adjustable from the keypad when the Default screen is displayed.

Step	Action	
1	Press the MOD key:	
2	To adjust the contrast darker press:	
3	To adjust the contrast lighter press:	
4	To confirm the setting press:	

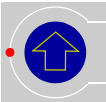
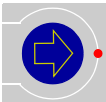
Keypad

The high-end processor has a keypad (see *Controls and Displays, p. 25*) with five keys that are mapped to a hardware address. On each of the two arrow keys is an LED:



- 1 5 keys
- 2 2 LEDs

Using the Keys Keypad functionalities

Key	Function	
	To cancel an entry, or suspend or stop an action in progress To display the preceding screens successively (step up the menu tree)	
	To confirm a selection or an entry	
	To set a field on the display into modify mode	
	LED: on	key active ● To scroll through menu options ● To scroll through modify mode field options
	LED: flashing	key active ● Field in modify mode has options to scroll through
	LED: off	key inactive ● No menu options, no field options
	LED on	key active ● To move around in a screen, field to field ● To go to the sub-menu
	LED flashing	key active ● To move around in a field that is in modify mode, digit to digit
	LED off	key inactive ● No sub-menu for menu option ● No moving around in a screen ● No moving around in a field

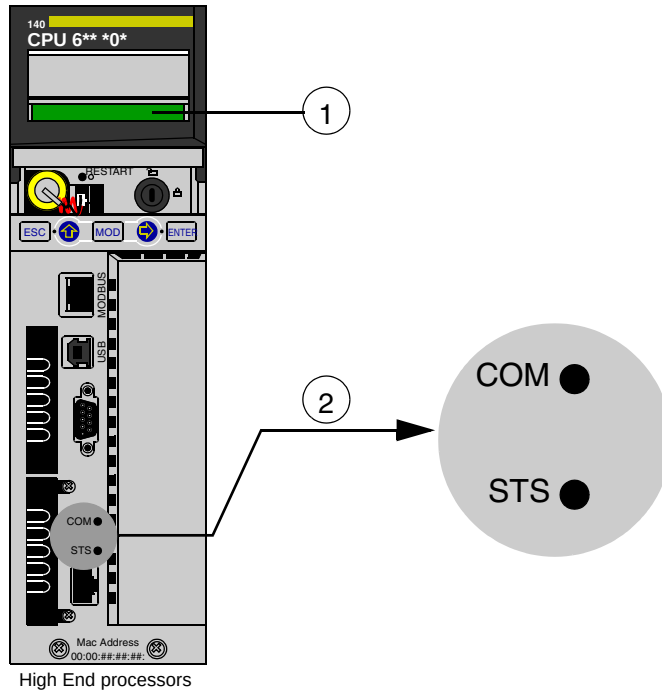
Indicators

Overview

The High End processors use two types of indicators:

1. LCD display: The Default Screen (see *Default Screen, p. 33*) serves as a Controller status screen.
2. LED Indicators: The functionality of the LEDs is described in a table after the figure.

The following figure shows the two types of indicators.



- 1 LCD Display (lens cover closed)
- 2 LED Indicators

LED Description

The following table shows the description for the LED indicators of the different High End CPU modules.

LEDs	Indication	
	Standard Processors 140 CPU 65* *0 / 140 CPU 651 60S	Hot StandBy Processors 140 CPU 671 60 / 140 CPU 671 60S
COM (yellow)	Controlled by the Coprocessor hardware Indicates Ethernet activity	Controlled by the Coprocessor hardware Indicates Primary or Standby activity
STS (yellow)	Controlled by the Coprocessor software	
	ON	Normal
	OFF	Copro auto tests unsuccessful. Possible hardware problem.
	Flashing:	
	1 Flash	Configuration in progress. Temporary situation.
	2 Flashes	Invalid MAC address
	3 Flashes	Link not connected
	4 Flashes	Duplicate IP Address. Module is set to its default IP address.
	5 Flashes	Waiting for IP address from address server
	7 Flashes	Firmware incompatibility between PLC OS and Copro firmware
- Controlled by the Coprocessor firmware - Blinking: system is redundant and data are exchanged from the Primary to Standby controller - ON: system not redundant / Copro booting from power-on to end of self-tests - OFF: Copro auto tests were not successful		

Note: 6-flash signal is not used.

Using the LCD Display Screens

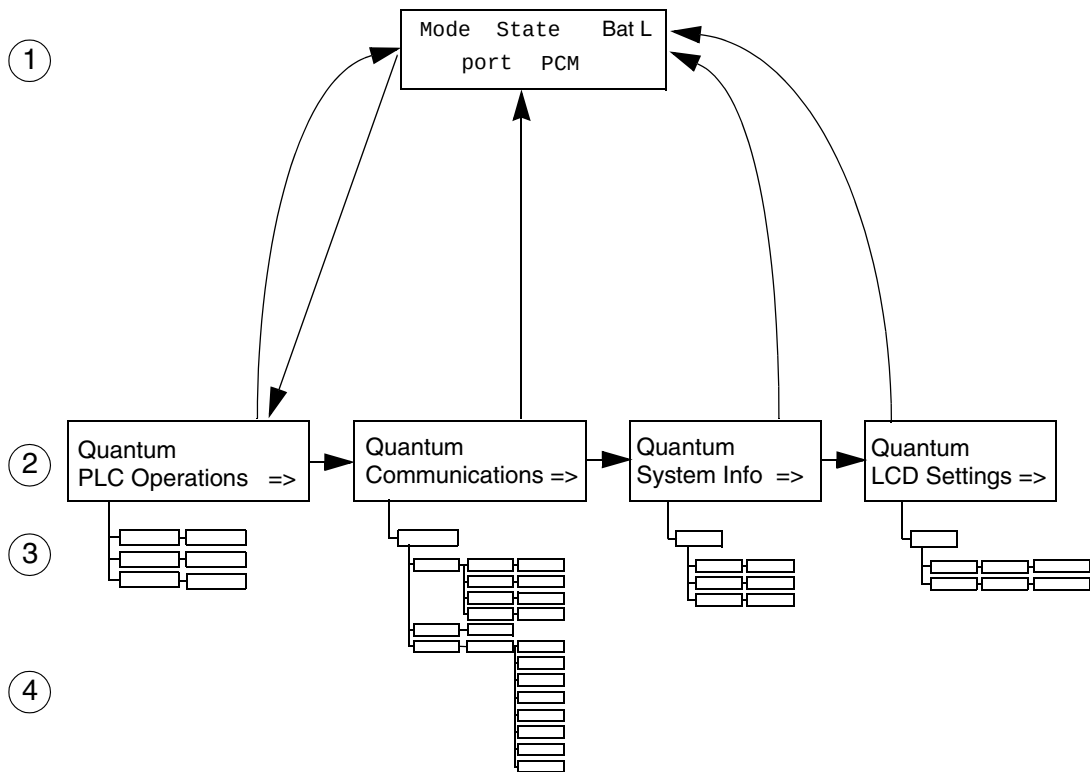
Overview

The controller's LCD displays messages. These messages indicate the controller's status. There are four levels of menus and submenus. Menus are accessed using the keypad (see *Controls and Displays*, p. 25) on the front of the controller.

For detailed information about the menus and submenus see:

- PLC Operations Menu and Submenus (see *PLC Operations Menu*, p. 35)
- Using the Communications Menu and Submenus (see *Communications Menu*, p. 38)
- Using the LCD Settings Menu and Submenus (see *System Info Menu*, p. 41)
- Using the System Info Menu and Submenus (see *LCD Settings Menu*, p. 42)

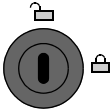
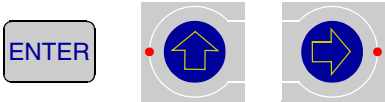
Structure: LCD display menu and submenu



- 1 Default Screen
- 2 System Menus
- 3 Sub Menus
- 4 Sub Screens

Accessing the Screens

Use the keys on the keypad to access the system menus and submenus.

Step	Action
1	To access the screens, ensure that the key switch is in the unlocked position. 
2	To step down to a lower menu, operate one of the following keys: 
3	To return to the previous menu, press: 

Default Screen

The Default screen displays the following information.

Mode	State	Bat L
port	PCM	

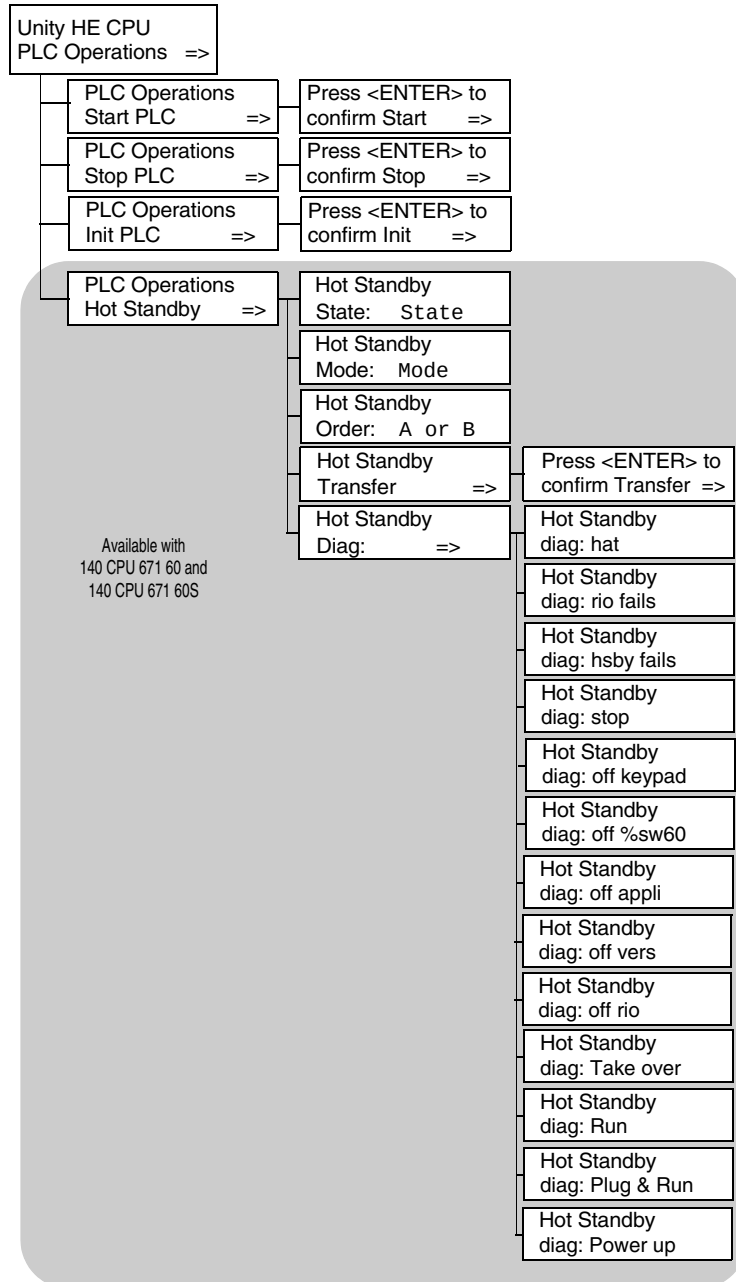
The default screen is read-only.

Fields Available		Options Available	Description
Mode		M	Maintenance Mode (on safety processors only)
		S	Safe Mode (on safety processors only)
State		RUN	application program is running
		RUN Prim	RUN as primary CPU processor (HotStandBy processors only)
		RUN Stby	RUN as standby CPU processor (HotStandBy processors only)
		RUN OffL	RUN offline (HotStandBy processor not connected to another processor)
		STOP	application program is NOT running
			STOP offline
		No Conf	processor has no application program
BatL			indicates battery health: ● steady = battery is low ● no message = battery is OK
Port	USB		indicates that port has activity

Fields Available		Options Available	Description
	Modbus Plus	MB+	indicates Modbus Plus activity
		mb+	no activity
	Modbus	232	serial port activity for RS-232
		485	serial port activity for RS-485
	PCM	1	displayed status indicates battery health of the PCMCIA card in slot 1: ● steady = battery is OK ● flashing = battery is low (only for green PCMCIA's (PV<04)) *
		2	displayed status indicates battery health of the PCMCIA card in slot 2: ● steady = battery is OK ● flashing = battery is low (only for green PCMCIA's (PV<04)) *
		* With blue PCMCIA's (PV>=04), when main battery is low there is no flash.	

PLC Operations Menu

Structure: PLC Operations menu and submenus



Submenu: PLC Operations: Start, Stop, Init

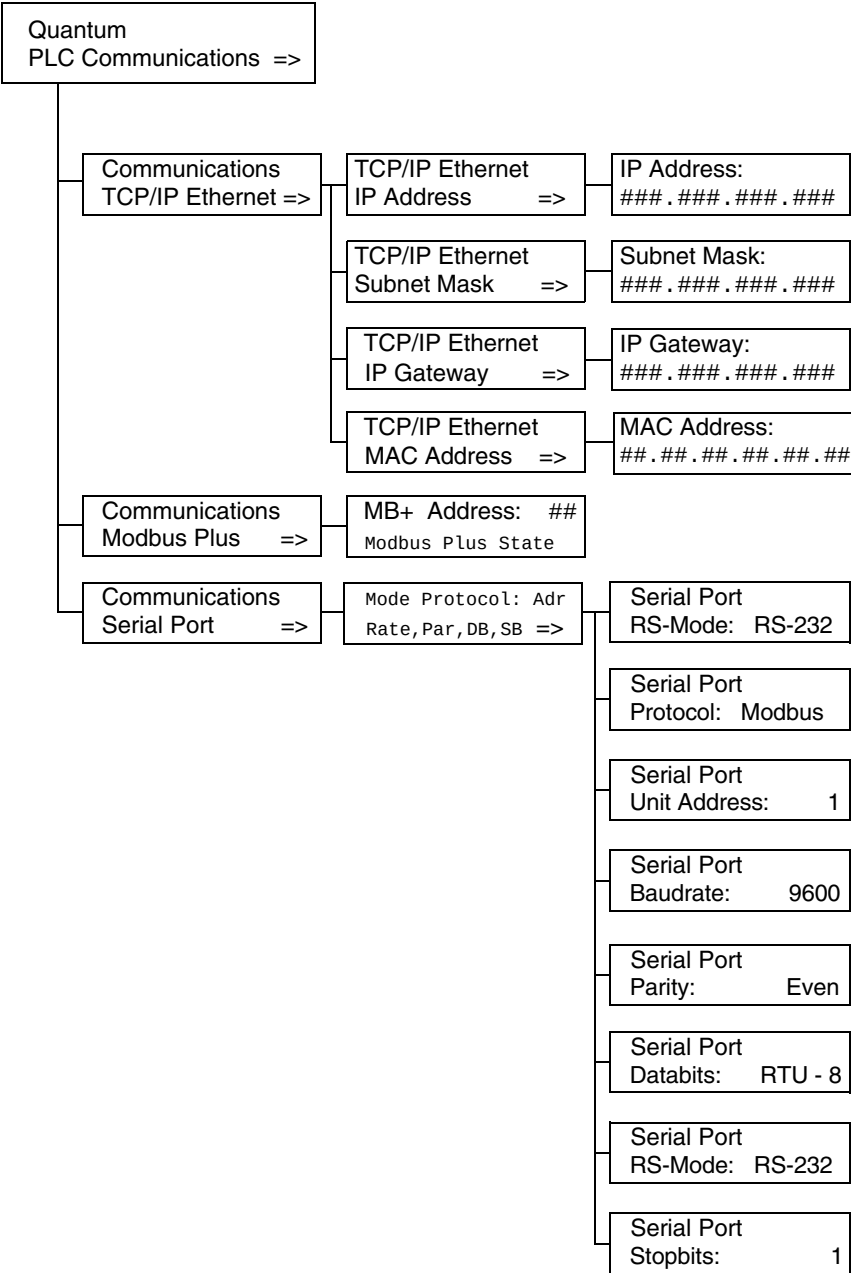
Start, Stop, Init Screens Display	Fields Available	Description
Start PLC	Press <ENTER> to confirm Start	Pressing <ENTER> starts the controller
Stop PLC	Press <ENTER> to confirm Stop	Pressing <ENTER> stops the controller
Init PLC	Press <ENTER> to confirm Init	Pressing <ENTER> initializes the controller On safety processors, this command is only available in maintenance mode

Submenu: PLC Operations Hot Standby CPU

Screen	Field	Option		Description
Hot Standby State:	State read only	PRIMARY CPU		Controller serves as primary CPU unit
		STANDBY CPU		Controller serves as standby CPU unit
		Offline		Controller not connected to another
Hot Standby Mode:	Mode (modifiable only if the key switch is in the unlocked position)	RUN	STS steady	Controller is active and is either serving as primary CPU controller or able to take over the primary CPU role if needed
			STS flashing	Controller is transferring/updating and when the transfer is done, RUN will stay on steady
		OFFLINE	STS steady	Controller is taken out of service without stopping it or disconnecting it from power If the controller is the primary CPU unit when the Mode state is changed to OFFLINE, control switches to the standby CPU unit. If the standby CPU controller is taken OFFLINE, the primary CPU unit continues to operate without a backup
			STS flashing	Controller is transferring/updating and when the transfer is done, OFFLINE will stay on steady

Screen	Field	Option	Description
Hot Standby Order:	A or B (modifiable only if the key switch is in the unlocked position)	FIRST	Hot Standby Power Order
		SECOND	
Hot Standby Transfer:	- (this menu option is only enabled, if the key switch is in the unlocked position)		Pressing the <ENTER> key confirms the Transfer. The transfer will initiate the request of a program update from the primary CPU controller. Pressing any other key will cancel the Transfer initiation and returns the Hot Standby Transfer menu option screen to the display.
Hot Standby Diag:	Order of diagnostic screen varies with the operation.		
	Halt		User's task in halt mode
	RIO fails		Error reported by RIO head
	HSBY fails		Error reported by optical link
	Stop		Stop command ordered
	Off keypad		Offline command entered on keypad
	Off %SW60		Offline command set in command register
	Off appli		Offline due to application mismatch
	Off vers		Offline due to PLC or Copro OS mismatch
	Off RIO		Offline due to Remote IO error
	Take over		Standby CPU switched to primary CPU mode
	Run		Run command ordered
	Plug & Run		Standby CPU plugged and started
	Power up		PLC has just started, no message

Communications Menu Structure: Communications menu and submenus structure



Submenu: PLC Communications: TCP/IP Ethernet

TCP/IP Ethernet Screen Displays	Fields Available	Options Available	Description
TCP/IP Ethernet IP Address ^{1,2}	### . ### . ### . ###	decimal numbers	displays IP address
TCP/IP Ethernet Subnet Mask ^{1,2}	### . ### . ### . ###	decimal numbers	displays Subnet Mask address
TCP/IP Ethernet IP Gateway ^{1,2}	### . ### . ### . ###	decimal numbers	displays Ethernet IP Gateway address
TCP/IP Ethernet MAC Address	## . ## . ## . ## . ## . ## (read only)	hexadecimal numbers	displays MAC (Medium Access Control) address

¹)Parameters can be modified only if no applications have been downloaded (NO CONF state).

²)When a new PLC application has been downloaded, the ethernet address on the screen is only updated after accessing the upper level of the menu structure.

Submenu: PLC Communications: Modbus Plus

Fields Available	Options Available	Description
## (modifiable only if the key switch is in the unlocked position)	1-64	to enter a valid Modbus Plus address
Modbus Plus State	Monitor Link	Modbus Plus State
	Normal Link	
	Sole Station	
	Duplicate address	
	No Token	

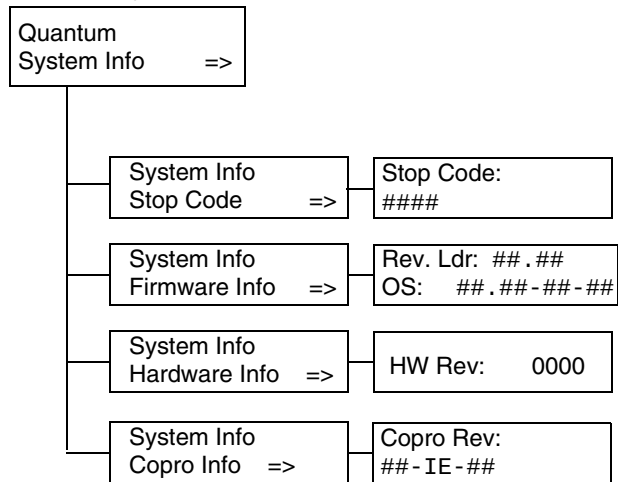
Submenu: PLC Communications: Serial Port

Fields Available*	Options Available	Description
Mode	232	RS mode
	485	
Protocol	ASCII	Protocols available
	RTU	
Adr	1 - 247	Unit address
	for Modbus switchover Primary CPU 1-119 Standby CPU 129 - 247	

Fields Available*	Options Available	Description
Rate	50, 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2400, 3600. 4800, 7200, 9600, 19200 bits/s	Baud rate
Par	NONE	Parity
	ODD	
	EVEN	
DB	7,8	Databits: if Protocol is Modbus then RTU-8 or ASCII-7
SB	1,2	Stopbits
*If the key switch is in the unlocked position, fields are modifiable.		

System Info Menu

Structure: System Info menus and submenus

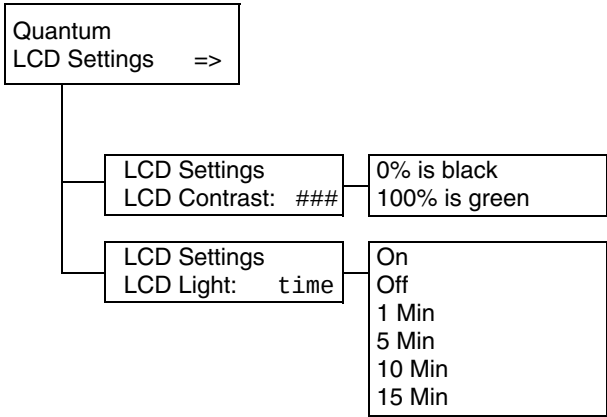


Submenu: PLC Communications: System Info

System Info Screen Displays	Fields Available*	Option Available	Description
Stop Code	####		machine stop code
	Description		description of the machine stop code
Firmware Info	Rev.Ldr : ##.##		Exec Revision
	OS: ##.##-##-##		OS loader Revision
Hardware Info	HW Rev: 0000		Hardware Revision
Copro Info	## - IE - ##		Copro Revision
*Fields are read only.			

LCD Settings Menu

Structure: LCD Settings menus and submenus



Submenu: LCD Settings: LCD Contrast

LCD Screen Contrast Screen Displays	Fields Available	Description
LCD Contrast:	####	A lower percent is darker. A higher percent is brighter. Use the arrow keys to adjust the setting: ● Up arrow increases percent ● Down arrow decreases percent

Submenu: LCD Settings: LCD Light

Screen Displays	Fields Available	Description
LCD Light:	On	LCD remains on permanently or until changed
	Off	LCD remains off permanently or until changed
	1 Min	LCD remains on for one minute
	5 Min	LCD remains on for five minutes
	10 Min	LCD remains on for ten minutes
	15 Min	LCD remains on for fifteen minutes

1.2 Module Description 140 NOE 771 xx and 140 NWM 100 00

Introduction

Overview This section contains the module descriptions for 140 NOE 771 xx and 140 NWM 100 00.

What's in this Section? This section contains the following topics:

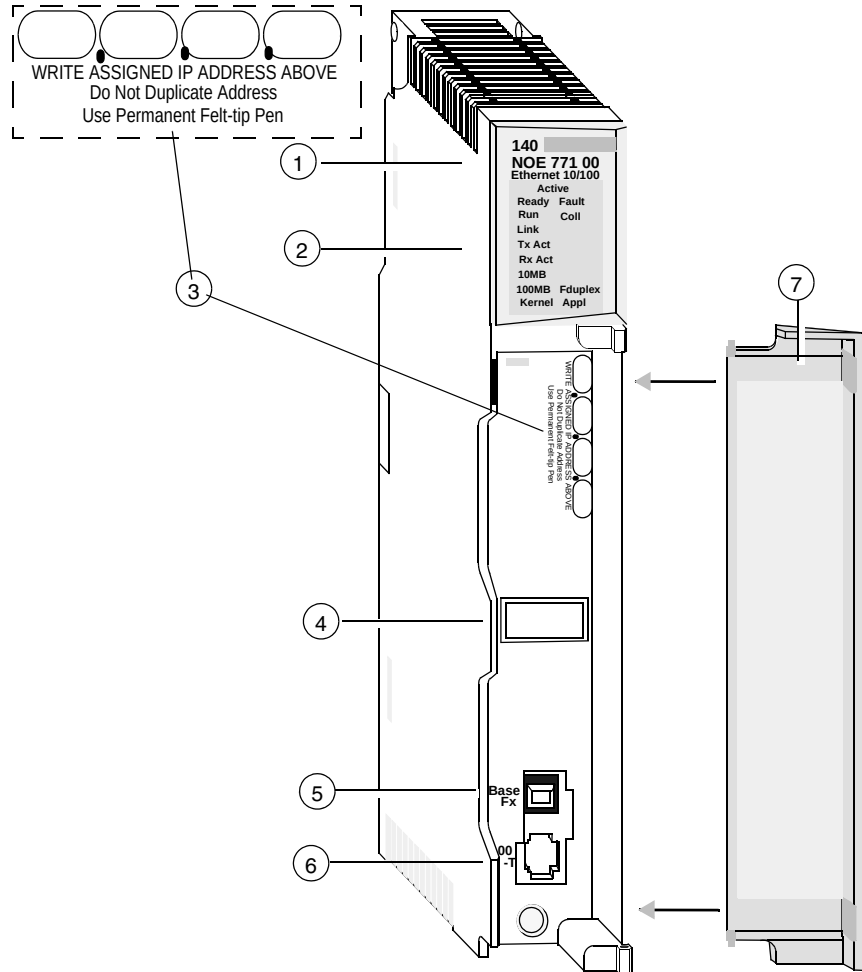
Topic	Page
Modicon Quantum Ethernet Modules Overview	44
Indicators for Ethernet Modules	49
Connectors and Cabling	51
Using the 140 NOE 771 11 Ethernet Module in a Quantum Safety Project	52

Modicon Quantum Ethernet Modules Overview

Overview	The following information provides overviews of all Modicon Quantum Ethernet modules.
General Description	The Modicon Quantum Ethernet module, shown below, is one of the latest models in a line of Modicon Quantum Ethernet TCP/IP modules designed to make it possible for a Modicon Quantum PLC to communicate with devices over an Ethernet network. The electronics for the Ethernet modules are contained in a standard Modicon Quantum single-width case that takes up one slot in a Modicon Quantum backplane. The module, which is capable of being hot swapped, can be plugged into any available slot in the backplane. The NOE 771 x0 and NOE 771 x1 modules provide real-time peer-to-peer communications and I/O scanning and a Modbus/TCP server. The included HTTP services provide maintenance and configuration utilities to the module.

Front View

The following figure shows the front of the NOE 771 00 Ethernet module as an example for all Ethernet modules.



- 1 model number, module description, color code
- 2 LED display
- 3 IP Address writable area
- 4 Global address label
- 5 100 BASE-FX MT-RJ cable connector
- 6 10/100 BASE-T RJ-45 cable connector
- 7 removable door

Key Ethernet Services

The key Ethernet services of the 140 NOE 771 (-00, -01, -10, -11) and 140 NWM 100 00 models are listed below:

Service	-00	-01	-10	-11	NWM
HTTP Server (see <i>Embedded Web Pages—HTTP Server, Web Configuration and Diagnostics, p. 95</i>)	X	X	X	X	X
FTP Server (see <i>FTP Server, p. 94</i>)	X	X	X	X	X
Flash File System (see <i>Flash File System, p. 97</i>)	X	X	X	X	X
BOOTP Client (see <i>Using BOOTP Lite to Assign Address Parameters, p. 74</i>)	X	X	X	X	X
Address Server (see <i>Address Server, p. 82</i>)	X	X	X	X	
SNMP V2 Agent (Network Management Service) (see <i>SNMP and Schneider Private MIB Overview, p. 84</i>)	X	X	X	X	X
Modbus Messaging (see <i>Modbus Messaging, p. 85</i>)	X	X	X	X	X
I/O Scanner (see <i>I/O Scanner, p. 87</i>)	X	X		X	
Hot Standby		X		X	
Global Data (Publish/Subscribe) (see <i>Global Data, p. 89</i>)		X		X	
Bandwidth Monitoring (see <i>Bandwidth Monitoring, p. 92</i>)		X		X	
Faulty Device Replacement (Server) (see <i>Address Server Configuration/Faulty Device Replacement, p. 213</i>)		X		X	
Enhanced Web Diagnosis (see <i>Embedded Web Pages—HTTP Server, Web Configuration and Diagnostics, p. 95</i>)		X		X	X
Schneider Private MIB (see <i>SNMP and Schneider Private MIB Overview, p. 84</i>)		X		X	X
FactoryCast Application (see <i>FactoryCast and User Customizable Web Pages, p. 97</i>)			X	X	X
User-programmed Web pages			X	X	X
JAVA Virtual Machine					X
Fiber optic connection	X	X	X	X	
RJ-45 connection	X	X	X	X	
Time Synchronization Service (see <i>Time Synchronization Service, p. 90</i>)				X	

Service	-00	-01	-10	-11	NWM
Electronic Mail Notification Service (see <i>Electronic Mail Notification Service, p. 91</i>)		X		X	

Note: In the detailed description of the key features, only modules in the NOE family are named. The features are also available for the 140 NWM 100 00 module, depending on the listed properties in the above table.

Note: In Unity Pro software, the 140 NWM 100 00 module is set in the TCP/IP Regular Network family, although it belongs to the TCP/IP FactoryCast network family. So, the services listed above (I/O scanning, Global Data, address server, Bandwidth monitoring) are not supported by the module. However, they can be selected in the TCP/IP regular network configuration in Unity Pro. (Even if they are configured, those services won't work with the module.)

NOEs in a Rack

The following table summarizes the total number of NOE modules per CPU.

Modicon Quantum CPU Type	Supported Number of NOEs
140 CPU 311 10	2
140 CPU 434 12A	6
140 CPU 534 14A	6
140 CPU 651 50	6
140 CPU 651 60	6
140 CPU 671 60	6

**Front Panel
Components**

The front panel of the Ethernet modules contains identification markings, color codes, and LED displays. A writable area for an IP address, a global address label, and two Ethernet cable connectors is located behind the removable front panel door.

The following table provides a description of the front panel components that are shown in following figure:

Component	Description
LED Indicator Panel (see <i>Indicators for Ethernet Modules, p. 49</i>)	Indicates the operating status of the module, and the fiber optic or Ethernet communications network to which it is connected.
IP Address Area	Provides a writable area to record the module's assigned IP address.
Global Address Label	Indicates the module's global Ethernet MAC address assigned at the factory.
100 BASE-FX Connector	Provides an MT-RJ socket for connection to a 100-megabit fiber-optic Ethernet cable.
10/100 BASE-T Connector	Provides an RJ-45 socket for connection to a shielded, twisted pair Ethernet cable.

Indicators for Ethernet Modules

Illustration

The following figure shows the NOE 771 00 LED indicators as a placeholder for all other Ethernet modules:

Active	
Ready	Fault
Run	Coll
Link	
Tx Act	
Rx Act	
10MB	
100MB	Fduplex
Kernel	Appl

Description

The following table shows the LED descriptions:

LED	Color	Description
Active	Green	Indicates the backplane is configured.
Ready	Green	Indicates module is healthy.
Fault	Red	Flashes when the NOE is in crash state.
Run	Green	Flashes to indicate diagnostic code, as described below.
Coll.	Red	Flashes when Ethernet collisions occur.
Link	Green	On when Ethernet link is active.
Tx Act	Green	Flashes to indicate Ethernet transmission.
Rx Act	Green	Flashes to indicate Ethernet reception.
10MB	Green	On when the module is connected to a 10-Megabit network.
100MB	Green	On when the module is connected to a 100-Megabit network.
Fduplex		On when Ethernet is operating in the full duplex mode.
Kernel	Amber	On when in Kernel Mode. Flashing while in download mode.
Appl	Green	On when crash log entry exists.

Run LED Status

The following table lists each available state of the Run LED indicator and provides diagnostic information for that state in both the 140 NOE 771x1 module and the 140 NWM 100 module.

Indicator State	Status for 140NOE771x1	Status for 140NWM100
On (steady)	Normal operation: The NOE module is ready for network communication.	Normal operation: The NOE module is ready for network communication.
Number of flashes in sequence		
1	Not used	Not used
2	Not used	Not used
3	No Link: the network cable is not connected or is defective	No Link: the network cable is not connected or is defective
4	Duplicate IP address: The module will be set to its default IP address.	Duplicate IP address: The module will stay off-line.
5	No IP address: The module is attempting to obtain an IP address from a BOOTP server. Module is set to its default IP address.	No IP address: The module is attempting to obtain an IP address from a BOOTP server.
6	Invalid IP configuration. (Likely cause: Default gateway is not on the same subnet mask.) Module is set to its default IP address.	Using default IP address
7	No valid executive NOE present	No valid executive NOE present
8	Not used	Not used
9	-	Flash file system inoperative.

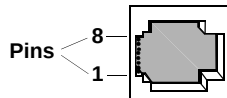
Connectors and Cabling

Overview

The following information describes the 10/100 BASE-T and 100 BASE-FX connectors.

10/100 BASE-T Twisted Pair Connector

The NOE 771 xx, NWM 100 00, and CPU 651 x0 modules' 10/100 BASE-T connector (shown below) is a standard RJ-45 twisted pair socket:



Schneider Electric recommends that you use Category 5 STP cabling, which is rated to 100 Mbps, with an RJ-45 connector.

The eight pins are arranged vertically and numbered in order from the bottom to the top. The RJ-45 pinout used by this module is:

- Receive Data (+)3
- Receive Data (-)6
- Transmit Data (+)1
- Transmit Data (-)2

100 BASE-FX

The 100 BASE-FX connector for the NOE 771 xx, NWM 100 00, and CPU 651 60 modules is an MT-RJ socket or a mating fiber optic cable connector.

For the NOE 771 xx and NWM 100 00, you may need an MT-RJ to SC (duplex) multimode fiber optic cable assembly 62.5/125mm. Schneider Electric recommends cable number 490NOC00005 to connect to fiber hubs/switches.

Note: The NOE 771 xx and NWM 100 00 are one-channel devices that can communicate over either 10/100 BASE-T or 100 BASE-FX Ethernet networks at any given time, but not over both at the same time.

Using the 140 NOE 771 11 Ethernet Module in a Quantum Safety Project

Overview

Version 4.2 and higher of the 140 NOE 771 11 Ethernet module can be included in one of the following:

- Quantum safety applications
- non-safety applications

A Quantum safety application is controlled by a Quantum safety PLC, consisting exclusively of safety modules that perform safety functions. A safety module is denoted by the letter *S* at the end of its module name.

When used in a Quantum safety application, the 140 NOE 771 11 is a *non-interfering module*—it does not negatively affect the execution of the PLC's safety functions.

For more information about Quantum safety products, refer to the *Quantum Safety PLC Safety Manual*.

Restricted and Unrestricted Memory Areas

The memory addresses of a Quantum safety PLC can be configured as one of the following:

- safety-restricted memory areas
- unrestricted memory areas

Only safety modules can write data to a safety-restricted memory area. For more information about restricted versus unrestricted memory areas, refer to the topic *Safety PLC Write Protection* in the *Unity Pro XLS Operating Mode Manual*.

The 140 NOE 771 11 Ethernet module—as a non-interfering module—cannot write data to safety-restricted memory areas. Instead, the 140 NOE 771 11 Ethernet module can write data only to unrestricted memory areas.

The memory areas of a Quantum safety project are user-configurable. Using Unity XLS, you can designate address ranges as either safety-restricted or unrestricted. For instructions on how to configure memory areas, refer to the topic *Configuration of Quantum Processors with Unity Pro XLS* in the *Unity Pro XLS Operating Mode Manual*.

Health Bit Assignments

CAUTION

Risk of Data Loss

The default address assignments for the following data blocks overlap:

- Global Data Health Bit block (%MW1)
- I/O Scanning Health Bit block (%MW1)
- I/O Scanning Device Control block (%MD1)

You must edit these address assignments so they do not overlap. If these address assignments overlap, the PLC will overwrite data and the overwritten data will be lost.

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

The 140 NOE 771 11 makes different address assignments—regarding both I/O Scanning and Global Data Health Bit Blocks—for safety and non-safety applications, as follows:

Health Bit Block	Non-Safety Application Addresses	Safety Application Addresses
I/O Scanning	%I %IW	%M ¹ %MW ¹
Global Data	%I %IW %MW	%MW ¹ (only)

¹ All I/O Scanning and Global Data Health Bit Block address assignments, for a Quantum safety application, must be made in unrestricted memory address areas.

1.3 Installing the Module

Overview

Introduction This section contains installation and configuration information for the NOE 771 xx Ethernet modules.

What's in this Section? This section contains the following topics:

Topic	Page
Before You Begin	55
Cable Schemes	57
Security	59
Mounting the Module in the Quantum PLC Backplane	60
Connecting the Cable	62
Assigning Ethernet Address Parameters	64
Establishing the FTP Password	68
Establishing HTTP and Write Passwords for NOE 771 0x	71
Using BOOTP Lite to Assign Address Parameters	74

Before You Begin

Initial Checks

CAUTION

UNINTENTIONAL OPERATION

If you do not enter the correct address pairs into the BOOTP server, you could communicate to the wrong device.

- Ensure that the MAC address matches the intended IP address in your BOOTP server.

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

- Ensure that your Ethernet module receives a unique IP address.

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

Complete the following checks before installing the module.

- Determine how the module will be assigned its Ethernet address parameters. The default method is BOOTP.
- Verify that your Ethernet network is properly constructed.
- Verify that you are using the proper cabling scheme for your application Cabling Schemes (see *Cable Schemes*, p. 57).

Determine the Appropriate Ethernet Address Parameters

Consult your system administrator to determine whether:

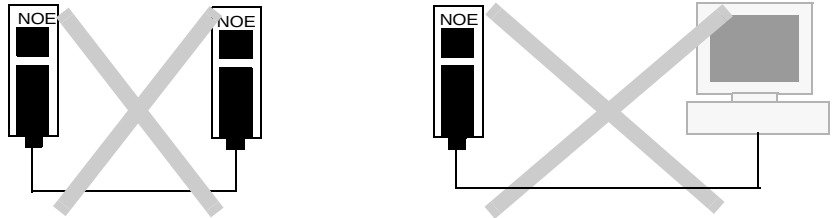
- you must configure new IP, gateway, and subnet mask addresses or
 - the module will obtain its Ethernet address parameters from a BOOTP server
- Assigning Ethernet Address Parameters

If the administrator assigns new address parameters, you will need to configure the module through the Unity Pro interface module configuration screen.

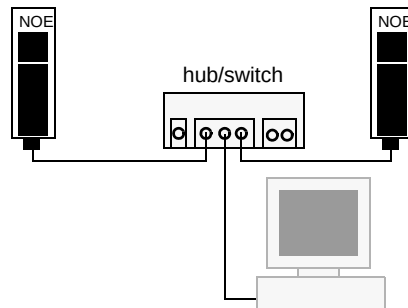
Verify the Network Topology

Because the module includes an Ethernet embedded web server, you must use a cross-link cable to connect it to another device. Do not use a standard cable. For the network to operate properly, you must route the cable for each device through an Ethernet hub or switch.

The following figure shows two incorrect network topologies.



The following figure shows a correct network topology.



Cable Schemes

Overview

The following information provides guidelines on proper cabling schemes for your Ethernet configuration.

Twisted Pair Length

In a standard Ethernet cabling scheme network nodes such as the Quantum Ethernet module connect via a cable to a port on a central hub or switch. The maximum cable length between nodes depends on whether they are connected through hubs or switches, as the following table describes:

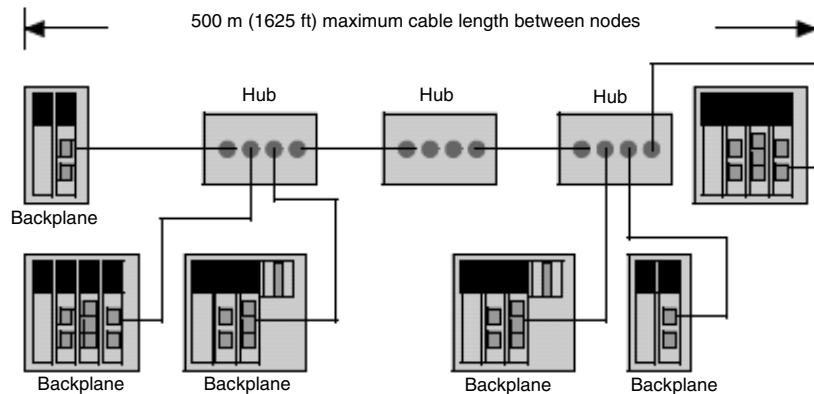
Device Type	Max. Cable Length from Node to Hub/Switch	Max. Number of Hubs/Switches Between Any Two Nodes	Max. Distance Between Network Nodes
Hub	10 BASE-T: 100 m	3	500 m
Switch	10/100 BASE-T: 100 m 100 BASE-FX: 2 km	Unlimited	Unlimited

Cabling with Conventional Hubs

The figures and tables that follow show the maximum number of hubs and the maximum cable length between nodes allowed if using hubs.

10BASE-T Distances with Hubs

The 10 BASE-T cabling allows for 3 hubs with a link maximum distance of 100 m (325 ft) and a total network diameter of 500 m (1625 ft).



**10/100BASE-T
Cable Distances
with Switches**

The 10/100 BASE-T cabling has a link maximum distance of 100 m. There is no limit on the number of switches.

100BASE-FX

The maximum length for 1300nm/multimode cable is 2 km. The 100BASE-FX has a maximum distance of 2 km. There is no limit on the number of switches.

Security

Overview

The following information describes firewalls. A firewall is a gateway that controls access to your network. To restrict access to your Ethernet controller and I/O network, you may want to consider a firewall.

Types of Firewalls

There are network-level and application-level firewalls:

- **Network-level firewalls:** These 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
-

Port Numbers Used by NOE

The following table contains the port numbers used by NOE:

Protocol	Port Number
Modbus/TCP	TCP 502
HTTP	TCP 80
SNMP	UDP 61
FTP	TCP 21

You may need to provide the information in this table to your system administrator so that the firewall configuration will allow access to your PLC from outside of your facility.

Mounting the Module in the Quantum PLC Backplane

Before you Begin Locate the backplane in which you will mount the module. Ensure that an open slot is available.

Note: The module can be installed only in a local backplane.

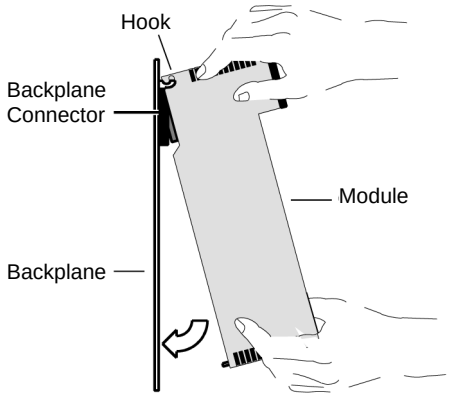
Note: Ensure when installing the module that it does not exceed the Quantum backplane power requirements as specified in the *Quantum with Unity Pro Hardware Reference Manual*.

Backplane Slot Replacement You may place the module in any slot on the backplane. You do not need to place it next to other modules.

Tools Required You will need one medium-size, Phillips-head screw driver.

Mounting the Module in the Backplane

Perform the following steps to mount the module.

Step	Action
1	Holding the module at an angle, mount it on the two hooks located near the top of the backplane. The following figure shows the correct way to hold the module. 
2	Swing the module down so its connector engages the backplane connector.
3	Using a Phillips-head screw driver, tighten the screw at the bottom of the module between 2 and 4 in-lbs or between .22 and .45 Newton meters of torque.

Grounding the Module

The module is grounded upon installation in the Quantum PLC backplane. For instructions on grounding the backplane, see the *Quantum with Unity Pro Hardware Reference Manual*.

Note: If you connect the module to the Ethernet hub or switch using a shielded cable, the cable is also grounded. Elsewhere in this guide is a discussion of cabling schemes and recommendations Cabling Schemes (see *Cable Schemes*, p. 57), as well as instructions for connecting the module to an Ethernet network Connecting the Cable (see *Connecting the Cable*, p. 62).

Connecting the Cable

Overview

The following information pertains to cabling.

Note: The 140 NOE 771 xx is capable of communicating over either a 10/100BASE-T or a 100BASE-FX Ethernet network at any given time, but not both at the same time.

Accessories

Schneider Electric sells the following switches:

Hub or Switch	Description
499NEH10410	hub with 4 ports 10 BASE-T
499NOH10510	hub with 3 ports 10 BASE-T and 2 ports 10 BASE-FL
499NTR10010	transceiver 10 BASE-T/10 BASE-FL
499NEH14100	hub with 4 ports 100 BASE-TX
499NTR10100	transceiver 100 BASE-TX
499NES18100	switch with 8 ports 10/100 BASE-TX
499NES17100	managed switch with 7 ports 10/100 BASE-TX
499NOS17100	managed switch with 5 ports 10/100 BASE-TX and 2 ports 100 BASE-FX

The following Schneider Electric cables support multicast filtering (see *Multicast Filtering*, p. 192):

Cable	Description
490NTW000 02/05/12/40/80 U	StraightThru cable
490NTC000 05/15/40/80 U	Crossover cable

Fiber Optic

Remove the protective cap from the module's MT-RJ connector port and the protective cap from the tip of the black connector on the MT-RJ fiber optic cable (as shown in the following figure). The plug only fits to the socket in one way. It should snap into place.



Assigning Ethernet Address Parameters

Overview

CAUTION

UNINTENTIONAL OPERATION

If you do not enter the correct address pairs into the BOOTP server, you could communicate to the wrong device.

- Ensure that the MAC address matches the intended IP address in your BOOTP server.

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

- Ensure that your Ethernet module receives a unique IP address.

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

The following information describes how to assign IP address parameters.

As shipped from the factory, the 140 NOE 771 xx module does not contain an IP address. If you have not programmed the unit with an Ethernet configuration extension, the module does not contain an IP address. When the module starts up without an IP address, the module will attempt to obtain an IP address from the network's BOOTP server.

You can assign IP address parameters using the BOOTP Lite software utility.

Note: You can configure the IP address using Web pages on the modules 140 NOE 771 01, -11, and NWM 100 00.

Using a BOOTP Server

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

See *Using BOOTP Lite to Assign Address Parameters*, p. 74.

**How an
Unconfigured
Module Obtains
an IP Address**

On startup, an unconfigured NOE 771 xx module ("as shipped") will attempt to obtain an IP address by issuing BOOTP requests. When a response from a BOOTP server is obtained, the IP address in the response is used. If no BOOTP response is received within two minutes, the module uses the default IP address derived from its MAC address.

Note: The MAC address is assigned at the factory and is recorded on a label on the front panel, above the cable connector. This is a unique 48-bit global assigned address. It is set in PROM. The Ethernet address is recorded on the label in hexadecimal, in the form 00.00.54.xx.xx.xx.

Connecting to the Default IP Address

To connect to the default IP address with your PC, set up an active route from your PC. To do this with Windows 95/98/ME/NT/2000 or Windows XP, use the following procedure. You can use the routes for connecting Ethernet components with other address ranges.

Step	Action																									
1	Be sure the NOE module is running.																									
2	Obtain the default IP address of the NOE derived from its MAC address (for example, 84.0.0.2).																									
3	Open an MS-DOS window.																									
4	Add an active route for the local NOE by typing: C:\>ROUTE ADD <target> MASK <mask> <gateway> e.g. C:\>ROUTE ADD 84.0.0.0 MASK 255.0.0.0 205.217.193.205 Use the default IP address of the NOE module as target address. Use a class A subnet mask for connecting to every 84.0.0.0 address. The gateway address is the IP of your PC. The result is that MS Windows will now talk to any address that starts with an 84 that is directly connected to a hub or switch directly accessible to your machine, or that can be seen by the specified route/gateway.																									
5	Confirm that there is a new entry in the active route table by typing: C:\>route print: The following figure confirms that the new entry was added to the active route table. <table><tr><th colspan="5">Active Routes:</th></tr><tr><th>Network Address</th><th>Netmask</th><th>Gateway Address</th><th>Interface</th><th>Metric</th></tr><tr><td>0.0.0.0</td><td>0.0.0.0</td><td>205.217.193.205</td><td>205.217.193.205</td><td>1</td></tr><tr><td>84.0.0.0</td><td>255.0.0.0</td><td>205.217.193.205</td><td>205.217.193.205</td><td>1</td></tr><tr><td>127.0.0.0</td><td>255.0.0.0</td><td>127.0.0.1</td><td>127.0.0.1</td><td>1</td></tr></table>	Active Routes:					Network Address	Netmask	Gateway Address	Interface	Metric	0.0.0.0	0.0.0.0	205.217.193.205	205.217.193.205	1	84.0.0.0	255.0.0.0	205.217.193.205	205.217.193.205	1	127.0.0.0	255.0.0.0	127.0.0.1	127.0.0.1	1
Active Routes:																										
Network Address	Netmask	Gateway Address	Interface	Metric																						
0.0.0.0	0.0.0.0	205.217.193.205	205.217.193.205	1																						
84.0.0.0	255.0.0.0	205.217.193.205	205.217.193.205	1																						
127.0.0.0	255.0.0.0	127.0.0.1	127.0.0.1	1																						
6	Verify that a connection is made by typing: C:\>ping 84.0.0.2 The following figure shows that the connection is verified. <table><tr><td>Reply from 84.0.0.2:</td><td>bytes=32</td><td>time<10ms</td><td>TTL=32</td></tr><tr><td>Reply from 84.0.0.2:</td><td>bytes=32</td><td>time<10ms</td><td>TTL=32</td></tr><tr><td>Reply from 84.0.0.2:</td><td>bytes=32</td><td>time<10ms</td><td>TTL=32</td></tr><tr><td>Reply from 84.0.0.2:</td><td>bytes=32</td><td>time<10ms</td><td>TTL=32</td></tr></table>	Reply from 84.0.0.2:	bytes=32	time<10ms	TTL=32	Reply from 84.0.0.2:	bytes=32	time<10ms	TTL=32	Reply from 84.0.0.2:	bytes=32	time<10ms	TTL=32	Reply from 84.0.0.2:	bytes=32	time<10ms	TTL=32									
Reply from 84.0.0.2:	bytes=32	time<10ms	TTL=32																							
Reply from 84.0.0.2:	bytes=32	time<10ms	TTL=32																							
Reply from 84.0.0.2:	bytes=32	time<10ms	TTL=32																							
Reply from 84.0.0.2:	bytes=32	time<10ms	TTL=32																							

Specifying Address Parameters	Consult your system administrator to obtain a valid IP address and an appropriate gateway and a subnet mask, if required. Then use your programming panel to make the appropriate changes.
BOOTP Server Responds	If the server responds with address parameters, the NOE 771 xx module will use those parameters as long as power remains applied to the module. If the server does not respond, the module will retry its request for two minutes.
BOOTP Server Does Not Respond	If no BOOTP response is received, the NOE 771 xx module will use the default IP Address. During this time the Run indicator displays a pattern of five flashes for a BOOTP attempt and six flashes for using the default IP.
NOE 771 xx Duplicate IP Address Test	In all cases, when the NOE 771 xx module receives an IP address, it will test for duplicate addresses by sending broadcast ARP requests three times at 5-second intervals. If a Duplicate IP Address is found on the network, the NOE 771 xx will stay off-line to avoid a network disruption. It will display a pattern of four flashes to indicate a Duplicate IP Address detection.
Automatic ARP	If there are no replies to its requests, the NOE 771 xx automatically sends three ARP requests at 2-second intervals to announce its presence on the network.

Establishing the FTP Password

Establishing the FTP Password

The FTP password is established using the Embedded Web Server. This topic contains information on how to access the web server for purposes of changing the FTP and HTTP passwords. The first thing the system administrator should do upon accessing the web server is change the FTP password. Doing this restricts access to the web server functionality to the system administrator.

Web server pages and their functionality are discussed in detail at Embedded Web Pages (see *Embedded Web Pages*, p. 265).

Introduction to Accessing the Web Server

Each Quantum 140 NOE 771 xx module contains an embedded Web server, which allows you to access diagnostics and online configurations for the module and its associated controller (PLC).

The web pages can only be viewed using Internet Explorer 4.0 or higher supporting JRE 1.4.2_04 or higher.

For information about the additional functionality provided by the FactoryCast system in the 140 NOE 771 1x modules, see the *FactoryCast Manual* (31001229).

How to Access the Web Server

Before you can access the module's home page, you must enter the full in the Address or Location box in the browser window. For example: *http://hostname* (*hostname* is the full IP address or DNS host name).

After you do this, the Schneider Electric Web Utility home page displays.

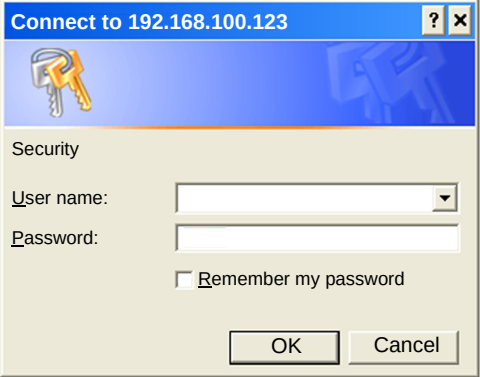
Schneider Web Utility Home Page

From the Quantum home page (see *Home Page*, p. 267) , you can access pages for:

- changing the FTP password
 - changing the HTTP password (see *Modify Passwords Page*, p. 72)
 - diagnostic and configuration information (embedded Web pages (see *Embedded Web Pages*, p. 265) provides additional information)
-

Modifying the FTP Server Password

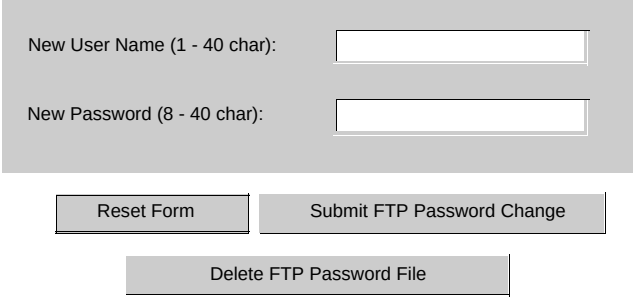
The following steps detail how to link to the correct web page for modifying the FTP password

Step	Action
1	Enter the URL, for example, <i>http://hostname/secure/embedded/ftp_passwd_config.htm</i>
2	At that URL, supply a user name and password:  Note: The default User name is USER, and the default Password is USERUSER. Both should be changed by the system administrator during module installation.
3	Upon supplying the user name, password, and clicking the OK button, the Modify FTP Server User Name and Password page displays.

FTP Username and Password Modify Page Overview

The following figure shows the page used for modifying the FTP user name and password:

Modify FTP Server User Name and Password



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Change the Username and Password

At this point, the system administrator should change the Username and Password to restrict future access to the system. The following steps should be used.

Step	Action
1	Type in the new Username in the New User Name field.
2	Type in the new Password in the New Password field.
3	Click the Submit FTP Password Change button.

The following figure shows the message that is generated if you click on the Submit FTP Password Change button:

Ethernet Configuration

Successfully changed User Name and Password

Please click Reboot Device button to use the new password.

Reboot Device

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Clicking the **Reboot Device** button will reset the username and password for the NOE 771 xx board.

Note: The reboot requires about 40 seconds. (With large applications, reboot may require up to one (1) minute.)
During the reboot, all services provided by the NOE 771 xx are not available.

Establishing HTTP and Write Passwords for NOE 771 0x

Overview

The following information describes how to set the passwords for HTTP and Data Monitor Write for the NOE 771 0x.

Connect to the Web Page

Before you can change the HTTP or Data Monitor Write passwords, you must connect to the correct web page:

Step	Action
1	Enter the URL, for example, <code>http://hostname/secure/embedded/http_passwd_config.htm</code>
2	At that URL, supply a user name and password in the dialog box:  Note: The default User Name is USER, and the default Password is USER. Both should be changed by the system administrator during module installation.
3	Upon supplying the user name, password, and clicking the OK button, the Modify Passwords page displays.

**Modify
Passwords Page**

A single web page is used to modify both the HTTP and Data Monitor Write passwords:

Modify Passwords

HTTP User Name and Password

New User Name:	
New Password:	
Confirm Password:	

Change HTTP Access

Data Monitor Write Password

Write Password:	
New Password:	
Confirm Password:	

Change Write Password

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Changing Security Access Parameters

A system administrator should change the default username (USER) and password (USER) to restrict future access to the system. After you decide whether you are changing the HTTP or Write Password security parameters, follow the appropriate procedure below:

HTTP (Username and Password)

Step	Action
1	Type a new username in the New User Name field.
2	Type a new password in the New Password field.
3	Confirm the new password in the Confirm Password field.
4	Click the Change HTTP Access button.

Data Monitor Write (Password)

Step	Action
1	Type the old password in the Write Password field.
2	Type a new password in the New Password field.
3	Confirm the new password in the Confirm Password field.
4	Click the Change Write Password button.

Security Access Change Verification

The following figure shows the message that is generated if you click the **Change HTTP Access** or **Change Write Password** button:

Ethernet Configuration

Successfully changed HTTP User Name and Password.
This modification will become effective on the next reboot.

Reboot Device

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Clicking the **Reboot Device** button will reset the username and password for the NOE 771 0x board.

Note: The Reboot will take about 40 seconds. Larger applications can take up to one (1) minute.
During the reboot all services provided by the NOE 771 0x are not available.

Using BOOTP Lite to Assign Address Parameters

Overview

 **CAUTION**

UNINTENTIONAL OPERATION

Ensure that the MAC address matches the intended IP address in your BOOTP server. If you do not enter the correct address pairs into the BOOTP server, you could communicate to the wrong device.

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

The following information describes how to use the BOOTP Lite utility software.

BOOTP Lite Utility

Instead of a BOOTP server, Schneider Electric's *BOOTP Lite Server Software* utility can be used to provide the IP address, subnet mask, and default gateway to the NOE 771 xx module.

Refer to the BOOTP Lite Server Software user documentation for instructions.

Note: BOOTP Lite Server Software and user documentation are available for download at www.modicon.com.

1.4 Customer Support

Introduction

Overview This section tells you how to get customer support from Schneider Electric's documentation and regional help centers.

What's in this Section? This section contains the following topics:

Topic	Page
Customer Support Documentation	76
Contact Information	77

Customer Support Documentation

**Support
Documentation**

If you have any problems, please first consult the documentation listed above or the MS-Windows documentation.

For the most up-to-date NOE Ethernet controller information, please:

Step	Action
1	Access the Schneider Electric Web site.
2	Search technical information.
3	Select Quantum from the list of cross-product families.
4	Access either: ● resolutions for resolutions to product issues ● product manuals for the most recently published user documentation ● product announcements

Contact Information

Contact Information

Please find the nearest Schneider Electric sales office by visiting <http://www.schneider-electric.com>. In the **Select a country** list, click the country closest to you for customer support.

Schneider Electric in your country:



Select a country

- Select a country
- Argentina
- Australia
- Austria
- Belgium
- Brazil
- Bulgaria
- Canada
- Chile
- China
- Colombia

Ethernet Communication Services

2

At a Glance

Introduction This chapter describes the Ethernet communications services available on 140 NOE 771 x1 and 140 CPU 651 x0.

What's in this Chapter? This chapter contains the following topics:

Topic	Page
Modicon Quantum with Unity Ethernet Services	80
Address Server	82
SNMP and Schneider Private MIB Overview	84
Modbus Messaging	85
I/O Scanner	87
Global Data	89
Time Synchronization Service	90
Electronic Mail Notification Service	91
Bandwidth Monitoring	92
FTP Server	94
Embedded Web Pages—HTTP Server, Web Configuration and Diagnostics	95
Additional Ethernet Services	97

Modicon Quantum with Unity Ethernet Services

Table of Ethernet Services

The Ethernet services of the 140 NOE 771 01, 140 NOE 771 11, and CPU 651 x0 add functionality to the system. Some services can be configured, others require no configuration. Some services provide diagnostic information. Access to the services is through either a Web page or the Unity Pro application.

Service		NOE 771 01	NOE 771 11	CPU 651 x0
Address Server (see <i>Address Server</i> , p. 82)	configure	Web Unity Pro	Web Unity Pro	Web
	diagnostic	NA	NA	NA
BOOTP Client (see <i>Using BOOTP Lite to Assign Address Parameters</i> , p. 74)	configure	Unity Pro	Unity Pro	Unity Pro
	diagnostic	NA	NA	NA
SNMP V2 Agent (Network Management Service) (see <i>SNMP and Schneider Private MIB Overview</i> , p. 84)	configure	Web	Web	Unity Pro
	diagnostic	NA	NA	NA
Schneider Private MIB (see <i>SNMP and Schneider Private MIB Overview</i> , p. 84)	configure	NA	NA	NA
	diagnostic	NA	NA	NA
Modbus Messaging (see <i>Modbus Messaging</i> , p. 85)	configure	Unity Pro	Unity Pro	Unity Pro
	diagnostic	Web Unity Pro	Web Unity Pro	Web Unity Pro
I/O Scanner (see <i>I/O Scanner</i> , p. 87)	configure	Unity Pro	Unity Pro	Unity Pro
	diagnostic	Web Unity Pro	Web Unity Pro	Web Unity Pro
Global Data (Publish/Subscribe) (see <i>Global Data</i> , p. 89)	configure	Web Unity Pro	Web Unity Pro	Unity Pro
	diagnostic	Web Unity Pro	Web Unity Pro	Web Unity Pro
Time Synchronization Service (see <i>Time Synchronization Service</i> , p. 90)	configure	NA	Web	NA
	diagnostic	NA	Web	NA
Electronic Mail Notification Service (see <i>Electronic Mail Notification Service</i> , p. 91)	configure	Web	Web	Web
	diagnostic	Web	Web	Web
Bandwidth Monitoring (see <i>Bandwidth Monitoring</i> , p. 92)	configure	Unity Pro	Unity Pro	Unity Pro
	diagnostic	Web Unity Pro	Web Unity Pro	Web Unity Pro
FTP Server (see <i>FTP Server</i> , p. 94)	configure	NA	NA	NA
	diagnostic	NA	NA	NA

		NOE 771 01	NOE 771 11	CPU 651 x0
Service				
HTTP Server (see <i>Embedded Web Pages—HTTP Server, Web Configuration and Diagnostics</i> , p. 95)	configure	NA	NA	NA
	diagnostic	NA	NA	NA
Faulty Device Replacement (Server) (see <i>Address Server Configuration/Faulty Device Replacement</i> , p. 213)	configure	Web Unity Pro	Web Unity Pro	Unity Pro
	diagnostic	NA	NA	NA
Hot Standby	configure	NA	NA	NA
	diagnostic	NA	NA	NA
Flash File System (see <i>Flash File System</i> , p. 97)	configure	NA	NA	NA
	diagnostic	NA	NA	NA
FactoryCast Application (see <i>FactoryCast and User Customizable Web Pages</i> , p. 97)	configure	NA	Web	NA
	diagnostic	NA	Web	NA

Address Server

Overview

The following information describes the services provided by the Address Server.

- BOOTP server
- DHCP server

The DHCP server responds to both a DHCP and a BOOTP server.

BOOTP Server

Note: The BOOTP server is available on the 140 NOE 771 xx models.

The BOOTstrap Protocol (BOOTP) software, compliant with RFC 951, is used to assign IP addresses to nodes on an Ethernet network. Devices (hosts) on the network issue BOOTP requests during their initialization sequence. A BOOTP server that receives the request will extract the required IP address information from its database and place it in BOOTP response messages to the requesting devices. The devices will use the assigned IP addresses from the BOOTP server for all network communication.

NOE BOOTP Server

Your NOE 771 xx module comes supplied with a BOOTP server. This feature allows you to provide IP addresses to all the I/O devices being serviced by the NOE 771 xx. Providing a BOOTP server that is built into your NOE 771 xx module eliminates the need for an external BOOTP server.

Note: The NOE 771 xx's BOOTP server can not provide its own IP address.

You can configure your NOE 771 xx's BOOTP server from the module's HTTP Web page. Configure the 140 CPU 651 x0 using the Unity Pro editors. Configuring allows you to add to, remove from, and edit devices in the BOOTP server's database, which is maintained in the module's non-volatile memory.

DHCP Server

Note: The DHCP server is available on the 140 NOE 771 x1 models.

The Dynamic Host Configuration Protocol (DHCP) is a superset of the BOOTP protocol. Your 140 NOE 771 x1 has a DHCP server. The DHCP server is compliant with RFC 1531. The DHCP server can be used to provide the IP configuration to devices using BOOTP or devices using DHCP.

The DHCP server has entries that use the MAC address to serve the IP configuration and entries in the server that use the role name to serve the IP configuration. Elsewhere in this book are details for the NOE Address server configuration (see *Address Server Configuration/Faulty Device Replacement*, p. 213).

If you are migrating a BOOTP configuration from a 140 NOE 771 x0 module to the new 140 NOE 771 x1 module, see *Address Server Configuration/Faulty Device Replacement* (see *Address Server Configuration/Faulty Device Replacement*, p. 213) for details on the automatic upgrade of your configuration for the new DHCP server.

Note:

Before placing the NOE on a corporate network, Schneider Electric recommends that you discuss the installation with your MIS department. It is likely that your company's corporate network has at least one DHCP server running already. If the NOE's DHCP server is running on the same network, it may disturb the network. To avoid any possible problem related to the NOE's DHCP server on the corporate network, ensure that the DHCP server is not running in the NOE by not having address entries in the configuration. If there are no configured devices in the Address server configuration page (see *Address Server Configuration/Faulty Device Replacement*, p. 213), then the NOE will not start the DHCP server.

Faulty Device Replacement

Faulty device replacement and the address server are discussed in detail at *Address Server Configuration/Faulty Device Replacement* (see *Address Server Configuration/Faulty Device Replacement*, p. 213).

SNMP and Schneider Private MIB Overview

Overview	Simple Network Management Protocol (SNMP) is configured on your NOE or 140 CPU 651 x0.
Introduction	Network management software allows a network manager to: • monitor and control network components • isolate problems and find their causes • query devices, such as a host computer(s), routers, switches, and bridges, to determine their status • obtain statistics about the networks to which they are attached
Simple Network Management Protocol	Your NOE module or 140 CPU 651 x0 controller supports the Simple Network Management Protocol (SNMP), which is the standard protocol used to manage a local area network (LAN). SNMP defines exactly how a <i>manager</i> communicates with an <i>agent</i>. The SNMP defines the format of: • requests that a manager sends to an agent • replies that the agent returns to the manager
MIB	Each object to which SNMP has access must be defined and given a unique name. Manager and agent programs must both agree on the names and meanings of the fetch and store operations. The set of all objects SNMP can access is known as a <i>Management Information Base (MIB)</i>.
Private MIB	Schneider obtained a private MIB, Groupe_Schneider (3833). Under the Groupe Schneider private MIB is a Transparent Factory Ethernet (TFE) private MIB. The Transparent Factory SNMP embedded component controls the Schneider private MIB function.

Modbus Messaging

Overview	The following information describes the functionality of the Modbus/TCP server.
The Client	The node that initiates a data transaction is called a <i>client</i> . All Modicon Quantum Ethernet modules provide the user with the capability to transfer data to and from nodes on a TCP/IP network using a communication instruction. All PLCs that support networking communication capabilities over Ethernet can use either the MSTR Ladder Logic instruction to read or write controller information or IEC communication blocks.
The Server	The node that receives an inquiry is the <i>server</i> . Using the standard Modbus/TCP protocol, all Modicon Quantum Ethernet modules provide access to controller data. Any device, PC, HMI package, another PLC, or any Modbus/TCP compliant device, can access data from the PLC. The Modbus/TCP server also allows programming panels to log into the controller over Ethernet.
Limitations	The Ethernet module supports up to 64 simultaneous Modbus/TCP server connections. To guarantee consistency of changes to the controller configuration, the Ethernet module allows only one programming panel to be logged in at a time. The Ethernet modules supports these Modbus/TCP commands: ● Read Data ● Write Data ● Read/Write Data ● Get Remote Statistics ● Clear Remote Statistics ● Modbus 125 Commands (used by programming panels to download a new exec to the NOE)

Performance

The following table shows the performance characteristics of the Ethernet module's Modbus/TCP server.

Parameter	Value
Typical Response Time (ms)	0.6
Number of Modbus connections (client and server)	64 (NOE 771 x1, NWM 100 00, HE CPU 651 x0) 16 Client (NOE 771 x0) 32 Server (NOE 771 x0)
Number of simultaneous login channels	1

Note: Ethernet module's Modbus/TCP performance measurements are made with a Modicon Quantum 140 CPU 534 14A PLC.

I/O Scanner

Introduction

The functionality of your Ethernet module is further enhanced by the addition of an I/O Scanner, which you can configure with either the Schneider Electric programming panels or on the Ethernet module's embedded Web page.

I/O Scanner Features

NOE version 3.5 and later include these enhancements:

Feature	Availability	Improvement	Description
Improved Timeout and Retry Transmission algorithm	Unity Concept ProWORX	Improves TCP connection management	2004 version uses a variable timeout. Older versions used a fixed timeout. Difference: Faster retransmission rates
Enable/Disable I/O Scanner entry	Unity Concept	Reduces network traffic volume	Use the 'Device Control Block' - Set = 0 Enable channel for normal data exchange - Set = 1 Disable channel Note: Concept Users Concept uses diagnostic words. Set = FF Disable channel
Send Modbus requests across a router	Unity Concept ProWORX	Allows routers to connect remote I/O devices to a controller	Automatic
Dynamic TCP port allocation	Unity Concept ProWORX	Improves connection/disconnection performance	Reserves TCP client ports 3072 (0xC00) through 4992 (0x1380) Allocates ports dynamically
Repetitive rate display	Unity	Check status using GUI	Status displays in I/O Scanning tab of module editor

**I/O Scanner
Parameters**

Functionality of the I/O Scanner.

Parameter	Value
Max. No. of Devices	64: 140 NOE 771 00 (Version 2.2 or earlier) 128: 140 NOE 771 00 (Version 3.0 or later), 140 NOE 771 01, and 140 NOE 771 11 only 128: HE CPU 651 x0
Max. No. of Input Words	4000
Max. No. of Output Words	4000
Health Timeout Value	User configured: 1...65535 ms in 1 ms increments
Last Value (Input)	User configured (zero or Hold)
IP Address	User configured IP address of scanned device (Slave IP)
Local and Remote Register Reference	User configured
Repetitive Rate	User configured: 0...65535 in multiples of: ● 16 ms, for 140 NOE 771 x1 ● 10 ms, for 140 CPU 651 x0
Unit ID	User configured Configure ID only if using a bridge
Operation through a bridge	Modbus bridge: Supported
	Modbus Plus bridge: Supported

The I/O Scanner Concepts topic (see *I/O Scanner Concepts*, p. 200) explains how to configure the I/O scanner.

Performance

Performance data details are provided at I/O Scanner Response Times topic (see *I/O Scanner Response Times: Remote Input to Remote Output*, p. 210).

Global Data

Overview

The Global Data service is a real-time publisher/subscriber mechanism providing the most efficient data exchange for PLC application coordination.

Devices that support Global Data are arranged in a distribution group for the purpose of application variable exchange and synchronization. Each Global Data device can publish up to one network (application) variable and subscribe up to 64 network (application) variables.

The Quantum NOE's embedded Global Data Configuration Page (see *Configuration of Global Data (Publish/Subscribe) by the Web for NOE 771 x1*, p. 195) provides a configuration screen to determine which and how many application variables are exchanged with this service. After configuration, the exchanges between all stations belonging to the same distribution group are done automatically.

The Global Data service uses %MW words (4x registers) for Global Data exchanges.

Key Features of Global Data

The main features for Global Data are:

- One publisher and multiple subscribers
- A device can publish one network variable of up to 512 %MW words (4x registers)
- A device can subscribe to several network variables of up to 2048 %MW words (4x registers)
- A device subscribes to the complete network variable
- One distribution group per network IP address
- Application defined publication rate
- Up to 64 Global Data network variables (numbered from 1 to 64) can be part of the data distribution group
- An NOE has only one multicast address; consequently, it can only publish and subscribe inside the group
- A device can participate in several distribution groups by using multiple NOEs in the rack

Global Data's publish/subscribe mechanism allows multiple subscribers to receive a single data transmission. This is an advantage over client/server services, which require multiple transmissions to specific destinations. There are two immediate benefits:

- reduces overall network traffic
 - ensures tighter synchronization of multiple subscribers
-

Time Synchronization Service

General

The time service synchronizes computer clocks over the Internet. For example, the time of one client is synchronized either with another server or to a referenced time source like a radio or satellite receiver.

Typical time service configurations utilize multiple redundant servers and diverse network paths to achieve high accuracy and reliability. Time service accuracy can be within a millisecond on LANs and up to a few tenths of milliseconds on WANs.

Use the time service for:

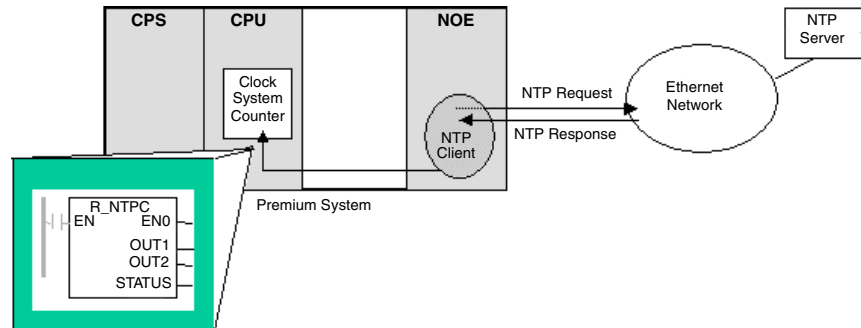
- event recording: sequence events
- event synchronization: trigger simultaneous events
- alarm and I/O synchronization: time stamp alarms

Time Synchronization and Time Stamps

On an Ethernet network, all controllers should be synchronized with the same clock time, which is provided by an NTP server. In each application program, events or application data (I/O values for example) can be time stamped using the application stacks.

The Modicon Quantum Ethernet interface module, an NOE 771 11, connects to an NTP time server and provides the source-time synchronization signal, which is sent to the CPU.

To read the clock, a function block is used in the controller's project (application program):



Electronic Mail Notification Service

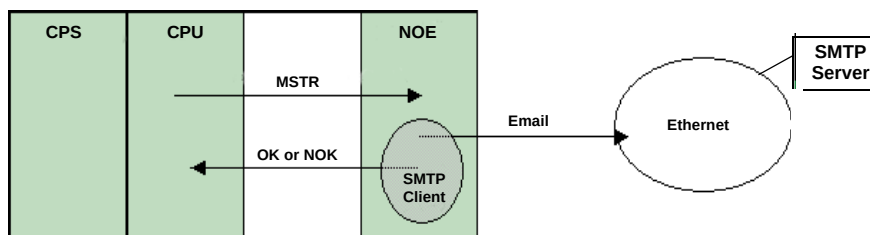
General

The electronic mail notification service allows controller-based projects to report alarms or events. The automation controller monitors the system and can automatically create an electronic mail message alert with data, alarms, and/or events. Mail recipients can be either local or remote.

- Based on predefined events or conditions, messages are created using the MSTR function block.
- The email message is constructed from predefined headers plus variables and text (a maximum of 238 bytes). This message is sent directly from the automation system to the local email server.
- Mail headers contain common predefined items—recipient list, sender name, and subject. These items can be updated by an authorized administrator.

Mail Service Client

The NOE 771 x1 and 140 CPU 651 x0 modules include an SMTP client. When the module receives a specific request from the controller, the module sends an email message to the mail server.



Bandwidth Monitoring

Overview

Bandwidth Monitoring allows the user to access and monitor the NOE's CPU allocation for each of the following services:

- Global Data (see *Global Data (Publish / Subscribe) Utility*, p. 187)
- I/O scanning (see *I/O Scanner*, p. 199)
- Modbus messaging (see *Modbus Messaging*, p. 85)

The Bandwidth Monitoring service retrieves workload data and returns one of two pieces of information: whether the module has free resources or whether the module is working at capacity. Knowing the resource allocation helps you:

- assess resource allocation
- determine the number of NOEs needed in a system

Note: Users who want to use Bandwidth Monitoring do not need to develop a new set of access functions. The actual NOE CPU load is computed each second.

**Bandwidth
Monitoring Load
Rates**

The Bandwidth Monitoring service checks once a second and computes four (4) values in private data. These values are returned as the percentage of the NOE's CPU that is allocated to:

- Global Data (see *Global Data (Publish / Subscribe) Utility*, p. 187)
- I/O scanner (see *I/O Scanner*, p. 199)
- Modbus messaging (see *Modbus Messaging*, p. 85)
- other services and idle

CPU time spent in other services is shown as "Other" or "Free." Bandwidth Monitoring uses the same functions as used by SNMP.

The three service rates, Global Data, I/O Scanner, and Messaging, are computed using the following formula:

$$(\text{Current load} * 100) / \text{Maximum Load}$$

The table shows the (dynamically computed) **Maximum Load Rate** for the NOE 771 x1:

Diagnostic Service	Workload Data Returned	Maximum Load
Global Data	Number of published variables per second	800
I/O Scanner	Number of transactions per second	4200
Messaging	Number of messages treated per second	410

Note: The loads depend on controller scan times. Each application has an expected scan time. Therefore, when evaluating loads, ensure that the controller scan time is set to the expected scan time for the modeled application.

FTP Server

Overview The following information describes the services provided by the FTP Server. The FTP server is available on all NOE 771 xx and CPU 651 x0 modules.

FTP Server The NOE 771 xx's and CPU 651 x0's FTP server is available as soon as the module receives an IP address. Any FTP client can log on to the module, which requires the client use the correct user name and password.

- The FTP Server can:
- update the NOE's firmware by downloading a new Exec
 - provide error log visibility by uploading error log files
 - upload/download BOOTP server and SNMP configuration files

Note: There is only one FTP client per module.

The FTP server is protected with a default user name and password.

Default user name	USER case-sensitive
Default password	USERUSER case-sensitive
See the FTP password (see <i>Establishing the FTP Password</i> , p. 68) topic to change the password or add/delete usernames on the FTP server.	

Embedded Web Pages—HTTP Server, Web Configuration and Diagnostics

HTTP Server

The Modicon Quantum with Unity Ethernet modules' Hypertext Transport Protocol (HTTP) server is available as soon as the module receives an IP address.

Use the HTTP Server to:

1. view . . .

- the module's Ethernet statistics
- the controller and I/O information
- the server information (BOOTP/DHCP/FDR)
- the diagnostic information for some Ethernet services

2. configure the module's Ethernet services

Use Internet Explorer version 4.0 or higher. For a complete list of services, see the Key Features table (see *Key Ethernet Services*, p. 46).

The HTTP server is protected with a default user name and password.

Default user name	USER case-sensitive
Default password	USER case-sensitive
Change either the user name or password via the Configuration page on the Ethernet modules' embedded web pages (see <i>Embedded Web Pages—HTTP Server, Web Configuration and Diagnostics</i> , p. 95). For the NOE 771 11 modules, user names and passwords can be changed via the FactoryCast Configurator.	

Note: The NOE 771 xx and CPU 651 xx support a maximum of 32 HTTP simultaneous connections. Browsers may open multiple connections so 32 HTTP connections do not indicate 32 simultaneous users.

Note: The NOE 771 00 and NOE 771 01 modules do not support user downloaded Web pages. You will need to purchase either the NOE 771 10, NOE 771 11, or the NWM 100 00 module to support user downloaded Web pages.

Web Diagnostics The embedded Web server provides Web pages to diagnose the following Transparent Factory/Real Time services.

Diagnostic Service	Description
Global Data (see <i>Global Data</i> , p. 89)	● status of all Global Data services ● status of all subscribed and published variables ● publication/subscription rate
I/O Scanning (see <i>I/O Scanner</i> , p. 87)	● status of all I/O Scanning services ● status of individual scanned devices ● actual I/O scanning rate
Messaging (see <i>Modbus Messaging</i> , p. 85)	● diagnostic information for Port 502 messaging
Time Synchronization (see <i>Time Synchronization Service</i> , p. 90)	● status of client and link to the server ● date and time ● status of Daylight Saving Time (DST) option
Electronic Mail Notification (see <i>Electronic Mail Notification Service</i> , p. 91)	● status of SMTP server ● track messages sent and received ● track errors
Bandwidth Monitoring (see <i>Bandwidth Monitoring</i> , p. 92)	● throughput measurement of NOE by service

Note: All these pages are protected by the general HTTP password.
--

Web Configuration Elsewhere in this guide is a description of the web configuration pages (see *Embedded Web Pages—HTTP Server, Web Configuration and Diagnostics*, p. 95).

Additional Ethernet Services

Hot Standby

The Ethernet Hot Standby system consists of two identical Modicon Quantum systems. Each Quantum system contains:

- a Modicon Quantum Hot Standby with Unity controller (140 CPU 671 xx0)
- a remote I/O head
- NOE 771 xx modules (no more than six)
- a power supply

The Hot Standby modules are connected to each other via a fiber-optic cable. Both remote I/O heads are connected to the remote I/O network and to each other.

Schneider Electric recommends:

1. remote I/O networks use redundant cables (drops are not redundant)
 2. switch connecting the NOEs to the network. Available switches are:
 - 499NES17100
 - 499NOS17100
-

FactoryCast and User Customizable Web Pages

FactoryCast is a software package that you use to customize a Web site on the embedded Web server module. The site can be accessed via a browser to view and modify data from a Modicon Quantum with Unity controller (PLC).

FactoryCast provides all the Web pages and Java applets you need to view run-time data from your controller. You can use the FactoryCast default Web site simply by configuring the module and accessing it with a browser over an intranet.

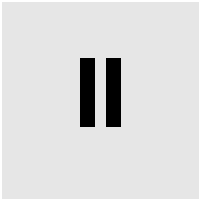
Modules that use FactoryCast to add customized web pages on a site are:

- NOE 771 10
 - NOE 771 11
 - 140 NWM 100 00
-

Flash File System

The NOE 771 xx modules are equipped with a Flash File System, which allows changing or updating the executive, kernel, and Web site files by an upload.

Modicon Quantum with Unity Ethernet Modules Services



At a Glance

Purpose	This part introduces the Ethernet services available with Modicon Quantum with Unity Ethernet modules.		
What's in this Part?	This part contains the following chapters:		
	Chapter	Chapter Name	Page
	3	Start Communication with Unity Pro	101

Start Communication with Unity Pro



At a Glance

Introduction This chapter tells you how to begin Ethernet network configuration with Unity Pro.

What's in this Chapter? This chapter contains the following sections:

Section	Topic	Page
3.1	How to Configure the Communication	103
3.2	Unity Soft Communication Links	108
3.3	Selecting the Ethernet Module	112
3.4	Selecting the Ethernet Coprocessor	117

3.1 How to Configure the Communication

Overview

Overview

This section describes how to configure the communication.

What's in this Section?

This section contains the following topics:

Topic	Page
Add a New Network to the Communication folder	104
Configure Network	105
Properties of a network	106
Delete an existing network folder	107

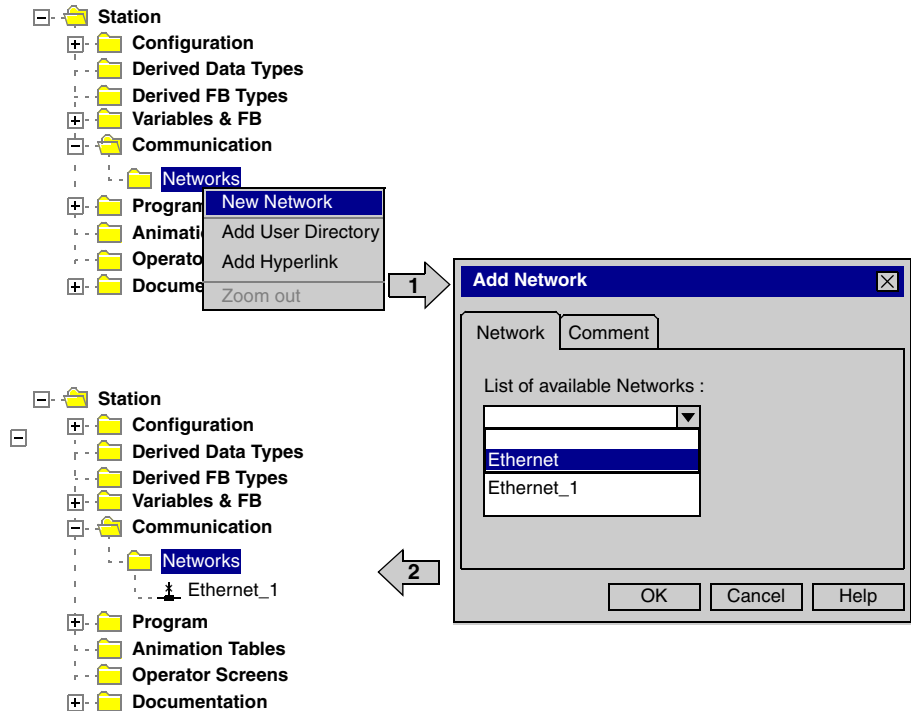
Add a New Network to the Communication folder

Add a New Network to the Communication Folder

After starting a new application, the **Communication** folder under the **Station** tree branches the **Network** folder and the **Routing** table folder (Premium platforms only). These two folders are empty. Under the **Network** folder, the user can insert the networks by menu. A click on the right mouse-button above **Network** pops up a contextual menu. The user selects the type of network he wants to add. For easier use, a network name will be suggested with the prefix of the network type (**Ethernet_1** or **Modbus+_1**). By choosing a new network the next available number for the network is chosen automatically, for example, **Ethernet_1** then **Ethernet_2** and so on. At any moment, the user may rename any NetLink.

The user can also attach a comment that describes each configured network. The OK button adds the network as subfolder.

The names of network nodes are also called NetLink. These are the names of logical networks.

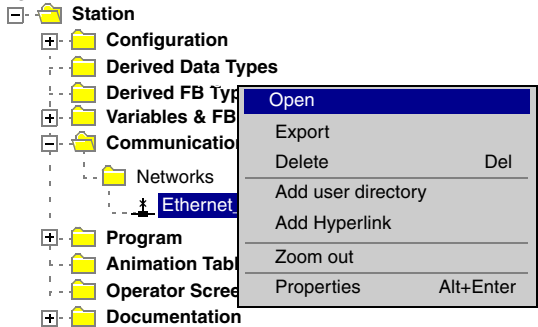


Configure Network

Configure Network

On the network folder, by a double-clicking action or by the Open item on contextual menu, the editor of the corresponding communication screen is opened in order to set the specific network services.

The figure shows the contextual menu to start network properties.

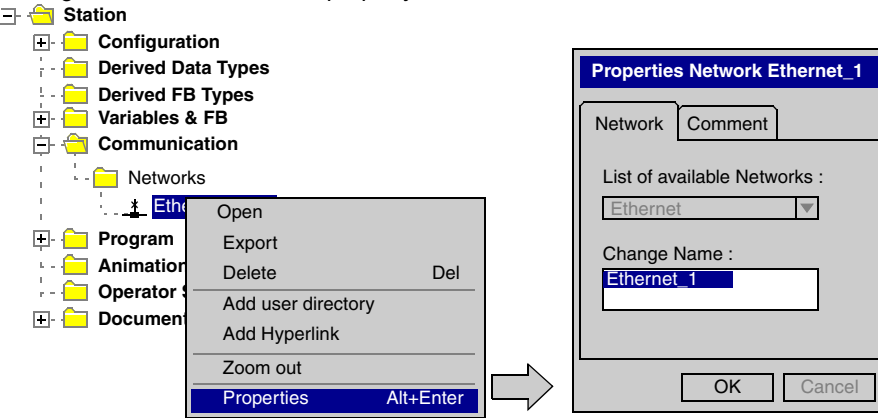


Properties of a network

Properties of a network

The contextual menu proposes the user to see again the properties of a configured network. Here, the user can change the NetLink name and the associated comment.

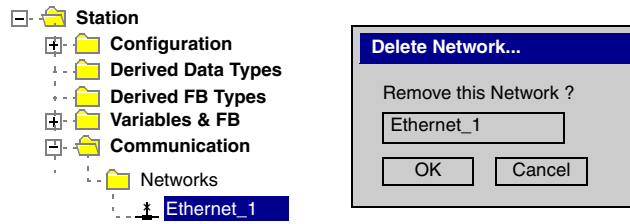
The figure shows the Ethernet property window



Delete an existing network folder

Delete an existing network folder

With a right-mouse-click above the network folder, a contextual menu appears. Here the user is able to delete the network configuration. In this case, the subfolder of the network will also be removed in application browser.



Note: If this removed network was previously attached to a communication module, this module loses its link and it will work with its default parameters.

3.2 Unity Soft Communication Links

At a Glance

Overview This section presents the principle of communication implementation and describes the relationship between software configuration of networks and the hardware configuration of the network controllers.

What's in this Section? This section contains the following topics:

Topic	Page
Communication Configuration Principle	109
Link between Configuration and Communication	110
Link between data and communication	111

Communication Configuration Principle

Introduction

The configuration of communication links between different devices with Unity Soft includes three different configuration parts.

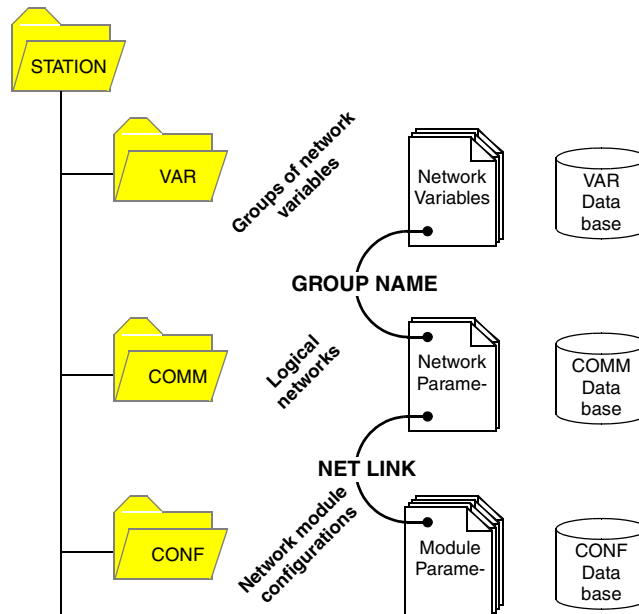
- configuration of the network controller
- configuration of the logical network
- configuration of network variables

Configuration

The communication configuration supports the *free mode* of Unity Soft. That means the user can first configure the module and then the communication or the user can configure the communication and then the module.

This will be provided through a NetLink that must be selected in the module configuration. The network variables including in the VAR folder are linked with a group name that defines an IP domain over Internet network.

The illustration shows the three parts involved in communication configuration:



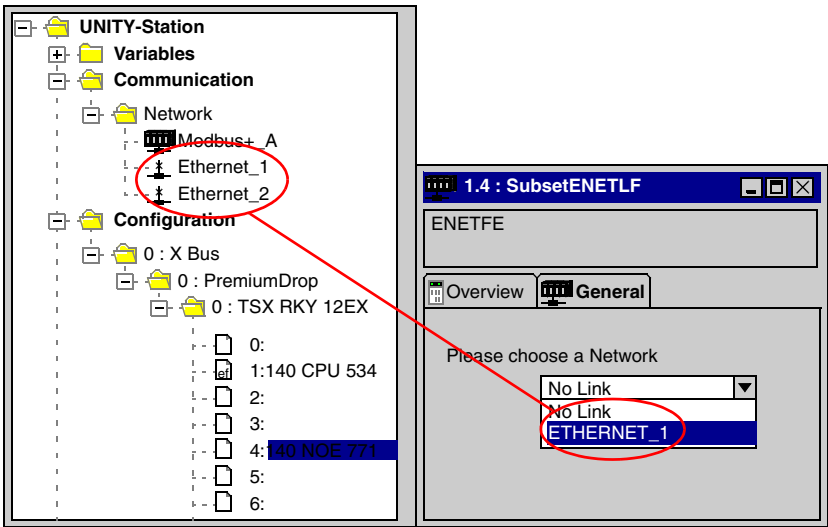
Link between Configuration and Communication

NetLinks

During Unity Pro application design, the NetLinks are created and inserted on sub-folder Communication under Network. These are the names of logical networks.

Under configuration folder, on the communication module node included in the current station, the list of existing NetLinks is proposed to select and attach one network to one module. Only the NetLink that can be managed by this module, are displayed in the list box on module configuration screen. No NetLink can be edited and created here (no edit box), but this list contains at least the No_Link field.

The following figure shows the window for the Ethernet link for the Quantum NOE module.



Attaching a NetLink to a Module

When a network is attached to a module, the icon of the corresponding node is changed and the network editor displays the address of the module in the rack .

The Icon in the Network folder indicates whether the link is attached to a module or not:

	Icon when no communication module is attached to the NetLink
	Icon when a communication module has been attached to the NetLink

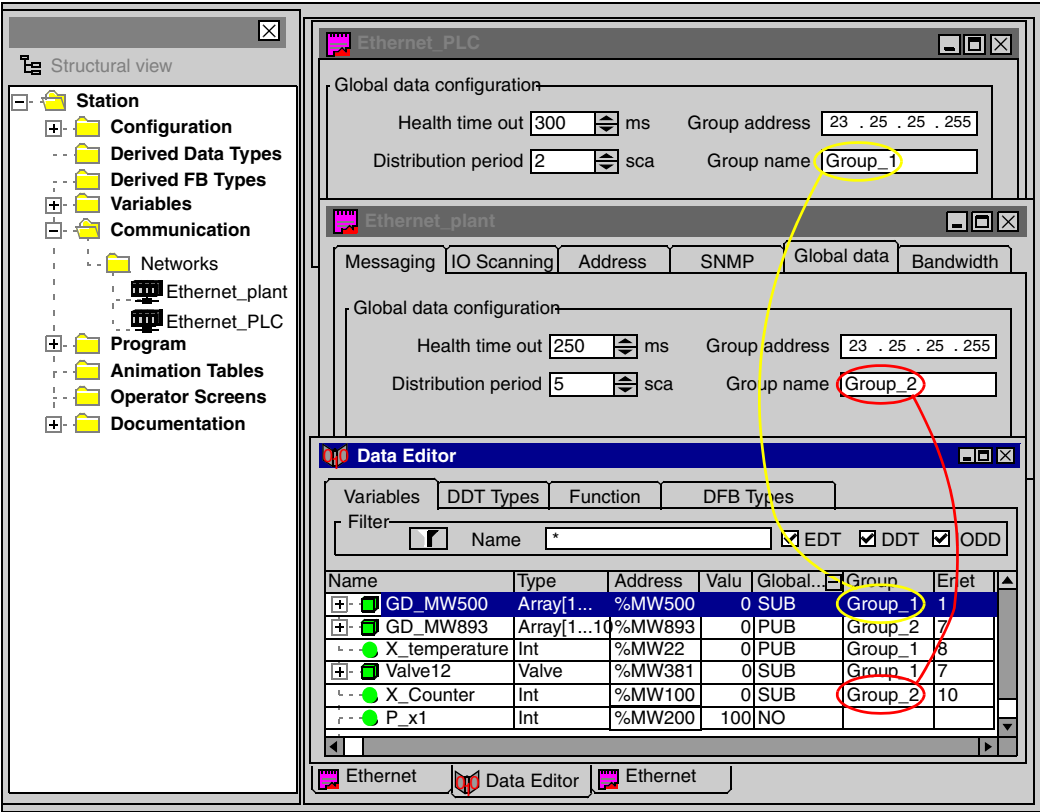
Link between data and communication

Network Variables and Groups

The groups of Ethernet network variables are created in the Ethernet network communication folders. An IP domain determines a group. In Unity Pro, one network can support only one group.

In Data Editor, the list of all current groups is provided to select in which group each Ethernet network variables is included. Nevertheless, the group field is also a free entry editing box, in order to give a group name not yet defined in communication folder. The build step checks this link.

The illustration shows corresponding fields in Communication configuration and the Data Editor:



3.3 Selecting the Ethernet Module

At a Glance

Introduction This chapter contains the software page *Selecting the Quantum NOE/NWM Ethernet Module*. The module families are the communication modules 140 NOE 771 xx, 140 NWM 100 00, and the processor module CPU 651 x0.

Note: The web page settings described only apply to the communication modules. The processor modules only offer the possibility for diagnostics via the web.

What's in this Section?

This section contains the following topics:

Topic	Page
Selecting the Quantum NOE Ethernet Module	113
IP Configuration	115
Quantum NOE Ethernet Messaging Configuration	116

Selecting the Quantum NOE Ethernet Module

General Description

After configuring Ethernet communication (see *Add a New Network to the Communication folder*, p. 104), the Ethernet module parameters can be configured.

When you select the model family, all the corresponding communication module configuration options are displayed automatically. The module services allow the following settings to be made:

Setting	Description
No	Setting deactivated
Yes	Setting activated. Parameters are set using the Unity Pro menu window.
Web	Setting activated. Parameters are set using the configured NOE Web pages. Unity Pro menu window deactivated. Note: Not available for every model family.

Note: The availability of the displayed settings depends on the selected model family and can vary.

The screen shot shows an example of the menu window of the Ethernet module NOE 771 x1 (TCP/IP 10/100 Regular connection).

Parameter description:

Parameter	Description
Model family	Quantum NOE Ethernet Module settings
Module address	Not used
Module utilities	For module service configuration options, see above
Module IP address	Overview of the IP address parameter set

After selecting the model family **TCP/IP 10/100 Regular Connection**, the following mask appears. The image also displays the activated module services.

ETHERNET_1

Model Family: TCP/IP 10/100 Regular Connection

Modul Address: Rack: , Module:

Module IP Address: IP Address: 0.0.0.0, Subnetwork Mask: 0.0.0.0, Gateway Address: 0.0.0.0

Module Utilities: YES Messaging, YES I/O Scanning, YES Global Data, YES SNMP, YES Address Server

IP Configuration | Messaging | I/O Scanning | Global Data | SNMP | Address Server | Bandwidth

IP Address Configuration: ☒ Configured, ☐ From a server, ☐ WEB Configurator

IP address: 13.12.10.14, Subnetwork mask: 25.25.0.0, Gateway address: 13.12.10.1

Ethernet configuration: ☒ Ethernet II, ☐ 802.3

Note: The availability of the displayed register depends on the selected model family and can vary.

After selecting the **Yes** option in module services, the tab corresponding to the module is activated.

IP Configuration

General Description

The **IP configuration** tab enables you to configure IP address settings for the Quantum Ethernet module. IP address settings become active after:

- the hardware is connected
- the configuration is downloaded to the PLC in the Quantum Ethernet module

The following figure shows the IP configuration for the Quantum Ethernet model family:

The screenshot shows the 'ETHERNET_1' configuration window. The 'Module Family' is set to 'TCP/IP 10/100 Regular Connec-'. The 'Module Address' section has 'Rack' and 'Module' fields. The 'Module IP Address' section shows 'IP Address' as '0 . 0 . 0 . 0', 'Subnetwork Mask' as '0 . 0 . 0 . 0', and 'Gateway Address' as '0 . 0 . 0 . 0'. The 'Module Utilities' section has checkboxes for 'Messaging', 'I/O Scanning', 'Global Data', 'SNMP', and 'Address Server', all of which are currently checked. Below this is a tabbed interface with 'IP Configuration' selected. The 'IP Address Configuration' section has a radio button for 'Configured' (selected), with fields for 'IP address' (13 . 12 . 10 . 14), 'Subnetwork mask' (25 . 25 . 0 . 0), and 'Gateway address' (13 . 12 . 10 . 1). There are also radio buttons for 'From a server' and 'WEB Configurator'. The 'Ethernet configuration' section has radio buttons for 'Ethernet II' (selected) and '802.3'.

Description of the selection properties

Selection	Description
Configured	Activate the IP address, subnet mask, and gateway address. The data is activated after the configuration is downloaded to the PLC.
Client / Server	The Quantum NOE Ethernet module receives its IP address parameter through a BOOTP server on startup.
Web configuration	The IP address parameter settings are made on the embedded Web page of the Quantum NOE Ethernet module.
Ethernet configuration	Select the default protocol as Ethernet or 802.3.

Quantum NOE Ethernet Messaging Configuration

Introduction

Ethernet messaging gives the user the opportunity to send and receive Ethernet messages. Data traffic is handled by the client/server procedure.

The following figure shows the Ethernet Messaging dialog box.

The screenshot shows the 'ETHERNET_1' dialog box. It has several sections: 'Model Family' with a dropdown set to 'TCP/IP 10/100 Regular Connec-'; 'Module Address' with 'Rack' and 'Module' input fields; 'Module IP Address' with 'IP Address', 'Subnetwork Mask', and 'Gateway Address' fields, all showing '0 . 0 . 0 . 0'; and 'Module Utilities' with checkboxes for 'Messaging', 'I/O Scanning', 'Global Data', 'SNMP', and 'Address Server', all set to 'YES'. Below these is a tabbed interface with tabs for 'IP Configuration', 'Messaging', 'I/O Scan-', 'Global Data', 'SNMP', 'Address', and 'Bandwidth'. The 'Messaging' tab is selected, showing a 'Connection configuration' section with a table of 12 rows. Each row has an 'Access' checkbox (all checked) and a 'Slave IP Address' field. The addresses are: 139.124.10.11, 100.32.0.12, 100.32.0.11, 100.32.0.10, 100.32.0.14, 139.124.10.12, 139.124.10.13, 100.32.0.12, 100.32.0.18, 100.32.0.10, 139.124.10.15, and an empty field for row 12.

	Access	Slave IP Address
1	☒	139.124.10.11
2	☒	100.32.0.12
3	☒	100.32.0.11
4	☒	100.32.0.10
5	☒	100.32.0.14
6	☒	139.124.10.12
7	☒	139.124.10.13
8	☒	100.32.0.12
9	☒	100.32.0.18
10	☒	100.32.0.10
11	☒	139.124.10.15
12	☒	

Parameter description:

Setting	Description
Connection configuration	Activates general data transfer
Access	Activates data transfer between specific nodes
Slave IP address	Defines the node for the Ethernet Messaging procedure

3.4 Selecting the Ethernet Coprocessor

At a Glance

Introduction This section describes configuring the Modicon Quantum with Unity coprocessor, 140 CPU 651 x0.

What's in this Section? This section contains the following topics:

Topic	Page
Selecting the Modicon Quantum with Unity Ethernet Controller	118
Configuring the IP Address of the Ethernet Controller	120
Modicon Quantum with Unity Ethernet Controller Messaging Configuration	121

Selecting the Modicon Quantum with Unity Ethernet Controller

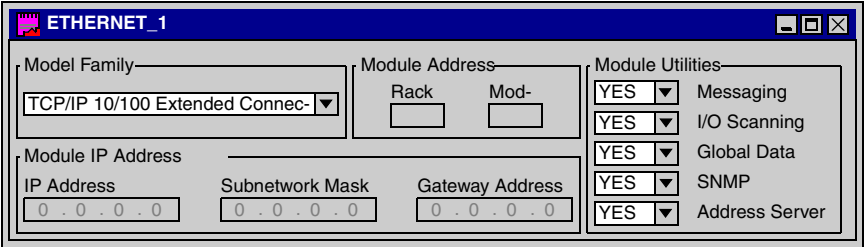
General description

After configuring Ethernet communication (see *Add a New Network to the Communication folder*, p. 104), the Ethernet module parameters can be configured. When you select the model family, all the corresponding communication-module configuration options display automatically. The module services allow the following settings to be made:

Setting	Description
No	Setting deactivated
Yes	Setting activated. Parameters are set using the Unity Pro menu window.

Note: The availability of the displayed settings varies and depends on the selected model family.

The screen shot shows an example of the menu window of the Ethernet module CPU 651 x0 (TCP/IP 10/100 Extended connection).



Parameter description:

Parameter	Description
Model family	Modicon Quantum with Unity Ethernet module settings
Module address	Not used
Module utilities	For module service configuration options, see above
Module IP address	Overview of the IP address parameter set

After selecting the model family **TCP/IP 10/100 Extended Connection**, the following mask appears. The image also displays the activated module services.

ETHERNET_1

Model Family: TCP/IP 10/100 Extended Connec-

Module Address: Rack: , Module:

Module IP Address: IP Address: 0.0.0.0, Subnetwork Mask: 0.0.0.0, Gateway Address: 0.0.0.0

Module Utilities: YES Messaging, YES I/O Scanning, YES Global Data, YES SNMP, YES Address Server

IP Configuration | Messaging | I/O Scan- | Global Data | SNMP | Address Server | Bandwidth

IP Address Configuration: ☒ Configured

IP address: 13.12.10.14

Subnetwork mask: 25.25.0.0

Gateway address: 13.12.10.1

☐ From a server

☐ WEB Configurator

Ethernet configuration: ☒ Ethernet II, ☐ 802.3

Note: The availability of the displayed register depends on the selected model family and can vary.

After selecting the **Yes** option in module services, the tab corresponding to the module is activated.

Configuring the IP Address of the Ethernet Controller

General description

The **IP configuration** tab enables you to configure the IP address settings. The settings are activated after the connection to the hardware and the configuration is downloaded to the Modicon Quantum with Unity Ethernet controller, 140 CPU 651 x0.

The diagram shows the IP configuration for the Modicon Quantum with Unity Ethernet controller, 140 CPU 651 x0.

The screenshot shows the 'ETHERNET_1' configuration window. The 'Model Family' is set to 'TCP/IP 10/100 Extended Connection'. The 'Module Address' section has 'Rack' and 'Module' fields. The 'Module IP Address' section has 'IP Address' (0.0.0.0), 'Subnetwork Mask' (0.0.0.0), and 'Gateway Address' (0.0.0.0). The 'Module Utilities' section has checkboxes for 'Messaging', 'I/O Scanning', 'Global Data', 'SNMP', and 'Address Server', all of which are checked. The 'IP Configuration' tab is selected, showing 'IP Address Configuration' with radio buttons for 'Configured' (selected), 'From a server', and 'WEB Configurator'. The 'Configured' section has fields for 'IP address' (13.12.10.14), 'Subnetwork mask' (25.25.0.0), and 'Gateway address' (13.12.10.1). The 'Ethernet configuration' section has radio buttons for 'Ethernet II' (selected) and '802.3'.

Description of the selection properties

Selection	Description
Configured	Activate the IP address, Subnet mask and Gateway address. The data is activated after the configuration is downloaded to the controller.
Client / Server	The Modicon Quantum with Unity Ethernet controller receives its IP address parameter through a BOOTP server on startup.
Web configuration	The IP address parameter settings are made on the embedded Web page of the Modicon Quantum with Unity Ethernet controller.

Modicon Quantum with Unity Ethernet Controller Messaging Configuration

Introduction

Send and receive messages though the Ethernet. Data traffic is handled by the Client / Server procedure.

The illustration shows the Ethernet Messaging dialog box.

ETHERNET_1

Model Family

TCP/IP 10/100 Extended Connection

Module Address

Rack

Module

Module IP Address

IP Address

Subnetwork Mask

Gateway Address

Module Utilities

Messaging

I/O Scanning

Global Data

SNMP

Address Server

IP Configuration

Messaging

I/O Scanning

Global Data

SNMP

Address

Bandwidth

Connection configuration

	Access	Slave IP Address
1	☒	139.124.10.11
2	☒	100.32.0.12
3	☒	100.32.0.11
4	☒	100.32.0.10
5	☒	100.32.0.14
6	☒	139.124.10.12
7	☒	139.124.10.13
8	☒	100.32.0.12
9	☒	100.32.0.18
10	☒	100.32.0.10
11	☒	139.124.10.15
12	☒	

Parameter description

Setting	Description
Connection configuration	Activates general data transfer
Access	Activates data transfer between specific nodes
Slave IP address	Defines the node for the Ethernet Messaging procedure

Using the Modicon Quantum with Unity Ethernet Services



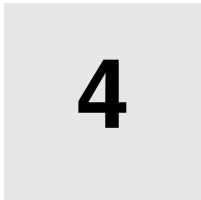
At a Glance

Purpose This part describes how to use the Ethernet services available on Modicon Quantum with Unity Ethernet modules.

What's in this Part? This part contains the following chapters:

Chapter	Chapter Name	Page
4	Transferring Data Using Communication Blocks	125
5	Global Data (Publish / Subscribe) Utility	187
6	I/O Scanner	199
7	Address Server Configuration/Faulty Device Replacement	213
8	Network Management Service (SNMP)	223
9	NTP Time Synchronization Service	243
10	Electronic Mail Notification Service	255
11	Embedded Web Pages	265
12	Hot Standby	309

Transferring Data Using Communication Blocks



Overview

Introduction This chapter describes how to transfer data to and from nodes on a TCP/IP network using communication blocks. You transfer the data using either a special MSTR instruction (the Master instruction of the 984 Ladder Logic instruction set) or an IEC Logic function. Operational statistics and error codes for reading and writing the controller information are included.

What's in this Chapter? This chapter contains the following sections:

Section	Topic	Page
4.1	Communications Issues	127
4.2	IEC Data Transfer Functions	129
4.3	MBP_MSTR	146

4.1 Communications Issues

Overloaded Network

Overview	If a NOE771xx is used to run in a 100Mb/s Ethernet and a persistent overloaded network occurs, the NOE771 may go into Kernel mode. This could the cause the primary CPU to STOP.
Example	An example of a persistent overloaded network would be when two ports of an Ethernet switch are linked to each other: this would be seen by all Ethernet nodes connected to the sub-network and result in a massive overloaded network - something that should not occur on properly configured network. Note: Broadcasts and especially ARPs, are part of standard Ethernet traffic and will have no adverse effects on a NOE. Even "small" storms that take up to 5% of the basic network traffic over short periods (from several seconds to 2-3 minutes) would not overload the NOE. It is only the massive and enduring overloaded network (such as those created by a looped nework cable) that can cause problems of the HSBY system with NOEs.
Impact on CPU	In order to serve the backplane communication, the NOE has direct access (DMA) to the memory of the CPU module. Therefore, if the NOE goes into Kernel mode while accessing the CPU, this may have an impact on the CPU behavior. In rare cases, it can even cause the Primary CPU to STOP.

**Recommended
Actions**

Take the following steps to protect against the unwanted effects of excessive broadcast traffic:

Step	Action
1	Reduce the speed of the port allocated to communicate with the respective NOEs from 100Mb/s to 10Mb/s.
2	Limit the potential effects of an overloaded network to the NOE by filtering it with an appropriate ConneXium switch set, with a limit of 500 packets per second. (Schneider Electric offers a line of a configurable ConneXium switch, capable of broadcast limiting.)
3	If the Ethernet switch must be set at 100Mb/s speed, the set the watchdog timer to 1.5 seconds (independent of the number of NOEs). Otherwise, if the watchdog timer is set too low, the the remaining system may also stop working if a persistent overloaded network occurs.

4.2 IEC Data Transfer Functions

At a Glance

Overview This section describes several IEC function blocks that manage data transfer to and from nodes on a TCP/IP network.

What's in this Section? This section contains the following topics:

Topic	Page
CREAD_REG	130
CWRITE_REG	134
READ_REG	138
WRITE_REG	141
TCP_IP_ADDR	144

CREAD_REG

Function Description

The CREAD_REG block reads register data continuously from an addressed node via TCP/IP-Ethernet.

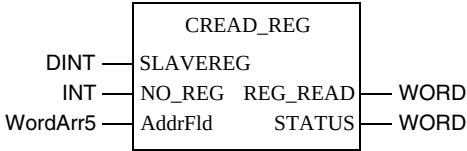
EN and ENO can be projected as additional parameters.

Note: About this function block:

- When programming this function, you must be familiar with the routing procedures used by your network.
- For technical reasons, this function block does not allow the use of ST and IL programming languages.

Representation

Block representation:



Parameter Description

Description of parameters:

Parameter	Data Type	Meaning
SLAVEREG	DINT	offset address of the first %MW word (4x register) in the slave to be read from
NO_REG	INT	number of registers to be read from slave
AddrFld	WordArr5	data structure describing the TCI/IP address
REG_READ	WORD	first %MW word (4x register) for read values
STATUS	WORD	error code

**Elementary
Description for
WordArr5 with
TCP/IP Ethernet**

Elementary description for WordArr5 with TCP/IP Ethernet:

Element	Data Type	Meaning
WordArr5[1]	WORD	Low value byte: MBP on Ethernet Transporter (MET) mapping index High value byte: Slot of the NOE module
WordArr5[2]	WORD	Byte 4 (MSB) of the 32-bit destination IP address
WordArr5[3]	WORD	Byte 3 of the 32-bit destination IP address
WordArr5[4]	WORD	Byte 2 of the 32-bit destination IP address
WordArr5[5]	WORD	Byte 1 (LSB) of the 32-bit destination IP address

**Function Mode of
the CREAD_REG
Block**

Although a large number of CREAD_REG function blocks can be programmed, only sixteen read operations may be active at the same time. In such a case it is insignificant whether they are the result of this function block or others (for example, MBP_MSTR, MSTR, READ_REG). All function blocks use one data transaction path and require multiple cycles to complete a job.

Note: A TCP/IP communication between a Quantum PLC (NOE 771 ••) and a Momentum PLC (all TCP/IP CPUs and all TCP/IP I/O modules) is only possible, when only one read or write job is carried out in every cycle. If several jobs are sent per PLC cycle, the communication stops without generating an error message in the status register of the function block.

Note: A TCP/IP communication between a Quantum PLC (NOE 211 00) and a Momentum PLC (all TCP/IP CPUs and all TCP/IP I/O modules) is only possible, when only one read or write job is carried out in every cycle. If several jobs are sent per PLC cycle, the communication stops without generating an error message in the status register of the function block.

The entire routing information is contained in data structure WordArr5 of input AddrFld. The type of function block connected to this input and thus the contents of the data structure depends on the network used.

Please use:

- TCP/IP Ethernet: the function block TCP_IP_ADDR

Note: For experts: The WordArr5 data structure can be used with constants as well.

Note: This function block puts a heavy load on the network; therefore the network load must be carefully monitored. If the network load is too high, the program logic should be reorganized in order to work with the READ_REG function block, a variation of this function block that does not operate in a continuous mode, but under command control.

SLAVEREG	SLAVEREG is the start of the area in the addressed slave from which the source data is read. The source area always resides within the %MW word (4x register) area. SLAVEREG expects the source reference as offset within that area. (In 4x registers, the leading "4" must be omitted. For example, "59" (contents of the variables or value of the literal) = 40059). The parameter can be specified as direct address, located variable, unlocated variable, or literal.
NO_REG	NO_REG is the number of registers to be read from the addressed slave (1 ... 100). The parameter can be entered as a Direct address, Located variable, Unlocated variable, or Literal.
REG_READ	The REG_READ word parameter addresses the first register in a series of NO_REG registers, listed one after the other, which are used as a destination data area. The parameter must be entered as a Direct address or located Variable.
STATUS	Error code, see Runtime errors. The STATUS parameter can be specified as direct address, located variable, or unlocated variable.

CWRITE_REG

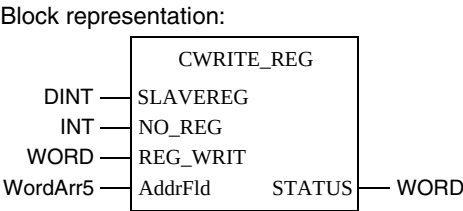
**Function
Description**

This CWRITE_REG block writes data to a register area continuously, transferring data from the PLC via TCP/IP Ethernet to an addressed slave.
EN and ENO can be configured as additional parameters.

Note: About this function block:

- When programming this function, you must be familiar with the routing procedures used by your network.
- For technical reasons, this function block does not allow the use of ST and IL programming languages.

Symbol



**Parameter
Description**

Description of parameters:

Parameter	Data Type	Meaning
SLAVEREG	DINT	offset address of the first %MW word (4x register) in the slave to be written to
NO_REG	INT	number of registers to be written to slave
REG_WRIT	WORD	first %MW word (4x register) of the source data area
AddrFld	WordArr5	data structure for transferring the TCI/IP address
STATUS	WORD	MSTR error code

**Elementary
Description for
WordArr5 with
TCP/IP Ethernet**

Elementary description for WordArr5 with TCP/IP Ethernet:

Element	Data Type	Meaning
WordArr5[1]	WORD	low value byte: MBP on Ethernet Transporter (MET) mapping index high value byte: slots of the NOE module
WordArr5[2]	WORD	byte 4 (MSB) of the 32-bit destination IP address
WordArr5[3]	WORD	byte 3 of the 32-bit destination IP address
WordArr5[4]	WORD	byte 2 of the 32-bit destination IP address
WordArr5[5]	WORD	byte 1 (LSB) of the 32-bit destination IP address

CWRITE_REG
Block Function
Mode

Although a large number of CWRITE_REG function blocks can be programmed, only sixteen write operations may be active at the same time. It makes no difference whether these operations are performed using this function block or others (for example, MBP_MSTR, MSTR, WRITE_REG). All function blocks use one data transaction path and require multiple cycles to complete a job.

If several CWRITE_REG function blocks are used within an application, they must at least differ in the values of their NO_REG or REG_WRITE parameters.

Note: A TCP/IP communication between a Quantum PLC (NOE 771xx) and a Momentum PLC (all TCP/IP CPUs and all TCP/IP I/O modules) is only possible, when only one read or write job is carried out in every cycle. If several jobs are sent per PLC cycle, the communication stops without generating an error message in the status register of the function block.

The entire routing information is contained in data structure WordArr5 of input AddrFld. The type of function block connected to this input and thus the contents of the data structure depend on the network used.

Please use:

- TCP/IP Ethernet: the function block TCP_IP_ADDR

Note: For experts: The WordArr5 data structure can also be used with constants.

Note: This function block puts a heavy load on the network. The network load must therefore be carefully monitored. If the network load is too high, the program logic should be reorganized to work with the WRITE_REG function block, which is a variant of this function block that does not operate in continuous mode but is command driven.

SLAVEREG

SLAVEREG is the start of the area in the addressed slave to which the source data are written. The destination area always resides within the %MW word (4x register) area. SLAVEREG expects the destination address as offset within that area. In 4x registers, the leading 4 must be omitted. For example, 59 (contents of the variables or value of the literal) = 40059.

The parameter can be specified as direct address, located variable, unlocated variable, or literal.

NO_REG	NO_REG is the number of registers to be written to slave processor (1 ... 100). The parameter can be specified as direct address, located variable, unlocated variable, or literal.
STATUS	Error code, see Runtime errors. The STATUS parameter can be specified as direct address, located variable or unlocated variable.
REG_WRIT	The REG_WRIT word parameter addresses the first register in a series of NO_REG Successive registers used as source data area. The parameter must be entered as a direct address or located variable.

READ_REG

Function Description

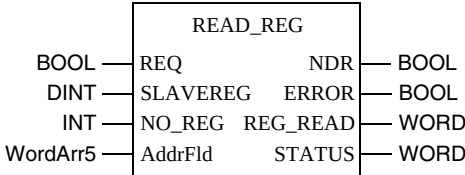
Upon request, the READ_REG block reads a register area once (rising edge of the REQ input). It reads data from an addressed slave via TCP/IP Ethernet.
EN and ENO can be projected as additional parameters.

Note: About this function block:

- When programming this function, you must be familiar with the routing procedures used by your network.
- For technical reasons, this function block does not allow the use of ST and IL programming languages.

Symbol

Block representation:



Parameter Description

Description of block parameters:

Parameter	Data Type	Meaning
REQ	BOOL	start read operation once
SLAVEREG	DINT	offset address of the first %MW word (4x register) in the slave to be read from
NO_REG	INT	number of registers to be read from slave
AddrFld	WordArr5	data structure describing the TCP/IP address
NDR	BOOL	set to 1 for one cycle after reading new data
ERROR	BOOL	set to 1 for one scan in case of error
STATUS	WORD	error code
REG_READ	WORD	first %MW word (4x register) for read values

Elementary Description for WordArr5 with TCP/IP Ethernet

Elementary description for WordArr5 with TCP/IP Ethernet:

Element	Data Type	Meaning
WordArr5[1]	WORD	low value byte: MBP on Ethernet Transporter (MET) mapping index high value byte: Slot of the NOE module
WordArr5[2]	WORD	byte 4 (MSB) of the 32-bit destination IP address
WordArr5[3]	WORD	byte 3 of the 32-bit destination IP address
WordArr5[4]	WORD	byte 2 of the 32-bit destination IP address
WordArr5[5]	WORD	byte 1 (LSB) of the 32-bit destination IP address

Function Mode of READ_REG Blocks

Although a large number of READ_REG function blocks can be programmed, only 16 read operations may be active at the same time. In such a case, it is insignificant whether they are the result of this function block or of other read operations (for example, MBP_MSTR, MSTR, CREAD_REG). All function blocks use 1 data transaction path and require multiple cycles to complete a job.

Note: A TCP/IP communication between a Quantum PLC (NOE 771xx) and a Momentum PLC (all TCP/IP CPUs and all TCP/IP I/O modules) is possible only when 1 read or write job is carried out in every cycle. If several jobs are sent per PLC cycle, the communication stops without generating an error message in the status register of the function block.

The entire routing information is contained in data structure WordArr5 of input AddrFld. The type of function block connected to this input and thus the contents of the data structure depends on the network used.

Please use:

- TCP/IP Ethernet: the function block TCP_IP_ADDR

Note: For experts: The WordArr5 data structure can be used with constants as well.

REQ

A rising edge triggers the read transaction.

The REQ parameter can be specified as direct address, located variable, unlocated variable, or Literal.

SLAVEREG	SLAVEREG is the start of the area in the addressed slave from which the source data is read. The source area always resides within the %MW word (4x register) area. SLAVEREG expects the source reference as offset within that area. In 4x registers, the leading 4 must be omitted. For example, 59 (contents of the variables or value of the literal) = 40059. The parameter can be specified as direct address, located variable, unlocated variable, or literal.
NO_REG	Number of registers to be read from the addressed slave (1 ... 100). The NO_REG parameter can be specified as direct address, located variable, unlocated variable, or literal.
NDR	Transition to ON state for one program cycle signifies receipt of new data ready to be processed. The NDR parameter can be specified as direct address, located variable, or unlocated variable.
ERROR	Transition to ON state for one program cycle signifies detection of a new error. The ERROR parameter can be specified as direct address, located variable, or unlocated variable.
REG_READ	This word parameter addresses the first register in a series of NO_REG registers lying in series used as destination data area. The REG_READ parameter must be entered as a direct address or located variable.
STATUS	Error code, see Runtime errors. The STATUS parameter can be specified as direct address, located variable or unlocated variable.

WRITE_REG

Function Description

Upon request, the WRITE_REG block writes a register area once (rising edge of the REQ input). It transfers data from the PLC via TCP/IP Ethernet to an addressed slave.

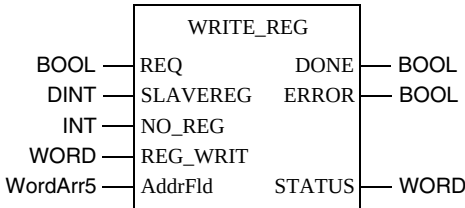
EN and ENO can be configured as additional parameters.

Note: About this function block:

- When programming this function, you must be familiar with the routing procedures used by your network.
- For technical reasons, this function block does not allow the use of ST and IL programming languages.

Symbol

Block representation:



Parameter Description

Description of parameters:

Parameter	Data Type	Meaning
REQ	BOOL	start write operation once
SLAVEREG	DINT	offset address of the first %MW word (4x register) in the slave to be written to
NO_REG	INT	number of registers to be written from slave
AddrFld	WordArr5	data structure transferring the TCP/IP address
REG_WRIT	WORD	first %MW word (4x register) of the source data area
DONE	BOOL	set to "1" for one scan after writing data
ERROR	BOOL	set to "1" for one scan in case of error
STATUS	WORD	error code

Elementary Description for WordArr5 with TCP/IP Ethernet

Elementary description for WordArr5 with TCP/IP Ethernet:

Element	Data Type	Meaning
WordArr5[1]	WORD	high value byte: Slot of the NOE module low value byte: MBP on Ethernet Transporter (MET) mapping index
WordArr5[2]	WORD	byte 4 (MSB) of the 32-bit destination IP address
WordArr5[3]	WORD	byte 3 of the 32-bit destination IP address
WordArr5[4]	WORD	byte 2 of the 32-bit destination IP address
WordArr5[5]	WORD	byte 1 (LSB) of the 32-bit destination IP address

Function Mode of the WRITE_REG Module

Although a large number of WRITE_REG function blocks can be programmed, only sixteen write operations may be active at the same time. In such a case, it is insignificant whether they are the result of this function block or of other write operations (for example, MBP_MSTR, MSTR, CWRITE_REG). All function blocks use one data transaction path and require multiple cycles to complete a job.

If several WRITE_REG function blocks are used within an application, they must at least differ in the values of their NO_REG or REG_WRITE parameters.

Note: A TCP/IP communication between a Quantum PLC (NOE 771xx) and a Momentum PLC (all TCP/IP CPUs and all TCP/IP I/O modules) is possible only when one read or write job is carried out in every cycle. If several jobs are sent per PLC cycle, the communication stops without generating an error message in the status register of the function block.

The status signals DONE and ERROR report the function block state to the user program.

The entire routing information is contained in data structure WordArr5 of input AddrFld. The type of function block connected to this input and thus the contents of the data structure depend on the network used.

Please use:

- TCP/IP Ethernet: the function block TCP_IP_ADDR

Note: For experts: The WordArr5 data structure can also be used with constants.

REQ

A rising edge triggers the read transaction.

The REQ parameter can be specified as direct address, located variable or unlocated variable.

SLAVEREG	SLAVEREG is the start of the area in the addressed slave from which the source data is read. The source area always resides within the %MW word (4x register) area. SLAVEREG expects the source reference as offset within that area. In 4x registers, the leading 4 must be omitted. For example, 59 (contents of the variables or value of the literal) = 40059. The parameter can be specified as direct address, located variable, unlocated variable, or literal.
NO_REG	Number of registers to be read from the addressed slave (1 ... 100). The parameter can be specified as direct address, located variable, unlocated variable, or literal.
REG_WRIT	The REG_WRIT word parameter addresses the first register in a series of NO_REG registers used as source data area. The parameter must be entered as a direct address or located variable.
DONE	Transition to ON state for one program scan signifies data have been transferred. The DONE parameter can be specified as direct address, located variable or unlocated variable.
ERROR	Transition to ON state for one program scan signifies detection of a new error. The parameter can be specified as direct address, located variable or unlocated variable.
STATUS	Error code, see Runtime errors. The parameter can be specified as direct address, located variable, or unlocated variable.

TCP_IP_ADDR

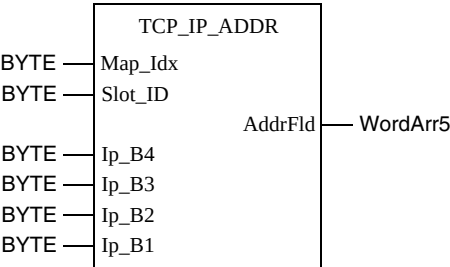
**Function
Description**

The TCP_IP_ADDR block enables the input of TCP/IP addresses for the READ_REG (see *READ_REG*, p. 138), CREAD_REG (see *CREAD_REG*, p. 130), WRITE_REG (see *WRITE_REG*, p. 141), and CWRITE_REG (see *CWRITE_REG*, p. 134) blocks. The address is transferred in the form of a data structure. EN and ENO can be projected as additional parameters.

Note: When programming the TCP_IP_ADDR function, you must be familiar with your network's routing procedures.

Symbol

Block representation:



**Parameter
Description**

Description of parameters:

Parameter	Data Type	Meaning
Map_Idx	BYTE	Map-Index MBP on Ethernet Transporter (MET) mapping index
Slot_ID	BYTE	slot ID slot of the NOE module
Ip_B4	BYTE	byte 4 (MSB) of the 32-bit destination IP address
Ip_B3	BYTE	byte 3 of the 32-bit destination IP address
Ip_B2	BYTE	byte 2 of the 32-bit destination IP address
Ip_B1	BYTE	byte 1 (LSB) of the 32-bit destination IP address
AddrFld	WordArr5	data structure used to transfer the TCP/IP address

Elementary Description for WordArr5

Elementary description for WordArr5:

Element	Data Type	Meaning
WordArr5[1]	WORD	high value byte: Slot of the NOE module low value byte: MBP on Ethernet Transporter (MET) mapping index
WordArr5[2]	WORD	byte 4 (MSB) of the 32-bit destination IP address
WordArr5[3]	WORD	byte 3 of the 32-bit destination IP address
WordArr5[4]	WORD	byte 2 of the 32-bit destination IP address
WordArr5[5]	WORD	byte 1 (LSB) of the 32-bit destination IP address

Map_Idx

The MBP on Ethernet Transporter (MET) mapping index is given at the Map_Idx input. That is, if MET is 6, the value appears as follows:

0	0	0	0	0	1	1	0
---	---	---	---	---	---	---	---

Slot_ID

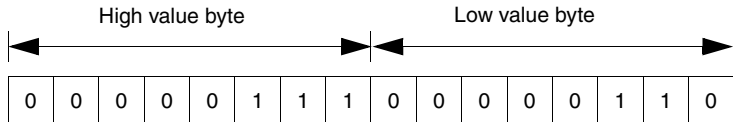
If an NOE in the rack of a Quantum controller is addressed as destination node, the value at the Slot_ID input represents the physical NOE slot. That is, if the NOE is plugged in at Slot 7 of the rack, the value appears as follows:

0	0	0	0	0	1	1	1
---	---	---	---	---	---	---	---

Note: When using an integrated Ethernet CPU module such as the 140 CPU 651 x0, the slot ID must be 254 (FE hex) regardless of the CPU slot.

AddrFid

If an NOE in the rack of a Quantum controller is addressed as a destination node, the value in the High value byte represents the physical slot of the NOE and the Low value byte represents the MBP on Ethernet Transporter (MET) mapping index. That is, if the NOE is inserted in slot 7 of the rack and the MET mapping index is 6, the first element of the data structure looks as follows:



High value byte Slots 1 ... 16

Low value byte MBP on Ethernet Transporter (MET) mapping index

4.3 MBP_MSTR

At a Glance

Overview This section describes the 14 different communication function provided in the MBP_MSTR function block.

What's in this Section? This section contains the following topics:

Topic	Page
Block Description	147
Operational Function Codes	151
Network Control Block Structures	152
Modbus Plus, SY/MAX, and Ethernet TCP/IP Error Codes	155
CTE Error Codes for SY/MAX and TCP/IP Ethernet	160
SY/MAX-Specific Error Codes	161
Read Data	163
Write Data	165
Get Local Statistics	167
Clear Local Statistics	168
Write Global Data	169
Read Global Data	170
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TCP/IP Ethernet Network Statistics	174
Peer Cop Health	177
Reset Optional Module	178
Read CTE	179
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Block Description

Function Description

You can select one of 14 available network communication operations (see *Operational Function Codes, p. 151*) using the MBP_MSTR function block.

Depending on the communication protocol you are using, you can have up to 16 MBP_MSTR function blocks active at the same time.

- Modbus Plus supports up to 4 blocks at the same time
- TCP/IP Ethernet supports up to 16 blocks at the same time

All function blocks use 1 data transaction path and require multiple cycles to complete an operation.

EN and ENO can be configured as additional parameters.

Note: You must be familiar with the routing procedures of your network when programming an MBP_MSTR function block. Modbus Plus routing path structures are described in detail in the *Modbus Plus Network Planning and Installation Guide*. If TCP/IP or SY/MAX Ethernet routing is implemented, standard Ethernet IP router products must be used. A full description of the TCP/IP routing is provided in the *Quantum with Unity Pro TCP/IP Configuration User Guide*.

Note: In FBD and LD sections, this function block can be used only on the program level, i.e. not in derived function blocks (DFBs).
For technical reasons, an MBP_MSTR function block does not allow the use of ST and IL programming languages.

Note: A TCP/IP communication between a Quantum PLC and a Momentum PLC is possible only when only one read or write job is carried out in every cycle. If several jobs are sent per PLC cycle, the communication stops without generating an error message in the status register of the function block.

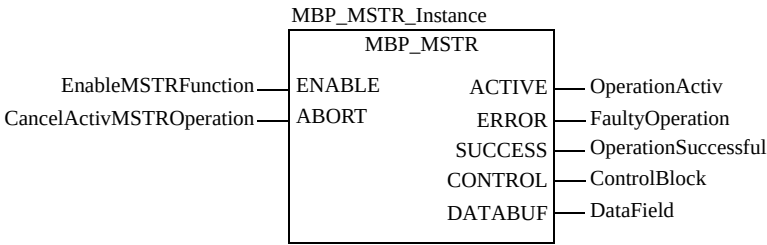
Example:

- you can send MBP_MSTR.Enable:=(HSBY_NOEPLCMSTR_ON) AND (%SW61.1) AND NOT (%SW61.0)
or
- you can create a boolean variable, primary_state:=(%SW61.1) AND NOT (%SW61.0), and insert it for executing the section

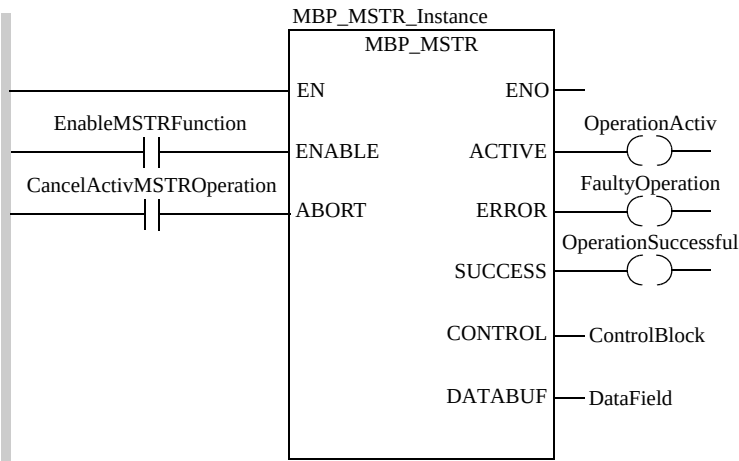
Note: To prevent the former standby CPU, which has switched its state for RUN offline from executing communication functions, you must add a condition on the status bits to disable the function, if the CPU is offline.

Note: Several copies of this function block can be used in the program. However, multiple instancing of these copies is not possible.

Representation
in FBD



Representation
in LD



Input Parameters

Parameter	Data Type	Description
ENABLE	BOOL	When ON, the operation specified in the first element of the CONTROL register is enabled.
ABORT	BOOL	When ON, the currently active operation (see <i>Operational Function Codes</i> , p. 151) is aborted.

Output Parameters

Parameter	Data Type	Description
ACTIVE	BOOL	ON when the operation is active.
ERROR	BOOL	ON when the operation is aborted without success.
SUCCESS	BOOL	ON when the operation concludes successfully.
CONTROL	WORD	This field contains the control block. The first element CONTROL[1] contains the number of the operation code of the operation to be performed (see <i>Operational Function Codes</i>, p. 151). The content of the sequence register is determined by the operation. The data field must be declared as a located variable. The structure of the control block differs according to the network used (see <i>Network Control Block Structures</i>, p. 152).
DATABUF	WORD	For operations providing data, e.g. a write operation, the data field is the data source. For operations receiving data, e.g. the read operation, the data field is the data destination. With Ethernet CTE read and write operations, the data field holds the contents of the Ethernet configuration extension table. DATABUF must be defined as an array of at least 10 elements in this case. The data field must be declared as a located variable.

Runtime Error

In the event of an error occurring during an MBP_MSTR operation, a hexadecimal error code is displayed in the CONTROL[2] register of the control block for one cycle.

Function error codes are network-specific:

- Modbus Plus and SY/MAX Ethernet error codes (see *Modbus Plus, SY/MAX, and Ethernet TCP/IP Error Codes*, p. 155)
- SY/MAX specific error codes (see *SY/MAX-Specific Error Codes*, p. 161)
- TCP/IP Ethernet error codes (See Unity Pro 4.0, Quantum with Unity Pro, Modbus Plus Network Modules, User Manual)
- CTE Error Codes for SY/MAX and TCP/IP Ethernet (see *CTE Error Codes for SY/MAX and TCP/IP Ethernet*, p. 160)
- Send e-mail error codes (see *Mail Service Error Codes*, p. 262)

Note: For a list of all block error codes and values, refer to the tables of error codes for the communication library.

Operational Function Codes

Valid MBP_MSTR Function Codes

Using the MBP_MSTR block, one of 14 available network communication operations can be triggered via the network. Each operation has a function code assigned to it. The availability of specific operations depends on the type of network you are using.

Function Code	Operation	Modbus Plus	TCP/IP Ethernet	SY/MAX Ethernet
1	Write data	X	X	X
2	Read data	X	X	X
3	Get local statistics	X	X	-
4	Clear local statistics	X	X	-
5	Write global data, Peer Cop	X	-	-
6	Read global data, Peer Cop	X	-	-
7	Get remote statistics	X	X	-
8	Clear remote statistics (see <i>Clear Remote Statistics</i> , p. 173)	X	X	-
9	Peer Cop health status	X	-	-
10	Reset optional module	-	X	X
11	Read CTE (Config extension)	-	X	X
12	Write CTE (Config extension)	-	X	X
13	Send email (see <i>Send Email</i> , p. 183)		X	
23	Read/write data (see <i>Read/Write Data</i> , p. 185)		X	

where:

- X indicates *Yes*
- - indicates *No*

Network Control Block Structures

Summary

The structure of the MBP_MSTR control block varies according to the type of network you are using. Structures for Modbus Plus, TCP/IP Ethernet, and SyMax Ethernet are described below.

Control Block for Modbus Plus

Register	Contents
CONTROL[1]	Indicates an operation that is valid for Modbus Plus
CONTROL[2]	Indicates the error status
CONTROL[3]	Indicates the length, i.e., the number of data units transferred (max. 100)
CONTROL[4]	Indicates MSTR operation-dependent information
CONTROL[5]	Routing register 1: used to specify a destination node during network transfer (routing path addresses one of five) Most significant byte: source node address, i.e., the slot for the Modbus Plus Network Options Module (NOM) When using the Modbus Plus Port on the CPU, this byte must be set to 0 (regardless of the CPU slot). Least significant byte: destination node address, i.e., a value that represents a direct or a bridge address. If there is no bridge, this value contains the destination node address. If there is a bridge, this value contains the address of the bridge. If the NOM is inserted in slot 7 on the module rack, the most significant byte of routing register 1 looks as follows (value 0x0706): most significant byte least significant byte Most significant byte Slots 1 ... 16 Least significant byte Destination address (binary value between 1 and 64 (normal) or 65 to 255 (extended))
CONTROL[6]	Routing register 2, the destination node address (further bridge or Modbus Plus modules). If addressing in the previous routing register has finished, the value is set to 0.
CONTROL[7]	Routing register 3, similar to routing register 2
CONTROL[8]	Routing register 4, similar to routing register 2 (see Routing Register 2)
CONTROL[9]	Routing register 5, similar to routing register 2 (see Routing Register 2)

**Control Block for
TCP/IP Ethernet**

Register	Contents
CONTROL[1]	Indicates an operation that is valid for TCP/IP
CONTROL[2]	Indicates the error status
CONTROL[3]	Indicates the length, i.e., the number of data units transferred (max. 100)
CONTROL[4]	Indicates MSTR operation-dependent information
CONTROL[5]	Routing register: used to specify a destination node during network transfer Most significant byte: source node address, i.e., the NOE slot for the NOE module When using an integrated Ethernet on the CPU, this byte must be set to 254 (FE hex) regardless of the CPU slot. Least significant byte: destination node address, i.e, a value that represents a direct or bridge address. If there is no bridge the value in the least significant byte is set to 0. If there is a bridge, this value contains the MBP for the Ethernet mapping index (MET). If the NOM is inserted in slot 7 on the module rack and the Ethernet mapping index (MET) is 6, the routing register looks as follows (value 0x0706): most significant byte least significant byte <pre> 0 0 0 0 0 1 1 1 0 0 0 0 0 0 1 1 0 </pre> Most significant byte Slots 1 ... 16 Least significant byte MBP on Ethernet Transporter (MET) mapping index
CONTROL[6]	Byte 4, MSB of the 32-bit destination IP address
CONTROL[7]	Byte 3 of the 32-bit destination IP address
CONTROL[8]	Byte 2 of the 32-bit destination IP address
CONTROL[9]	Byte 1, LSB of the 32-bit destination IP address

**Control Block for
SY/MAX Ethernet**

Register	Contents																
CONTROL[1]	Indicates an operation that is valid for SY/MAX																
CONTROL[2]	Indicates the error status																
CONTROL[3]	Indicates the length, i.e., the number of registers transferred (max. 100)																
CONTROL[4]	Indicates MSTR operation-dependent information																
CONTROL[5]	Routing register: used to specify a destination node during network transfer Most significant byte: source node address, ie.e, the slot for the NOE module Least significant byte: destination node address, i.e, a value that represents a direct or bridge address. If there is no bridge the value in the least significant byte is set to 0. If there is a bridge, this value contains the MBP for the Ethernet mapping index (MET). If NOM is inserted in slot 7 on the module rack and the Ethernet mapping index (MET) is 6, the routing register looks as follows (value 0x0706): most significant byte ◀────────────────────────────────▶▶────────────────────────────────▶▶ least significant byte <table border="1" style="margin: 10px auto; border-collapse: collapse;"><tr><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>1</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>1</td><td>1</td><td>0</td></tr></table> Most significant byte Slots 1 ... 16 Least significant byte MBP on Ethernet Transporter (MET) mapping index	0	0	0	0	0	1	1	1	0	0	0	0	0	1	1	0
0	0	0	0	0	1	1	1	0	0	0	0	0	1	1	0		
CONTROL[6]	Destination drop number (or set to FF hex)																
CONTROL[7]	Terminator (set to FF hex)																

Modbus Plus, SY/MAX, and Ethernet TCP/IP Error Codes

Form of the Function Error Code

Function error codes for Modbus Plus and SY/MAX Ethernet transactions appear as **Mmss**, where:

- **M** is the high code
 - **m** is the low code
 - **ss** is a subcode
-

**Modbus Plus and
SY/MAX Ethernet
Network Errors**

Hexadecimal error codes for Modbus Plus and SY/MAX Ethernet:

Hex. Error Code	Description
1001	Abort by user
2001	An operation type that is not supported has been specified in the control block
2002	One or more control block parameters were modified while the MSTR element was active (this only applies to operations which require several cycles for completion). Control block parameters may only be modified in inactive MSTR components.
2003	Invalid value in the length field of the control block
2004	Invalid value in the offset field of the control block
2005	Invalid value in the length and offset fields of the control block
2006	Unauthorized data field on slave
2007	Unauthorized network field on slave
2008	Unauthorized network routing path on slave
2009	Routing path equivalent to their own address
200A	Attempt to get more global data words than available
200B	PEER Cop conflict on write/read global data
200C	Bad pattern for change address request
200D	Bad address for change address request
200E	The control block is not assigned, or parts of the control block are located outside of the %MW (4x) range.
30ss	Exceptional response by Modbus slave (see <i>ss Hexadecimal Value in 30ss Error Code, p. 159</i>)
4001	Inconsistent response by Modbus slave
5001	Inconsistent response by the network
6007	Invalid slot ID
6mss	Routing path error (see <i>ss Hexadecimal Value in 6mss Error Code, p. 159</i>) The subfield m shows where the error occurred (a 0 value means local node, 2 means 2nd device in route, etc).

**TCP/IP Ethernet
Network Errors**

Hexadecimal error codes for TCP/IP Ethernet:

Hex. Error Code	Meaning
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	Argument is invalid
5017	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 already connected
5039	Socket 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 down

Hex. Error Code	Meaning
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
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	Non-operational TCP connection
5057	Incoherent configuration

Note:

- Error code 5055 can occur before a 503C error.
 - No remote device takes precedence over a timeout.
-

**ss Hexadecimal
Value in 30ss
Error Code**

ss hexadecimal value in 30ss error code:

ss Hex. Value	Description
01	Slave does not support requested operation
02	Non-existing slave registers were requested
03	An unauthorized data value was requested
05	Slave has accepted a lengthy program command
06	Function cannot currently be carried out: lengthy command running
07	Slave has rejected lengthy program command

**ss Hexadecimal
Value in 6mss
Error Code**

Note: Subfield m in error code 6mss is an Index in the routing information that shows where an error has been detected (a 0 value indicates the local node, 2 means the second device in the route, etc.).

The ss subfield in error code 6mss is as follows:

ss Hex. Value	Description
01	No response reception
02	Access to program denied
03	Node out of service and unable to communicate
04	Unusual response received
05	Router-node data path busy
06	Slave out of order
07	Wrong destination address
08	Unauthorized node type in routing path
10	Slave has rejected the command
20	Slave has lost an activated transaction
40	Unexpected master output path received
80	Unexpected response received
F001	Wrong destination node was specified for the MSTR operation

CTE Error Codes for SY/MAX and TCP/IP Ethernet

CTE Error Codes for SY/MAX and TCP/IP Ethernet

The following error codes are displayed in the CONTROL[1] register of the control block, if there is a problem with the Ethernet configuration extension table (CTE) in your program configuration.

CTE error codes for SY/MAX and TCP/IP Ethernet:

Hex. Error Code	Description
7001	There is no Ethernet configuration extension.
7002	The CTE is not available for access.
7003	The offset is not valid.
7004	Offset + length are not valid.
7005	Bad data field in the CTE.

SY/MAX-Specific Error Codes

SY/MAX-Specific Error Codes When utilizing SY/MAX Ethernet, three additional types of errors may appear in the CONTROL [1] register of the control block ().

The error codes have the following meaning:

- 71xx Error: Errors found by the SY/MAX remote device
- 72xx Error: Errors found by the server
- 73xx Error: Errors found by the Quantum translator

SY/MAX-Specific Hexadecimal Error Codes SY/MAX-specific hexadecimal error codes:

Hex. Error Code	Description
7101	Invalid opcode found by the SY/MAX remote device
7103	Invalid address found by the SY/MAX remote device
7109	Attempt to write to a write protected register found by the SY/MAX remote device
F710	Receiver overflow found by the SY/MAX remote device
7110	Invalid length found by the SY/MAX remote device
7111	Remote device not active, no connection (occurs when retry attempts and time-out have been used up), found by the SY/MAX remote device
7113	Invalid parameter in a read operation found by the SY/MAX remote device
711D	Invalid route found by the SY/MAX remote device
7149	Invalid parameter in a write operation found by the SY/MAX remote device
714B	Invalid drop number found by the SY/MAX remote device
7201	Invalid opcode found by the SY/MAX server
7203	Invalid address found by the SY/MAX server
7209	Attempt to write to a write protected register found by the SY/MAX server
F720	Receiver overflow found by the SY/MAX server
7210	Invalid length found by the SY/MAX server
7211	Remote device not active, no connection (occurs when retry attempts and time-out have been used up), found by the SY/MAX server
7213	Invalid parameter in a read operation found by the SY/MAX server
721D	Invalid route found by the SY/MAX server
7249	Invalid parameter in a write operation found by the SY/MAX server
724B	Invalid drop number found by the SY/MAX server
7301	Invalid opcode in an MSTR block request from the Quantum translator

Hex. Error Code	Description
7303	Read/Write QSE module status (200 route address out of range)
7309	Attempt to write to a write protected register when a status write is carried out (200 route)
731D	Invalid route found by the Quantum translator. Valid routes: • dest_drop, 0xFF • 200, dest_drop, 0xFF • 100+drop, dest_drop, 0xFF • All other routing values produce an error
734B	One of the following errors occurred: • No CTE (configuration extension table) has been configured • No CTE table entry has been made for the QSE model slot number • No valid drop has been specified • The QSE module has not been reset after the creation of the CTE. Note: After writing and configuring the CTE and downloading to the QSE module, the QSE module must be reset for the modifications to become effective. • When using an MSTR instruction no valid slot or drop has been specified

Read Data

Description

A read operation transfers data from a specified slave source device to a master destination device on the network. It uses a master transaction path and may require several cycles to complete. To program an MBP_MSTR block to perform a write operation, use function code 1 (see *Operational Function Codes*, p. 151).

Note: Do not attempt to program an MBP_MSTR to read to its own station address. This action causes the function block to generate an error in the CONTROL[2] register of the control block (see *Network Control Block Structures*, p. 152). You can perform a read operation on a nonexistent slave register. The slave detects the status and logs it. This can last for several cycles.

Network Implementation

The read operation can be performed on Modbus Plus, TCP/IP Ethernet, and SY/MAX Ethernet networks.

Control Block Usage for Modbus Plus

Register	Meaning
CONTROL[1]	2 = Read data
CONTROL[2]	Indicates the error status.
CONTROL[3]	Number of registers to be read from the slave
CONTROL[4]	Determines the %MW starting register in the slave from which the data is read, e.g., 1 = %MW1, 49 = %MW49).
CONTROL[5] ...	Routing register 1 is used to specify the address (routing path address 1 of 5) of the node during a network transfer.
CONTROL[9]	The last byte in the routing path that is not 0 is the destination node.

**Control Block
Usage for TCP/IP
Ethernet**

Register	Meaning
CONTROL[1]	2 = read data
CONTROL[2]	Indicates the error status.
CONTROL[3]	Number of addresses to be read from the slave
CONTROL[4]	Determines the %MW starting register in the slave from which the data is read, e.g., 1 = %MW1, 49 = %MW49)
CONTROL[5]	Routing register: Most significant byte: network adapter module slot Least significant byte: MBP on Ethernet Transporter (MET) mapping index
CONTROL[6] ... CONTROL[9]	Each address contains 1 byte of the 32-bit IP address, where the MSB is in CONTROL[6] and the LSB is in CONTROL[9].

**Control Block
Usage for SY/
MAX Ethernet**

Register	Meaning
CONTROL[1]	2 = Read data
CONTROL[2]	Indicates the error status.
CONTROL[3]	Number of addresses to be read from the slave
CONTROL[4]	Determines the %MW starting register in the slave to which the data is written, e.g., 1 = %MW1, 49 = %MW49).
CONTROL[5]	Routing register Most significant byte: network adapter module slot Least significant byte: destination drop number
CONTROL[6] ... CONTROL[9]	Terminator: FF hex

Write Data

Description A write operation transfers data from a master source device to a specified slave destination device on the network. It uses a master transaction path and may require several cycles to complete. To program an MBP_MSTR block to perform a write operation, use function code 2 (see *Operational Function Codes*, p. 151).

Note: Do not attempt to program an MBP_MSTR to write to its own drop address. This action causes the function block to generate an error in the CONTROL[2] register of the control block (see *Network Control Block Structures*, p. 152). You can perform a write operation to a nonexistent slave register. The slave detects the status and logs it. This can last for several cycles.

Network Implementation The write operation can be performed on Modbus Plus, TCP/IP Ethernet, and SY/MAX Ethernet networks.

Control Block Usage for Modbus Plus

Register	Meaning
CONTROL[1]	1 = write data
CONTROL[2]	Indicates the error status
CONTROL[3]	Number of addresses sent to the slave
CONTROL[4]	Determines the %MW starting register in the slave to which the data is written, e.g. 1 = %MW1, 49 = %MW49
CONTROL[5] ...	Routing register 1 is used to specify the address (routing path address 1 of 5) of the node during a network transfer.
CONTROL[9]	The last byte in the routing path that is not 0 is the destination node.

**Control Block
Usage for TCP/IP
Ethernet**

Register	Meaning
CONTROL[1]	1 = write data
CONTROL[2]	Indicates the error status
CONTROL[3]	Number of addresses sent to the slave
CONTROL[4]	Determines the CONTROL[] start address of the slave to which the data is written
CONTROL[5]	Routing register Most significant byte: network adapter module slot Least significant byte: MBP on Ethernet transporter (MET) mapping index
CONTROL[6]	Each address contains 1 byte of the 32-bit IP address.
...	
CONTROL[7]	

**Control Block
Usage for SY/
MAX Ethernet**

Register	Meaning
CONTROL[1]	1 = Write data
CONTROL[2]	Indicates the error status
CONTROL[3]	Number of addresses sent to the slave
CONTROL[4]	Determines the %MW starting register in the slave to which the data is written, e.g., 1 = %MW1, 49 = %MW49)
CONTROL[5]	Routing register Most significant byte: network adapter module slot Least significant byte: destination drop number
CONTROL[6]	Terminator: FF hex
...	
CONTROL[9]	

Get Local Statistics

Description A get local statistics operation reads the data from the local node in one cycle and does not require a master transaction path. To program an MBP_MSTR block to get local statistics, use function code 3 (see *Operational Function Codes, p. 151*).

Network implementation A get local statistics operation can be performed on Modbus Plus and TCP/IP Ethernet networks (see *TCP/IP Ethernet Network Statistics, p. 174*).

Control Block Usage for Modbus Plus

Register	Meaning
CONTROL[1]	3 = read local statistics
CONTROL[2]	indicates the error status.
CONTROL[3]	Number of addresses to be read from local statistics (0...53)
CONTROL[4]	First address from which the statistics table must be read (Reg1=0)
CONTROL[5]	Routing register 1 is used to specify the address (routing path address 1 of 5) of the node during a network transfer. The last byte in the routing path that is not 0 is the destination mode.

Control Block Usage for TCP/IP Ethernet

Register	Meaning
CONTROL[1]	3 = read local statistics
CONTROL[2]	indicates the error status.
CONTROL[3]	Number of addresses to be read from local statistics (0...37)
CONTROL[4]	First address from which the statistics table must be read (Reg1=0)
CONTROL[5]	Routing register Most significant byte: Network adapter module slot
CONTROL[6]	Not used
... CONTROL[9]	

Clear Local Statistics

Description A clear local statistics operation clears the values from words 13 ... 22 in the statistics table of the local node. The operation is carried out in one cycle and does not require a master transaction path. To program an MBP_MSTR block to clear local statistics, use function code 4 (see *Operational Function Codes*, p. 151).

Network Implementation A clear local statistics operation can be performed on Modbus Plus and TCP/IP Ethernet networks (see *TCP/IP Ethernet Network Statistics*, p. 174).

**Control Block
Usage for
Modbus Plus**

Register	Meaning
CONTROL[1]	4 = clear local statistics
CONTROL[2]	Indicates the error status
CONTROL[3]	Reserved
CONTROL[4]	Reserved
CONTROL[5]	Routing register 1 is used to specify the address (routing path address 1 of 5) of the node during a network transfer. The last byte in the routing path that is not 0 is the destination mode.

**Control Block
Usage for TCP/IP
Ethernet**

Register	Meaning
CONTROL[1]	4 = clear local statistics
CONTROL[2]	Indicates the error status
CONTROL[3]	Reserved
CONTROL[4]	Reserved
CONTROL[5]	Routing register Most significant byte: network adapter module slot
CONTROL[6]	Reserved
... CONTROL[9]	

Write Global Data

Description A write global data operation transfers data to the communication processor of the current node; the data can be transmitted on the network as soon as the node receives the token and then read by all nodes connected to the local network (see *Read Global Data*, p. 170) .

A write global data operation is carried out in one cycle and does not require a master transaction path. To program an MBP_MSTR block to write global data, use function code 5 (see *Operational Function Codes*, p. 151).

Network Implementation A write global data operation can be performed only on Modbus Plus networks. The read and write global data operations comprise a Modbus Plus capability known as *Peer Cop*.

Control Block Usage for Modbus Plus

Register	Meaning
CONTROL[1]	5 = write global data
CONTROL[2]	Indicates the error status
CONTROL[3]	Number of addresses to be written from state RAM into global data memory (comm processor) (1...32)
CONTROL[4]	Reserved
CONTROL[5]	If global data is sent via a NOM, enter the NOM module slot in the most significant byte of this register.

Read Global Data

Description

A read global data operation reads data from the communications processor of a node on the network that has written global data (see *Write Global Data*, p. 169). A master transaction path is not required.

A read global data operation can take several cycles if the global data is not currently available with the nodes called. If global data is available, the operation is executed in one cycle. To program an MBP_MSTR block to write global data, use function code 6 (see *Operational Function Codes*, p. 151).

Network Implementation

A read global data operation can be performed only on Modbus Plus networks. The read and write global data operations comprise a Modbus Plus capability known as *Peer Cop*.

**Control Block
Usage for
Modbus Plus**

Register	Meaning
CONTROL[1]	6 = read global data
CONTROL[2]	Indicates the error status
CONTROL[3]	Number of addresses to be sent from global data memory (comm processor) (1...32)
CONTROL[4]	Displays the addresses available in the scanned node. (This register is automatically updated.)
CONTROL[5]	The least significant byte contains the address of the node whose global data is to be read. It can be a value in the range 1 ... 64. If global data is received via a NOM, enter the NOM module slot in the most significant byte of this address.

Get Remote Statistics

Description

A get remote statistics operation can be used to read data from remote nodes on the network. With each query, the remote communications processor supplies a complete table of statistics even if the query does not refer to the entire table. It then copies only the words that you queried into identified \$MW addresses.

An operation can take several cycles to complete; it does not require a master data transaction path. To program an MBP_MSTR block to get remote statistics, use function code 7 (see *Operational Function Codes*, p. 151).

Network Implementation

A get remote statistics operation can be performed on Modbus Plus and TCP/IP Ethernet networks.

Control Block Usage for Modbus Plus

Register	Meaning
CONTROL[1]	7 = get remote statistics
CONTROL[2]	Indicates the error status
CONTROL[3]	Number of addresses to be read from the statistics data field (0 ... 37). Note: The size of databuf must be at least the size of this entry.
CONTROL[4]	First address from which the node statistics must be read. The number of available statistics registers cannot be exceeded.
CONTROL[5] ... CONTROL[9]	Routing address 1 ... 5 of the node. The last byte in the routing path that is not 0 is the destination node.

**Control Block
Usage for TCP/IP
Ethernet**

Register	Meaning
CONTROL[1]	7 = get remote statistics
CONTROL[2]	Indicates the error status
CONTROL[3]	Number of addresses to be read from the statistics data field (0 ... 37). Note: The size of databuf must be at least the size of this entry.
CONTROL[4]	First address from which the node statistics must be read. The number of available statistics registers cannot be exceeded.
CONTROL[5]	Routing register Most significant byte: network adapter module slot
CONTROL[6] ... CONTROL[9]	Each address contains 1 byte of the 32-bit IP address, where the value in CONTROL[6] is the MSB and the value in CONTROL[9] is the LSB.

Clear Remote Statistics

Description A clear remote statistics operation clears remote-node values from words 13 ... 22 in the statistics table of the local node. It uses a master transaction path and may require several cycles to complete. To program an MBP_MSTR block to perform a clear remote statistics operation, use function code 8 (see *Operational Function Codes, p. 151*).

Network Implementation A clear remote statistics operation can be performed on Modbus Plus and TCP/IP Ethernet networks (see *TCP/IP Ethernet Network Statistics, p. 174*).

Control Block Usage for Modbus Plus

Register	Meaning
CONTROL[1]	8 = clear remote statistics
CONTROL[2]	Indicates the error status
CONTROL[3]	Reserved
CONTROL[4]	Reserved
CONTROL[5]	Routing register 1 is used to specify the address (routing path address 1 of 5) of the destination node during a network transfer.
...	
CONTROL[9]	
CONTROL[9]	The last byte in the routing path that is not 0 is the destination mode.

Control Block Usage for TCP/IP Ethernet

Register	Meaning
CONTROL[1]	8 = clear remote statistics
CONTROL[2]	Indicates the error status
CONTROL[3]	Reserved
CONTROL[4]	Reserved
CONTROL[5]	Routing Register Most significant byte: network adapter module slot
CONTROL[6]	Each address contains one byte of the 32-bit IP address, where the MSB is in CONTROL[6] and the LSB is in CONTROL[9].
...	
CONTROL[9]	

TCP/IP Ethernet Network Statistics

TCP/IP Ethernet Network Statistics

A TCP/IP Ethernet module replies to local and remote statistics commands from the MBP_MSTR block with the following information:

Word	Meaning								
00 to 02	MAC address e.g. MAC address 00 00 54 00 12 34 is displayed as follows: <table> <tr> <th>Word</th><th>Contents</th></tr> <tr> <td>00</td><td>00 00</td></tr> <tr> <td>01</td><td>00 54</td></tr> <tr> <td>02</td><td>34 12</td></tr> </table>	Word	Contents	00	00 00	01	00 54	02	34 12
Word	Contents								
00	00 00								
01	00 54								
02	34 12								
03	Module state ● 0x0001 = Running ● 0x4000 = APPI LED (1=ON, 0 = OFF) ● 0x8000 = LED connection								
04 and 05	Number of receiver interrupts								
06 and 07	Number of transfer interrupts								
08 and 09	Transfer timeout error count								
10 and 11	Collision detection error count								
12 and 13	Omitted packets								
14 and 15	Memory error count								
16 and 17	Number of restarts performed by the driver								
18 and 19	Receive framing error count								
20 and 21	Overflow error count receiver								
22 and 23	Receive CRC error counter								
24 and 25	Receive buffer error counter								
26 and 27	Transfer buffer error counter								
28 and 29	Transfer bin underflow counter								
30 and 31	Late collision counter								
32 and 33	Lost carrier counter								
34 and 35	Number of retries								
36 and 37	IP address e.g. the IP address 198.202.137.113 (or c6 CA 89 71) is represented as follows: <table> <tr> <th>Word</th><th>Contents</th></tr> <tr> <td>36</td><td>89 71</td></tr> <tr> <td>37</td><td>C6 CA</td></tr> </table>	Word	Contents	36	89 71	37	C6 CA		
Word	Contents								
36	89 71								
37	C6 CA								

**Board Status
Word Bit
Definition**

The following table describes the word bit definitions for board status for the:

- 140 NOE 771 x1, versions 2.0, 3.0, 3.1, 3.3 and 3.6, and
- 140 NOE 771 x0, versions 3.0, 3.3 and 3.4

Bit #	Definition
15	0 = Link LED off 1 = Link LED on
14	0 = Appl LED off 1 = Appl LED on
13	0 = twisted pair 1 = fiber
12	0 = 10 Mbit 1 = 100 Mbit
11 ... 8	(Reserved)
7 ... 4	Module type (see table, below)
3	(Reserved)
2	0 = half duplex 1 = full duplex
1	0 = not configured 1 = configured
0	0 = PLC not running 1 = PLC/NOE running

Note: Bits are counted from right to left, starting with bit 0 (low bit). For example, **PLC running** = 0x0001, **Application LED** = 0x4000, and **LED Connection** = 0x8000.

The following table describes the word bit definitions for board status for the:

- 140 NOE 771 x1, version 3.5
- 140 NOE 771 x0, versions 1.02 and 2.0, and
- 140 CPU 651 x0

Bit #	Definition
15 ... 12	Module type (see table below)
11	(Reserved)
10	0 = half duplex 1 = full duplex
9	0 = not configured 1 = configured
8	0 = PLC not running 1 = PLC/NOE running
7	0 = Link LED off 1 = Link LED on
6	0 = Appl LED off 1 = Appl LED on
5	0 = twisted pair 1 = fiber
4	0 = 10 Mbit 1 = 100 Mbit
3 ... 0	(Reserved)

Note: Bits are counted from right to left, starting with bit 0 (low bit). For example, **PLC running** = 0x0100, **Application LED** = 0x0040, and **LED Connection** = 0x0080.

**Board Status
Word Bit
Definition by
Module Type**

The following table describes the values of the module types:

Value of bits 7...4 or 15...12 (see tables, above, for the bit range that applies to your module's software version)	Module Type
0	NOE 2x1
1	ENT
2	M1E
3	NOE 771 00
4	ETY
5	CIP
6	(reserved)
7	140 CPU 651 x0
8	(reserved)
9	(reserved)
10	NOE 771 10
11	NOE 771 01
12	NOE 771 11
13 ... 15	(reserved)

Peer Cop Health

Description A peer cop health operation reads selected data from the peer cop communications health table and downloads the data to the specified %MW addresses in state RAM. To program an MBP_MSTR block to perform a clear remote statistics operation, use function code 9 (see *Operational Function Codes*, p. 151).

Note: Peer cop health is operational only when a peer cop-based I/O scanner has been configured.

The peer cop communications health table is 12 words long; MBP_MSTR indexes these words with the numbers 0 ... 11.

Network Implementation A peer cop health operation can be performed only on Modbus Plus networks.

Control Block Usage for Modbus Plus

Register	Meaning
CONTROL[1]	9 = peer cop health
CONTROL[2]	indicates the error status.
CONTROL[3]	Number of words wanted by the peer cop table (1...12)
CONTROL[4]	First word to be read from the peer cop table, where 0 = the first word and 11 = the last word)
CONTROL[5]	Routing address 1 If this is the second of two local nodes, set the value in the high byte to 1.

Reset Optional Module

Description

A reset optional module operation causes a Quantum NOE Ethernet communications module or the Ethernet port on a 140CPU65150/60 CPU module to enter a cycle that resets its working environment. To program an MBP_MSTR block to perform a reset option module operation, use function code 10 (see *Operational Function Codes*, p. 151).

Network Implementation

A reset optional module operation can be performed on TCP/IP Ethernet (see *TCP/IP Ethernet Network Statistics*, p. 174) and SY/MAX Ethernet networks.

Control Block Usage for TCP/IP Ethernet

Register	Meaning
CONTROL[1]	10 = reset optional module
CONTROL[2]	Indicates the error status
CONTROL[3]	No significance
CONTROL[4]	No significance
CONTROL[5]	Routing register The value shown in the high byte in area 1 through 16 indicates the slot in the Quantum backplane where the NOE module is located.
CONTROL[6]	No significance
...	
CONTROL[9]	

Control Block Usage for SY/MAX Ethernet (CONTROL)

Register	Meaning
CONTROL[1]	10 = reset optional module
CONTROL[2]	Indicates the error status
CONTROL[3]	No significance
CONTROL[4]	No significance
CONTROL[5]	Routing register MSB: network adapter module slot
CONTROL[6]	No significance
...	
CONTROL[9]	

Read CTE

Description A read CTE operation reads a specified number of bytes from the Ethernet configuration extension table in the specified buffer of PLC memory. The bytes to be read start with a byte offset at the start of the CTE table. The contents of the CTE table are displayed in the DATABUF output parameter. (see *Input Parameters, p. 149*) To program an MBP_MSTR block to perform a clear remote statistics operation, use function code 11 (see *Operational Function Codes, p. 151*).

Network Implementation A read CTE operation can be performed on TCP/IP Ethernet and SY/MAX Ethernet networks.

Control Block Usage for TCP/IP Ethernet

Register	Meaning
CONTROL[1]	11 = read CTE
CONTROL[2]	Indicates the error status
CONTROL[3]	The length setting: a value from 12 to 37
CONTROL[4]	No significance
CONTROL[5]	Routing register Least significant byte = mapping index Either a value displayed in the byte of the register or is not used. or Most significant byte = network adapter module slot
CONTROL[6] ... CONTROL[9]	The number shown in the least significant byte in the area 1 through 16 indicates the slot where the optional module is located.

**Control Block
Usage for SY/
MAX Ethernet**

Register	Meaning
CONTROL[1]	11 = read CTE
CONTROL[2]	Indicates the error status
CONTROL[3]	Number of words transferred
CONTROL[4]	Byte offset in the PLC register structure, specifying from where the CTE bytes are read
CONTROL[5]	Routing register MSB: slot of the NOE module
CONTROL[6]	Terminator: FF hex
...	
CONTROL[9]	

**CTE Indicator
Implementation
(DATABUF)**

The values in the CTE table are displayed in the DATABUF output when a CTE read operation is implemented. The registers display the following CTE data:

CTE indicator implementation (DATABUF):

Parameter	Register	Contents
Frame type	DATABUF[0]	1 = 802.3 2 = Ethernet
IP address	DATABUF[1]	First byte of the IP address
	DATABUF[2]	Second byte of the IP address
	DATABUF[3]	Third byte of the IP address
	DATABUF[4]	Fourth byte of the IP address
Lower netmask	DATABUF[5]	Most significant word
	DATABUF[6]	Least significant word
Gateway	DATABUF[7]	First byte of the gateway
	DATABUF[8]	Second byte of the gateway
	DATABUF[9]	Third byte of the gateway
	DATABUF[10]	Fourth byte of the gateway

Write CTE

Description A write CTE operation writes the CTE configuration table from the specified data (DATABUF) to a specified Ethernet configuration extension table or to a specific slot. To program an MBP_MSTR block to perform a write CTE operation, use function code 12 (see *Operational Function Codes*, p. 151).

Network Implementation A write CTE operation can be performed on TCP/IP Ethernet (see *TCP/IP Ethernet Network Statistics*, p. 174) and SY/MAX Ethernet networks.

Control Block Usage for TCP/IP Ethernet

Register	Meaning
CONTROL[1]	12 = write CTE
CONTROL[2]	Indicates the error status
CONTROL[3]	The length setting: a value from 12 to 37.
CONTROL[4]	No significance
CONTROL[5]	Routing register Least significant byte = mapping index Either a value displayed in the byte of the address or is not used. or Most significant byte = network adapter module slot
CONTROL[6] ... CONTROL[9]	The number shown in the least significant byte in the area 1 through 16 indicates the slot where the optional module is located.

**Control Block
Usage for SY/
MAX Ethernet**

Register	Meaning
CONTROL[1]	12 = Write CTE (Config extension table)
CONTROL[2]	Indicates the error status
CONTROL[3]	Number of words transferred
CONTROL[4]	Byte offset in the PLC address structure specifying where the CTE bytes are written
CONTROL[5]	Routing register Most significant byte = NOE module slot Least significant byte = Destination drop number
CONTROL[6]	Terminator: FF hex
CONTROL[7]	No significance
...	
CONTROL[9]	

**CTE Indicator
Implementation
(DATABUF)**

The values in the Ethernet configuration extension table are displayed in the DATABUF output field when a write CTE operation is implemented. The registers are used to transfer the following CTE data:

CTE indicator implementation (DATABUF):

Parameter	Register	Contents
Frame type	DATABUF[0]	1 = 802.3 2 = Ethernet
IP address	DATABUF[1]	First byte of the IP address
	DATABUF[2]	Second byte of the IP address
	DATABUF[3]	Third byte of the IP address
	DATABUF[4]	Fourth byte of the IP address
Lower netmask	DATABUF[5]	Most significant word
	DATABUF[6]	Least significant word
Gateway	DATABUF[7]	First byte of the gateway
	DATABUF[8]	Second byte of the gateway
	DATABUF[9]	Third byte of the gateway
	DATABUF[10]	Fourth byte of the gateway

Send Email

Description

The electronic mail notification service allows controller-based projects to report alarms or events. The controller monitors the system and dynamically creates an electronic mail message, which alerts local or remote users.

A user-defined event or condition triggers the MSTR block to create a message. Each message uses one of three user-defined headers. Each message sent from the controller can contain text and variable information (with a maximum of 238 bytes).

The project selects the appropriate header. Each header contains:

- sender name
- list of recipients
- subject

To program an MBP_MSTR block to send email, use function code 13 (see *Valid MBP_MSTR Function Codes*, p. 151).

Network Implementation

A send email operation can be performed on a TCP/IP Ethernet network.

Control Block Usage for TCP/IP Ethernet

Register	Meaning
CONTROL[1]	13 = send Email
CONTROL[2]	Indicates the email-specific error codes (see <i>Mail Service Error Codes</i> , p. 262)
CONTROL[3]	Number of words transferred
CONTROL[4]	Not used
CONTROL[5]	High byte: slot address of the NOE module or 0xFE for the 140 CPU 651 60
	Low byte: always 0
CONTROL[6]	Not used
...	
CONTROL[9]	

**DATABUF
Parameter
Description**

Register	Contents
DATABUF 1	The mail header is the least significant byte with a value of 1, 2, or 3.
	The most significant byte contains the number (<i>n</i>) of characters in the subject, a value between 0 and 238.
DATABUF 2 ... DATABUF 119	The data (in ASCII format) that will be copied into the Email message. The first <i>n</i> characters are added to the configured Email subject. The remaining characters ($2 * N - 2 - n$) are part of the message body, where <i>N</i> is the number of words transferred.

Read/Write Data

Introduction

In a single transaction, the MSTR read and write operations can transfer data from a master source device to a specified slave destination device, then transfer data from this specified slave source to the master. It uses a master transaction path and may require several cycles to complete. To program an MBP_MSTR block to perform a combined read/write operation, use function code 23 (see *Operational Function Codes*, p. 151).

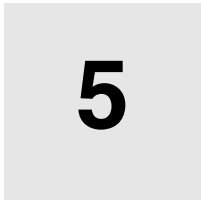
The combined read/write operation can be used only with these two Quantum models:

- NOE 771 01 (version 2.0 and later)
- NOE 771 11 (version 2.0 and later)
- CPU 651 50 (with embedded Ethernet port)
- CPU 651 60 (with embedded Ethernet port)
- CPU 652 60 (with embedded Ethernet port)

Control Block Usage

Register	Content
CONTROL[1]	23 = read/write data
CONTROL[2]	Indicates the error status
CONTROL[3]	Number of addresses to be read from the slave and written to the master
CONTROL[4]	Determines the %MW starting register in the slave from which the data is read, e.g., 1 = %MW1, 49 = %MW49)
CONTROL[5]	Routing register: Most significant byte: network adapter module slot Least significant byte: MBP on Ethernet Transporter (MET) mapping index
CONTROL[6] ... CONTROL[9]	Each address contains 1 byte of the 32-bit IP address, where the MSB is in CONTROL[6] and the LSB is in CONTROL[9].
CONTROL[10]	Number of registers to be read from slave
CONTROL[11]	Specifies first %MW word in the target slave where the data will be read

Global Data (Publish / Subscribe) Utility



At a Glance

Introduction The material in this section presents the Global Data (Publish / Subscribe) utility available on the following modules.

- 140 NOE 771 01
- 140 NOE 771 11
- HE CPU 651 x0

For more information on the publish-subscribe model, go to this URL:
<http://www.isa.org/journals/intech/feature/printable/1,1171,596,00.html>

What's in this Chapter? This chapter contains the following topics:

Topic	Page
Planning the Global Data (Publish/Subscribe) System	188
Multicast Filtering	192
Quantum NOE Global Data Configuration	193
Configuration of Global Data (Publish/Subscribe) by the Web for NOE 771 x1	195

Planning the Global Data (Publish/Subscribe) System

Overview

Global Data service is a real-time publisher/subscriber mechanism that provides the most efficient data exchange for PLC application coordination.

Devices that support Global Data are arranged in a distribution group for the purpose of application variable exchange and synchronization. Each Global Data device can publish up to one network (application) variable and subscribe to up to 64 network (application) variables.

The Quantum NOE's embedded **Global Data Configuration** Web page provides a configuration screen (see *Quantum NOE Global Data Configuration*, p. 193) to determine which and how many application variables are exchanged with this service. After configuration, exchanges between all stations belonging to the same distribution group are done automatically.

The Global Data service uses %MW (4x registers) for Global Data exchanges.

Key Features of Global Data

The main features for Global Data are:

- One publisher and many subscribers
- A device can publish one network variable of up to 512 %MW words (4x registers)
- A device can subscribe to up to 64 network variables of up to 2048 %MW words (4x registers)
- A device subscribes to the complete network variable
- One distribution group per network IP address
- Application-defined publication rate
- Up to 64 Global Data Network variables (numbered from 1 to 64) can be part of the data distribution group
- An NOE has only one multicast address. Consequently, it can only publish and subscribe within the group
- A device can participate in several distribution groups by using multiple NOEs in the rack

Global Data has an advantage over client/server services when more than one subscriber is receiving the same data since only one transaction is necessary for all subscribers to receive the data. There are two benefits:

- the reduction of overall network traffic
 - tighter synchronization of multiple subscribers
-

Planning Your System Configuration

The Global Data (publish/subscribe) utility is a powerful function incorporated into the NOE product line. Implementing Global Data requires a configuration that spans many PLCs throughout the system. Therefore, we recommend pre-planning your installation before implementation. Pre-planning saves time and money by:

- reducing errors, which circumvents a debugging effort
- ensuring system consistency

Go to paper before computer.

We offer the following table to assist in system planning. The **Global Data Planning Spreadsheet** below is a graphic representation of a recommended configuration table for system planning. You can create your own table using the format below or you can download a Microsoft *Excel*TM spreadsheet template, which is available on the Schneider public Web site.

Here is the graphic representation of the **Global Data Planning Spreadsheet**:

Parameter Checking	Variable ID	Symbol*	Length (Registers)	Device Number				Variable Public. Status
				1	2	...	3	
	1	VALVE_STATUS	20	PUB	SUB		NONE	OK
	2	VALVE_CONTROL	10	SUB	NONE		PUB	OK
	...							
	64	PUMP_CONTROL	50	SUB	PUB		NONE	OK
Device Publication Status:				OK	OK		OK	
Total Publication Size per Node:				20	50		10	
Total Subscription Size per Node:				60	20		0	
Group IP Address		239.255.255.0						
Multicast Filtering Enabled		OFF						
Default %MW Address for Health		%MW100						
Distribution Period		10						
Health Timeout		1000						
Data Zone		%MW200						
*Entries or changes to the symbol (description) do NOT affect or change a variable or the system. The symbol used in the Quantum product line has no relation to the Concept/Unity product line symbol(s).								

Table of **Global Data Limits**:

Parameter	Limit
Maximum number of publish variables per device	1

Parameter	Limit
Maximum size for the publish variable	512 registers = 512 Words (16 bits) = 1024 bytes
Maximum number of subscription variables per device	64 (63 if this device is publishing)
Maximum size for the subscribe variables per device	2048 registers = 2048 Words (16 bits) = 4096 bytes

Note: We recommend that you consider the following when planning.

- Allow for a 10 to 20 % increase in growth of any variable.
- Add variables at the end of the configuration where they do not affect the existing application address. Therefore, you avoid changing the existing addresses in your configuration, which can be a time consuming process.

Table of **Global Data Planning Spreadsheet**

Parameter	Description
Parameter Checking	Reserved
Variable Id	Represents the Data ID on the NOE's Global Data Configuration Web page
Symbol	Symbolic name for Global Data exchange.
Length Words (Registers)	Length of Global Data information. Number of %MW words (4x registers).
Device Number	Number of devices (up to 64) for the Global Data network.
Variable Public. Status	Automatic information of the correct publication status of the Global Data network. Only by using the Microsoft <i>Excel</i> TM spreadsheet. Information per symbol.
Device Publication Status	Automatic information of the correct publication status of the Global Data network. Only by using the Microsoft <i>Excel</i> TM spreadsheet. Information per device.
Total Publication Size per Node	Publication size for the specific node. The maximum publication size is 512 words (registers) per node
Total Subscription Size per Node	Subscription size for the specific node. The maximum subscription size is 2048 words (registers) per node
Group IP Address Enabled	IP address for multicast networking. Identifies the stations distribution group. The address range is from 224.0.0.0 to 239.255.255.255
Multicast Filtering Enabled	A check box for Ethernet switches that support multicast filtering.

Parameter	Description
Default Address for Health%MW (4x register)	%MW (4x register) address for the Health bits. This is the memory area where the Health bits are stored. It has the size of 4 words (registers).
Distribution Period	Is the minimum number of controller scan times before an update will occur.
Health Timeout	Is the maximum time between received subscriptions before a subscription is declared unhealthy (faulty). The value is measured in milliseconds and can be set from 50 to 15000 ms in 50 ms increments.
Data Zone	The starting address for the data. This are the registers where the data information are stored.

Multicast Filtering

Overview

Your NOE may offer the multicast filtering functionality.

The global data service synchronizes several stations located in a distribution group. A distribution group is a set of stations identified by using the same IP multicast address for all stations in the group. By using the same IP address for multiple devices, multicast exchanges can be used to distribute global data. Several independent distribution groups can coexist on the same sub-network. Each distribution group possesses its own unique IP multicast address.

Early versions of switches treat multicast packets as a broadcast, thereby broadcasting to all nodes and suppressing all benefits of both switching and multicasting. Newer versions of switches provide automatic multicast filtering, and consequently only forward multicast traffic to ports that are connected to registered end stations.

Multicast filtering uses the GARP Multicast Registration Protocol (GMRP) to inform a switch which IP multicast addresses are of interest to the attached device

GMRP is defined in the IEEE 802.1D-1998 Standard, which is available as a free download at: <http://IEEE802.org>.

In order to use Multicast filtering, you need to:

1. Ensure that your switch supports IEEE 802.1D - 1998
2. Click the Multicast filtering check box (see *Illustration, p. 284*) on the **Global Data Configuration** area on the NOE 771 x1 web page.

Reducing Traffic

Multicast filtering helps to reduce the traffic on a network, because broadcasts are sent only to interested, or subscribed, devices.

For distributed applications and one to many communications, multicast affords advantages over unicast because it:

- utilizes the network bandwidth more efficiently
- sends a single transmission instead of multiple transmissions.
- reduces collisions
- optimizes the performance of Ethernet module processing

Using Multicast Filtering

These ConneXium switches support multicast filtering. Other switches from alternate vendors also support multicast filtering.

Switch	Description
499NES17100	Managed Switch with 7 ports 10/100 BASE-TX
499NOS17100	Managed Switch with 5 ports 10/100 BASE-TX and 2 ports 100 BASE-FX

Quantum NOE Global Data Configuration

Introduction

Global data configuration is carried out in the network configuration as well as the data editor. The variables for the publish/subscribe procedure are configured in the data editor.

The screen shot shows the network configuration Global data configuration settings:

The screenshot shows the 'ETHERNET_1' configuration window. It has several tabs: 'IP Configuration', 'Messaging', 'I/O Scanning', 'Global Data', 'SNMP', 'Address', and 'Bandwidth'. The 'Global Data' tab is selected. Inside this tab, there is a 'Global data configuration' section with the following settings:

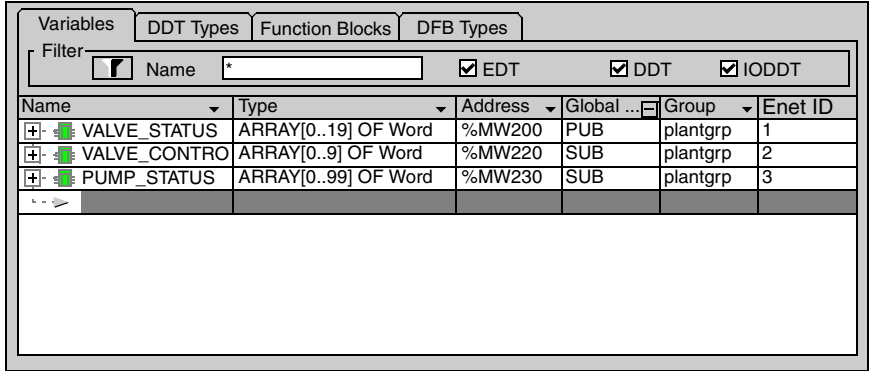
- Model Family:** TCP/IP 10/100 Regular connection (dropdown)
- Module Address:** Rack (empty), Module (empty)
- Module IP Address:**
 - IP-Adresse: 0 . 0 . 0 . 0
 - Subnetwork Mask: 0 . 0 . 0 . 0
 - Gateway Address: 0 . 0 . 0 . 0
- Module Utilities:**
 - Messaging: YES (dropdown)
 - I/O Scanning: YES (dropdown)
 - Global Data: YES (dropdown)
 - SNMP: YES (dropdown)
 - Address Server: YES (dropdown)
- Global data configuration (expanded):**
 - HealthTimeout: 100 ms (spin box)
 - Group address: 23 . 10 . 10 . 10 (text box)
 - Diistribution period: 10 scan (spin box)
 - Group name: plantgrp (text box)
 - Health bit block (%I / %WIW): %IW1 (text box)
 - ☒ Multicast Filtering

Parameter description:

Parameter	Description
Health timeout	After this time period expires, the received data becomes invalid.
Group address	Class D multicast IP address. All nodes in the global data procedure use the same multicast address for distributing or receiving data. The address range is: 224.0.0.0 to 239.255.255.255.
Distribution time	Time after which the data is received or sent. Minimum scan time of the PLC.
Group name	Logical name. Defines the varibale allocation to different communication configurations in the variable editor.
Status bit block	Address for retrieving the status information of the global data procedure.

Parameter	Description
Multicast filtering	Activates an Ethernet switch on connection that supports multicast filtering.

The screen shot shows an image of the data editor:



Parameter description:

Parameter	Description
Name	Variables symbols
Type	Variable type
Address	Variable address
Global Data	Type of Global Data Variable. Options: No/Publish/Subscribe
Group	Group name for allocating the variables of the existing network description. When creating the different Ethernet networks, a logical connection is arranged here between the network and the variable declaration.
ID	Variable ID

Configuration of Global Data (Publish/Subscribe) by the Web for NOE 771 x1

Modeling the System Configuration

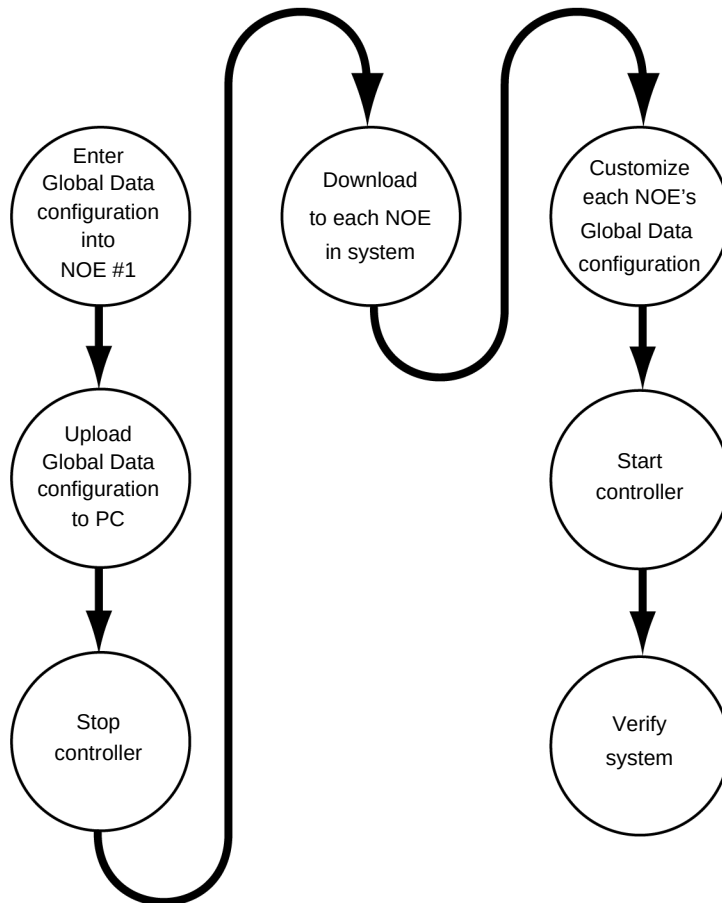
There are two methods of configuring a system:

- Configuring each device separately
Configure each device through the **Global Data Configuration** Web page (see *Global Data (Publish/Subscribe) Utility Configuration*, p. 284). Repeat for each device in the system. Entry errors may occur because the same information must be reentered on each and every device, possibly as many as 64 times.
- Copying the configuration (preferred)
Configure all variable IDs, symbols (descriptions), and lengths on one NOE, upload to your PC, download the same configuration to all devices and finish with a small customization to each node.

Note: The **Copy Configuration** method reduces entry errors, allows for verifying the configuration, and permits you to determine if the system is satisfactory for your needs before implementing the configuration system wide. You enter the variable ID, symbol (description), and length only once, thus maintaining consistency.

When your planning is complete, follow the *Configuring Your NOE* steps below. We present these steps both as a picture and as instructions.

The following illustration shows the *Configuring Your NOE* steps:



Configuring the NOE

Step	Action
1	Select one NOE.
2	Using your browser, navigate to that NOE's Global Data Configuration page. Follow these links: Setup Global Data
3	Enter the configuration's variable IDs, symbols (description), and lengths.
4	Click the Update Global Data Configuration button to update the file. This creates the file <code>glbdata.ini</code> . Full path follows: <code>ftp://NOE_IP_ADDRESS/wwwroot/conf/glbdata/glbdata.ini</code> Note: You substitute NOE_IP_ADDRESS with an address like 192.168.000.010. Please check the address with your system administrator.
5	Using the FTP process, upload the <code>glbdata.ini</code> file to a PC. (See the information below at Uploading a glbdata.ini file.)
6	Stop each controller before you do the customization.
7	Using the same path, download the <code>glbdata.ini</code> file to the other devices. (See the information below at Downloading a glbdata.ini file.)
8	Connect your Web browser to each device to customize start address and the Publish/Subscribe setting.

Note: The Global Data Configuration page is populated with data from the `glbdata.ini` configuration file.

Uploading a glbdat.ini File to a PC

Step	Action
1	At the DOS prompt type FTP followed by the IP address and press Enter .
2	At the User prompt type FTP Username and press Enter .
3	At the password prompt enter your FTP Password and press Enter .
4	At the FTP prompt type cd wwwroot/conf/glbdata and press Enter .
5	At the FTP prompt type get and press Enter .
6	At the local file prompt type glbdata.ini and press Enter .
7	At the remote file prompt type glbdata.ini and press Enter .

Downloading a glbdat.ini File to another NOE

Step	Action
1	At the DOS prompt type FTP followed by the IP address and press Enter .
2	At the User prompt type the FTP username and press Enter .
3	At the password prompt enter your FTP Password and press Enter .
4	At the FTP prompt type cd wwwroot/conf/glbdata and press Enter .
5	At the FTP prompt type put and press Enter .
6	At the local file prompt type glbdata.ini and press Enter .
7	At the remote file prompt type glbdata.ini and press Enter .

Verifying System Operation

Step	Action
1	Verify all controllers are running.
2	Look at the health of all variables using the Global Data Diagnostic page. Follow these links: Diagnostics NOE Diagnostics Global Data

At a Glance

Introduction This chapter discusses the Ethernet modules' I/O scanner capabilities.

What's in this Chapter? This chapter contains the following topics:

Topic	Page
I/O Scanner Concepts	200
Configuring the Modicon Quantum I/O Scanner with Unity	205
I/O Scanner Response Times: Remote Input to Remote Output	210

I/O Scanner Concepts

Introduction

The I/O Scanner is a feature that resides in an Ethernet (NOE 771 00, -01, -11, and CPU 651 x0 modules). The I/O Scanner allows, through a controller, repeated reading from and/or writing to scanned devices.

Use the I/O scanner to transfer data between network devices.

Configure the I/O Scanner with Schneider Electric's programming package Unity Pro. (I/O Scanner configuration information (see *Configuring the Modicon Quantum I/O Scanner with Unity*, p. 205) appears elsewhere in this guide.)

Health Block Bits

Each bit corresponds to an entry in the I/O Scanner table. Each entry in the table represents one logical device.

The bits contain the health status for the Modicon Quantum I/O Scanner.

Device Control Block

With the Device Control Block, disable an individual entry/device in the I/O Scanner table by checking the box and setting the associated bit in Device Control Block to 1.

I/O Scan List

The I/O scan list is a configuration table that identifies the targets to which repetitive communications are authorized. While the controller is running, the Ethernet module transfers data to and from the controller's registers as indicated by the I/O scan list.

**I/O Scanner
Parameters**

The I/O Scanner parameters are described in the following table:

Parameter	Value
Max. No. of Devices	64: 140 NOE 771 00 (Version 2.2 or earlier) 128: 140 NOE 771 00 (Version 3.0 or later), 140 NOE 771 01, and 140 NOE 771 11 only 128: 140 CPU 651 x0
Max. No. of Input Words	4000
Max. No. of Output Words	4000
Health Timeout Value	User configured: 1...65535 ms in 1 ms increments
Last Value (Input)	User configured (Zero or Hold)
IP Address	User configured IP address of scanned device (Slave IP)
Local and Remote Register Reference	User configured
Repetitive Rate	User configured: 0...65535 ms in multiples of: • 16 ms, for 140 NOE 771 xx • 10 ms, for 140 CPU 651 xx
Unit ID	User configured Configure ID only if using a bridge
Operation through a bridge	Modbus bridge: Supported
	Modbus Plus bridge: Supported

Elsewhere in this guide is information about I/O scan response times for high-performance communications modules (see *I/O Scanner Response Times: Remote Input to Remote Output*, p. 210).

**Using the I/O
Scanner with an
IP Router**

Note: The I/O Scanners in the NOE 771 x1 modules and 140 CPU 651 x0 send out requests with a Time To Live (TTL) of 10, which allows passage through multiple routers.

Device Control Block

Important information about using the Device Control Block:

Registers	The Device Control Block consists of registers either eight (8) single words or four (4) double words. Contents of the registers are mapped in the controller's memory. Each bit corresponds to an entry in the table (see the tables below.)
Disabling Devices	Each I/O Scanner device can be disabled. To disable individual devices: 1. Select the Device Control Block option on the I/O Scanner tab in Unity Pro. (Insert a check mark in the box.) 2. Set the associated bit = 1.
Mapping Device Control Block Bits to I/O Scanner Entry Numbers (#)	See the table for mapping entry numbers to bits. Each entry number represents a logical device on the network.
Setting Bits	If Device Control Block bit is set to ● 0 = Device is enabled ● 1 = Device is disabled

**Mapping Device
Control Block
Bits to I/O
Scanner Entry
Numbers (#)**

Single Word (W) Register (%MDx:4)																	
W1 %MW [x+1]	Table Entry #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
W2 %MW [x+2]	Table Entry #	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
	Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
W3 %MW [x+3]	Table Entry #	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
	Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
							Word 4 through Word 7 (Table Entry 49 through 112)										
W8 %MW [x+8]	Table Entry #	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128
	Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Note: Bits are counted from right to left starting from bit 0 (low bit). Examples: to configure %MD1:4 as a device control block in the I/O Scanner table, use %MW2, bit 15 to enable or disable table entry 1. Use %MW3, bit 15 to enable or disable table entry 17.

Double Word (DW) Register (%MDx:4)																	
DW1 %MD x[0]	Table Entry #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
	Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16

Double Word (DW) Register (%MDx:4)																	
DW2 %MD x[1]	Table Entry #	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
	Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
	Table Entry #	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
	Bit	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
							Word 3 through Word 4 (Table Entry 49 through 112)										
DW %MD x[4]	Table Entry #	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128
	Bit	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0

Note: Bits are counted from right to left starting from bit 0 (low bit). For example, to configure %MD1:4 as a device control block in the I/O scanner table, use %MD1[0], bit 31 to enable or disable table entry 1. Use %MD1[1], bit 15 to enable or disable table entry 17.

Configuring the Modicon Quantum I/O Scanner with Unity

The I/O Scanner Configuration Dialog

When you click on the **I/O Scanning** tab in the **Communications** → **Ethernet** screen, one of the two **I/O Scanner configuration** dialogs similar to the ones below appear.

Screen A will appear if you are using Unity Pro software V3.1 or lower.

Screen A

The screenshot shows the 'I/O Scanner configuration' dialog box. At the top, there are tabs: 'IP Configuration', 'Messaging', 'I/O Scanning' (selected), 'Global Data', 'SNMP', 'Address Server', and 'Bandwidth'. Below the tabs, the 'I/O Scanner configuration' section contains two input fields: 'Health Block : (%I / %IW)' with the value '%IW0' (callout 1), and 'Device Control Block : (%MDx:4)' with the value '%MD2:4' (callout 2). Below these fields is a table with 11 columns: 'Slave IP Address', 'Unit ID', 'Health Timeout (ms)', 'Repetitive rate (ms)', 'RD Master Object', 'RD Slave Index', 'RD length', 'Last value (input)', 'WR Master Object', and 'WR Slave Index'. The table contains 10 rows of data. Callout 3 points to the table header. Callout 4 points to the 'Slave IP Address' column. Callout 5 points to the 'Unit ID' column. Callout 6 points to the 'Health Timeout (ms)' column. Callout 7 points to the 'Repetitive rate (ms)' column. Callout 8 points to the 'RD Master Object' column. Callout 9 points to the 'RD Slave Index' column. Callout 10 points to the 'RD length' column. Callout 11 points to the 'Last value (input)' column. Callout 12 points to the 'WR Master Object' column. Callout 13 points to the 'WR Slave Index' column. The table data is as follows:

	Slave IP Address	Unit ID	Health Timeout (ms)	Repetitive rate (ms)	RD Master Object	RD Slave Index	RD length	Last value (input)	WR Master Object	WR Slave Index
1	139.124.10.81	255	1500	208	%MW200	0	2	Hold Last	%MW100	0
2	139.124.10.82	255	1500	208	%MW202	2	2	Set to 0	%MW102	2
3	139.124.10.83	255	1500	208	%MW204	4	2	Set to 0	%MW104	4
4	139.124.10.84	255	1500	208	%MW206	6	2	Hold Last	%MW106	6
5	139.124.10.85	255	1500	208	%MW208	8	2	Hold Last	%MW108	8
6	139.124.10.86	255	1500	208	%MW210	10	2	Set to 0	%MW110	10
7										
8										
9								Set to 0		
10										

Screen B appears if you are using Unity Pro software V4.0 or higher.

Screen B

The screenshot shows the 'I/O Scanning' tab in the Unity Pro software. At the top, there are tabs for 'IP Address', 'Messaging', 'I/O Scanning', 'Global Data', 'SNMP', 'Address Server', and 'Bandwidth'. Below these tabs, there are configuration fields: 'Health Block (%I/%IW):' with a dropdown set to '%IW1', a checked 'Device Control Block (%MD:)' with values '2' and '5', and 'Repetitive rate step:' with a value of '5'. The main area is a table with 16 columns, each with a numbered callout: 1 (Health Block dropdown), 2 (Device Control Block dropdown), 3 (Repetitive rate step dropdown), 4 (Table header), 5 (IP Address), 6 (Unit ID), 7 (Health Timeout), 8 (Repetitive Rate), 9 (RD Master Object), 10 (RD Slave Index), 11 (RD length), 12 (Last value), 13 (WR Master Object), 14 (WR Slave Index), 15 (WR length), and 16 (Description). The table contains three rows of data for IP addresses 192.168.1.100, 192.168.1.101, and 192.168.1.102, with various values for the other columns.

Note: These screens show I/O Scanner dialogs for an NOE 771 01 or -11 module. The **I/O Scanner configuration** dialog is slightly different for the CPU 651 x0, which does not display a **Health Block** field (item 1 above).

The Health Block

The **Health Block** field (item 1 in the illustration above) lets you define the first word or bit in a health table. That table can be up to 8 words (%IW) or 128 bits (%I) in length. Each bit in the table represents the status of an individual device. The table below shows how the bits are displayed based on the data type you use.

Bit	Data Type	
	%I	%IW
1	%I1	%IW1.0
2	%I 2	%IW1.1
...		
16	%I16	%IW1.15
17	%I17	%IW2.0

By default, the table comprises words starting at %IW1.0. If you want to set the table to bits, you need to specify a %I value in an increment of 16 (%I1, %I16, %I32, etc.).

Note: The **Health Block** field is available only for the NOE 771 00, -01, and -11. It is not available for the CPU 651 x0.

**The Device
Control Block**

The Device Control Block lets you disable any scanned device by setting a bit associated with that device to 1. The I/O scanner closes the connection and sets the Health Bit to 0 (unhealthy state).

To enable the Device Control Block select the checkbox in the **I/O Scanner configuration** dialog (item 2 in the illustration above).

Note: To enable the Device Control Block, you must have:

- Unity Pro at V2.0 or higher
- An NOE 771 01 or NOE 771 11at version 3.5 or higher
- A 140 CPU 651x0 at version 2.0 or higher

If you attempt to enable the Device Control Block with an earlier version of the firmware, the I/O scanning service is disabled.

If the checkbox is not selected, the I/O scanner service is enabled, and you cannot disable the I/O scanning of individual devices.

Disabling I/O scanning with the Device Control Block is equivalent to ending communication between the scanner and the device. Therefore:

- the fallback positions are applied to the inputs by the scanner
- communication with the device is stopped
- all the entries in the IN and OUT tables are still transferred between the CPU and the scanner on each scan

As a consequence of the last point above, if you modify a %MWi attached to an input, this %MWi is overwritten by the values coming from the I/O scanner in the next scan (with either 0 or the last input value).

It is possible (but meaningless) to access %MW attached to the outputs because they will not be transmitted to the device.

The Repetitive Rate Step (see Screen B)

Note: The Repetitive Rate Step box has been added to the I/O Scanner Dialog for I/O scanner improvement.

The Repetitive Rate Step box (see Screen B, item 3) is where you enter a rate of time for how often you want the I/O scanner to send a query to the device after the rate has timed out.

The rate displayed in the Representative Rate Step box is the rate for all entries. It is set in multiples of 5 ms (the minimum) through 200 ms (the maximum) and appears in the Repetitive Rate (ms) column (see Screen B, item 7).

Note: An entry in the Repetitive Rate column will be rounded up to the next multiple that was entered in the Repetitive Rate Step box if the entry is not a multiple of the Repetitive Rate Step. For instance:

If the entry in the Representative Rate Step box is 5 and you enter a 7 in the Representative Rate column, the 7 in the Representative Rate column will be rounded up to 10; if you change the Representative Rate Step to 6 and enter a 7 in the Representative Rate column, the entry in the Representative Rate column will be rounded up to 12.

Note: The representative rate of the I/O scanner is a multiple of the rate displayed in the Representative Rate Step box. The real representative rate being executed by the I/O scanner service is shown in the Representative Rate column.

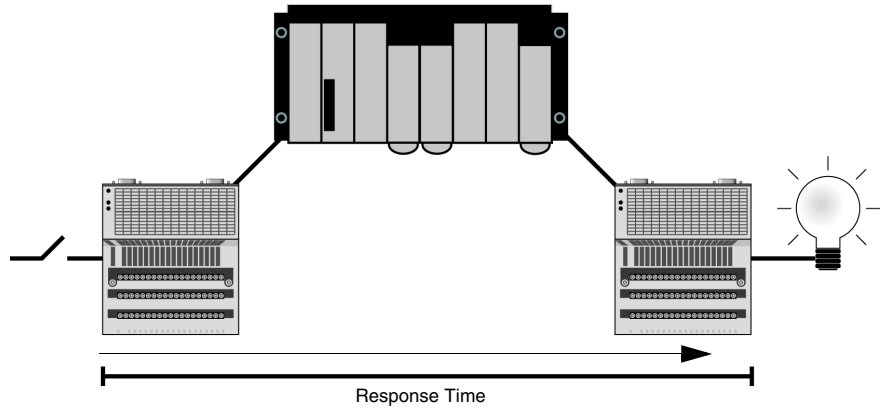
Configuration Parameters Set configuration parameters in the **I/O Scanner configuration** dialog. Enter data in appropriate fields.

Parameter/Field		Description
Entry #	see item 4 in the illustrations	A list of contiguous numbers from 1 -128. Each entry is a logical Ethernet device on the network that may be scanned.
Slave IP Address and IP Address	see item 5 in the illustrations	The IP address of the scanned device.
Unit ID	see item 6 in the illustrations	The unit ID of the device on the Modbus/Modbus Plus network. The device connects to the Ethernet through a bridge.
Health Timeout (ms)	see item 7 in the illustrations	The valid operating range for the Health Timeout parameter is 1 ... 65535 (representing 1 ms increments). After the configured time period expires, the received data becomes invalid. If the parameter value is set to 0, the health bit is not active and will not provide health information.
Repetitive rate (ms)	see item 8 in the illustrations	The rate at which data will be scanned, from 0...65535 in multiples of: • If you are running Unity Pro V3.1 or lower with the following firmware versions: • NOE (v4.2 or lower): 16 ms • CPU (V2.5 or lower): 10 ms • If you are running Unity Pro V4.0 or higher with the following firmware versions: • NOE (V4.3 or higher): 5 - 200 ms • CPU (V2.6 or higher): 5 - 200 ms
RD Master Object	see item 9 in the illustrations	The destination address in the controller for read operations.
RD Slave Index	see item 10 in the illustrations	The source address of the input/output module for the read period.
RD length	see item 11 in the illustrations	The number of words to be read.
Last value (Input)	see item 12 in the illustrations	The status of the inputs in the event of an error.
WR Master Object	see item 13 in the illustrations	The source address of the controller for write operations. A write operation is carried out in words.
WR Slave Object	see item 14 in the illustrations	The destination address of the slave for write operations.
WR length	see item 15 in the illustrations	The number of words to be written.
Description	see item 16 in the illustrations	User-provided information.

I/O Scanner Response Times: Remote Input to Remote Output

Measurement Setup

The set of curves below illustrates Quantum PLC response times when a signal is sent from a remote input module to a remote output module through a Quantum PLC:

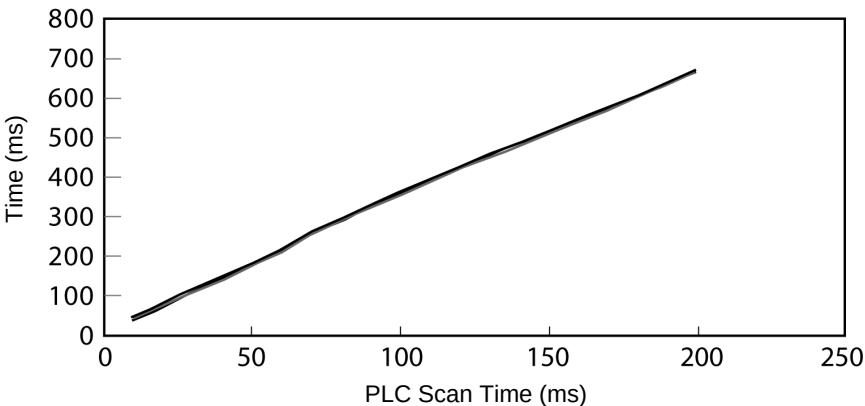


The signal is:

- 1 triggered by a Momentum input module with a response time of ~2 ms
 - 2 scanned into the Quantum PLC at a repetitive rate of 0 ms
 - 3 copied to another internal variable within the PLC
 - 4 written to a Momentum output module with a response time of ~2 ms
-

**140 CPU 434 12A
with
140 NOE 771 x1
Module**

The 140 CPU 434 12A with an NOE 771 x1 (v3.3) was used for the following measurements:



The plot shows four lines representing the number of scanned devices:

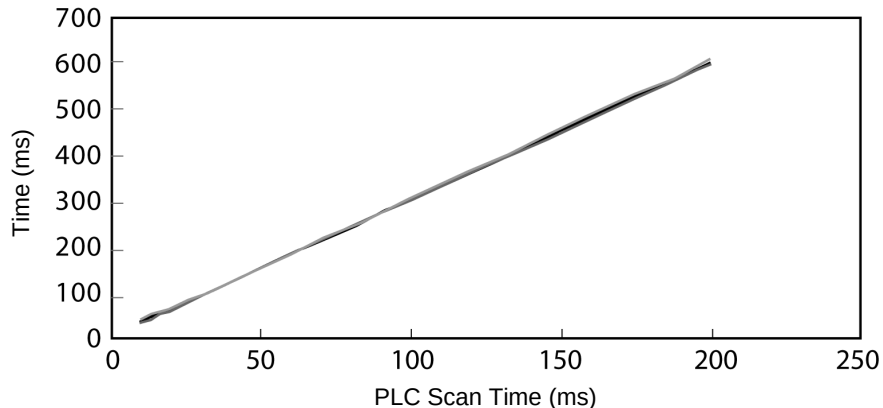
- 1 device
- 8 devices
- 16 devices
- 32 devices

The four lines are indistinguishable at this scale because the response times are so similar. You can see the similarity in the following table of data from which the above graph was plotted:

Number of Devices to Scan	Time from Scanned Device Input to Scanned Device Output (ms)				
	10 ms scan	20 ms scan	50 ms scan	100 ms scan	200 ms scan
434 12A + NOE 771 x1 (v3.3)					
1 device	41	73	179	358	665
8 devices	42	75	180	360	666
16 devices	44	77	182	361	668
32 devices	46	79	185	364	671

**140 CPU 65 150
with NOE 771 x1
(v3.3)**

The 140 CPU 65 150 with an NOE 771 x1 (v3.3) is used for the following measurements:



The plot shows four lines representing the number of scanned devices:

- 1 device
- 8 devices
- 16 devices
- 32 devices

The four lines are indistinguishable at this scale because the response times are so similar. You can see the similarity in the following table of data from which the above graph was plotted:

Number of Devices to Scan	Time from Scanned Device Input to Scanned Device Output (ms)				
	10 ms scan	20 ms scan	50 ms scan	100 ms scan	200 ms scan
65150 + NOE 771x1 (v3.3)					
1 device	35	61	153	302	602
8 devices	36	62	154	303	603
16 devices	38	64	155	305	606
32 devices	40	66	157	307	609

Address Server Configuration/ Faulty Device Replacement



At a Glance

Introduction This chapter covers the Address Server Configuration/Faulty Device Replacement service available on the NOE 771 01 and -11 (Transparent Factory/Real Time modules) and HE CPU modules. The Faulty Device Replacement service offers you a method of handling device replacement without disrupting the system or service.

What's in this Chapter? This chapter contains the following topics:

Topic	Page
Address Server Configuration/Faulty Device Replacement	214
Understanding Faulty Device Replacement	216
Configuring Faulty Device Replacement	219

Address Server Configuration/Faulty Device Replacement

Overview

The address server provides two capabilities:

1. **Standard BOOTP server behavior:** Enter the MAC address and IP configuration. The NOE BOOTP server will provide the IP configuration when the device sends a BOOTP request.
2. **Faulty Device Replacement (FDR) behavior:** Enter the role name or the MAC address of the device. The device will send its role name or the MAC address with its DHCP request. With the DHCP response from the NOE, the device will receive its IP Configuration, plus the name and location of a configuration file. The next step for an FDR-compliant device is to download its configuration from the NOE.

Note: Consult your Schneider Electric sales representative for the current list of FDR-compliant devices.

The address server in the NOE supports both modes at the same time. You select a mode by entering either the MAC address or the role name in the Address Server Node Configuration (see *Configure Address Server Page, p. 287*) page. You may enter only one or the other, but not both.

The Faulty Device Replacement capability allows automatic configuration of FDR-compliant devices.

Identifying a Role Name

Role names play an important role in Faulty Device Replacement. A role name is a logical name that the user assigns to a device, a logical name that has a meaning within the application. Example role names might be:

- **ENT_6:** The sixth Momentum ENT in your application.
- **OUTPUT_VALVE_2:** The second output valve in your application

Note: Role names are case-sensitive.

Role Name

The logical role name should be written on devices. The technician can get the new device from stores, enter the corresponding role name into the device, and place the device in the system. The device automatically gets its configuration and starts running with no further input from the technician. This process is designed to get your machine up and running quickly. All the technician has to do for any FDR compliant device is to enter the role name into the new device.

Address Server Limits

This table displays the parameters and limits of the address server:

Parameter	Limit
Maximum number of address server entries	128
Maximum size of the configuration file per device	4K bytes
Total size of Faulty Device Replacement storage	512K bytes
Maximum role name size	16 Characters

Note: For the DHCP server to work correctly the following must be observed.

- Address class and subnet class configured for the devices must match.
- Address class of the NOE and of the devices must be the same.

Operating on a Corporate Network

Keep these points in mind when operating on a corporate network:

- Before placing the NOE on a corporate network, Schneider Electric recommends that you discuss the installation with your MIS department. It is likely that your company's corporate network has at least one DHCP server running already. If the NOE's DHCP server is running on the same network, it may disturb the network.
- To avoid any possible problem related to the NOE's DHCP server on the corporate network, you have to ensure that the DHCP server is not running in the NOE by not having address entries in the configuration. If there are no configured devices in the address server Configuration page, then the NOE will not start the DHCP server.

Available FDR Agents

Three FDR agents are available:

- Momentum ENT
- Micro ETZ
- ATV58

The `role-name.prm` configuration files are stored in the NOE in non-volatile memory. Therefore, after a power failure all configurations will be available.

BOOTP and DHCP Compatible Devices

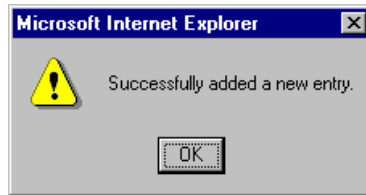
Use either the MAC address or the role name (see *Adding Entries*, p. 288) to assign IP addresses. Therefore, you may use the DHCP server with devices that support BOOTP only, such as Momentum ENT v1.

Understanding Faulty Device Replacement

Understanding Confirmation and Error Messages

In addition to highlighting errors, the system provides confirmation information and error messages.

Confirmation Message If you successfully added, modified, or removed an entry, the following alert message appears:



Error Messages Error messages, appearing as icons in the seventh column, display on the Address Server Configuration page (see *Configure Address Server Page*, p. 287), or in a dialog box.

Error Icon If an entry is not loaded in the DHCP server or loaded with a different configuration, an icon of an exclamation point displays in the seventh column. The icon informs you of the difference between the current and stored information.

- Not loaded in the server: A red icon displays.

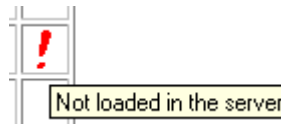


- Duplicate configuration: A blue icon displays.

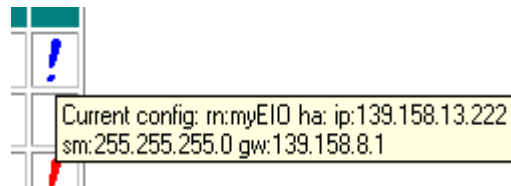


Place the pointer over the icon and a pop-up window appears and displays a message

- Not Loaded in the server:



- Present configuration:



Error Dialog Box If you entered an existing role name or MAC address, you will receive an alert message asking you to correct the entry.



Modifying the Database

If you need to add or modify an entry in the database, use the Address Server Configuration page (see *Configure Address Server Page*, p. 287). Three fields must be filled in:

- Device IP address
- Subnet Mask
- Gateway

Choose either the **Role Name** or **Device MAC address** field. When one field is selected, the other is made unavailable.

Adding Entries If you are adding a device, the page appears with values. You need to enter either a Role Name or a MAC Address.

If you are adding an entry, submit your selection using the **Add the Entry** button.

Modifying Entries If you are modifying an entry, the **Device IP address**, **Subnet Mask**, and **Gateway** fields display with the current configuration.

If you are modifying an entry, submit your selection using the **Reset the Form** button.

Each field of the **Address Server Node Configuration** page has restrictions, which are detailed below.

- **Role Name:** Each role name must be unique. Only letters, numerals, and underscores are allowed. No more than 16 characters are allowed, and no spaces are allowed.
 - **Device MAC Address:** This address must be in hexadecimal format and six (6) bytes long (6x2 characters). The MAC address can be entered with or without a delimiting character between each pair of lower- or upper-case hexadecimal characters. The delimiting characters improve readability. There are three choices for a delimiting character:
 - Space " " (spacebar)
 - Colon ":"
 - Hyphen "-"
 - **Device IP Address:** The IP address must use the standard numeric Internet Protocol address that uniquely identifies each computer on the network. The IP address is a 32-bit identifier made up of four groups of numbers (from 0 through 255), each number separated by a period, for example 123 . 456 . 78 . 9.
 - **Subnet Mask:** The subnet mask must be entered in IP address format.
 - **Gateway:** The gateway must be entered in IP address format. The gateway must be on the same subnet as the device.
-

Configuring Faulty Device Replacement

Configuring the Address Server

To configure the Address Server you use Web pages generated by the embedded Web server. The first page that appears is the **Address Server Configuration** page. The first column contains buttons used for selecting devices. The **Address Server Configuration** page displays configuration information for each device in the system and has seven columns in the table.

Displayed on this page is information about:

- Role Name
- MAC Address
- IP Address
- Subnet Mask
- Gateway

A additional, unnamed column indicates any difference between the current and stored configuration. If a difference exists, an exclamation point is displayed.

This is the **Address Server Configuration** page. All devices are compatible.

Address Server Configuration

	Role Name	MAC Address	IP Address	Subnet Mask	Gateway	
☐	myNIP		192.168.3.11	255.255.255.0	192.168.3.11	
☐	ENT_1st_floor		192.168.5.14	255.255.0.0	192.168.2.1	

Refresh Address Server Database Table

Add a New Entry

Change an Entry

Delete an Entry

On the Address Server Configuration page you can:

- Add a New Entry
- Change an Entry
- Delete an Entry
- Refresh the data table

Choosing Options

The Address Server Configuration page allows you to choose different options for adding or altering the configurations of your NOE. The options available to you are:

- select an entry
- add an entry
- change an entry
- delete an entry

Below we describe the method and options chosen to perform any of the four options listed above. Screen shots are presented to accompany the *Adding an entry* section.

Selecting an Entry When the page displays, by default no entries are selected.

Use the radio buttons in the first column to select an entry. Only one entry may be selected at a time.

Adding an Entry When the **Add a New Entry** button is selected, the **Address Server Node Configuration** page appears. This page displays information about a device.

If you selected a device, this page displays the device's configuration.

Configuration information appears in four of the five fields of the dialog box. Only the Role information field is blank. You should enter a Role name, for example *ENT_7*.

If no device is selected, default values appear in all the fields.

Changing an Entry Before using this button, you must select an entry in the database by choosing one of the radio buttons in the first column. If you fail to choose an entry, an error message appears.

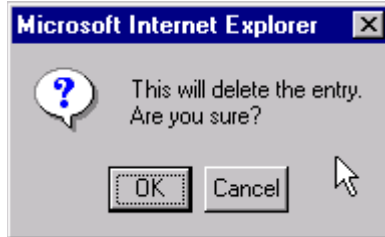
When the **Change an Entry** button is selected, the **Address Server Node Configuration** page appears. The information displayed is for the device selected.

Address Server Node Configuration

Role Name:	ENT_7
Device Mac address:	
Device IP address:	139.160.234.172
Subnet Mask:	255.255.254.0
Gateway:	139.160.134.1

Deleting an Entry Before using this button, you must select an entry in the database by choosing one of the radio buttons in the first column. If you fail to choose an entry, an error message appears. The entry selected will be removed from the database. Before completely deleting an entry, a warning message appears. Click **Yes** if you want to delete the entry, **No** if you don't.

If you click **Yes**, a dialog box appears.



Click **OK**. Another dialog box appears notifying you that the deletion was successful.



Highlighting Errors

If there are problems with the entered configuration parameter information, the system indicates problems using a highlighting mechanism. All the configurations appear in purple and italic, and the device with configuration problems appears in red and bold.

The system detects the following errors:

- **Bad Role Name**

The valid **Role Name** characters are:

- a through z (lower case)
- A through Z (upper case)
- " _ " (underscore)

- **Bad MAC Address**

The valid **MAC Address** characters are:

- 0 through 9
- A through F

- **Wrong IP Address**

- **Wrong Subnet Mask**

- **Wrong Gateway**

- **Double Entry**

Each entry must have a unique **Role Name** or **MAC Address**. If a duplicate **Role Name** or **MAC Address** is entered, the system highlights the error.

Erroneous entries are not loaded into the DHCP server. Therefore, errors must be corrected before loading. There are two ways of correcting the error:

- **Correcting through Web page:** Make the changes on the Web page and submit the change.
 - **Correcting through the Address Server configuration file:** Make the changes in the file and reboot the server.
-

Network Management Service (SNMP)

8

At a Glance

Introduction The following material describes SNMP and the Schneider private MIB. Under the Schneider private MIB is the Transparent Factory Ethernet private MIB.

What's in this Chapter? This chapter contains the following topics:

Topic	Page
SNMP	224
ASN.1 Naming Scheme	227
Configuring an NOE with SNMP	229
Configuring an NOE with TFE Private MIB	231

SNMP

Introduction

This topic describes the Simple Network Management Protocol (SNMP), which is configured on your NOE or 140 CPU 651 x0. Network management software allows a network manager to:

- monitor and control network components
 - isolate problems and identify their causes
 - query the status of devices such as a host computer, routers, switches, and bridges
 - obtain statistics about the networks to which devices are connected
-

Manager/Agent Paradigm

Network management software follows the conventional client-server model. To avoid confusion with other network communication protocols that use the client/server terminology, network management software uses the following terms:

- *Manager*: the client application that runs on the manager's computer
- *Agent*: the application that runs on a network device

The manager uses conventional transport protocols (for example, TCP or UDP) to establish communication with the agent. Managers and agents then exchange requests and responses according to the network management protocol.

Simple Network Management Protocol

Your NOE module is configured with the Simple Network Management Protocol (SNMP), which is the standard protocol used to manage a local area network (LAN). SNMP defines exactly how a *manager* communicates with an *agent*.

The SNMP defines the format of the requests that a manager sends to an agent and the format of the replies that the agent returns to the manager.

The MIB

Each SNMP object has to be defined and given a unique name. Both the manager and agent programs must agree on the names and the meanings of the fetch and store operations. The set of all objects SNMP can access is known as a *Management Information Base (MIB)*.

Private MIB

Schneider obtained a private MIB, Groupe_Schneider (3833). Under the Groupe Schneider private MIB is a Transparent Factory Ethernet (TFE) private MIB. The Transparent Factory SNMP embedded component controls the Schneider private MIB function.

Choosing an SNMP Manager

If you already have a working SNMP manager, you may continue to use it. Any of the many SNMP version 1-compliant managers on the market will work.

If you do not currently use an SNMP manager in your organization and are evaluating SNMP managers for purchase, then we recommend that you consider HiVision with the ConnexView Add-On developed for use with Schneider Automation PLCs.

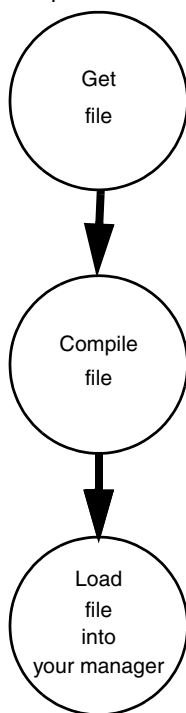
Please contact your Schneider Electric sales office for availability and pricing of HiVision and ConnexView.

Using a SNMP Manager

The process for obtaining a SNMP Manager

Step	Action
1	Get Schneider .mib file from the NOE Web page. You are going to find the .mib file as a packed file under /wwwroot/SchneiderTFE.zip on your NOE module.
2	Compile .mib file in the compiler that comes with the NOE.
3	Load compiled .mib file to the SNMP manager.
4	When you are done, you will see the Schneider private MIB manager in your manager.

The process is simple.



**Other SNMP
Resources**

SNMP and related subjects are well-documented on Web sites and in many books:

- As of this writing, a useful description appears on Microsoft's *Technet* pages. Browse to <http://www.microsoft.com/technet>. Use the **Search** function to find "Network Management for Microsoft Networks Using SNMP."
 - Use an Internet search engine to search for an SNMP introduction, tutorial, or other resource.
 - The SNMP FAQs from the news group `comp.protocols.snmp` appear on many `.com` and `.org` Web pages. Search for the combination of "`comp.protocols.snmp`" and "FAQ."
-

ASN.1 Naming Scheme

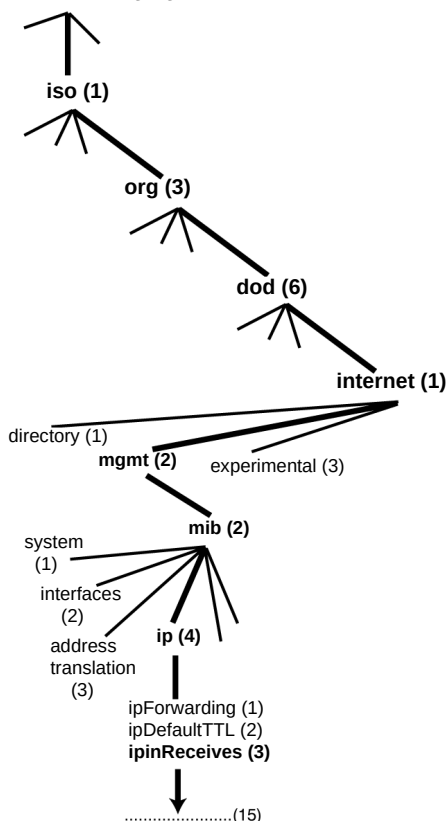
ASN.1 Overview

Abstract Syntax Notation One (ASN.1) is a formal language for abstractly describing messages to be exchanged between distributed computer systems.

An Example

Objects in a MIB are defined with the ASN.1 naming scheme that assigns each object a long prefix that guarantees that the name will be unique. For example, an integer that counts the number of IP datagrams that a device has received is named: *iso.org.dod.internet.mib.ip.ipinReceives*.

The following figure depicts the ASN.1 naming scheme example.



This object name is represented in an SNMP message by assigning each part an integer. So, the above message would appear as 1.3.6.1.2.2.4.3.

Each integer has the following meaning:

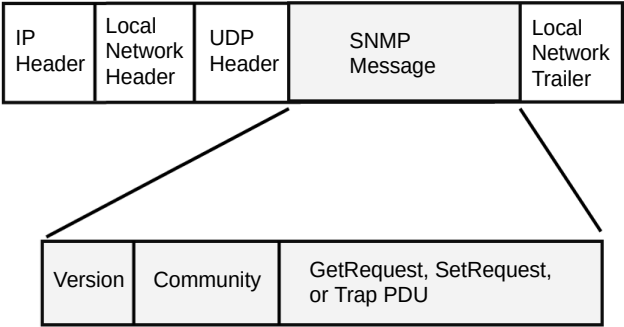
- 1 = ISO (International Organization for Standardization)

- 3 = identified organization (one of branches under the ISO root)
 - 6 = U. S. Department of Defense (DoD) (one of the children under branch 1.3)
 - 1 = the Internet subtree under 1.3.6
 - 2 = the mgm branch — (one of seven) of the Internet subtree. It is managed by the Internet Assigned Numbers Authority, and includes the standard MIBs
 - 2 = mib-2(1) group of managed objects
 - 4 = ip (the mib-2(1) IP group (one of 11))
 - 3 = ipInReceives (the MIB object)
-

Configuring an NOE with SNMP

Object Identifier (OID) In the ASN.1 Naming Scheme example (see *An Example, p. 227*), the MIB object identified by the notation 1.3.6.1.2.2.4.3 is referred to as the Object Identifier or OID. All OIDs can be seen as part of a tree structure that begins at the root (ISO) and branches out with each subtree identified by an integer.

SNMP Protocol Data Units SNMP uses protocol data units (PDUs) to carry the requests and responses, between the manager and the agents, for the information contained in an OID. As the following figure shows, the SNMP message is the innermost part of a typical network transmission frame.



The PDUs within the SNMP initiate the communication between the manager and the agents.

The SNMP installed on your NOE module uses the following three PDUs:

- GetRequest
- SetRequest
- Trap

GetRequest PDU The GetRequest (shortened to Get) PDU is used by the SNMP manager to retrieve the value of one or more objects (OIDs) from an agent.

SetRequest PDU The SetRequest (shortened to Set) PDU is used by the SNMP manager to assign a value to one or more objects (OIDs) residing in an agent.

Trap PDU The Trap PDU is used by the agent to alert the manager that a predefined event has occurred.

**Version &
Community
Identifiers**

The version identifies the version number of the SNMP software being used by the manager and the agent. Your NOE supports Version 1 of the SNMP. The community is an identifier that you assign to your SNMP network. If community names for the manager and the agent do not agree, the agent will send an authentication failure trap message to the manager. If the community names and version number agree, the SNMP PDU will be processed.

**What Can Be
Configured**

Your NOE module can be configured to send an authentication trap to two SNMP managers if it receives a community name in a Get/Set request that does not match the configured name. Also, you can configure the SysContact and SysLocation via the configuration page in the module's embedded web pages. After making changes in the SNMP Configuration Web page and to set those changes, reboot the module using hot swap.

Configuring an NOE with TFE Private MIB

Introduction

A MIB, a Management Information Base, is an element used in network management. Network management services are based on the need to monitor and manage:

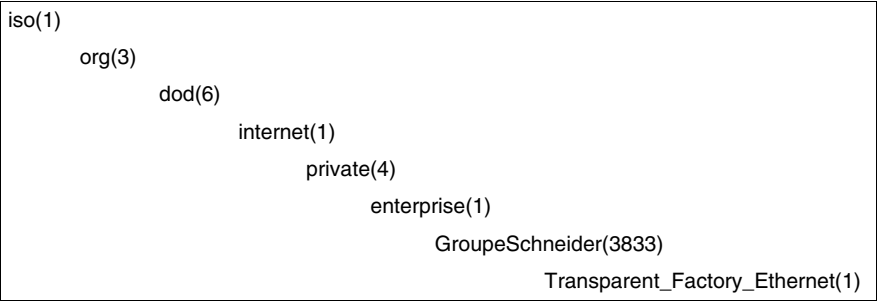
- performance
- fault occurrences
- security

Each MIB contains a finite number of objects. Manage your MIB with a management station running an SNMP management application. The management application uses **GETs** and **SETs** to retrieve system information and to set system environment variables.

Schneider Private MIB

Schneider Electric obtained a Private Enterprise Number (PEN) from the Internet Assigned Numbers Authority (IANA). That number represents a subtree in the SNMP MIB, a number that is a unique identifier used for Groupe Schneider.

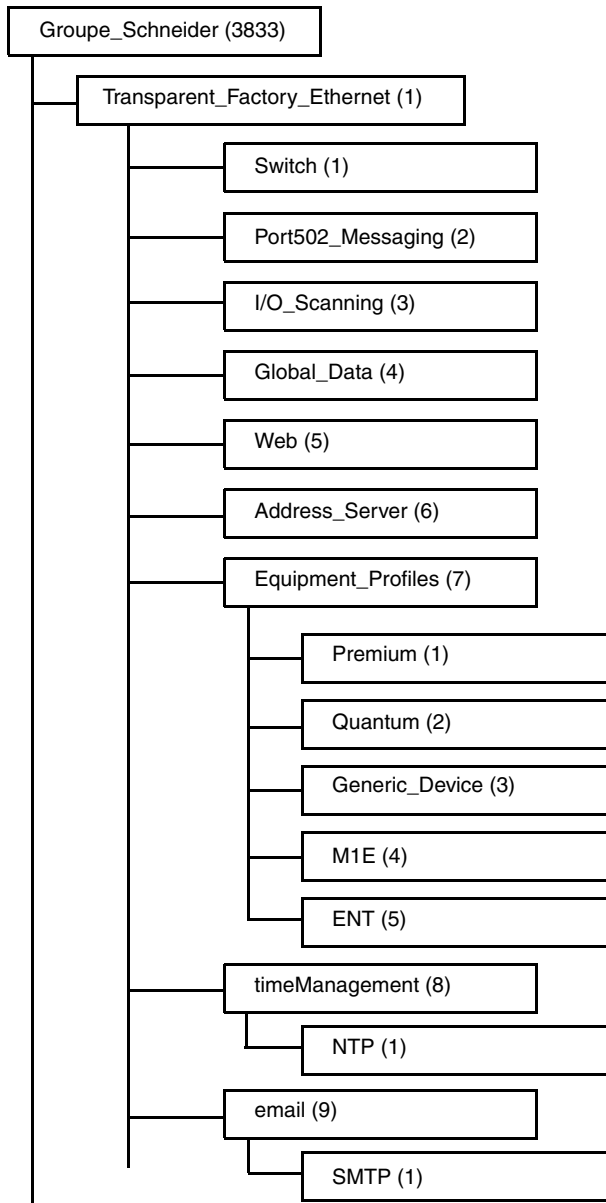
The object identifier for the root of the Groupe Schneider subtree is **1.3.6.1.4.1.3833** and represents a path to the subtree as follows:



Under the GroupeSchneider private MIB is a Transparent Factory Ethernet (TFE) private MIB, **Transparent_Factory_Ethernet(1)**.

TFE Private MIB The Transparent Factory SNMP-embedded component controls the Schneider private MIB function. The Schneider private MIB, and associated services, perform Network Management on all system components. The Transparent Factory private MIB provides the data to manage the main Transparent Factory communication services for all the communication components of the Transparent Factory architecture (ETYs, NOEs, third party toolkit, ENTs, M1Es). The Transparent Factory private MIB does not define the specific management applications and policies.

The diagram following illustrates the Schneider Electric (Groupe_Schneider (3833)) private enterprise MIB subtree.



The **Groupe_Schneider (3833)** subtree is the root of Groupe Schneider's private MIB in the Structure of Management Information (SMI) used by SNMP and defined in RFC-1155, which is a specification that defines the structure and identification of management information for TCP/IP-based networks.

Transparent Factory Ethernet Subtree

The **Transparent_Factory_Ethernet (1)** subtree defines groups that support the Transparent Factory Ethernet services and devices.

Service	Subtree Definition
Switch(1)	brand of switches labeled: ConneXium switches private MIB
Port502_Messaging(2)	objects for managing explicit client/server communications supporting applications, such as HMI, SCADA, or programming tools
I/O_Scanning(3)	objects for managing I/O device communications that use the I/O Scanner mechanism with the MB/TCP protocol
Global_Data(4)	objects for managing the application coordination service using a publish/subscribe protocol
Web(5)	objects for managing the activity of the embedded Web servers
Address_Server(6)	objects for managing the activity of the BOOTP and (or) DHCP servers
Equipment_Profiles(7)	objects for each type of device in Transparent Factory Ethernet's product portfolio
timeManagement(8)	objects for managing the UTC time stamp service
email(9)	objects for managing the mail service

Device subtrees, or groups, will be defined for the following devices:

- **Premium(1)**
- **Quantum(2)**
- **Generic_Device(3)**
- **M1E(4)**
- **ENT(5)**

As devices are added to Schneider's catalog, Schneider's private MIB will be extended in the following manner:

- If needed, a Transparent Factory, communication-service object will be added for the new device in the corresponding **Equipment_Profiles(7)** subtree. This subtree can hold as many objects as are required.
- If needed, a new branch will be added at the same level as **Transparent_Factory_Ethernet(1)**. This subtree will be created for product-specific objects (such as the ATV58 object under the **IndustrialControl-Products (3)** subtree).

When a new device is created, a corresponding object description is created in the ASN.1 format. The ASN.1 file(s) are then given to producers of SNMP manager software for inclusion in their products.

**Port502
Messaging
Subtree**

The Port502_Messaging (2) subtree, or group, provides connection management and data flow services. The following list describes the function of each object.

Service	Indicates . . .
port502Status(1)	status of the service (idle, operational)
port502SupportedProtocol(2)	supported protocols (MODBUS, Xway)
port502IpSecurity(3):	status of the Port502 IP Security service (enabled/disabled)
port502MaxConn(4)	maximum number of TCP connections supported by the Port502 entity
port502LocalConn(5)	TCP connection number currently opened by the local Port502 entity
port502RemConn(6)	TCP connection number currently opened by the remote entity to the local Port502 entity
port502IpSecurityTable(7)	a table containing the number of unsuccessful TCP connection open tries from a remote TCP entity
port502ConnTable(8)	a table containing Port502 TCP specific information (MsgIn, MsgOut)
port502MsgIn(9)	total number of Port502 messages received from the network
port502MsgOut(10)	total number of Port502 messages sent from the network
port502MsgOutErr(11)	total number of error messages built by the Port502 messaging entity and sent to the network
port502AddStackStat(12)	the support of additional port502 stack statistics: ● 1 - disabled ● 2 - enabled
port502AddStackStatTable(13)	additional stack statistics for Port502 (optional)

I/O Scanning Subtree

The I/O_Scanning (3) subtree, or group, contains the objects related to I/O scanning device management and associated MODBUS communications on Port502.

Service	Indicates . . .
ioScanStatus(1)	global status of the I/O scanning service: ● 1 - idle ● 2 - operational ● 3 - stopped
ioScanMaxDevice(2)	maximum number of devices supported by the I/O scanning entity
ioScanPolledDevice(3)	number of devices currently polled by the I/O scanning entity
ioScanTransSend(4)	total number of transactions sent by the I/O scanning entity
ioScanGlbHealth(5)	global status of health for the I/O scanning service: ● 2 - OK: Every remote I/O device is responding ● 4 - Warning: At least one remote I/O device is not responding
ioScanDeviceTable(6)	a table containing information on each remote devices polled by the I/O scanning entity

Global Data Subtree

The Global_Data (4) subtree, or group, contains the objects related to the Global Data service.

Service	Indicates . . .
glbDataStatus(1)	global status of the Global Data service: ● 1 - idle ● 2 - operational ● 3 - stopped
glbDataMaxPub(2)	maximum number of published variables configured by the Global Data entity
glbDataMaxSub(3)	maximum number of subscribed variables configured by the Global Data entity
glbDataPub(4)	total number of publications sent to the network
glbDataSub(5)	total number of subscriptions received from the network
glbDataPubErr(6)	total number of publication errors detected by the local entity
glbDataSubErr(7)	total number of subscription errors detected by the local entity
glbDataGlbSubHealth(8)	global status of health for the Global Data subscribed variables: ● 2 - OK: The health status of all subscribed variables is OK ● 4 - Warning: At least one subscribed variable has a health fault
glbDataPubTable(9)	a table containing information on each published variable (the number of publications, the source IP address, the number of errors)
glbDataSubTable(10)	a table containing information on each subscribed variable (the number of subscriptions, the source IP address, the number of errors, Health)

Web Subtree

The Web (5) subtree, or group, contains the objects related to the Web server service.

Service	Indicates . . .
webStatus(1)	global status of the Web service: ● 1 - idle ● 2 - operational
webPassword (2)	switch to enable or disable the use of Web passwords: ● 1 - disabled ● 2 - enabled
webSuccessfulAccess (3)	total number of successful accesses to the Web site
webFailedAttempts (4)	total number of unsuccessful accesses to the Web site

Address Server Subtree

The Address_Server (6) subtree, or group, contains the objects related to the Address Server service. The Address Server can be either a BOOTP server or a DHCP server.

Service	Indicates . . .
addressServerStatus(1)	global status of the address server service: ● 1 - idle ● 2 - operational

Equipment Profile Subtree

The Equipment_Profiles (7) subtree contains a set of common objects.

Service	Indicates . . .
profileProductName(1)	the commercial name of the communication product in a string form (for example, 140 NOE 771 11)
profileVersion(2)	the software version of the communication product in a string form (for example, Vx.y or V1.1)
profileCommunicationServices(3)	the communication services supported by the profile (Port502Messaging, I/O scanning Messaging, Global Data, Web, and Address Server)
profileGlobalStatus(4)	the global status of the communication module: ● 1 - NOK ● 2 - OK
profileConfigMode(5)	the IP configuration mode of the communication module: ● 1 - Local: The IP configuration is created locally ● 2 - dhcpServed: The IP configuration is created by a remote DHCP server
profileRoleName(6)	the role name for the IP address management if it exists (empty string if there is none)
profileBandwidthMgt(7)	the status of Bandwidth Management: ● 1 - disabled ● 2 - enabled
profileBandwidthDistTable(8)	the CPU time distribution between Global Data, Port502 Messaging, I/O scanning
profileLedDisplayTable(9)	a table giving the name and the state of each module's LEDs
profileSlot(10)	the position of the communication module inside the rack if there is one. If there is no rack, the profileSlot value will be zero
profileCPUType(11)	the host for which that communication module is a part when a CPU type exists (if there is no host, the string is empty)
profileTrapTableEntriesMax(12)	the maximum numbers of entries in the Trap Table (equal to the number of possible remote managers)
profileTrapTable(13)	a table allowing you to enable or disable the private traps for each of the communication services
profileSpecificId(14)	a unique Profile Specific Identification inside the equipmentProfile object of the Schneider Transparent Factory MIB (for example, the PLC Premium family is 100)

Service	Indicates . . .
profileIpAddress(15)	the IP address of the SNMP agent
profileIpNetMask(16)	the subnet mask associated with the IP address of the SNMP agent (the value of the mask is an IP address with all the network bits set to 1 and all the host bits set to 0)
profileIpGateway(17)	the default Gateway IP address of the SNMP agent
profileMacAddress(18)	the Ethernet media-dependent address of the SNMP agent

NTP Subtree

The NTP (1) subtree contains a set of common objects.

Service	Indicates . . .
ntpStatus(1)	the status of NTP service (not server): 1 = Idle no configuration 2 = Operational
ntpSrvAddr(2)	the IP address of NTP server in dot notation format
ntpLnkSrvStatus(3)	the status of link between module and NTP server: 1 = NOK (module can not reach NTP server) 2 = OK
ntpReqCnt(4)	the number of requests sent to NTP server
ntpRespCnt(5)	the number of responses received from NTP server
ntpErrCnt(6)	the total number of communication errors
ntpDate(7)	date of the day
ntpTime(8)	time of the day
ntpTimeZone(9)	current time zone
ntpDSTStatus(10)	Daylight Savings Time status: 1 = ON (Daylight Savings Time) 2 = OFF (Standard Time)
ntpLastErr(11)	Last error code generated by system

SMTP Subtree

The SMTP (1) subtree contains a set of common objects.

Service	Indicates . . .
emailIndex(1)	the index value in the email service table
smtpStatus(2)	the status of SMTP service (not server): • 1 = Idle (no configuration) • 2 = operational
smtpSrvAddr(3)	the IP address of SMTP server in dot notation format
smtpMailSentCnt(4)	the total number of emails sent to the network and successfully acknowledged by the server
smtpErrCnt(5)	the total number of email messages that could not be sent to the network or that have been sent but not acknowledged by the server
smtpLastErr(6)	the error code of the last error that occurred while trying to send an email message to the network
smtpLastMailElapsedTime(7)	the number of elapsed seconds since last successful email was sent to the server
smtpLnkSrvStatus(8)	the status of link with SMTP server: 1. 1 = NOK (not OK), link is down; module failed to contact SMTP server 2. 2 = OK
smtpSrvChkFailCnt(9)	the number of times the link to SMTP server is detected as 'down.'

See the Electronic Mail Notification Service subtree table (see *Electronic Mail Notification Service Subtree*, p. 263).

Note: A diagram of the Schneider Electric private enterprise MIB subtree appears in Simple Network Management Service (SNMP) (see *Network Management Service (SNMP)*, p. 223).

Private Traps and MIB Files

Traps are used to signal status changes to the manager. Using traps helps to avoid adding traffic.

The status changes signaled by the trap are for the:

- LEDs
- communication ports
- I/O scanning health values
- Global Data health
- NTP service
- SMTP service

The following list describes the characteristics of private traps, which means that they can:

- send messages to the two managers whose IP addresses are configured in the SNMP configuration (either the PL7 or the Web page)
- use the community name given to this configuration
- enable or disable each of the Transparent Factory Ethernet Private MIB groups: Switch (1), Port502_Messaging (2), I/O_Scanning (3), Global_Data (4), Web (5), Address_Server (6), Equipment_Profiles (7), NTP (8), and SMTP (9)

Private traps are described in the MIB ASN.1 description, which is contained in a **.mib** text file.

NTP Traps

1. **DST Change Trap:** notifies the manager that the NTP server time has changed either from (a) standard time to daylight saving time or (b) daylight saving time to standard time
 2. **NTP Status Change Trap:** sent when the NTP component status changes (ntpStatus(1))
 3. **Leap Second Trap:** sent when leap seconds are inserted
-

SMTP Traps

1. **SMTP Status Change Trap:** sent when SMTPStatus changes
 2. **SMTP Link to Server Status Change:** sent when tSMTPLnkSrvStatus changes. Trap is sent when service tries to send an email. Every 30 minutes a periodic test checks the connection to the SMTP server.
-

NTP Time Synchronization Service

9

At a Glance

Introduction

This chapter describes the NTP time synchronization service, which provides an accurate local clock using NTP.

What's in this Chapter?

This chapter contains the following topics:

Topic	Page
Introducing the NTP Time Synchronization Service	244
Using the R_NTPTC Block for Time Synchronization	247
NTP Time Synchronization Service Operating Conditions	249
Configuring the Quantum 140 NOE 771 11 NTP Time Service	250

Introducing the NTP Time Synchronization Service

General

The NTP time service synchronizes computer clocks over the Internet. For example, the time of one client is synchronized either with another server or to a referenced time source like a radio or satellite receiver.

Typical time service configurations utilize redundant servers and diverse network paths to achieve high accuracy and reliability. Time service accuracy can be within a millisecond on LANs and up to a few tenths of milliseconds on WANs.

Use the time service for:

- event recording (sequence events)
- event synchronization (trigger simultaneous events)
- alarm and I/O synchronization (time stamp alarms)

Features of the NTP Time Service

Some features of the NTP time synchronization service are:

- periodic time correction obtained from the reference-standard time server
- automatic switch over to a backup time server if a problem occurs with the normal time server system
- controller projects use a function block to read the accurate clock, a feature that allows project events or variables to be time stamped
- estimated time stamping accuracy of:
 - 5 mSec for 140 CPU 651 x0's and higher
 - 10 mSec for other CPUs
- local time zone is configurable and customizable including daylight savings time
- Web page diagnostics for the time synchronization service

NTP Time Synchronization and Time Stamps

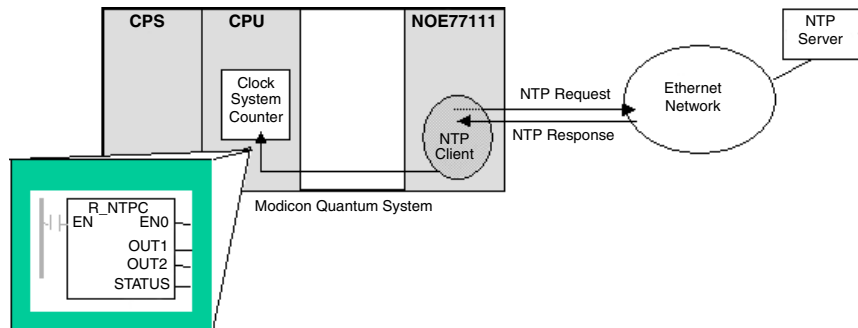
The Schneider Electric Ethernet interface module NOE 771 11 provides the source time-synchronization signal sent to a controller. The module's firmware includes an NTP client, which provides time synchronization.

Action	Result
NTP Client requests a time synchronization signal from an NTP server. (Request is sent over an Ethernet network.)	NTP Server responds with a signal.
NTP Client stores the time.	
NTP Client sends a message to the controller's clock system counter.	The controller updates its internal clock with the following granularity: • 1 ms

To read the clock from the PLC application:

- Use the R_NTPC function block (see *Using the R_NTPC Block for Time Synchronization*, p. 247) in either MAST, FAST, or Interrupt sections.

On an Ethernet network, all controllers should be synchronized with the same NTP server.



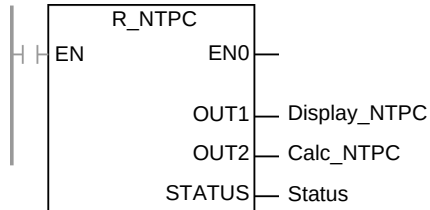
**NTP Time
Synchronization
Definitions**

Term	Description of Service
Local clock offset	Accurate local time is maintained by adjusting the time by using a local clock offset. The local clock offset is calculated by the formula: $((T4 - T1) + (T3 - T2)) / 2$ The formula's variables are: • T1 = Time at which the NTP request is transmitted from the module • T2 = Time at which the NTP Server receives the request (provided by the module in response) • T3 = Time at which the NTP Server transmits the response (provided to the module in the response) • T4 = Time at which the NTP Response is received by the module
Time accuracy	Local Time error is < 10 ms compared to the reference NTP server: • Typical: under 5 ms • Worst case: <10 ms Note: 1. Settling Time: The maximum accuracy is obtained after 2 updates from the NTP server. 2. Polling Period Dependency: The accuracy is dependent upon the polling period. Less than 10 mSec of error is guaranteed for polling periods of 120 seconds or less. To obtain the best possible accuracy and if your network bandwidth will allow, reduce the polling period to a small value. 3. For example, choosing a polling time of 5 seconds provides better accuracy than a time of 30 seconds.
Time zone	Default format: Universal Time, Coordinated (UTC) Optional: Configure the service to use a local time zone. For example, GMT+1 for Barcelona or Paris
Daylight savings time	Automatic: module adjusts time in spring and fall
Leap Second	Automatic: module inserts or deletes a second Note: 1. To compensate for the deceleration of the earth's rotation, a leap second is inserted in the UTC time every 18 months by an INTERNATIONAL EARTH ROTATION SERVICE (IERS). 2. Leap seconds will be inserted automatically as needed. If needed, leap seconds are inserted at the end of the last minute in June or December, as commanded by the NTP server.

Using the R_NTPC Block for Time Synchronization

R_NTPC Representation

The block reads the Ethernet network system time and transfers it into specified parameters. The additional parameter EN should be configured.



R_NTPC block has a 16-bit status word.

R_NTPC
Parameter
Description

Description of parameters:

Parameter	Data Type	Description		
Display_NT PC (OUT1)	DT + INT	NTP clock value displayed in: - year, month, day, hours, minutes, and seconds using the DT format - milliseconds as an INT		
Calc_NTPC (OUT2)	UDINT+INT	NTP clock value displayed in: - seconds as an UDINT - fractions of a second as an INT		
Status	INT	Low Byte	High Byte	Description
		0	0	un-initialized state
		1	0	illegal
		0	1	The CPU is out of synchronization with the NTP server, but the clock has been updated at least once by an external server.
		1	1	normal operation
		The low byte is managed by the controller - Set = 0 - The clock value is NOT available. - The date/time is NOT updated within last two minutes. - Set = 1 - The date/time is updated within the last two minutes. - The date/time is acceptable.		
		The high byte is managed by the NOE. - Set = 0 - The NTP server clock value is not available. - Set = 1 - The updated date/time is received from server and sent to the module (at least once). - within two-minute time interval - acceptable (10 ms or less error)		
		For a valid time in the CPU, the low and high bytes of the STATUS parameter must be set to 1.		

NTP Time Synchronization Service Operating Conditions

Introduction

This material describes special operating conditions related to:

- powering up
 - stop or run PLC
 - downloading applications
 - configuring the time service
-

Power up

To establish the accurate Ethernet system network time, the system does the following at power-up:

- requires the Ethernet module to boot
- uses the Ethernet module to obtain the time from the NTP server
- requires a predefined interval until time is accurate; user's configuration determines how long before time is accurate
- may require several updates to achieve peak accuracy

Once an accurate time is received, the service sets the STATUS in the associated time service register.

The time-service clock value starts at 0 until fully updated from the module.

Model	Starting Date
Modicon Quantum with Unity	January 1st 1980 00:00:00.00

Stop or Run PLC

- Stop and Run have no effect on the accuracy of the clock.
 - Stop and Run have no effect on the update of the clock.
 - A transition from one mode to the other has no effect on the accuracy of the system Ethernet network time.
-

Download Application

The status clock value associated with the time service register in the CPU is reinitialized after an application is downloaded or after an NTP server swap.

There will be two polling periods before the time is accurate.

NTP Configuration

The time service topic (see *Configuring the Time Synchronization Service*, p. 290) contains information about NTP configuration.

Configuring the Quantum 140 NOE 771 11 NTP Time Service

Configuring the NTP Time Service Configure or change the following parameters on the **NTP Configuration** page.

Model Family
TCP/IP 10/100 Regular connection

Module Address
Rack Module Channel

Module Utilities

No

 IO Scanning

No

 Global Data

Yes

 SNMP

No

 Address Server

Yes

 NTP

Module IP Address
IP Address Subnetwork Mask Gateway Address

0 . 0 . 0 . 0

0 . 0 . 0 . 0

0 . 0 . 0 . 0

IP Configuration | Messaging | IO Scanning | Global Data | SNMP | Address Server | **NTP** | Bandwidth

NTP Server Configuration
IP address of Primary NTP Server

0 . 0 . 0 . 0

IP address of Secondary NTP Server

0 . 0 . 0 . 0

Polling period

5

 seconds

Time Zone

(GMT)Greenwich Mean Time(Dublin Edinburgh Lisbon London)

☒ Automatically adjust clock for daylight saving change

Ethernet_1

Field	Parameter	Action
NTP Server Configuration		
	IP address of primary NTP server	Enter a valid IP address
	IP address of secondary NTP server	Enter a valid IP address
	Polling Period (in seconds)	Enter a value - min = 1sec - max = 120sec - default = 5 sec
Time Zone		Select from the drop-down menu: - Universal Time, Coordinated (GMT) = default - Custom time zone

Field	Parameter	Action
	Automatically adjust clock for daylight saving change	This parameter is selected by default (check mark appears) if daylight saving time is chosen.

Changing Time Service Parameters

To make any changes to the time synchronization service:

Step	Action
1	Enter changes in the appropriate field on the NTP Configuration page for one or all of the configurable parameters.
2	Click Save .

Important Information about the Time Service

Note: About the time service:

- 1. Automatically adjust clock for daylight savings change parameter:** If this check box is selected, the module automatically corrects the local time to account for daylight saving time. Therefore, no action is required, since the daylight saving time start and end are automatically changed each year.
- 2. Polling Time Parameter:** The time (in seconds) is the time between time updates from the NTP server. The default is 5 seconds.
- 3. Storing the Time Service Configuration:** The last time service configuration is saved internally in the Ethernet module.
- 4. Replacing the Ethernet Module:** If the Ethernet module has to be replaced, the stored configuration is lost, and the system returns to the default configuration.

**Customizing
Time Zone
Parameters**

If you want a time zone not listed in the time zone table:

Step	Action	Comment
1	Write the text rules for the custom time zone.	
2	Using an FTP client, store your rules in the file: /FLASH0/wwwroot/conf/NTP/customrules user ID: ntpupdate password: ntpupdate	Root directory to store 'customrules' is set by the FTP server as: /FLASH0/wwwroot/conf/NTP
3	When the rules are written, choose the drop down menu on the NTP Configuration web page, and configure (or reboot) the module by selecting Time Zone = Custom	The NTP component looks for customrules, calls the tz compiler and generates a new file called 'tz_custom'. This file is binary file and should not be edited. If the tz compiler detects a syntax error in customrules, the error is logged in the file: /FLASH0/wwwroot/conf/NTP/error.log 1. NTP component is not launched 2. NTP Status field in diagnostic web page displays NOT OK.
4	If you want more information, the syntax to write those rules along with a few examples are found in the module in: /FLASH0/wwwroot/conf/NTP/instructions.txt	

Time Zone Parameters

Select a time zone from the drop-down menu:

Time Zone	Description	DST Available
Custom		Yes
(GMT-12:00)	Dateline Standard Time [Eniwetok Kwajalein]	No
(GMT-11:00)	Samoa Standard Time [Midway Is Samoa]	No
(GMT-10:00)	Hawaiian Standard Time [Hawaii Honolulu]	No
(GMT-09:00)	Alaskan Standard Time [Anchorage]	Yes
(GMT-08:00)	Pacific Standard Time [Los Angeles Tijuana]	Yes
(GMT-07:00)	Mexican Standard Time [Chihuahua La Paz Mazatlan]	Yes
(GMT-07:00)	Mountain Standard Time [Arizona Phoenix]	No
(GMT-07:00)	Mountain Standard Time [Denver]	Yes
(GMT-06:00)	Central Standard Time [Chicago]	Yes
(GMT-06:00)	Mexico Standard Time [Tegucigalpa]	No
(GMT-06:00)	Canada Central Standard Time [Saskatchewan Regina]	No
(GMT-06:00)	Central America Standard Time [Mexico_city]	Yes
(GMT-05:00)	SA Pacific Standard Time [Bogota Lima Quito]	No
(GMT-05:00)	Eastern Standard Time [New York]	Yes
(GMT-05:00)	Eastern Standard Time [Indiana (East)] [Indianapolis]	No
(GMT-04:00)	SA Western Standard Time [Caracas La Paz]	No
(GMT-04:00)	Pacific SA Standard Time [Santiago]	Yes
(GMT-03:30)	Newfoundland Standard Time [Newfoundland St Johns]	Yes
(GMT-03:00)	E. South America Standard Time [Brasilia Sao_Paulo]	Yes
(GMT-03:00)	SA Eastern Standard Time [Buenos Aires Georgetown]	No
(GMT-02:00)	Mid-Atlantic Standard Time [South_Georgia]	No
(GMT-01:00)	Azores Standard Time [Azores Cape Verde Island]	Yes
(GMT)	Universal Coordinated Time [Casablanca, Monrovia]	No
(GMT0)	Greenwich Mean Time [Dublin Edinburgh Lisbon London]	Yes
(GMT+01:00)	Romance Standard Time [Amsterdam CopenHagen Madrid Paris Vilnius]	Yes
(GMT+01:00)	Central European Standard Time [Belgrade Sarajevo Skopje Sofija Zagreb]	Yes
(GMT+01:00)	Central Europe Standard Time [Bratislava Budapest Ljubljana Prague Warsaw]	Yes
(GMT+01:00)	W. Europe Standard Time [Brussels Berlin Bern Rome Stockholm Vienna]	Yes
(GMT+02:00)	GTB Standard Time [Athens Istanbul Minsk]	Yes
(GMT+02:00)	E. Europe Standard Time [Bucharest]	Yes
(GMT+02:00)	Egypt Standard Time [Cairo]	Yes

Time Zone	Description	DST Available
(GMT+02:00)	South Africa Standard Time [Johannesburg Harare Pretoria]	No
(GMT+02:00)	FLE Standard Time [Helsinki Riga Tallinn]	Yes
(GMT+02:00)	Israel Standard Time [Israel Jerusalem]	Yes
(GMT+03:00)	Arabic Standard Time [Baghdad]	Yes
(GMT+03:00)	Arab Standard Time [Kuwait Riyadh]	No
(GMT+03:00)	Russian Standard Time [Moscow St. Petersburg Volgograd]	Yes
(GMT+03:00)	E. Africa Standard Time [Nairobi]	No
(GMT+03:30)	Iran Standard Time [Tehran]	Yes
(GMT+04:00)	Arabian Standard Time [Abu Dhabi Muscat]	No
(GMT+04:00)	Caucasus Standard Time [Baku Tbilisi]	Yes
(GMT+04:00)	Afghanistan Standard Time [Kabul]	No
(GMT+05:00)	Ekaterinburg Standard Time [Ekaterinburg]	Yes
(GMT+05:00)	West Asia Standard Time [Islamabad Karachi Tashkent]	No
(GMT+05:30)	India Standard Time [Bombay Calcutta Madras New Delhi]	No
(GMT+06:00)	Central Asia Standard Time [Almaty Dhaka]	Yes
(GMT+06:00)	Sri Lanka Standard Time [Columbo]	No
(GMT+07:00)	SE Asia Standard Time [Bangkok Hanoi Jakarta]	No
(GMT+08:00)	China Standard Time [Beijing Chongqing Hong Kong Urumqi]	No
(GMT+08:00)	W. Australia Standard Time [Perth]	No
(GMT+08:00)	Singapore Standard Time [Singapore]	No
(GMT+08:00)	Taipei Standard Time [Taipei]	No
(GMT+09:00)	Tokyo Standard Time [Osako Sapporo Tokyo]	No
(GMT+09:00)	Korea Standard Time [Seoul]	No
(GMT+09:00)	Yakutsk Standard Time [Yakutsk]	Yes
(GMT+09:30)	Cen. Australia Standard Time [Adelaide]	Yes
(GMT+09:30)	AUS Central Standard Time [Darwin]	No
(GMT+10:00)	E. Australia Standard Time [Brisbane]	No
(GMT+10:00)	AUS Eastern Standard Time [Canberra Melbourne Sydney]	Yes
(GMT+10:00)	West Pacific Standard Time [Guam Port Moresby]	No
(GMT+10:00)	Tasmania Standard Time [Hobart]	Yes
(GMT+10:00)	Vladivostok Standard Time [Vladivostok]	Yes
(GMT+11:00)	Central Pacific Standard Time [Magadan Solomon Is New Caledonia]	Yes
(GMT+12:00)	New Zealand Standard Time [Auckland Wellington]	Yes
(GMT+12:00)	Fiji Standard Time [Fiji Kamchatka Marshall Is]	No

Electronic Mail Notification Service

10

At a Glance

Introduction This chapter describes the electronic mail notification service, which uses SMTP to allow the controller’s project to send e-mail messages.

What's in this Chapter? This chapter contains the following topics:

Topic	Page
Introducing the Electronic Mail Notification Service	256
Mail Service	258
Using the MSTR Block for Mail Service Communication	259
Mail Service Error Codes	262
Electronic Mail Notification Service Subtree	263

Introducing the Electronic Mail Notification Service

General

The electronic mail notification service allows controller-based projects to report alarms or events. The automation controller monitors the system and can automatically create an electronic mail message alert with data, alarms, and/or events. Mail recipients can be either local or remote.

- Based on predefined events or conditions, messages are created using the MSTR function block.
 - The email message is constructed from predefined headers plus variables and text (a maximum of 238 bytes). This message is sent directly from the automation system to the local email server.
 - Mail headers contain common predefined items—recipient list, sender name, and subject. These items can be updated by an authorized administrator.
-

Mail System Types

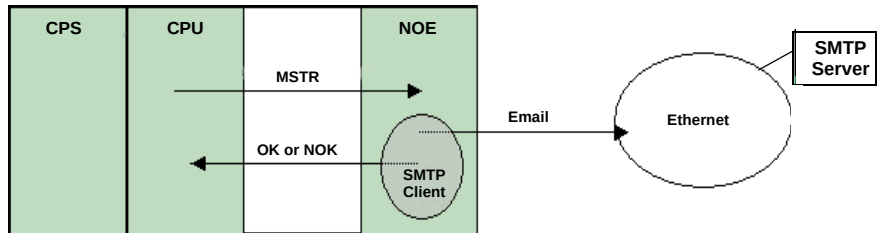
The Simple Mail Transfer Protocol (SMTP) provides two mechanisms for the transmission of email messages:

- direct connection
- relay system

Mechanism	Condition	Result
Direct connection	Sender and receiver are connected to the same transport service.	Email messages are sent to host.
Relay system	Sender and receiver are NOT connected to the same transport service.	Email messages are relayed from one server to another server. To relay messages, the SMTP server must be supplied with the address of the: • destination host • destination mailbox

Mail Service Client

The Quantum Ethernet module includes an SMTP client. When the module receives a specific request from the project, it sends an email message to the mail server.



Operating Modes and Sending Requests

Because the project sends the email request, a controller cannot send an email message either while in the stopped mode or while downloading a project. As soon as the controller is in RUN mode, the function block sends a request during the first project scan.

Diagnostic counters are reset to 0 after either a power-up, a project download, or a reconfiguration of the mail service.

Mail Service

Configuring the Mail Service

As an authorized administrator, use the SMTP Configuration Web page to:

- configure the service
- set the IP address of the mail server

Elsewhere in this guide is detailed information about configuring the electronic mail service (see *Configuring the Mail Service with the Email Configuration Page*, p. 295).

Note: Default TCP Port: The default TCP port number for SMTP is 25. Ensure that you configure the port specified by your local mail server.

Message Creation and Delivery

A user-defined event or condition triggers the MSTR block to create a message. Each message uses one of three user-defined headers. Each message sent from the controller can contain text and variable information (with a maximum of 238 bytes).

The project selects the appropriate header. Each header contains:

- sender name
- list of recipients
- subject

Header Examples

The text and variable information can be defined and updated by an authorized administrator using an embedded Web page (SMTP Configuration page). Define mail headers to indicate different levels of importance. For example:

- Header 1 could be "Urgent problem reported by PLC 10"
- Header 2 could be "NOTIFICATION from substation 10"
- Header 3 could be "INFO message from water system"

Listing different recipients in each of the three headers ensures that the right information quickly flows to the right recipients. The project adds pertinent information such as the specific device, process, or location. This pertinent information is added to the body of the mail message. Then the complete message is sent to an electronic mail server for distribution to recipients. These recipients could be engineers, managers, or process owners.

Security (Authentication)

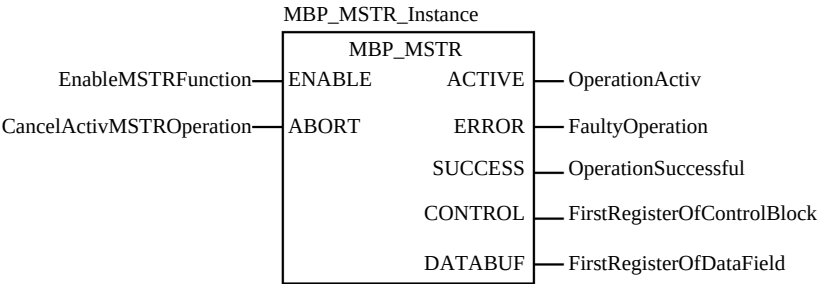
An optional login (system ID) and password can be used to authenticate the connection to the SMTP mail server. The SMTP-supported authentication method is LOGIN.

System Diagnostics

The SMTP Diagnostic Web page displays the status of the service. Diagnostic information is also available for remote management using the SNMP network management standard.

Using the MSTR Block for Mail Service Communication

Block Representation Each operation is designated by a code. To send an email message, use the MSTR block with function code 13 (see *Send Email, p. 183*).



Parameter
Description

The following table describes the MSTR parameters:

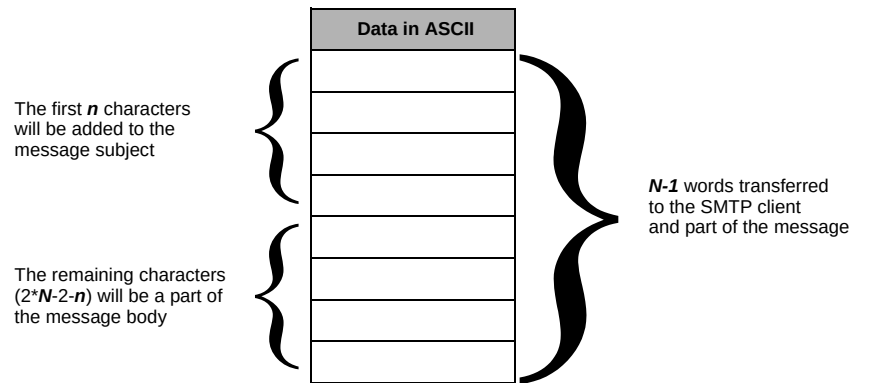
Parameter	Data Type	Description
ENABLE	None	ON = enables selected MSTR operation
ABORT	None	ON = terminates active MSTR operation
ACTIVE	None	ON while the instruction is active
ERROR	None	ON if the MSTR operation is terminated prior to completion
SUCCESS	None	ON = operation successful
CONTROL	INT, UINT	Control block is the first of several network-dependant, contiguous, holding words, and the first of nine contiguous words entered in the top node. The remaining eight words are:
		Displayed: Identifies one of the MSTR = 13
		First implied displays error status (see Mail Service Error Codes (see <i>Mail Service Error Codes</i> , p. 262))
		Second implied displays length (number of words transferred)
		Third implied (not used)
		Fourth implied high byte: slot address of the NOE module or 0xFE for the 140 CPU 651 x0 low byte: 0 (not used)
		Fifth implied (not used)
		Sixth implied (not used)
		Seventh implied (not used)
		Eighth implied (not used)
DATABUF	INT, UINT	The DATABUF parameter is the address of the buffer including the data inserted into the body of the email message. The data should be in ASCII format starting at the second word. Note: 1. Least significant byte of the first word: contains a valid (configured) mail header (should be of value 1, 2, or 3). 2. Most significant byte of the first word: contains the length of the dynamic part of the message's subject field. The length must be between 0 and 238 characters.

**DATABUF
Parameter
Description**

The first word of the DATABUF parameter contains the following information:

Byte Number	Description	Value
1 (least significant byte)	Mail header	{1, 2, 3}
2 (most significant byte)	Nb n of extra characters in subject	User-defined (between 0 and 238)

The second and subsequent words (maximum 119) contain the data (ASCII format) that will be copied into the email message. The first **n** characters will be added to the configured email subject. The remaining characters ($2*N-2-n$) will be part of the message body. **N** represents the number of words transferred.



Mail Service Error Codes

Error Codes

The electronic mail notification service supports the following error codes:

Hex. Error Code	Description
5100	Internal error
5101	SMTP component not operational
5102	Mail Header not configured
5103	Invalid Mail Header value (should be 1, 2 or 3)
5104	Cannot connect to SMTP server
5105	Error in transmitting content of email body to SMTP server
5106	Closing SMTP connection with the server returned an error
5107	SMTP HELO request failed
5108	SMTP MAIL request failed. SMTP server may require authentication
5109	SMTP RCPT request failed
510A	No recipient has been accepted by the SMTP server
510B	SMTP DATA request failed
510C	Send email request contains an invalid length
510D	Authentication failed
510E	A Reset component request has been received while the connection was open

Electronic Mail Notification Service Subtree

Summary

The electronic mail delivery service subtree contains the following objects:

Service	Description
emailIndex (1)	index value in the email service table
smtpStatus (2)	global status of the SMTP service: ● idle(1): no configuration ● operational(2): operational and running ● stopped(3): stopped
smtpSrvAddr (3)	IP address of the remote SMTP server
smtpMailSentCnt (4)	total number of emails sent to the network and successfully acknowledged by server
smtpErrCnt (5)	total number of emails: ● not sent to the network ● sent but not successfully acknowledged by server (The smtpLastErr (6) object details the errors.)
smtpLastErr (6)	last error code (see details at Configuring an NOE with TFE Private MIB (see <i>Configuring an NOE with TFE Private MIB</i> , p. 231))
smtpLastMailElapsedTime (7)	number of seconds elapsed since last successful email sent
smtpLnkSrvStatus (8)	status of link between communication module and remote SMTP server: ● NOK (1) = SMTP server can NOT be reached ● OK (2) = SMTP server can be reached
smtpSrvChkFailCnt (9)	number of times link to SMTP server has been detected as down

Embedded Web Pages

11

At a Glance

Introduction

This chapter presents the contents of the embedded Web pages contained in the Quantum 140 NOE 771 xx modules. These Web pages enable you to access diagnostic information, view configuration information, and change the online configurations for the module.

What's in this Chapter?

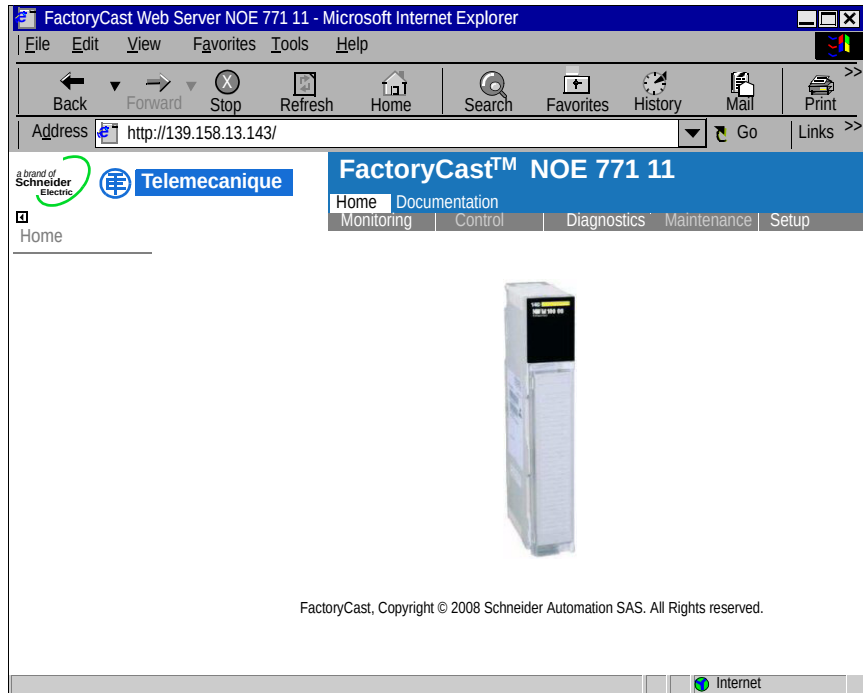
This chapter contains the following topics:

Topic	Page
Quantum Home Page	267
Monitoring Home Page	268
Diagnostics Home Page	270
Setup Home Page	271
Accessing the Web Utility Home Page	273
Configured Local Rack Page	275
CPU Configuration Page	277
CPU Configuration Screen: Data Field Descriptions	278
Remote I/O Status	279
Quantum PLC Data Monitor Page	280
SNMP Configuration	281
Global Data (Publish/Subscribe) Utility Configuration	284
Configure Address Server Page	287
Configuring the Time Synchronization Service	290
Mail Service Configuration	295
Ethernet Module Diagnostic Pages	297
NTP Diagnostics Page	304
NOE Properties Page	306
Contacting Schneider Electric Page	307

Quantum Home Page

Home Page

The visitor accesses the Quantum home page by entering the IP address of the module in his web browser. No password is required to display the home page:



Links

From the Quantum home page, you can access the following pages :

- Monitoring (see *Monitoring Home Page*, p. 268)
- Diagnostics (see *Diagnostics Home Page*, p. 270)
- Setup (see *Setup Home Page*, p. 271)
- Documentation

The visitor will have to supply a user name and a password to access the services on these pages.

Monitoring Home Page

Home Page

This page lists the various viewer services supported by the default Web site of the module and provides links for accessing the services you require.

Illustration

The Monitoring home page looks like this:



To access a service, click on a link. The services include:

- Data editor (See FactoryCast User Guide, For Quantum and Premium, Data Editor): for creating variable data tables to determine their values when the table is animated.
- Data editor lite (See FactoryCast User Guide, For Quantum and Premium, Data Editor Lite): for creating variable data tables to determine their values when the table is animated. (This editor contains fewer features than the standard Data editor.)
- Graphic editor (See FactoryCast User Guide, For Quantum and Premium, Graphic Editor): for creating graphics to determine the values of variables when the graphic is animated.

- Graphic viewer (See FactoryCast User Guide, For Quantum and Premium, Graphic Viewer): for viewing graphics to determine the values of variables when the graphic is animated.
-

Diagnostics Home Page

Home Page

This page lists the various services supported by the default Web site of the module and provides links for accessing the services you require.

Illustration

The **Diagnostics** home page looks like this:



Links

To access the service you require, click on a link:

- [Configured Local Rack](#) (see *Configured Local Rack Page*, p. 275)
- [Controller Status](#) (see *Sample Page*, p. 277)
- [RIO Status](#) (see *Remote I/O Status*, p. 279)
- [Alarm Viewer](#) (See *FactoryCast User Guide*, For Quantum and Premium, Alarm Viewer)
- [NOE Diagnostics](#) (see *Ethernet Module Diagnostic Pages*, p. 297)
- [NOE Properties](#) (see *NOE Properties Page*, p. 306)

Setup Home Page

Home Page

The NOE 771 11 **Setup** page lists the various services used to configure the module. You can navigate to this page from the link on the Welcome Page (see *Home Page*, p. 267).

Illustration

The **Setup** page looks like this:



Setup Page Links These links are on the **Setup** page:

Link	Result
SNMP	Provides the ability to configure the SNMP Agent in the NOE
Address Server (see <i>Configure Address Server Page, p. 287</i>)	Configure the IP assignments, including showing the BOOTP and DHCP database
Global Data (see <i>Configuration of Global Data (Publish/Subscribe) by the Web for NOE 771 x1, p. 195</i>)	Displays the Global Data Configuration page. Configure the Group Address, Multicast filtering, Distribution period, Health Time Out, Health Bits, and Data Zones. The Global Data Configuration page also displays a Variable Table.
NTP (see <i>Configuring the Time Synchronization Service, p. 290</i>)	Configure the IP address of the primary and secondary NTP server. Set a polling period. Select a time zone from the drop-down list, and automatic adjustment for daylight savings time.
Email (see <i>Electronic Mail Notification Service, p. 91</i>)	Configure the email server's IP and Port (default port is 25). If security is required, select Enable and set a Login and Password. Create three mail headers.

Accessing the Web Utility Home Page

Introduction

Each Modicon Quantum 10-/100-Megabit Ethernet module contains an embedded Web server that allows you to access diagnostics and online configurations for the module and its associated controller (PLC).

Pages on the embedded Web site display the following information:

- Configurable menus of the Address Server both BOOTP and DHCP and for SNMP (see *Configure Address Server Page*, p. 287)
- Ethernet statistics for the node (see *Embedded Web Pages*, p. 265)
- Controller's configuration (Controller Status on menu) (see *Sample Page*, p. 277)
- Controller's register values
- Remote I/O status and configuration (see *Remote I/O Status*, p. 279)
- Remote I/O register values
- Remote I/O distributed values

The FactoryCast/Real Time modules (see *FactoryCast and User Customizable Web Pages*, p. 97) offer these additional pages:

- Configuration and status for Global Data (publish/subscribe) (see *Global Data (Publish/Subscribe) Utility Configuration*, p. 284)
- Bandwidth monitoring (see *Bandwidth Monitoring*, p. 92)
- I/O Scanner status (see *I/O Scanning Page*, p. 298)
- MODBUS Messaging status (see *Modbus Messaging*, p. 85)
- NTP configuration and status (see *NTP Diagnostics Page*, p. 301)
- SMTP configuration and status (see *Email Diagnostics Page*, p. 302)

The web pages can be viewed using Internet Explorer 4.0 or higher. Either browser supports JRE 1.4.2_04 or higher.

For information about the additional functionality provided by the FactoryCast system in the Ethernet modules, see the *FactoryCast Manual* (31001229).

Accessing the Module's Home Page

Do the following.

Step	Action
1	Obtain the full IP address or URL from your system administrator.
2	Type the address or URL in the address or location box in the browser window. The Schneider Electric Web Utility home page displays.
3	On the Quantum home page (see <i>Home Page, p. 267</i>), click Diagnostics .
4	You will be requested to supply a user name and password.
5	After supplying the user name, password, and clicking OK , the Quantum Welcome Page appears. The Quantum Welcome Page provides the links to all the Quantum configuration and diagnostic pages and to the Data Editor / Data Monitor . NOTE: The default User Name is USER, and the default password is USER. Both should be changed by the system administrator during module installation.

Configured Local Rack Page

Overview

The Configured Local Rack page shows the current configuration:





Telemecanique

FactoryCast™

NOE 771 11

Home

Documentation

Monitoring

Control

Diagnostics

Maintenance

Setup

☒ Diagnostics

Configured Local Rack

Controller Status

RIO Status

☒ NOE Diagnostics

Global Data

I/O Scanning

Messaging

Bandwidth Monitoring

Statistics

NTP

Email

UPLoad MIB File

Crash Log File

NOE Properties

QUANTUM CONFIGURED LOCAL RACK



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Internet

33002479 06 07/2008

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Configured Local Rack Page Overview

The following table details the links on the Configured Local Rack page. To view the pages related to each of these topics, click the topic.

Link	Display
Global Data (see <i>Global Data Page, p. 297</i>)	general diagnostics of the global data and a table of all published/subscribed variables in a distribution group
I/O Scanning (see <i>I/O Scanning Page, p. 298</i>)	general diagnostics of the I/O scanning utility and a summary of the status of all modules
Messaging (see <i>Messaging Page, p. 299</i>)	current information on open TCP connections on Port502
Bandwidth Monitoring (see <i>Bandwidth Monitoring Page, p. 300</i>)	load distribution of the Embedded Server module between the global data utilities, I/O scanning, messaging, and other utilities
Statistics (see <i>Ethernet Statistics Page, p. 300</i>)	Ethernet module statistics with the reset counters link
NTP (see <i>NTP Diagnostics Page, p. 301</i>)	time synchronization service parameters
Email (see <i>Email Diagnostics Page, p. 302</i>)	Email notification service parameters
Upload MIB file	upload the private MIB source file
Crash Log file (see <i>Crash Log Diagnostics Page, p. 303</i>)	crash message (after crash) and status message (normal operations)

CPU Configuration Page

Overview The **CPU Configuration Page** provides up-to-date information about the controller and its configuration. Access this page by selecting the CPU model from the Configured Local Rack (see *Configured Local Rack Page, p. 275*) or the hyperlink Controller Status (see *Sample Page, p. 277*).

Sample Page Here is an example of a CPU Configuration page.

QUANTUM CONTROLLER STATUS

Status:RunningReference:CPU 534 14

Battery:OKProduct Type:Quantum

Rack:1Exec ID:883

Slot:2Logged In:No

Description	Registers		ASCII	
System Memory [Kb]	64 Kb	0xxxxx	000001-001536	Total Words0
Extended Memory [Kb]	96 Kb	1xxxxx	100001-100512	Total Messages0
Total Memory [Bytes]	163840	3xxxxx	300001-300512	Word Used0
I/O Map Words	161	4xxxxx	400001-401872	Messages Used0
Segments	32	6xxxxx	600000-	Available Words0
DCP Drop ID	0	Battery Coil	0----	Available Mes-0
Memory Protect	Off	Timer Register	4----	# ASCII Ports0
Constant Sweep	Off	Time of Day	4----	ASCII Inputs4----
Optimize	No	Stopped Codes	0x0000	ASCII Outputs4----

Dynamic Data Some of the data provided on this page is dynamic. Dynamic data is constantly refreshed at a rate determined by the performance of the Embedded Server, network, and client CPU.

CPU Configuration Screen: Data Field Descriptions

Description Fields

The following table describes the description fields on the CPU Configuration Screen (see *CPU Configuration Page*, p. 277):

Field	Description
System Memory [Kb]	Amount of system memory used
Extended Memory [Kb]	Amount of extended memory used
Total Memory [Bytes]	Total memory used in bytes
I/O Map Words	Number of I/O words mapped.
Segments	Number of segments
DCP Drop ID	Drop number for distributed control
Memory Protect	Position of the memory protect switch
Constant Sweep	Current status of constant sweep
Optimize	Current status of optimization

Word Fields

The following table describes the Word fields on the CPU Configuration Screen (see *CPU Configuration Page*, p. 277):

Field	Description
%M	valid address of %M
%I	valid address of %I
%IW	valid address of %IW
%MW	valid address of %MW
Battery Coil	address of battery bit
Timer Register	address of timer word
Time of Day Clock	address of timer of day clock
Stopped Codes	reason for controlled stopping

ASCII Fields

The ASCII column on the CPU Configuration Screen (see *CPU Configuration Page*, p. 277) contains information about the ASCII fields.

Remote I/O Status

Overview

The Remote I/O Status page gives an overview of the status and health of the Remote I/O network communications. Access this page by selecting the CRP Drop down menu item **Remote I/O Status** or using the hyperlink RIO Status.

Sample Page

Here is an example of a **Remote I/O Status** page.

QUANTUM REMOTE I/O COMMUNICATION STATUS

Global Status:

Not OK

Global Health:

Not OK

Cable A:

Not OK

Cable B:

Not OK

Description	Cable A	Cable B	LAN Errors	Cable A	Cable B
Startup Errors	0	0	Short Frame	0	0
Framing Errors	0	0	No EOF	0	0
DMA Receive Overruns	0	0	CRC	0	0
Receive Errors	0	0	Alignment	0	0
Bad Drop Reception	0	0	Overruns	0	0

Global Communications

	Cable A	Cable B		
Global Communication Status	Not OK	Not OK	Global Communication Health	Not OK
Detected Error Count	0	0	Lost CommunicationsCount	0
Global No Response Count	0	0	Total Retry Count	0

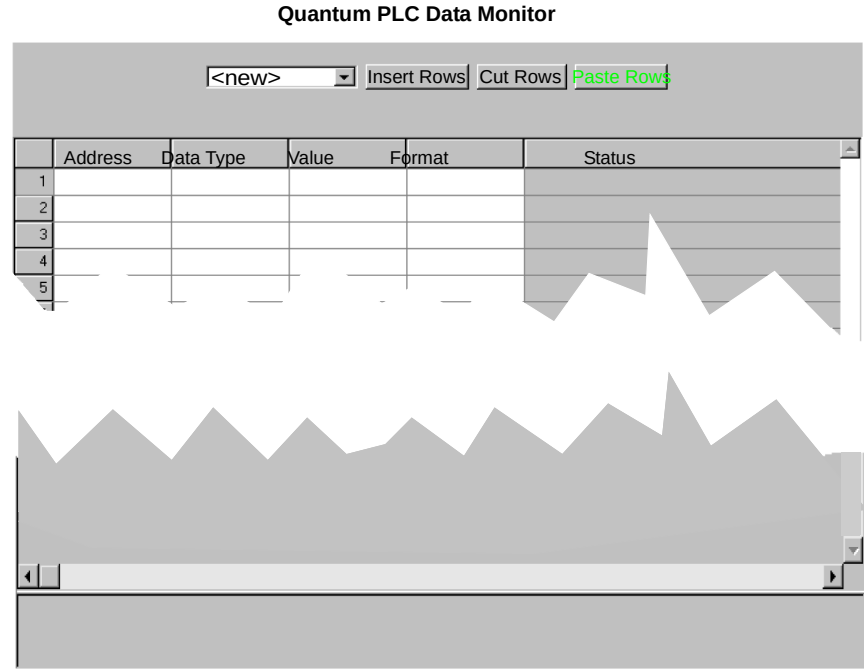
Dynamic Data

Some of the data provided on this page is dynamic. Dynamic data is constantly refreshed at a rate determined by the performance of the embedded server, network, and client CPU.

Quantum PLC Data Monitor Page

Introduction to the PLC Data Monitor Page

The following figure shows the Web page that allows you to display Quantum PLC data.



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You can add, delete, and copy Quantum PLC data as described in the following list:

- Insert additional rows of data by clicking on the **Insert Rows** button.
- Delete specific rows of data by clicking on the **Cut Rows** button.
- Copy in rows of data by clicking on the **Paste Rows** button.

SNMP Configuration

Overview

This topic describes SNMP configuration for the Quantum Ethernet module through the **SNMP Configuration** page.

SNMP Configuration Page

Click the **SNMP** link in the **Setup** home page to display the Configure SNMP page:

SNMP Configuration

System Name: 140-NOE-771-01 Module

System Description: Quantum Ethernet TCP/IP Communications Module

Managers IP Addresses

Manager I: 192.168.1.100 Manager II: 0.0.0.0

Agent

Location [SysLocation]: Test_Setup_1

Contact [SysContact]: Julien

Community

Set: NonTriv1

Get: NonTriv2

Trap: NonTriv3

Security

☐ Authentication Failure Trap Enabled

Reset the Form

Update SNMP

Show SNMP Configuration

The following table describes the SNMP configuration tasks that you can perform through the Web page:

Task	How To
To display the current SNMP configuration	Click Show SNMP Configuration
To clear the fields	Click Reset the Form
To change the SNMP configuration	Change the information on the page and click Update SNMP

**SNMP Page
Fields**

The following table describes the SNMP fields that you can modify.

Field	Information To Be Supplied
Manager I	IP Address of first SNMP Manager
Manager II	IP Address of second SNMP Manager
Location [SysLocation]	Location of the module
Contact [SysContact]	Name of the responsible systems engineer
Set	Designation of user level who can set the configuration
Get	Designation of user level who can view the configuration
Trap	Designation of user level who can capture information
Authentication Failure Trap Enabled	Turns on Community Name Checking

After you make your modifications to any of the above parameters, click **Update SNMP**. A new page displays the following message: "Successfully updated SNMP database." Note that this page contains the same links as those on the **Configure SNMP** page.

Note: You must reset the module in order for the changes to take effect.

**SNMP
Community
Strings**

Use strings to restrict access to the SNMP Agent. These strings should be set to Non-Trivial names during module installation.

Modifying the
SNMP
Community
Strings

To configure the SNMP community strings:

Step	Action
1	Enter the following URL into your browser: http://hostname/secure/embedded/builtin?submit=Configure+SNMP or click the SNMP link in the Setup home page to navigate to the SNMP Configuration page.
2	Enter the Community names for Set , Get , and Trap into the SNMP Configuration page as shown below. SNMP Configuration System Name: 140-NOE-771-01 Module System Description: Quantum Ethernet TCP/IP Communications Module Managers IP Addresses Manager I: Manager II: Agent Location [SysLocation]: Contact [SysContact]: Community Set: Get: Trap: Security ☐ Authentication Failure Trap Enabled Reset the Form Update SNMP Show SNMP Configuration
3	Click Update SNMP .
4	To set your changes, use hot swap to reboot the module.

Global Data (Publish/Subscribe) Utility Configuration

Overview

Whether you use either the Configure Each Device Separately or the Copy Configuration method (see *Modeling the System Configuration*, p. 195), the procedure to configure individual parameters is the same. Therefore, in order to use the Global Data (publish/subscribe) utility in the NOE, you need to configure the Global Data parameters including:

- Distribution period
- Multicast filtering
- Health bit location
- Global Data base address
- Group IP address

The following sections describe in detail the exact steps to configure each parameter on the **Global Data Configuration** page.

Illustration

You can change the configuration in the **Global Data Configuration** page:

Global Data Configuration

Group Address	239, 200, 255, 255	☒ Multicast filtering	Distribution period	5 scan	
Health Time Out	1000 ms	Health Bits	%MW 4 to 7	Data Zone	%MW 0 to 5
Update Global Data Configuration					

Variable Table

Data ID	Type	Symbol	Address	Length
1	SUB	var 01	%M 48	2
2	PUB	var 02	%M 60	2
3	SUB	var 03	%M 44	2
4	NON		%M	
5	NON		%M	
6	NON		%M	
7	NON		%M	
8	NON		%M	
9	NON		%M	

Configuring Global Data

After you have completed the Modeling System Configuration process (see *Modeling the System Configuration*, p. 195) using the second method, Copy Configuration, you modify the following parameters:

- Distribution period
- Health Time Out
- Health Bits location
- Start address
- Type: Pub / Sub / None

Please **do not** change Symbol (description), and Length.

To change the Global Data variables of the group box on the **Global Data Configuration** page, follow the instructions below.

Step	Action
1	Adjust the Distribution Period cycle. Enter a value from 1 through 50. Note: Distribution Period is the minimum number of controller scan times before an update occurs.
2	Before entering a value in the Group Address field, identify the station's distribution group. The Group Address entry will be an IP address from 224.0.0.0 through 239.255.255.255. Group Address: the Class D Multicast IP address used for a distribution group. All members of this distribution group are configured to use the same group address, and therefore, all members can communicate with each other using Global Data.
3	Set the timeout in the Health Time Out field. This value is measured in milliseconds and can be set to a value that ranges from 50 through 15000 ms (in 50 ms increments) Note: Health Time Out is the maximum time between received subscriptions before a subscription is declared unhealthy (faulty).
4	In the 4x starting address, set the Data Zone field.
5	If you are connected to an Ethernet switch that supports multicast filtering, click the Multicast filtering check box.
6	Enter %MW word (4x register) location for the Health Bits. This is the location for storing health bits.

Note: Health bits run in different directions.

- I/O scanner health bits run left to right.
- Global Data health bits run right to left.

Changing Global Data Variables

To change the Global Data variables that appear in the **Variable Table** area, follow the instructions below.

Step	Action
1	Highlight the identification number in the Data ID column.
2	In the Type column select the publish/subscribe variable type from the drop down list. Three options are available publish, subscribe, or none, displayed as: • NONE • SUB • PUB
3	In the Symbol column you may enter text to describe the variable.
4	In the Address column you see the application address for this variable. Note: This is a read only field.
5	In the Length column for each row, type a value, which represents the number of 4x registers. The ending 4x register field is automatically updated. If you are using the second method, Copy Configuration , update Length the first time only.
6	When you are finished, click the Update Global Data Configuration button.

Verifying System Operation

To ensure that the system is operational, do the following:

Step	Action
1	Verify that all controllers are running.
2	Look at the health of all variables using the Global Data Diagnostics page. Follow these links: Diagnostics NOE Diagnostics Global Data

Configure Address Server Page

Overview This topic describes the DHCP and BOOTP address server configuration for the Transparent Factory Ethernet modules.

Note: To configure the address server for the 140 NOE 771 x FactoryCast Web server modules, see Address Server Configuration/Faulty Device Replacement (see *Address Server Configuration/Faulty Device Replacement*, p. 214), which describes the BOOTP process.

Address Server Page

The Address Server Configuration page appears below:



FactoryCast™ NOE 771 11

Home Documentation

Monitoring | Control | Diagnostics | Maintenance | Setup

Setup

SNMP

Address Server

Global Data

NTP

Email

Address Server Configuration

Role Name	MAC Address	IP Address	Subnet Mask	Gateway
-----------	-------------	------------	-------------	---------

Refresh Address Server Database Table

Add a New Entry | Change an Entry | Delete an Entry

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Internet

Adding Entries

Create new address server configurations with these steps:

Step	Action
1	Press Add a New Entry. A dialog appears in the web frame: Address Server Node Configuration Role Name: test_1 Device MAC Address: Device IP Address: 192.168.1.1 Subnet Mask: 255.255.255.0 Gateway: 192.168.1.200 Add the Entry Reset the Form Show Address Server Configuration Copyright © 1998-2004 Schneider Automation SAS. All Rights reserved. Note: The system does not allow you to enter text in both the Role Name and Device MAC Address text fields. Create either a DHCP configuration (Role Name) or a BOOTP (Device MAC Address) configuration.
2	For the address server configuration type (DHCP or BOOTP), enter text in the appropriate field: • Role Name: variable name for DHCP address server configuration • Device MAC Address: MAC address for BOOTP address server configuration
3	Enter an address in the Device IP Address field. (We have provided an example address.)
4	Enter an address in the Subnet Mask field. (We have provided an example address.)
5	Enter an address in the Gateway field. (We have provided an example address.)
6	Press the Add the Entry button.

When you press the **Add the Entry** button, a new entry that corresponds to your input appears in the table in the web frame:

Address Server Configuration

	Role Name	MAC Address	IP Address	Subnet Mask	Gateway	
☐	test_1		192.168.1.1	255.255.255.0	192.168.1.200	

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When you use the same **Add the Entry** procedure to add subsequent entries, multiple entries appear in the table:

Address Server Configuration

	Role Name	MAC Address	IP Address	Subnet Mask	Gateway	
☒	test_1		192.168.1.1	255.255.255.0	192.168.1.200	
☐	test_2		192.168.102.102	255.255.240.0	192.168.100.200	

Refresh Address Server Database Table

Add a New Entry

Change an Entry

Delete an Entry

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In the above figure, a user has highlighted the radio button for *test_1*. That item can now be edited with the last row of buttons:

Button	Function
Change an Entry	Change the table data for the entry.
Delete an Entry	Delete the entry from the table data for the entry.
Note: The selected radio button has no effect on the Add a New Entry function. Note: You can press the Refresh Address Server Database Table button to refresh the table data at any time.	

Configuring the Time Synchronization Service

Configuring the Time Service

You must use the module’s embedded Web page to configure the time service. No other method is available.

NTP Configuration

NTP Server Configuration

IP Address of Primary NTP Server:

192.168.5.100

IP Address of Secondary NTP Server:

0.0.0.0

Polling Period:

15

sec

Time Zone

(GMT-05:00)Eastern Standard Time(New York)

☒ Automatically adjust clock for daylight saving change

Save

Cancel

Disable NTP

[Home](#) | [Configure NOE](#) | [NOE Properties](#) | [NOE Diagnostics](#) | [Support](#)

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Time Service Command Buttons

Execute the following commands:

Button	Description
Save	Stores new NTP (time service) configuration. Previous configuration is no longer valid.
Cancel	Cancels new NTP (time service) configuration. Previous configuration is valid.
Disable NTP	IP of Primary and Standby set = 0. NTP server not polled. Time in controller not updated.

**Configurable
Time Service
Parameters**

Configure or change the following parameters on the **NTP Configuration** page.

1. IP address of primary NTP server
 - Enter a valid IP address
2. IP address of secondary NTP server
 - Enter a valid IP address
3. Polling Period (in seconds)
Enter a value
 - min = 1sec
 - max = 120sec
 - default = 5 sec
4. Time Zone
 - Select from drop-down menu
Universal Time, Coordinated (GMT) = default
 - Custom time zone
5. Automatically adjust clock for daylight saving change
 - Parameter is selected by default (check mark appears) if daylight saving time is chosen.

**Changing Time
Service
Parameters**

To make any changes to the time synchronization service:

Step	Action
1	Enter changes in the appropriate field on the NTP Configuration page for one or all of the configurable parameters.
2	Click Save .

**Important
Information
about the Time
Service**

Note: About the time service:

1. **Enable/Disable Daylight Savings Time parameter:** If the Enable/Disable check box is selected, the module automatically corrects the local time to account for daylight savings time. Therefore, no action is required, since the daylight saving time start and end are automatically changed each year.
2. **Polling Time Parameter:** The time (in seconds) is the time between time updates from the NTP server. The default is 5 seconds.
3. **Storing the Time Service Configuration:** The last time service configuration is saved internally in the Ethernet module.
4. **Replacing the Ethernet Module:** If the Ethernet module has to be replaced, the stored configuration is lost, and the system returns to the default configuration.

Customizing Time Zone Parameters

If you want a time zone not listed in the time zone table:

Step	Action	Comment
1	Write the text rules for the custom time zone.	
2	Using an FTP client, store your rules in the file: /FLASH0/wwwroot/conf/NTP/customrules user ID: ntpupdate password: ntpupdate	Root directory to store 'customrules' is set by the FTP server as: /FLASH0/wwwroot/conf/NTP
3	When the rules are written, choose the drop down menu on the NTP Configuration web page, and configure (or reboot) the module by selecting Time Zone = Custom	The NTP component looks for customrules, calls the tz compiler and generates a new file called 'tz_custom'. This file is binary file and should not be edited. If the tz compiler detects a syntax error in customrules, the error is logged in the file: /FLASH0/wwwroot/conf/NTP/error.log 1. NTP component is not launched 2. NTP Status field in diagnostic web page displays NOT OK.
4	If you want more information, the syntax to write those rules along with a few examples are found in the module in: /FLASH0/wwwroot/conf/NTP/instructions.txt	

**Time Zone
Parameters**

Select a time zone from the drop-down menu.

Time Zone	Description	DST Available
Custom		Yes
(GMT-12:00)	Dateline Standard Time [Eniwetok Kwajalein]	No
(GMT-11:00)	Samoa Standard Time [Midway Is Samoa]	No
(GMT-10:00)	Hawaiian Standard Time [Hawaii Honolulu]	No
(GMT-09:00)	Alaskan Standard Time [Anchorage]	Yes
(GMT-08:00)	Pacific Standard Time [Los Angeles Tijuana]	Yes
(GMT-07:00)	Mexican Standard Time [Chihuahua La Paz Mazatlan]	Yes
(GMT-07:00)	Mountain Standard Time [Arizona Phoenix]	No
(GMT-07:00)	Mountain Standard Time [Denver]	Yes
(GMT-06:00)	Central Standard Time [Chicago]	Yes
(GMT-06:00)	Mexico Standard Time [Tegucigalpa]	No
(GMT-06:00)	Canada Central Standard Time [Saskatchewan Regina]	No
(GMT-06:00)	Central America Standard Time [Mexico_city]	Yes
(GMT-05:00)	SA Pacific Standard Time [Bogota Lima Quito]	No
(GMT-05:00)	Eastern Standard Time [New York]	Yes
(GMT-05:00)	Eastern Standard Time [Indiana (East)] [Indianapolis]	No
(GMT-04:00)	SA Western Standard Time [Caracas La Paz]	No
(GMT-04:00)	Pacific SA Standard Time [Santiago]	Yes
(GMT-03:30)	Newfoundland Standard Time [Newfoundland St Johns]	Yes
(GMT-03:00)	E. South America Standard Time [Brasilia Sao_Paulo]	Yes
(GMT-03:00)	SA Eastern Standard Time [Buenos Aires Georgetown]	No
(GMT-02:00)	Mid-Atlantic Standard Time [South_Georgia]	No
(GMT-01:00)	Azores Standard Time [Azores Cape Verde Island]	Yes
(GMT)	Universal Coordinated Time [Casablanca, Monrovia]	No
(GMT0)	Greenwich Mean Time [Dublin Edinburgh Lisbon London]	Yes
(GMT+01:00)	Romance Standard Time [Amsterdam CopenHagen Madrid Paris Vilnius]	Yes
(GMT+01:00)	Central European Standard Time [Belgrade Sarajevo Skopje Sofija Zagreb]	Yes
(GMT+01:00)	Central Europe Standard Time [Bratislava Budapest Ljubljana Prague Warsaw]	Yes
(GMT+01:00)	W. Europe Standard Time [Brussels Berlin Bern Rome Stockholm Vienna]	Yes
(GMT+02:00)	GTB Standard Time [Athens Istanbul Minsk]	Yes
(GMT+02:00)	E. Europe Standard Time [Bucharest]	Yes
(GMT+02:00)	Egypt Standard Time [Cairo]	Yes

Time Zone	Description	DST Available
(GMT+02:00)	South Africa Standard Time [Johannesburg Harare Pretoria]	No
(GMT+02:00)	FLE Standard Time [Helsinki Riga Tallinn]	Yes
(GMT+02:00)	Israel Standard Time [Israel Jerusalem]	Yes
(GMT+03:00)	Arabic Standard Time [Baghdad]	Yes
(GMT+03:00)	Arab Standard Time [Kuwait Riyadh]	No
(GMT+03:00)	Russian Standard Time [Moscow St. Petersburg Volgograd]	Yes
(GMT+03:00)	E. Africa Standard Time [Nairobi]	No
(GMT+03:30)	Iran Standard Time [Tehran]	Yes
(GMT+04:00)	Arabian Standard Time [Abu Dhabi Muscat]	No
(GMT+04:00)	Caucasus Standard Time [Baku Tbilisi]	Yes
(GMT+04:00)	Afghanistan Standard Time [Kabul]	No
(GMT+05:00)	Ekaterinburg Standard Time [Ekaterinburg]	Yes
(GMT+05:00)	West Asia Standard Time [Islamabad Karachi Tashkent]	No
(GMT+05:30)	India Standard Time [Bombay Calcutta Madras New Delhi]	No
(GMT+06:00)	Central Asia Standard Time [Almaty Dhaka]	Yes
(GMT+06:00)	Sri Lanka Standard Time [Columbo]	No
(GMT+07:00)	SE Asia Standard Time [Bangkok Hanoi Jakarta]	No
(GMT+08:00)	China Standard Time [Beijing Chongqing Hong Kong Urumqi]	No
(GMT+08:00)	W. Australia Standard Time [Perth]	No
(GMT+08:00)	Singapore Standard Time [Singapore]	No
(GMT+08:00)	Taipei Standard Time [Taipei]	No
(GMT+09:00)	Tokyo Standard Time [Osako Sapporo Tokyo]	No
(GMT+09:00)	Korea Standard Time [Seoul]	No
(GMT+09:00)	Yakutsk Standard Time [Yakutsk]	Yes
(GMT+09:30)	Cen. Australia Standard Time [Adelaide]	Yes
(GMT+09:30)	AUS Central Standard Time [Darwin]	No
(GMT+10:00)	E. Australia Standard Time [Brisbane]	No
(GMT+10:00)	AUS Eastern Standard Time [Canberra Melbourne Sydney]	Yes
(GMT+10:00)	West Pacific Standard Time [Guam Port Moresby]	No
(GMT+10:00)	Tasmania Standard Time [Hobart]	Yes
(GMT+10:00)	Vladivostok Standard Time [Vladivostok]	Yes
(GMT+11:00)	Central Pacific Standard Time [Magadan Solomon Is New Caledonia]	Yes
(GMT+12:00)	New Zealand Standard Time [Auckland Wellington]	Yes
(GMT+12:00)	Fiji Standard Time [Fiji Kamchatka Marshall Is]	No

Mail Service Configuration

Configuring the Mail Service with the Email Configuration Page

Use the module's embedded Web page to configure the Electronic Mail Notification service. No other method is available.

Email Configuration

Email Server Configuration

IP Address of Email

192.168.3.1

Port:

25

Password Authentication

☒ Enable

Login:

knight@mycomp

Password:

Mail Header 1

From:

NOE_Pump2

To:

support_automation@mycompany.com

Subject:

Alarm 4: water level low

Mail Header 2

From:

Statio_N4

To:

myManager@mycompany.com

Subject:

Warning: big problem with Pump2

Mail Header 3

From:

To:

Subject:

Save

Cancel

Disable Email

**Mail Service
Command
Buttons**

Button	Description
Save	Saves the new Email configuration. Note: The previous configuration is no longer valid and it is not stored.
Cancel	Cancels the entries in the fields. The previous configuration is valid.
Disable Email	Clears the stored configuration, and disables the email service. Note: The next time the service is enabled, a new configuration is required.

**Configurable
Mail Service
Parameters**

Parameter	Description
IP address of Email	Enter a valid IP address. (This parameter identifies the SMTP server.)
Port	Default = 25 (If necessary, you may enter a new value.)
Password Authentication	If security is needed, enable Password Authentication by entering a check mark in the box. Enter values for: • Login: • Any printable character allowed • 64 character maximum • Password: • Any printable character allowed • 64 character maximum
3 mail headers	Each header must contain 1. sender's ID in the From: field • 32 character maximum; no spaces 2. list of recipients in the To: field • Separate each email address with a comma. • 128 character maximum 3. fixed part of message in the Subject: field • (32 character maximum)
The Subject field consists of two parts: 1. Fixed (32 character maximum) 2. Dynamic (206 character maximum)	

Ethernet Module Diagnostic Pages

Overview

The **NOE Diagnostics** menu contains a list of links for accessing the different diagnostic pages for the Ethernet module:

- Global Data
- I/O scanning (see *I/O Scanner*, p. 199)
- Messaging utility
- Bandwidth monitoring (see *Bandwidth Monitoring*, p. 92)
- Ethernet module statistics
- NTP utility
- Email utility

A link also allows the uploading of the private MIB source file.

Click on a link to access the desired diagnostics page.

Global Data Page

Information on the general diagnostics of Global Data can be found at the top of this page:

- Status
- Number of publications per second
- Number of subscriptions per second

This page also shows a table of all published and subscribed variables in the same distribution group. Each variable is identified by its Identifier:

- Green for the subscribed variables
- Black for the published variables
- White for all unconfigured variables
- Red for variables with communication faults

GLOBAL DATA DIAGNOSTIC

Global Data Status: NOK
Number of subscriptions per sec. : 0 | Number of publications per sec. : 0

Global Data Status

16

1

32

17

48

33

64

49

Not configured

Sub Variable

Pub Variable

Fault

I/O Scanning Page

General diagnostics for the I/O scanning service are shown at the top of this page:

- the I/O scanning status
- the number of transactions per second
- the number of connections

A value of NOK in the **I/O Scanning Status** field indicates that the local system is not scanning. In this case, any data that appears in the **Scanned Device Status** display is meaningless.

A value of OK in the **I/O Scanning Status** field indicates that the values in the **Scanned Device Status** display are reporting the state of scanned devices.

In the **Scanned Device Status** display, the colors that appear in each block indicate the following states for specific remote devices:

- Green indicates that a device is being scanned
- Black indicates that I/O scanning of the specific device has been intentionally disabled via the Device Control Block
- White indicates an unconfigured device
- Red indicates a faulty device

I/O SCANNING DIAGNOSTICS

I/O Scanning Status: NOK

Number of transactions per sec.: 0 | Number of connections: 0

SCANNED DEVICE STATUS															
1															16
17															32
33															48
49															64

☐ Not configured
☒ Scanned
☐ Disabled
☐ Fault

Note: Be aware that the green **Scanning** indicator may incorrectly remain green for a remote scanned device after the Ethernet cable gets removed from that device. This inaccurate indication occurs when the health timeout value in the I/O Scanning configuration screen is set to 0 (see *Configuration Parameters*, p. 209). You should configure an operational health timeout value in the range 1...65535 (in 1 ms increments). If the health timeout value is set to any value in this range, the **Scanning** indicator reports I/O scanning health correctly.

Messaging Page This page provides current information on the open TCP connections on port 502. The number of sent/received messages on the port can be found at the top of this page.

A table provides, for each connection (numbered from 1 to 64):

- The remote IP Address
- The remote TCP port
- The local TCP port
- The number of messages sent from this connection
- The number of messages received from this connection
- The error number on this connection

MESSAGING DIAGNOSTICS

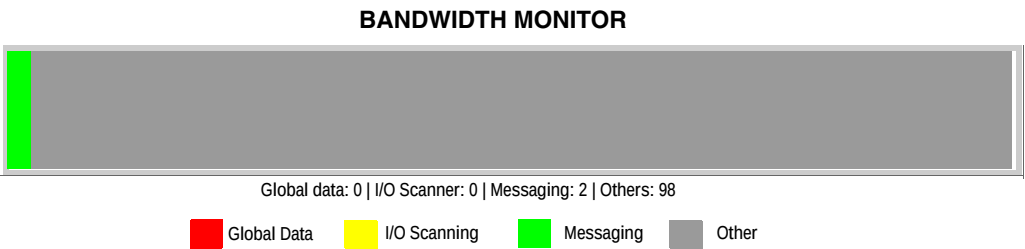
Number of Messages sent: 2007 | Number of Messages received: 2007

Conn.	Remote address	Remote port	Local Port	Mess. sent	Mess. received	Error sent.
1	192.168.2.10	1240	502	356	356	0
2	139.168.2.10	1247	502	56	56	0

Note: Following a request to close a connection, the PLC may hold the connection open in its memory for a few minutes, during which the table will reflect the open connection.

Number of Messages received is not reset after a port 502 connection is closed. Therefore, the count indicates the total number of messages that have been received since the module was started.

Bandwidth Monitoring Page This page displays the load distribution of the Embedded Server module between the Global Data utilities, I/O Scanning, Messaging, and other utilities:



Ethernet Statistics Page The Ethernet Module Statistics page provides information about the status, transmit and receive statistics, and errors for the Embedded Server module. Access this page by selecting the NOE module form the local rack or use the hyperlink Statistics. The following graphic is an example **Ethernet Module Statistics** page:

ETHERNET MODULE STATISTICS

Status:	Running Link Appl	Host Name:	139.158.13.143
Reference:	140 NOE 771 10	MAC Address:	00 00 54 10 20 ae
Rack:	1	IP Address:	139.158.13.143
Slot:	Unknown	Subnet Mask:	Unknown
Transmit Speed:	10 MB	Gateway Address:	Unknown

Transmit Statistics		Receive Statistics		Functioning Errors	
Transmits	13161058	Receives	24446416	Missed Packets	0
Transmit Retries	0	Framing Errors	0	Collision Errors	0
Lost Carrier	1	Overflow Errors	0	Transmit Timeouts	0
Late Collision	0	CRC Errors	0	Memory Errors	0
Transmit Buffer Errors	0	Receive Buffer Errors	0	Net Interface Restarts	0
Silo Underflow	0				

Note: Refer to *Modicon Quantum Ethernet TCP/IP Module User Guide 840 USE 107 00* and *Modicon Quantum Ethernet TCP/IP Module User Guide 840 USE 115 00* for definitions of terms.

NTP Diagnostics
Page

NTP DIAGNOSTICS

NTP Status:

NTP Server Status

Link to the NTP Server: Server Time Quality within microsec/
Server: Primary

NTP Request Statistic

Number of Requests: Number of
Number of Responses: Last Error:

NTP Date and Time

Date: Time: DST Sta-
Time Zone:

Time synchronization service parameters:

Parameter	Description
NTP status	Service is correctly configured (OK)
NTP server status	NTP client is connected to the NTP server, and if the server is Primary or Standby
NTP requests	Total number of client requests sent to the NTP server
NTP responses	Total number of server responses sent from the NTP server
Number of errors	Total number of unanswered NTP requests
Last error code	Last error code received from the NTP client
Date	Date in d/m/y format
Time	Time
Time zone	Time zone plus or minus Universal Time, Coordinated (UTC)
DST	Daylight saving time (DST) parameter is either 1. on (enabled) 2. off (disabled)

Last Error field displays values, which indicate the type of error.

Type of Error	Value
Component OK and running	0
Excessive network traffic or server overload	1
Bad parameters in the configuration	3

Type of Error	Value
Component is disabled	4
Incorrect IP	9
Time zone file absent	14
Syntax error in the customrules file	15

Email Diagnostics Page

The dialog:

EMAIL DIAGNOSTIC

Email Status:

Link to Server Status: ☒ **Email Server IP Address:**

Number of e-mail sent:

Number of Responses from Email Server:

Number of Errors:

Last Errors:

Last Mail Header Used:

Number of seconds elapsed since last e-mail successfully sent:

Number of times the link to the server has been detected down:

Electronic mail notification service parameters

Parameter	Description
Email status	Email service is correctly configured (OK).
Link to Server Status	Ethernet module is connected to the SMTP server. Status is checked at start-up and at least every 30 minutes after start-up: ● Green = module connected to server ● Red = module NOT connected to server
SMTP Server IP Address	IP address of the SMTP server
Number of e-mails sent	Total number of emails sent successfully
Number of Responses from SMTP Server	Total number of SMTP messages received from the SMTP server
Number of Errors	Total number of e-mails NOT sent because of an error
Last Errors	Reason for the last error with a code in hexadecimal. 0 displays if no error occurs

Parameter	Description
Last Mail Header Used	Last header used by giving the number.
Number of seconds elapsed since last e-mail successfully sent	Counts the number of seconds since the last email was successfully sent.
Number of times the link to the server has been detected down	Number of times the SMTP server could not be reached. (Link checked every 30 minutes.)

Crash Log Diagnostics Page

The Crash Diagnostics Page displays a crash log file when a crash has occurred, and a status message when no crash has occurred.

Press **Clear Crash Log File** to clear the crash log file (see *Reading and Clearing the Crash Log*, p. 333).

NTP Diagnostics Page

NTP Diagnostic Dialog

Time synchronization service parameters are in the table:

Parameter	Description
NTP status	Service is correctly configured (OK)
NTP server status	NTP client is connected to the NTP server, and if the server is Primary or Standby
NTP requests	Total number of client requests sent to the NTP server
NTP responses	Total number of server responses sent from the NTP server
Number of errors	Total number of unanswered NTP requests
Last error code	Last error code received from the NTP client
Date	Date in d/m/y format
Time	Time
Time zone	Time zone plus or minus Universal Time, Coordinated (UTC)
DST	Daylight saving time (DST) parameter is either - on (enabled) - off (disabled)

The dialog:

NTP Diagnostics

NTP Status:

NTP Server Status

Link to the NTP Server: ☐ ### Server Time Quality within microsec/

Server: Primary

NTP Request Statistic

Number of Requests:

Number of

Number of Responses:

Last Errors:

NTP Date and Time

Date:

Time:

DST Status:

Time Zone:

Last Error Field Last Error field displays values, which indicate the type of error.

Type of Error	Value
Component OK and running	0
Excessive network traffic or server overload	1
Bad parameters in the configuration	3
Component is disabled	4
Incorrect IP	9
Time zone file absent	14
Syntax error in the customrules file	15

NOE Properties Page

Introduction to the NOE Properties Page

You can navigate to the **NOE Properties** page from the Diagnostics page. (see *Illustration, p. 270*) The **NOE Properties** page displays the versions of the Exec, Kernel, and Web Pages and the Physical Media:

NOE Properties

Exec Version:	version 3.60
Kernel Version:	version 2.0
Web Pages Version:	version 3.1
Physical Media:	10/100BASE-T

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Note: This page only reports this information. The fields cannot be changed.

Contacting Schneider Electric Page

Schneider Electric Contact Page

The following figure shows the Contacting Schneider Electric page, which contains information about how to obtain support for the NOE 771 xx modules.

Contacting Schneider Electric

Technical Information

[Click here](#) to go to the Schneider Electric Automation web site.

Contact Us

[Click here](#) to contact Schneider Electric in your country.

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At a Glance

Overview	The Quantum Ethernt module offers a Hot Standby configuration available for Quantum controllers.																
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Quantum Hot Standby for Unity Pro

The Hot Standby Solution

CAUTION

COMMUNICATION FAILURE

Whenever possible, use of a switch (not a hub) to connect the NOE modules to each other or to the network.

Schneider Electric offers switches. Contact a local sales office for more information.

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

WARNING

UNINTENDED EQUIPMENT OPERATION

Design your application so that unmonitored modules support communication only to noncritical parts of the application.

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

In the hot standby solution, two identically configured PLC systems are set up to control the same application. One PLC, the primary, runs the application and updates the other secondary (standby) PLC. The standby maintains awareness of the application status but does not perform any control functions. In the event of a failure in the primary PLC, the standby PLC takes over the primary PLC responsibilities. When the PLC that has failed becomes operational again, it comes back up in the hot standby system as the new secondary PLC.

The NOEs coordinate the swapping of IP addresses. After closing both the client and the server connections, each NOE sends a swap UDP message to its peer NOE. The sending NOE then waits a specified timeout (500 ms) for the peer swap of UDP messages. Either after receiving the messages or after a timeout, the NOE changes its IP address.

Note: NOEs must communicate with each other in order to swap IP addresses. Schneider Electric recommends that you connect the primary and secondary NOEs to the same switch because:

- Communication failures between the NOEs increases the time to swap.
- Connecting 2 NOEs to the same switch minimizes the probability of a communication failure.

Note: Schneider Electric recommends that you use a switch (not a hub) to connect the NOEs to each other or to the network. Schneider Electric offers switches; please contact a local sales office for more information.

The NOE waits for either a change in the controller's Hot Standby state or the swap of UDP messages. Then the NOE performs 1 of 2 Hot Standby actions.

If the NOE . . .	Then
Detects that the new Hot Standby state is either primary or standby	The NOE changes the IP address.
Receives a swap UDP message	The NOE transmits a Swap UDP message and swaps the IP address.

All client/server services (I/O scanner, global data, messaging, FTP, SNMP, and HTTP) continue to run after the switch from the old to the new primary NOE.

Note: Failure of an NOE module is not a condition for the primary system to leave the primary state.

Hot Standby and NOE Module Functionality

The following table identifies the Ethernet services that are available and unavailable in a hot standby solution.

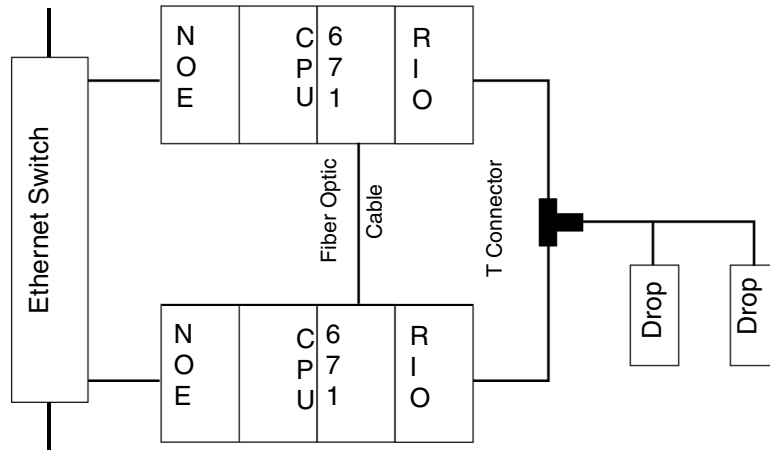
Service	NOE 771 Family
I/O Scanning	Available
Global Data	Available
Modbus Messaging	Available
FTP/TFTP	Available
SNMP	Available
HTTP Server	Available
DHCP	Unavailable

Note: Only the 140 NOE 771 01 or 140 NOE 771 11 (TCP/IP Ethernet modules) support a Modicon Quantum Hot Standby with Unity V2.0 system.

Hot Standby Topology

Hot Standby Interconnection

The following diagram shows a Hot Standby system and the relationship between the 2 redundant systems. Two 140 CPU 671 60 controllers are connected via a link created with fiber optic cable. The RIOs are connected both to each other (through the fiber optic cable) and to the RIO drops.



Note: The following three items are required.

1. Two identical systems
2. identical order of modules in each rack
3. identical software revisions

The NOEs are connected to the same switch. Connecting to the same switch is recommended because the NOEs communicate with each other in order to swap the IP address.

There are two reasons to connect to the same switch:

- If a failure to communicate between the NOEs occurs, the time to swap increases.
- To minimize the probability of a failure, connect the two NOEs to the same switch.

The other requirement for the switches is that they are on the same sub-network.

NOE Configuration and Hot Standby

TCP/IP Configuration

When an NOE goes into service the first time, the NOE attempts to get its IP address from a BOOTP server. If a BOOTP server is not available, the NOE derives its IP address from its MAC address. Connecting to a BOOTP server or deriving the IP address from a MAC address gives you a connection to the NOE, and you can then download a project to the PLC.

All standard rules apply to IP addressing with the additional restriction that the IP address cannot be greater than 253 or broadcast address minus 2. Also, no other device can be assigned the configured IP + 1 address.

IP Address Assignment

Configuring the NOE

The NOE can be configured to work in conjunction with the Modicon Quantum Hot Standby with Unity controller. Since the primary CPU and secondary controllers must have an identical configuration, the configured IP addresses will be the same. The NOE's IP address is either the configured IP address or the configured IP address +1. The current local Hot Standby state determines the IP address.

In the offline state, the IP address is determined by whether or not the other controller is in transition to the primary CPU state.

The following table shows the IP address assignments.

Hot Standby State	IP Address
Primary CPU	Configured IP address
Standby CPU	Configured IP address + 1
Transition from primary to offline	Configured IP address, if peer controller does not go to primary CPU
Transition from standby to offline	Configured IP address + 1

IP Address Restriction

Do not use either **broadcast IP address** or **broadcast IP address - 2** to configure an NOE.

IP Address Transparency

CAUTION

UNINTENDED EQUIPMENT OPERATION

For a Quantum Hot Standby configuration:

- Do not use the address IP + 1.
- Do not use consecutive IP addresses of the configured IP address.
- Do not configure the primary CPU address as nnn.nnn.nnn.254. This causes the standby CPU IP address to be: nnn.nnn.nnn.255. The module would then return the diagnostic code **Bad IP configuration**.

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

When a switchover occurs, a new primary CPU PLC takes the IP address of the old primary CPU PLC. When the PLC that has stopped becomes operational again and rejoins the hot standby system, it takes the IP address of the secondary PLC. A new primary CPU NOE must have the same IP address as the former primary CPU NOE. The IP address in the secondary NOE (an NOE in the secondary state) is IP address + 1.

The NOEs integrated into the Modicon Quantum Hot Standby with Unity configuration coordinate this swapping IP address with the management of Ethernet services used.

NOE Operating Modes and Modicon Quantum Hot Standby with Unity

The NOE Modes

The NOE module modes are:

- **Primary CPU Mode**
The Hot Standby state is primary CPU, and all client/server services are active.
- **Secondary Mode**
The Hot Standby state is standby, and all server services are active except DHCP.
- **Standalone Mode**
The NOE is in a non-redundant system, or the HE CPU module is not present or is not healthy.
- **Offline Mode**
The CPU is stopped.

The Modicon Quantum Hot Standby with Unity and the NOE operating modes are synchronized by the conditions described in the following table:

HE CPU Module Status	HSBY State	NOE Operating Mode
Present and Healthy	Primary CPU	Primary CPU
Present and Healthy	Standby CPU	Secondary
Present and Healthy	Offline	Offline
Present and Healthy	Unassigned	Standalone
Not present or unhealthy	N/A	Standalone

Any 1 of 4 events will affect the NOE operating mode. These 4 events occur when:

- the NOE is powered up
 - an NOE executes a Hot Standby switch over
 - an NOE goes to offline mode
 - a new application is downloaded to the NOE
-

Power Up and IP Address Assignment

An NOE obtains its IP address assignment at power up as follows:

If the HSBY state is ...	Then the IP address assigned is ...
unassigned	configured IP address
primary CPU	configured IP address
secondary	configured IP address + 1
unassigned to offline	See the <i>Offline Mode at Power-up Sequence</i> in the next table.

If two NOEs power up simultaneously, a *resolution algorithm*:

- determines the primary CPU NOE
- assigns the configured IP address to that primary CPU NOE
- assigns the configured IP address + 1 to the secondary NOE

Offline Mode at Power-up Sequence	Result
Controller A powers-up before controller B	• IP address of controller A is the configured IP address • IP address of controller B is the configured IP address + 1
Both controller A and controller B power-up at the same time	The resolution algorithm will assign controller A the configured IP address, and it will assign controller B the configured IP address + 1.

The NOE performs a duplicate IP test by issuing an ARP request to the configured IP address. If a response is received within 3 seconds, the IP address remains at the default IP and blinks a diagnostic code.

If no IP configuration exists, the NOE remains in standalone mode, and the IP address must be obtained from either a BOOTP server or a MAC address.

Power Up and Ethernet Services

The following table shows how the status of an NOE service is affected by the Modicon Quantum Hot Standby with Unity HSBY state.

HSBY State	Status of NOE Services					
	Client Services		Client/Server Services	Server Services		
	I/O Scanner	Global Data	Modbus Messaging	FTP	SNMP	HTTP
Unassigned	Run	Run	Run	Run	Run	Run
Primary CPU	Run	Run	Run	Run	Run	Run
Secondary	Stop	Stop	Run	Run	Run	Run
Offline	Stop	Stop	Run	Run	Run	Run

Hot Standby Switchover

The following table describes the manner in which NOEs coordinate the Hot Standby switchover.

Step	Action
1	NOE A is running in the primary CPU PLC and NOE B is in the secondary PLC in a hot standby configuration.
2	NOE A detects that its PLC has changed from primary CPU to offline mode.
3	NOE A changes its HSBY state from primary CPU to offline with the same Ethernet services running, and starts its watchdog timer (with 500 ms timeout setting). It waits for a UDP request to swap IP addresses from NOE B.
4	NOE B detects that its PLC has changed state from secondary to primary CPU.
5	NOE B stops all its Ethernet services, sends a UDP request to NOE A for the synchronization of the IP address swap, starts its watchdog timer (with 500 ms timeout setting), and waits for an UDP response from NOE A.
6	Once NOE A receives the UDP request from NOE B (or after its watchdog timer times out), it stops all its Ethernet services. If it has received a UDP request, NOE B sends a UDP response to NOE A; if its watchdog timer has timed out, NOE B does not send a UDP response. NOE A then swaps its IP address and starts secondary services.
7	NOE B swaps IP addresses and starts Ethernet services as primary CPU.
8	After NOE A senses that its local controller changes state from offline to standby, it takes the secondary IP address.
9	NOE B now becomes the primary CPU NOE.
10	NOE B opens all client connections and listens for all server connections and reestablishes those connections.
11	NOE A listens for all server connections and reestablishes those connections.

Note: During the Hot Standby switchover, there is a loss of communication during 500 ms between the PLC and the HMI and/or Unity Pro.

Going to Offline When either the CPU stops or the Hot Standby state goes to offline mode, 2 events occur:

1. NOE mode goes to offline
2. NOE uses the IP address of the present configuration

IP Address Assignment and Going Offline

HSBY State	IP Address Assigned Is ...
Primary CPU to offline	Configured IP address, if other controller does not go to primary CPU
Standby CPU to offline	Configured IP address + 1

Address Swap Times

Description

The following table details address swap times, such as the time to close connections, time to swap IP addresses, or time to establish connections.

Service	Typical Swap Time	Maximum Swap Time
Swap IP addresses	6 ms	500 ms
I/O Scanning	1 initial cycle of I/O scanning	500 ms + 1 initial cycle of I/O scanning
Global data	For swap times, please see the <i>Quantum NOE 771xx Ethernet Modules User Guide</i> (840 USE 116).	500 ms + 1 CPU scan
Client messaging	1 CPU scan	500 ms + 1 CPU scan
Server messaging	1 CPU scan + the time of the client re-establishment connection	500 ms + the time of the client re-establishment connection
FTP/TFTP server	The time of the client re-establishment connection	500 ms + the time of the client reestablishment connection
SNMP	1 CPU scan	500 ms + 1 CPU scan
HTTP server	The time of the client re-establishment connection	500 ms + the time of the client re-establishment connection

Network Effects of Modicon Quantum Hot Standby with Unity Solution

Overview

The Modicon Quantum Hot Standby with Unity Pro solution is a powerful feature of NOEs, a feature that increases the reliability of your installation. Hot Standby uses a network, and using the Hot Standby feature over a network can affect the behavior of:

- browsers
- remote and local clients
- I/O scanning service
- global data service
- FTP/TFTP server

The following are factors you may encounter while using the Modicon Quantum Hot Standby with Unity solution.

Browsers

Note: In Modicon Quantum Hot Standby with Unity Pro configuration, the NOE's I/O Scanner must be enabled.

If a browser requests a page and during the process of downloading that page an IP address switchover occurs, the browser will either hang or time out. Click the **Refresh** or **Reload** button.

Remote Clients

Hot Standby switchover affect remote clients.

An NOE will reset under the following conditions:

Remote Connection Request during Hot Standby : If a remote client establishes a TCP/IP connection during a Hot Standby switchover, the server closes the connection using a TCP/IP reset.

Hot Standby Switchover during Remote Connection Request : If a remote client makes a connection request and a Hot Standby switchover occurs during the connection request, the sever rejects the TCP/IP connection by sending a reset.

Outstanding Requests : If there is an outstanding request, the NOE will not respond to the request, but the NOE will reset the connection.

The NOE will do a Modbus logout if any connection has logged in.

Local Clients

During a switchover, the NOE will reset all client connections using a TCP/IP reset.

**I/O Scanning
Service**

** WARNING**

**UNINTENDED EQUIPMENT OPERATION - DEVICES GO TO THEIR
FALLBACK STATES DURING SWITCHOVER**

Configure Ethernet output devices to their Hold Last Value fallback state whenever possible. Output devices that support only a Set to Zero fallback state may produce a pulse during switchover.

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

I/O scanning provides the repetitive exchange of data with remote TCP/IP nodes I/O devices. While the PLC is running, the primary CPU NOE sends Modbus read/write, read, or write requests to remote I/O devices, and transfers data to and from the PLC memory. In the secondary controller, the I/O scanning service is stopped.

When the Hot Standby switchover occurs, the primary CPU NOE closes all connections with I/O devices by sending a TCP/IP reset. The I/O scanning service in this NOE is standby CPU.

After the switchover, the new primary CPU NOE re-establishes the connection with each I/O devices. It restarts the repetitive exchange of data with these re-connections.

The module provide the I/O scanning feature. Configure this feature with the Unity Pro software.

Using either method, the configuration and transfer of data between network addresses can be done without using the MSTR/IEC function block.

Note:

You must account for the following Ethernet I/O scanning considerations during a switchover.

- If MSTR/IEC function block is used for TCP/IP, only some of the opcode will be used. Therefore, the block does not complete its transaction, and it returns error code 0•8000.
- While the NOE is in the process of performing the transaction, a new MSTR/IEC function block may become active.
- The output states of the scanned I/Os will follow the state defined in the last value option configured in the I/O scanning table of the NOE module (in Unity Pro software).

These 2 states are either:

1. set to 0
2. hold last

With the above considerations, we recommend using switchover with Ethernet I/O scanning for less critical applications.

**Global Data
(Publish/
Subscribe)
Service**

The Hot Standby primary CPU NOE is 1 station within a distribution group. Distribution groups exchange application variables. Exchanging application variables allows the system to coordinate all the stations in the distribution group. Every station publishes local application variable in a distribution group for all other stations and can subscribe to remote application variables independent of the location of the producer.

The communication port has only 1 multicast address.

In this network service, the Modicon Quantum Hot Standby with Unity controllers are viewed like only 1 station. The primary CPU NOE publishes the Hot Standby application variables and receives the subscription variables. The secondary NOE global data service is in a stopped state.

When the Hot Standby switchover occurs, the primary CPU NOE stops the global data service. The NOE does not publish the local variable during a switchover. And after the switchover, the new primary CPU NOE starts to publish application variables and to receive the subscription variables.

FTP/TFTP Server The FTP/TFTP server is available as soon as the module receives an IP address. Any FTP/TFTP client can logon to the module. Access requires the correct user name and password. Modicon Quantum Hot Standby with Unity allows only 1 active FTP/TFTP client session per NOE module.

When the Hot Standby switchover occurs, the primary CPU and secondary NOEs close the FTP/TFTP connection. If you send an FTP/TFTP request during the switchover, the communication is closed.

Whenever you re-open communication, you must re-enter a user name and a password.

Appendices



At a Glance

Introduction The appendices provide supplementary reference information for the Quantum 140 NOE 771 xx series of modules and the 140 NWM 100 00 module.

What's in this Appendix? The appendix contains the following chapters:

Chapter	Chapter Name	Page
A	Maintenance	327
B	Specifications	339
C	Quantum Ethernet TCP/IP Modbus Application Protocol	343
D	Installation and Configuration of a Modicon Quantum Platform	353

Maintenance



At a Glance

Introduction This chapter details information about system maintenance including accessing and clearing the crash log and downloading the new NOE exec.

What's in this Chapter? This chapter contains the following topics:

Topic	Page
Responding to Errors	328
Reading and Clearing the Crash Log	333
Downloading a New NOE Exec	334
Downloading a New NOE Exec via FTP	335
Downloading a New NOE Kernel	337

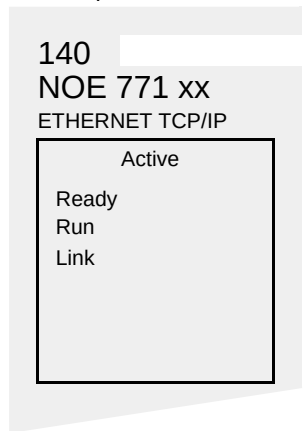
Responding to Errors

Overview

The following information describes how to respond to errors on the 140 NOE 771 x0.

Detecting Errors

When faults occur, the NOE 771 xx LED display can help you determine what went wrong. The following figure shows the pattern that the LEDs should display during normal operation.



The **Run** indicator will be solid. The **Coll** (collision) LED may flash, indicating that collisions are occurring on the Ethernet network. Such collisions are normal.

If a fault occurs, the normal LEDs may be extinguished or other indicators may light. This topic discusses errors reported by the **Active**, **Ready**, **Coll**, **Link**, **Kernel**, **Appl** and **Fault** indicators.

For each type of error, try the suggested remedies in the order given. If no remedy suggested here overcomes the error, call your local service representative or call Schneider Electric customer service at 1-800-468-5342 for further directions.

Procedure for Responding to an Active LED Error Indicator

If the Active LED fails to light, the NOE 771 00 module is not communicating with the backplane . The following procedure describes the steps to perform to respond to an Active LED error.

Step	Action
1	Make sure the NOE 771 module and the controller are installed properly.
2	Verify that the controller is working; if it is not, replace it.
3	If neither the new controller nor the NOE 771 module functions, replace the backplane.
4	Make sure that no more than two network option modules (including NOE, NWM, NOM, and CRP 811 modules) have been installed in the backplane with a 140 CPU 311 10; not more than six network option modules with a 140 CPU 434 12A, 140 CPU 534 14A, 140 CPU 651 x0, or 140 CPU 671 60.
5	Check the version of the controller executive. You must have version 2.0 or greater to support the Ethernet module. Earlier versions do not recognize the module.
6	If steps 4 and 5 above check out ok, replace the NOE 771 module.

Procedure for Responding to a Ready LED Error Indicator

If the **Ready** LED fails to light, the NOE 771 module has failed internal diagnostic tests. The following procedure describes the steps to perform.

Step	Action
1	Make sure that power has been applied to the backplane.
2	If step 1 checks out ok, replace the NOE 771 module.

Procedure for Responding to a Link LED Error Indicator

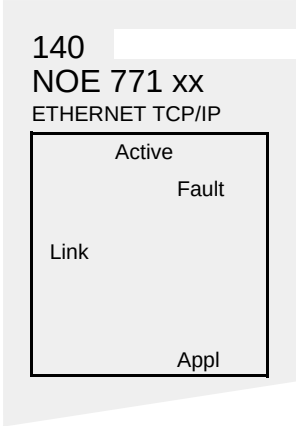
If the **Link** LED fails to light, the NOE 771 module is not communicating with the Ethernet hub/switch. The following procedure describes the steps to perform to respond to a **Link** LED error.

Step	Action
1	Make sure that the cable has been installed correctly and the module is functioning properly.
2	Verify that the hub/switch is working properly.
3	If steps 1 and 2 check ok, replace the NOE 771 module.

Kernel LED Error The following table describes the **Kernel** LED errors that may occur and how to respond to them.

If	Then
The Ready LED is on and the Kernel LED is flashing	The module has detected an invalid software image.
The Ready LED is on and the Kernel LED is shining steadily,	An attempt to download a software image has failed and the module is in kernel mode.
Either of the above conditions exists.	Download a new NOE Exec (see <i>Downloading a New NOE Exec</i> , p. 334).

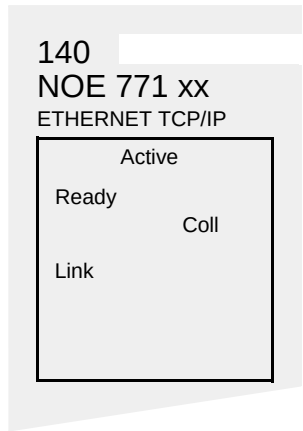
Fault LED The **Fault** LED will flash briefly following an error as the module attempts to recover.
The following figure shows the **Fault** LED.



Collision LED Error

If the twisted pair cable has not been connected properly, the **Coll** LED will shine steadily and the **Link** LED will be extinguished. (This condition does not occur with fiber optic modules.)

The following figure shows the Collision LED.



Procedure for Responding to a Collision LED Error

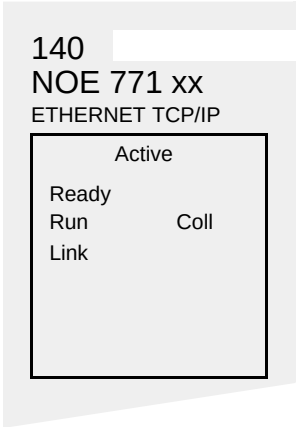
If the Collision LED fails to light, use the following procedure.

Step	Action
1	Make sure that the cable has been installed and is working properly.
2	Verify that the Ethernet Hub/Switch is working properly.

Collision LED
Normal
Condition

If the **Coll** LED is flashing, the module is reporting collisions on the Ethernet network. While such collisions are normal, the frequency of the flashes is an indication of the volume of traffic on the network. The flashes may be so frequent that the LED appears to be shining steadily. Heavy traffic will slow communications. If response time is important to your application, you should consider segmenting your network to reduce the frequency of collisions.

The following figure shows the Collision LED under normal conditions.



Run LED

The following table describes the action to be taken if the **Run** LED is flashing. The action depends on the number of flashes in sequence.

Number of Flashes in Sequence	Action
Three	Check Ethernet connection
Four	Change IP address
Five	Provide IP address
Six	Connect using default IP address and configure
Seven	Download a new NOE Exec (see <i>Downloading a New NOE Exec</i> , p. 334)

Application LED

If the module crashes, it will note the reason in a log. If the module is able to recover, the **Appl** LED will light, indicating that an entry has been made in the crash log. You can read and clear the crash log (see *Reading and Clearing the Crash Log*, p. 333).

Reading and Clearing the Crash Log

Overview

The following information describes the crash log.

Introduction

The crash log provides you with the ability to capture conditions that lead to an anomalous condition. By providing the crash log to Schneider Electric technical support, you can facilitate their assistance in resolving your problems.

Note: The crash log is provided with the understanding that, with a complex product in thousands of customer applications, there may be conditions that require advance diagnostics. The crash log is one of the tools used to solve complex problems.

The Crash Log

If the **Appl** (application) indicator is on, entries have been made in the crash log. The log may hold up to 64K of entries.

Reading the Crash Log

The crash log can be read from the Embedded Web Pages (see *Embedded Web Pages*, p. 265) or via FTP.

Procedure for Reading the Crash Log via FTP

To access the crash log via FTP:

Step	Action
1	Log in to the module's FTP server.
2	Change the directory to <i>wwwroot/conf/diag</i> .
3	Perform an FTP to get the crash log file: <code>get crash.log</code>

Clearing the Crash Log

The crash log can be cleared from the Embedded Web Pages (see *Embedded Web Pages*, p. 265) or via FTP.

Procedure for Clearing the Crash Log via FTP

To access the crash log via FTP:

Step	Action
1	Log in to the module's FTP Server.
2	Change the directory to <i>wwwroot/conf/diag</i> .
3	Perform an FTP to delete the crash log file: <code>rm crash.log</code>

Downloading a New NOE Exec

Introduction

The following tools can be used to download a new NOE Exec:

- Schneider Electric programming packages (see corresponding manuals)
- FTP

Use the OS loader to update the NOE Executive and web pages. (Refer to the Unity Pro documentation.)

Downloading a New NOE Exec via FTP

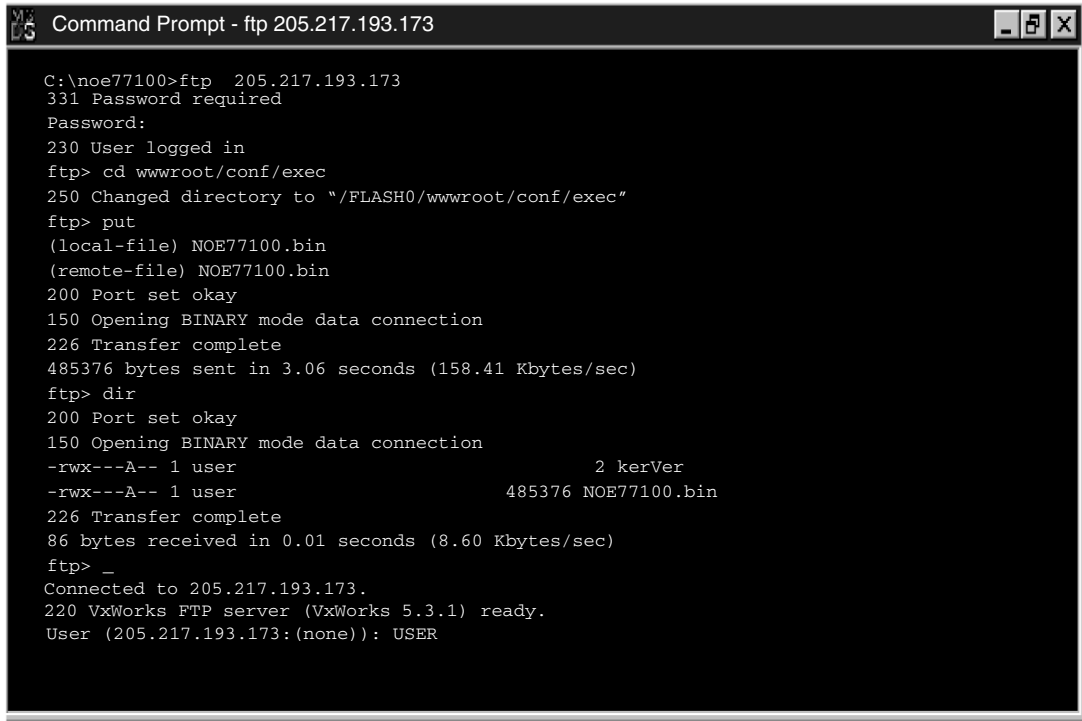
Exec Version Please check the current NOE Exec file version on the **NOE Properties** Web page. Follow these links: | **Diagnostics** | **NOE Properties** |

Procedure The following procedure describes the steps to use to download a new NOE Exec via FTP. An example follows the procedure.

Step	Action
1	At the DOS prompt, type FTP, followed by the IP Address and press Enter .
2	At the User prompt, type: USER and press Enter .
3	At the password prompt, enter your FTP Password and press Enter .
4	At the FTP prompt, type cd wwwroot/conf/exec and press Enter .
5	At the FTP prompt, type put and press Enter . Note: Pay attention that the NOE771xx.bin has to be to the local path on your PC (default path: c:\).
6	At the local file prompt, type NOE771xx.bin and press Enter .
7	At the remote file prompt, type NOE771xx.bin and press Enter .
8	After the transfer is complete you must reboot the NOE to allow the new EXEC to become operational. Note: The file name is case-sensitive and must be entered with the name in uppercase and the extension in lowercase as shown in the figure below. For example: NOE771xx.bin

Sample FTP Session

The following FTP session was used to download an NOE Exec.



```
Command Prompt - ftp 205.217.193.173

C:\noe77100>ftp 205.217.193.173
331 Password required
Password:
230 User logged in
ftp> cd wwwroot/conf/exec
250 Changed directory to "/FLASH0/wwwroot/conf/exec"
ftp> put
(local-file) NOE77100.bin
(remote-file) NOE77100.bin
200 Port set okay
150 Opening BINARY mode data connection
226 Transfer complete
485376 bytes sent in 3.06 seconds (158.41 Kbytes/sec)
ftp> dir
200 Port set okay
150 Opening BINARY mode data connection
-rwx---A-- 1 user                2 kerVer
-rwx---A-- 1 user                485376 NOE77100.bin
226 Transfer complete
86 bytes received in 0.01 seconds (8.60 Kbytes/sec)
ftp> _
Connected to 205.217.193.173.
220 VxWorks FTP server (VxWorks 5.3.1) ready.
User (205.217.193.173:(none)): USER
```

Note: The NOE Kernel can not be downloaded via FTP.

**Reboot
Information after
FTP**

Note: After downloading by FTP, reboot the module.
Perform a download or a reboot when your system can tolerate these actions.

Downloading a New NOE Kernel

Procedure

The NOE Executive (Exec) adds a new feature that allows updating of the low level Kernel within the NOE 771 xx's firmware. For the proper installation of new kernel firmware, use the following procedure.

Step	Action
1	Check the current version of the NOE's Executive firmware (Exec file).
2	If the Exec is not the appropriate version, the Exec must be updated before updating the Kernel.
3	Use the EXECLoader to load the latest version of the EXEC.
4	After loading the new Exec and before loading the Kernel, make sure to cycle power to the NOE.
5	Load the Kernel using the EXECLoader.
6	After the transfer displays as Successful, the NOE needs approximately 1 minute to burn the new Kernel into the NOE's FLASH.
7	The NOE goes go through a reboot sequence.

Kernel Version

CAUTION

UNINTENDED EQUIPMENT OPERATION

Failure to perform the preceding update procedure will render the NOE inoperable.

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

The NOE Kernel can not be downloaded via FTP.

Please check the current NOE Kernel version on the NOE Properties (see *NOE Properties Page, p. 306*) Web page.

Follow these links: | **Diagnostics** | **NOE Properties** |

Specifications

B

Specifications

**140 NOE 771 ••
Specification
Table**

The main specifications for the Quantum 140 NOE 771 xx Ethernet module are described in the following table:

Communication Ports	One auto-sensing 10/100 BASE-T shielded twisted pair (RJ-45 connector) port and one 100 BASE-FX (MT-RJ connector) port. Both ports transmit and receive Modbus commands encapsulated in TCP/IP protocol
Bus Current Required	750 mA
Power Dissipation	3.8 W
Fuse	None
Programming Software	
Type and version	Concept, Ver. 2.2, or higher
	Unity Pro, Ver. 1.0, or higher
	Modlink, Ver. 2.0, or higher
	Modsoft, Ver. 2.6, or higher
	ProWORX NxT, Ver. 2.1, or higher
Firmware	
CPU Type and version	Quantum Executive, Ver. 2.0, or higher
NOE Upgradeable	Field Upgradeable via FTP or Programming Panel.
Operating Conditions	
Temperature	0 to +60° C
Humidity	0 to 95% Rh non condensing @ 60° C
Altitude	15,000 ft (4500 m)
Vibration	10-57 Hz @ 0.0075 mm d.a
	57-150 Hz @ 1 g
Storage Conditions	

Specifications

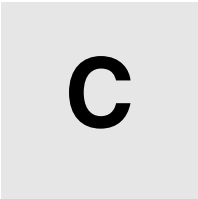
Temperature	-40 to +85°C
Humidity	0 to 95% Rh non condensing @ 60°C
Free Fall	1 m unpackaged
Shock	3 shocks / axis, 15 g, 11 ms

**140 NWM 100 00
Specification
Table**

The main specifications for the Quantum 140 NWM 100 00 Ethernet module are described in the following table:

Specification	Description
Communication Ports	One auto-sensing 10/100 BASE-T shielded twisted pair (RJ-45 connector) port and one 100 BASE-FX (MT-RJ connector) port. Both ports transmit and receive Modbus commands encapsulated in TCP/IP protocol
Bus Current Required	900 mA
Power Dissipation	4.5 W
Fuse	None
Programming Software	
Type and version	Concept, Ver. 2.6, or higher
	Unity Pro, Ver. 1.0, or higher
Firmware	
CPU Type and version	Quantum Executive, Ver. 2.6, or higher
NOE Upgradeable	Field Upgradeable via FTP or Programming Panel.
Operating Conditions	
Temperature	0 to +60° C
Humidity	0 to 95% Rh non-condensing @ 60° C
Altitude	15,000 ft (4500 m)
Vibration	10-57 Hz @ 0.0075 mm d.a
	57-150 Hz @ 1 g
Storage Conditions	
Temperature	-40 to +85°C
Humidity	0 to 95% Rh non-condensing @ 60°C
Free Fall	1 m unpackaged
Shock	3 shocks/axis, 15 g, 11 ms
Immunity	
International Standard	IEC 61131-2
US Standard	UL 508
European Standard	EN61131-2, EN50081-2
Canadian Standard	CAN/CSA C22.2 No. 142
Agency Approvals	UL: UL 508 CSA: CSA 142 CE: EN61131-2 Factory Mutual Class 1 Division 2

Quantum Ethernet TCP/IP Modbus Application Protocol



At a Glance

Introduction This chapter describes the Quantum Ethernet TCP/IP Modbus Application Protocol.

What's in this Chapter? This chapter contains the following topics:

Topic	Page
Modbus Application Protocol Overview	344
Modbus Application Protocol PDU	346
Modbus Application Protocol Service Classes	348
Modbus Application Protocol PDU Analysis	349
TCP/IP Specific Issues	351
Reference Documents	352

Modbus Application Protocol Overview

Introduction

The following information describes the Modbus Application Protocol (MBAP).

The Modbus Application Protocol (MBAP) is a layer-7 protocol providing peer-to-peer communication between programmable logic controllers (PLCs) and other host-based nodes on a LAN. Collectively, these nodes implement all or part of a control application used for industrial automation applications in the automotive, tire and rubber, food and beverage, and utilities industries, to name a few

Client-Server Communications

Modbus protocol transactions are typical request-response message pairs between a client node and a server node. These nodes function as follows

Client : The node that initiates a data transaction is called a *client*. The Modicon Quantum Ethernet module provides the user with the capability to transfer data to and from nodes on a TCP/IP network using a communication instruction. All PLCs that support networking communication capabilities over Ethernet can use either the MSTR Ladder Logic instruction to read or write controller information or IEC communication blocks.

Server : The node that receives an inquiry is the *server*. Using the standard Modbus/TCP protocol, the Modicon Quantum Ethernet module provides access to controller data. Any device, PC, HMI package, another PLC, or any Modbus/TCP compliant device can access data from the PLC. The Modbus/TCP server also allows programming panels to log into the controller over Ethernet.

Modbus requests contain function codes representing several classes of service including data access, online programming, and program download and upload classes. Modbus responses can be ACKs with and without data, or NACKs with error information.

The Modbus Application Protocol can be transmitted over any communication system that supports messaging services. However, the current Quantum implementation transports Modbus Application Protocol PDUs over TCP/IP. The Quantum PLC accommodates both Ethernet II and IEEE 802.3 framing, although Ethernet II framing is the default.

Limitations

The Modicon Quantum Ethernet module supports up to 64 simultaneous Modbus/TCP server connections. To guarantee consistency of changes to the controller configuration, the module allows only one programming panel to be logged in at a time.

The module supports these Modbus/TCP commands:

- Read Data
- Write Data
- Read/Write Data
- Get Remote Statistics
- Clear Remote Statistics
- Modbus 125 Commands (used by programming panels to download a new exec to the module)

For More Information

For more information about Modbus communications, consult the *Modbus Protocol Reference Guide* (PI-MBUS-300). For more information about communication blocks, consult Chapter 4, Transferring Data Using Communication Blocks (see *Transferring Data Using Communication Blocks*, p. 125).

Modbus Application Protocol PDU

Overview	The following information describes the structure and content of the Modbus Application Protocol PDU.																				
Description	The Modbus Application Protocol PDU, mbap_pdu, is received at TCP port number 502. The current maximum size of the mbap_pdu for this class of services is 256 bytes. The structure and content of the mbap_pdu is defined to be: <pre>mbap_pdu ::= {inv_id[2], proto_id[2], len[2], dst_idx[1], data=mb_pdu}</pre> The header is seven bytes long and includes the fields listed in the following table: <table><tr><th>Field</th><th>Description</th></tr><tr><td>inv_id</td><td>[2 bytes] invocation id used for transaction pairing</td></tr><tr><td>proto_id</td><td>[2 bytes] used for intra-system multiplexing, default is 0 for Modbus services</td></tr><tr><td>len</td><td>[2 bytes] the len field is a byte count of the remaining fields, and it includes the dst_id and data fields</td></tr></table> The remainder of the pdu includes two fields: <table><tr><th>Field</th><th>Description</th></tr><tr><td>dst_idx</td><td>[1 byte] destination index is used for intra-system routing of packets (currently not implemented)</td></tr><tr><td>data</td><td>[n bytes] this is the service portion of the Modbus pdu, mb_pdu, and it is defined below</td></tr></table> The service portion of the Modbus Application Protocol, called mb_pdu, contains two fields: <pre>mb_pdu ::= {func_code[1], data[n]}</pre> The following table describes the fields in mb_pdu.: <table><tr><th>Field</th><th>Description</th></tr><tr><td>func_code{1 byte</td><td>Modbus function code</td></tr><tr><td>data</td><td>[n bytes] this field is function code dependent and usually contains information such as variable references, variable counts, and data offsets</td></tr></table> The size and content of the data field are dependent on the value of the function code.	Field	Description	inv_id	[2 bytes] invocation id used for transaction pairing	proto_id	[2 bytes] used for intra-system multiplexing, default is 0 for Modbus services	len	[2 bytes] the len field is a byte count of the remaining fields, and it includes the dst_id and data fields	Field	Description	dst_idx	[1 byte] destination index is used for intra-system routing of packets (currently not implemented)	data	[n bytes] this is the service portion of the Modbus pdu, mb_pdu, and it is defined below	Field	Description	func_code{1 byte	Modbus function code	data	[n bytes] this field is function code dependent and usually contains information such as variable references, variable counts, and data offsets
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Field	Description																				
func_code{1 byte	Modbus function code																				
data	[n bytes] this field is function code dependent and usually contains information such as variable references, variable counts, and data offsets																				

Example

Here are the values for a sample mbap_pdu for reading a register:

00 01 00 00 00 06 01 03 00 00 00 01

The following table shows the structure and content for this example:

inv_id	00 01	
	proto_id	00 00
	len	00 00
	dst_idx	01
	func_code	03
	data	00 00 00 01

Modbus Application Protocol Service Classes

Introduction	There are several classes of service that are part of the Modbus Application Protocol. Each of these classes is described below.
Data Access	Read/write both discrete and analog data values from PLC register files.
Online Programming	Services make relatively minor alterations to ladder logic programs with a highly controlled introduction of these changes into the executing program.
Image Download/Upload	Image download services support the downloading of a ladder logic control program to the PLC. Image upload services support the uploading of a ladder logic control program from a PLC to PC host for archival/backup purposes.
Configuration	Configuration services allow the user to define parameter values which affect the PIC's register files, I/O map, communication port configuration and scan attributes, to name a few.
Device Execution State Control	The class of service allows the user to start/stop the PLC scan execution. These services require the user to be in an application login context which is obtained through other Modbus services.

Modbus Application Protocol PDU Analysis

Overview

The following information provides an analysis of the Modbus Application Protocol.

Analysis

The Modbus Application Protocol PDU is transmitted over a TCP/IP Ethernet stack. Both Ethernet II and IEEE 802.3 framing will be accommodated. Ethernet II framing is the default.

```
. . . from the wire in for IEEE 802.3 framing . . .
. . . is IEEE 802.3 framing if length <=1500 . . .802.3_pdu
::= {dst_addr[6], src_addr[6], length[2], data=802.2_pdu}*an
IEEE 802.3 PDU has a maxFrameSize of 1518 octets
*an IEEE 802.3 PDU has a minFrameSize of 64 octets802.2_pdu :
{dsap[1], ssap[1], frm_cntrl[1], snap_hdr[5], data=ip_pdu}
*the snap_hdr is associated with a "well-known" 802.2 sap
snap_hdr
::={org_code[3], ethertype[2] }
```

*the snap_hdr (sub network access protocol) allows the older style

Ethernet protocols to run on the newer IEEE 802.2 interface.

The

ethertype parameter indicates the service, ex. ip or arp. IP has a value

```
0x800. . . from the wire in for Ethernet II framing . . .
. . . is Ethernet II framing if length >1500 . . .802.3_pdu
::= {dst_addr[6], src_addr[6], length[2], data=ip_pdu}. . .
the common part of the packet begins here . . .ip_pdu ::=
{ip_hdr[20], data=tcp_pdu}tcp_pdu ::= {tcp_hdr[24],
data=appl_pdu=mbap_pdu}
```

The mbap_pdu is the Modbus Application Protocol whose messages are received at a well-known port. The current maximum size of the mbap_pdu for this class of services is 256 bytes.

Structure and Content

The structure and content of the mbap_pdu is defined to be:

```
mbap_pdu ::= { inv_id[2], proto_id[2], len[2], dst_idx[1],
data=mb_pdu }
```

The header is 7 bytes long, and includes the following fields:

- inv_id[2 bytes] invocation id used for transaction pairing
- proto_id[2 bytes] used for intra-system multiplexing, default is 0 for Modbus
- serviceslen[2 bytes] the len field is a byte count of the remaining fields and includes the dst_id and data fields.

The remainder of the pdu includes two fields:

- dst_idx[1 byte] destination index is used for intra-system routing of packets. (currently not implemented)
- data[n bytes] this is the service portion of the Modbus pdu, mb_pdu, and is defined below

The service portion of the Modbus Application Protocol, called mb_pdu, contains 2 fields:

```
mb_pdu ::= { func_code[1], data[n] }
```

- func_code[1 byte] MB function code
- data[n bytes] this field is function code dependent and usually contains information such as variable references, variable counts, and data offsets.

The size and content of the data field are dependent on the value of the function code.

TCP/IP Specific Issues

Overview

The following information describes some TCP/IP specific issues.

Broadcast/ Multicast

Although broadcast and/or multicast are supported by both IP network address and IEEE 802.3 MAC address, the Modbus Application Protocol does not support either broadcast or multicast at the application layer.

Schneider Electric's Quantum PLCs use broadcast addressing because they use ARP as the means of locating the destination node. The client interface to the Modbus Application Protocol service on the PLC, the MSTR block, requires the user to provide the destination IP address. Also the embedded stack does use a pre-configured default gateway IP address in the case where ARP does not succeed.

TCP Port Number

Schneider Electric has obtained a well-known system port from an Internet Authority. Schneider Electric's well-known system port number is 502. The Internet Authority assigned the system port number 502 to asa-appl-proto with Dennis Dubé as the company point of contact.

This port number allows Schneider Electric to transport various application protocols over with TCP or UDP. The particular protocol is indicated by the value of the proto_id parameter in the mbap_pdu. Currently the only assignment is 0 meaning Modbus Application Protocol.

Reference Documents

Overview

The following information provides a list of reference documents that you may find helpful.

Introduction

Following is a list of related documentation.

- ANSI/IEEE Std 802.3-1985, ISO DIS 8802/3, ISBN - 0-471-82749-5, May 1988
 - ANSI/IEEE Std 802.2-1985, ISO DIS 8802/2, ISBN 0-471-82748-7, Feb 1988
 - RFC793, TCP (Transmission Control Protocol) DARPA Internet Program Protocol Specification, Sep 1981
 - RFC 791, IP (Internet Protocol) DARPA Internet Protocol Specification, Sep 1981
 - RFC826, An Ethernet Address Resolution Protocol (ARP), David Plummer, NIC Sep 1982
 - RFC1042, A Standard for the Transmission of IP Datagrams over IEEE 802.2 Networks, Postel & Reynolds, ISI, Feb 1988
 - RFC 792, ICMP (Internet Control Message Protocol) DARPA Internet C Control Message Protocol Specification, Jon Postel, Sep 1981
 - RFC951, BOOTSTRAP PROTOCOL (BOOTP), Bill Croft and John Gilmore, September 1985
 - RFC783, The Trivial File Transfer Protocol (TFTP) rev 2, K.R. Solons MIT, June 1981
-

Installation and Configuration of a Modicon Quantum Platform

D

At a Glance

Overview This quick start guide describes how to install and configure a Modicon Quantum Ethernet module. It also sets up the I/O scanning service to allow data transfer to occur between the PLC and a remote slave device. Instructions for connecting to the module's embedded web server pages are also provided at the end of the guide.

What's in this Chapter? This chapter contains the following topics:

Topic	Page
Overview	354
Installation	355
Configuring the Rack with Unity Pro	356
Configuring the Ethernet Network with Unity Pro	359
Configuring the I/O Scanning Service	362
Building and Downloading the Configuration Program	366
Diagnosing the Ethernet Module Using the Web Server	370

Overview

Introduction

This quick start guide explains how to install and configure Modicon Quantum Ethernet modules and set up a I/O scanning communication service. The following types of modules are applicable to this guide:

- 140 NOE 771 01
- 140 NOE 771 11
- 140 CPU 651 50
- 140 CPU 651 60

Hardware/ Software Requirements

For the example discussed in this guide, the following Modicon Quantum Ethernet modules are required:

- 140 CPS 114 x0 power supply
- 140 CPU 651 50 CPU
- 140 NOE 77101 communication module

Also, a PC running Windows 2000 or XP with Schneider's Unity Pro configuration software installed on it is required.

Finally, either a USB or a Modbus cable is required to connect the PC to the network PLC.

Intended Audience

This user guide is intended for anyone who is involved in installing and configuring Modicon Quantum Ethernet modules in a network arrangement that can perform a variety of communication services.

Anyone reading this guide should:

- be familiar with Ethernet networks and the TCP/IP protocol
- understand the operation of PLCs

Installation

Introduction

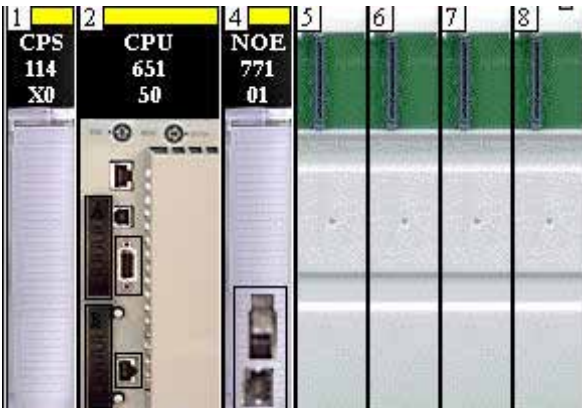
The Modicon Quantum Ethernet modules used for the example in this guide may vary from the ones available at your site. You can substitute the appropriate power supply, CPU, and Ethernet communication module(s) and other Quantum modules to make up a rack similar to the one described below.

Assembling the Rack

Assemble the modules into the rack as follows:

Step	Action
1	Insert the power supply into the leftmost slot (1) on the rack.
2	Add the CPU to the next two slots (2 & 3) on the right of the power supply.
3	Place the remaining Quantum communication modules, beginning with slot 4, to complete your installation.

In our example (see below), we use a CPS 114 x0 power supply, a CPU 651 50 processor, and a single NOE 771 01 Ethernet module to makeup our rack.



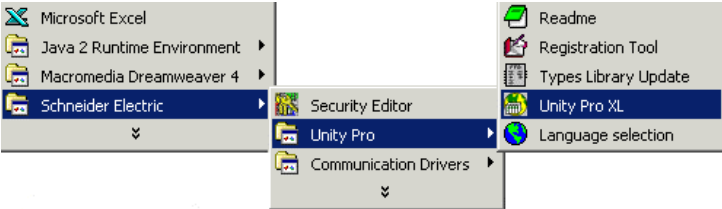
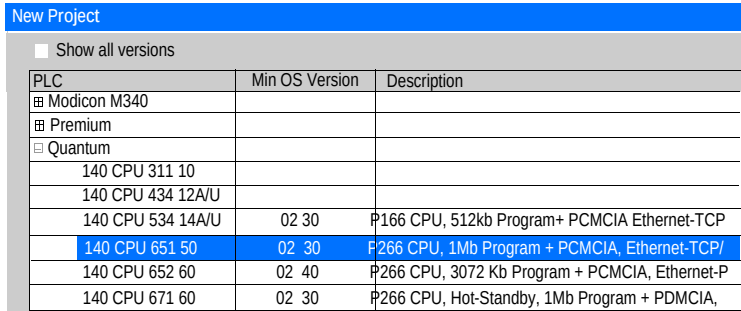
Configuring the Rack with Unity Pro

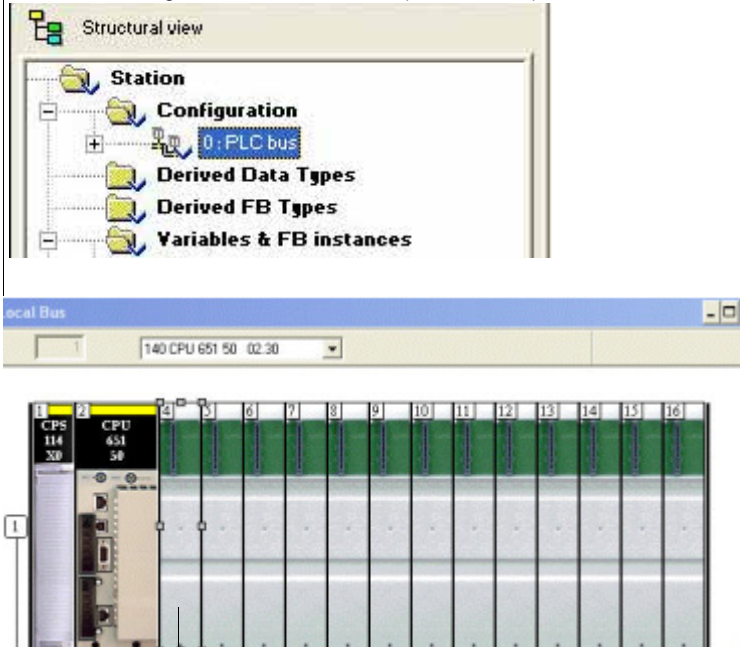
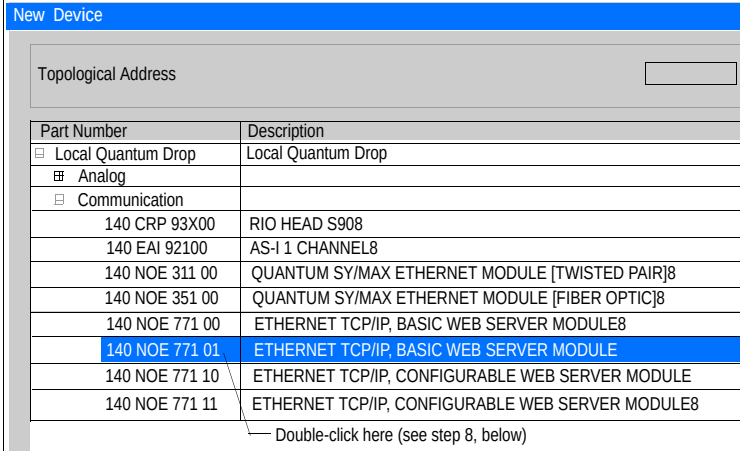
Introduction

We begin this procedure by configuring the Modicon Quantum Ethernet module rack using Schneider Electric’s Unity Pro configuration program.

Configuring the Rack

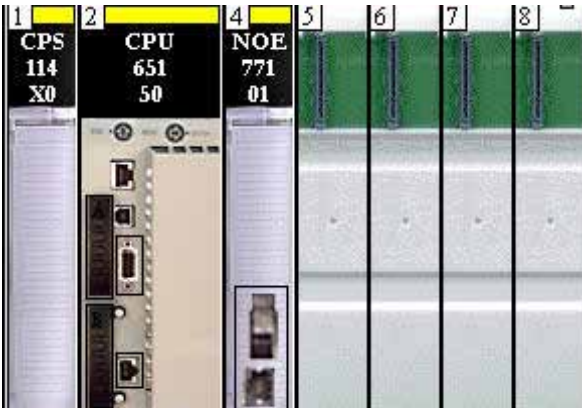
Using a PC loaded with Unity Pro software, proceed as follows:

Step	Action
1	Click Start .
2	Select Programs .
3	Then select Schneider Electric → Unity Pro → Unity Pro XL.  Note: The name of your Unity Pro package may be different. It may be Unity Pro M, Unity Pro L, Unity Pro XL, etc.
4	Select New in the File menu to create a New Project dialog box.
5	In the New Project dialog box, expand the Quantum family to select the installed processor (the 140 CPU 65150 in our example). 

Step	Action
6	In the project browser, double-click Station → Configuration → PLC bus to access the configuration of the local rack (shown below). 
7	Double-click slot 4 to bring up the New Device menu to show the hardware catalog. 

Step	Action
8	Double-click the module that goes in slot 4 (140 NOE 771 01 in our example, shown above). Note: Alternately, you can click the module and drag it to the selected slot on the rack.
9	Repeat step 8 for each module included in your configuration

The figure below shows the completed rack assembly for our example with the 140 NOE 771 01 module in slot 4.

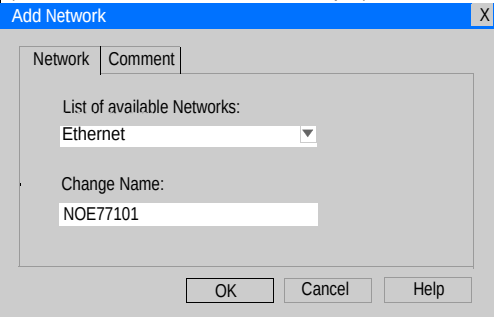


Configuring the Ethernet Network with Unity Pro

Introduction The following procedure describes how to add a new Ethernet network and link it to the Modicon Quantum module we configured in the previous section.

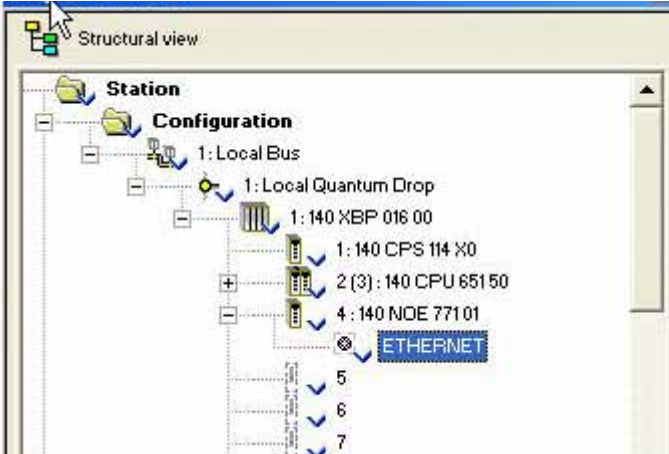
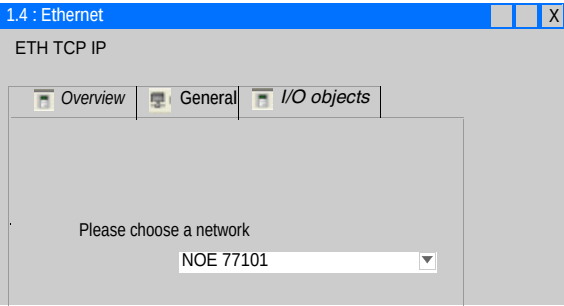
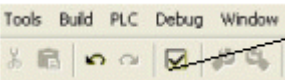
Setting Up the Network

Perform the following steps to add the Ethernet network:

Step	Action
1	Locate the Communications directory in the Project browser.
2	Right-click the Network subdirectory located under the Communications directory.
3	Select the New Network option to bring up the Add Network dialog box.
4	Scroll to Ethernet in the List of available Networks box.
5	Enter a meaningful name for your network in the Change Name field (NOE77101 was used in our example). 
6	Click OK .

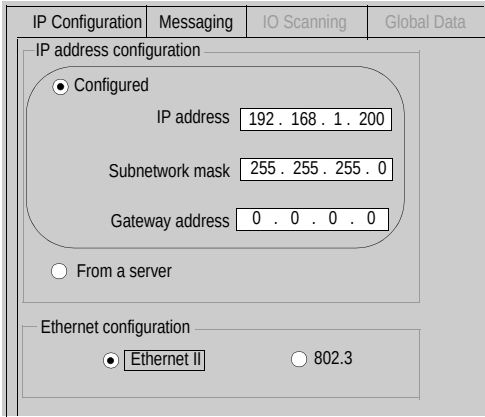
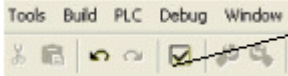
Linking the Network to the NOE 77101 Module

Perform the following steps to link the new logical Ethernet network with the NOE 77101 module.

Step	Action
1	Double-click Local Bus in the Project browser to show the rack configuration.
2	Expand the Local Quantum Drop to show the ETHERNET port under the 140 NOE 77101. 
3	Double-click the ETHERNET port to bring up the network link screen.
4	Under Please choose a network , scroll to locate the name of your logical network (NOE77101 in our example). 
5	Click the validate check box in the upper toolbar to confirm the network link configuration. 

Assigning an IP Address to the 140 NOE 771 01 Module

Perform the following steps to assign an IP address to the 140 NOE 771 01 communication module.

Step	Action
1	Locate the Communications\Networks directory in the Project browser.
2	Double-click your new logical network (NOE77101 in our example) to open the NOE077101 configuration screen. 
3	Click Configured in the IP Address Configuration group (circled area shown above). Note: Be sure to contact your network administrator and request the IP, Subnetwork mask, and Gateway addresses prior to performing the next step.
4	Enter the appropriate values in the IP address, Subnetwork mask, and Gateway address text fields.
5	Click the validate check box in the upper tool bar to confirm the IP configuration settings. 

Configuring the I/O Scanning Service

Introduction

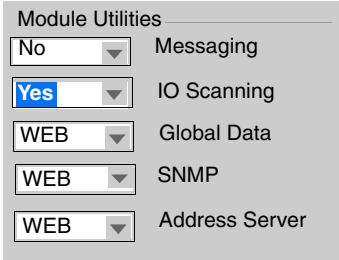
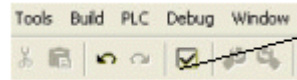
The Modicon 140 NOE 771 01 module supports Ethernet communication services such as I/O scanning, Global data, Modbus messaging, SNMP, etc. This example shows you how to configure the I/O scanning service. This service is used to:

- transfer data between network devices
- allow a CPU to regularly read data from and write data to scanned devices

Schneider's Unity Pro software is used to configure the I/O scanning service.

Selecting the I/O Scanning Parameters

Perform the following steps to setup the I/O scanning parameters:

Step	Action
1	Open the Unity Pro program on your PC.
2	In the Project browser, locate the Communication\Networks sub directory.
3	Click the network name (NOE77101 in our example) to open the module configuration table.
4	Under Module Utilities, select Yes in the I/O Scanning box. This will activate the I/O Scanning tab. 
5	Click the I/O Scanning tab to display the I/O scanning configuration screen (see below).
6	Type in the parameter settings under each of the column headings for the I/O Scanner Configuration. Refer to the I/O Scanning Parameters table (below) to see the settings we used for this example.
7	Click the validate check box in the upper tool bar to confirm the I/O scanning parameter settings. 

IP Configuration

Messaging

I/O Scanning

Global Data

SNMP

Address Server

Bandwidth

I/O Scanning configuration

Health Block:(%I%IW) %IW1 ☐ Device Control Block: (%MDx:4) %MD1:4

	IP Address	Unit ID	Health Timeout (ms)	Repetitive rate (ms)	RD Master Object	RD Slave Index	RD length	Last value (input)	WR Master Object	WR Slave Index	WR length	Descript
1	192.168.1.100	255	200	64	%MW1	1	10	Hold last	%MW20	100	1	eth_node
2												
3												
4												
5												
6												
7												

I/O Scanning Parameters

A description of the I/O scanning parameters used in this example are listed in the following table.

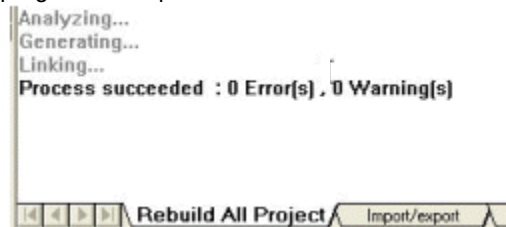
Parameter	Description	Example
IP Address	The IP address of the scanned Ethernet slave device	192.168.1.100
Unit ID	The Unit ID field is used to associate the slave address of the device connected to an Ethernet/Modbus gateway with the IP address of that gateway: - values: 1 to 255 - default value: 255 When using a bridge, enter the bridge index (1 to 255) into this field.	255
Health Timeout (ms)	In the Health Timeout (ms) field, you can set the maximum interval between two responses from a remote device. After this time period expires, the received data becomes invalid. The health timeout should be longer than the repetitive rate. For a Quantum NOE Ethernet module, the health timeout should also be longer than the CPU scan time. - configure range: 1ms to 50 seconds - interval: 1ms	200ms
Repetitive rate (ms)	In the Repetitive rate (ms) field you can associate an IP address with its scanning period (increments of 16 ms).	64ms
RD Master/ Slave (read) parameters*	Includes three parameters: - RD Master Object: address in master PLC into which newly read information is stored. - RD slave index: source address index in the slave/remote device. - RD length: number of words being read.	RD Master Object:%mw1 RD slave index: 1 RD length: 10 Master Object NOE 771 01 reads data from slave address 198.168.1.100, starting at index 1 and puts data into NOE's address starting at%mw1 with a read size of 10 words.

Parameter	Description	Example
WR Master/ Slave (write) parameters**	Includes three parameters: ● WR Master Object: source address of the master PLC whose data is being written into the slave/remote device. ● WR slave index: the address of the first word written into the slave/remote device. ● WR length: number of words to write.	WR Master Object:%mw20 WR slave index: 100 WR length: 1 Master Object NOE 771 01 writes data from its address%mw20 to slave address 198.168.100 at index 100 with a write size of 1 word.
Last value (input)	In the Last value (input) field you can configure the behavior of inputs in the event of an access error in relation to the remote device (for example: network error or device power failure, etc.): ● set to 0: fall back to 0 ● hold last: maintain last value	Hold last
*Master refers to the client PLC that makes the request. **Slave refers to the server from which data is read or to which data is written.		

Building and Downloading the Configuration Program

Building the Program

Next, you need to build the whole program before downloading it to the PLC. To do this, select **Build\Rebuild All Project** in the toolbar at the bottom of the screen (shown below). If it is successful, a **Process succeeded** message will appear at the program's completion.

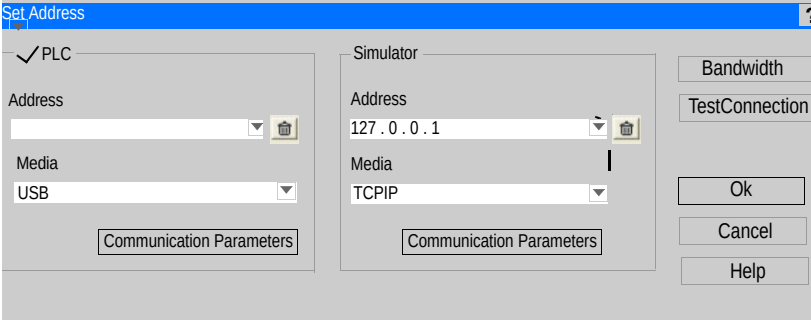


Connection Options

In order to run the configuration program it must first be downloaded to the PLC. Prior to downloading the program, the PLC must be connected to the PC containing the Unity Pro software. The connection can be accomplished using a communication network such as Ethernet, USB, Modbus, or Modbus Plus cabling. We describe both the USB and Modbus cable setups in the following examples.

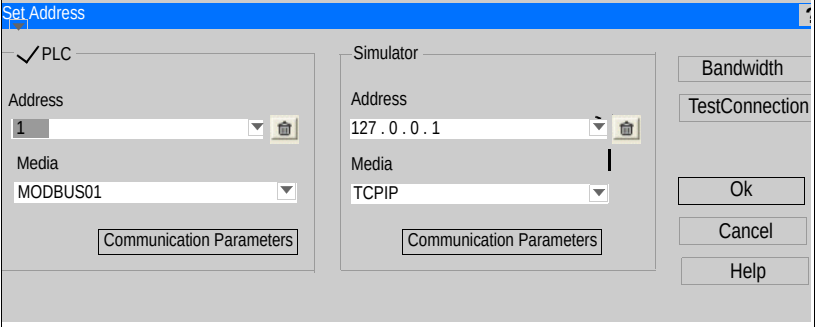
Connecting the PC to the PLC with a USB Cable

Proceed as follows to connect the PC to the PLC with USB.

Step	Action
1	Ensure that the Quantum system is powered up.
2	Connect the PLC to the PC with a USB cable.
3	On the PC, click the Unity Pro PLC\Set Address tab to bring up the Set Address dialog box. 
4	Select USB in the PLC Media box.
5	Leave the PLC Address field blank.
6	Click OK .
7	Proceed to Downloading and Running the Configuration Program (see <i>Downloading and Running the Configuration Program</i> , p. 369).

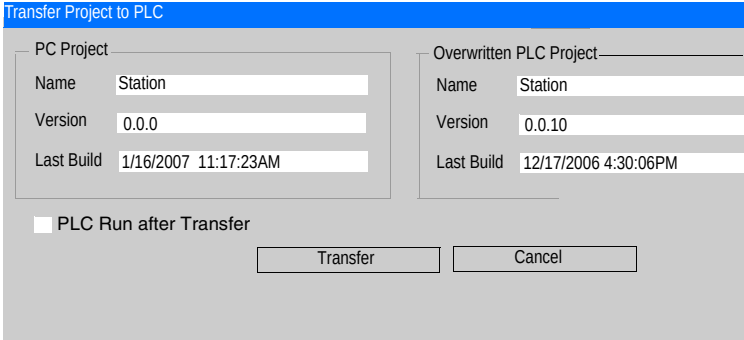
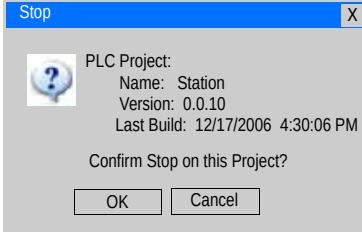
Connecting the PC to the PLC with a Modbus Cable

Proceed as follows to connect the PC to the PLC with Modbus.

Step	Action
1	Ensure that the Quantum system is powered up.
2	Connect the PLC to the PC with a Modbus cable.
3	On the PC, click the Unity Pro PLC\Set Address tab to bring up the Set Address menu. 
4	Select MODBUS01 in the PLC Media field.
5	Enter the Modbus address in the PLC Address field (the default address is 1). Note: You can also use the keypad on the 140 CPU 651 50 module to enter or change the Modbus address.
6	Click OK .
7	Proceed to Downloading and Running the Configuration Program (below).

**Downloading
and Running the
Configuration
Program**

Once the PC and the PLC are physically connected (above steps), the I/O scanning program can be downloaded to the PLC.

Step	Action
1	On the PC, select PLC \Connect on the Unity Pro screen.
2	Click the PLC\Transfer Project to PLC tab to bring up the Transfer Project to PLC dialog box. 
3	Click the Transfer button to download the program to the PLC.
4	When the confirm screen appears, click OK. 
5	Click Run on the Unity Pro upper toolbar to start the program.

Diagnosing the Ethernet Module Using the Web Server

Introduction

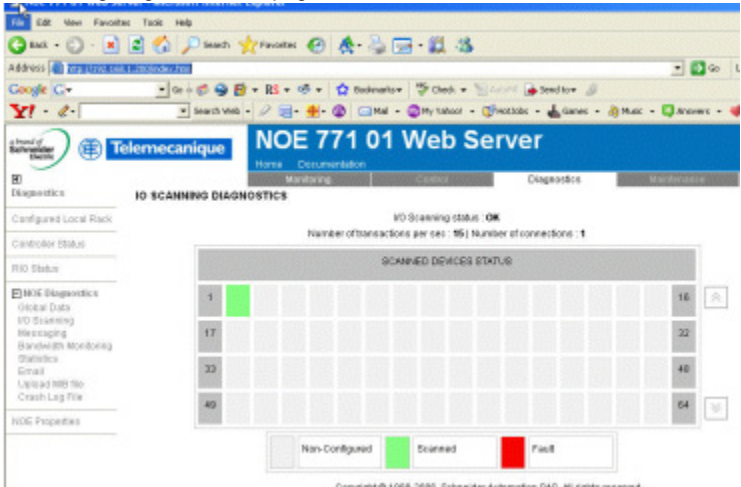
Quantum Ethernet modules have an embedded web server that provides web pages to diagnose the Ethernet module services, such as statistics, I/O scanning, Messages, global data, etc. You can access an Ethernet module's web pages by entering the IP address of the module in the web browser. No password is required to display the home page. From the NOE home page, you can access the Monitoring, Diagnostics, and Setup pages.

You can also use the module's LED display to diagnose problems. For information regarding the module's LED display refer to the *Quantum NOE 771xx Ethernet Modules User Manual*.

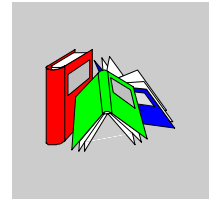
Accessing the Ethernet Module's Web Page

To access the NOE 771 01 module's web page, proceed as follows:

Step	Action
1	At the PC, start a Web browser such as Internet Explorer.
2	Enter the NOE 771 01's currently assigned IP address in the Address field of the browser to bring up the NOE's home page. 
3	Click the Diagnostics tab.
4	Enter a user name and password (the default is USER for both). Note: Check with your system administrator to see if the user name and password have been changed.

Step	Action
5	Click OK to bring up the NOE diagnostic web page. 
6	Click the I/O Scanning link on the left-hand side of the screen to access the I/O scanning diagnostics web page. 

Glossary



A

ACK	Acknowledgement
address	On a network, the identification of a station. In a frame, a grouping of bits that identifies the frame's source or destination.
API	Application Program Interface. The specification of functions and data used by one program module to access another; the programming interface that corresponds to the boundary between protocol layers.
ARP	Address Resolution Protocol. A network layer protocol used to determine the physical address that corresponds to the IP address for a host on the network. ARP is a sub-protocol that operates under TCP/IP.
ASN.1	Abstract Syntax Notation. Grammar used to define a protocol (OSI scope)

B

BOOTP	BOOTstrap Protocol. A protocol used at power-up in order to get an IP address that is provided by a BOOTP server and is based on the module's MAC address.
bps	Bits per second.

bridge	A device that connects two or more physical networks that use the same protocol. Bridges read frames and decide whether to transmit or block them based on their destination address.
BSP	Board Support Package. A software package that maps a specific real-time operating system (RTOS) onto a specific hardware.

C

client	A computer process requesting service from other computer processes.
Cyclic Data Exchange	Provides data transfer between two or more NOE 771 xx controllers on a TCP/IP network.

D

default gateway	The IP address of the network or host to which all packets addressed to an unknown network or host are sent. The default gateway is typically a router or other device.
DHCP	Dynamic Host Configuration Protocol. An improved version of BOOTP.
DHCP Client	Host on the network obtaining its configuration from a DHCP Server.
DHCP Server	Server providing configuration parameters to a DHCP Client.
DNS	Domain Name System. A protocol within TCP/IP used to find IP addresses based on host names

F

FactoryCast	An embedded Web server that the user customizes, permitting user access to controller diagnostics and Ethernet configuration.
field	A logical grouping of contiguous bits that convey one kind of information, such as the start or end of a message, an address, data, or an error check.

firewall	A gateway that controls access to a network or an application.
frame	A group of bits that form a discrete block of information. Frames contain network control information or data. The size and composition of a frame is determined by the network technology being used.
framing types	Two common framing types are Ethernet II and IEEE 802.3.
FTP	File Transfer Protocol. The protocol (over TCP) used to read or write a file into a remote station (the FTP server side).

G

gateway	A device that connects networks with dissimilar network architectures and that operates at the Application Layer. This term may refer to a router.
Global Data (Publish / Subscribe)	Service of inter PLC synchronization (shared databases).

H

half duplex	(HDX) A method of data transmission capable of communication in two directions, but only one direction at a time.
host	A node on a network.
hostname	A domain name given to a specific computer on a network and used to address that computer.
HTTP	A domain name given to a specific computer on a network and used to address that computer.
hub	A device that connects a series of flexible and centralized modules to create a network.

I

I/O Drop	One or two (depending on the system type) Remote I/O Channels consisting of a fixed number of I/O points.
I/O Map	An area in the controller configuration memory used to map input and output points. Previously called traffic cop.
I/O Scan	A procedure the processor follows to monitor inputs and control outputs.
I/O Scan List	A configuration table that identifies the targets with which repetitive communication is authorized.
I/O scanner	Software component that is in charge of scanning Ethernet based Momentum IO in order to get inputs and set outputs.
ICMP	Internet Control Message Protocol. A protocol within TCP/IP used to report errors in datagram transmission.
Internet	The global interconnection of TCP/IP based computer communication networks.
IP	Internet Protocol. A common network layer protocol. IP is most often used with TCP.
IP Address	Internet Protocol Address. A 32-bit address assigned to hosts using TCP/IP.

L

layer	In the OSI model, a portion of the structure of a device that provides defined services for the transfer of information.
Legacy	In the sense of network communication: Existing Components (PLC products etc.) that do not provide special (hardware) support for Control Intranet.

M

MAC Address	Media Access Control address. The hardware address of a device. A MAC address is assigned to an Ethernet TCP/IP module in the factory.
MBAP	Modbus Application Protocol
MIB	Management Information Base. Database that holds the configuration of a SNMP enabled device.
Modbus	A communication system that links Modicon controllers with intelligent terminals and computers over common carrier or dedicated lines
MSTR	A special master instruction that uses ladder logic to read and write controller information.

N

NACK	Negative acknowledgment indicating an error.
NDDS	Network Data Delivery Services.
NetLink	The logical name of a network.
network	Interconnected devices sharing a common data path and protocol for communication.
node	An addressable device on a communications network.
NTP	Network Time Protocol. A protocol used to synchronize the time of a client or server to the time of another server or referenced source like a satellite receiver.

O

OIT / OID	Object Information True / Object ID (identify OIT) Contain databases managing SNMP (MIBs)
------------------	---

OSI model Open System Interconnection model. A reference standard describing the required performance of devices for data communication. Produced by the International Standards Organization.

P

packet The unit of data sent across a network.

Peer Cop Software that allows you to configure data blocks to be transferred between controllers on a Modbus Plus network.

PING Packet Internet Groper. A program used to test whether a destination on a network can be reached.

PLC Programmable Logic Controller

port An access point for data entry or exit within a host using TCP services.

protocol Describes message formats and a set of rules used by two or more devices to communicate using those formats.

R

repeater A device that connects two sections of a network and conveys signals between them without making routing decisions or filtering packets.

RFC Request For Comment. Paper identified by a number in Internet world. They define the state of art regarding Internet protocols (ruled by IETF = Internet Engineering Task Force) <http://www.ietf.org>

router A device that connects two or more sections of a network and allows information to flow between them. A router examines every packet it receives and decides whether to block the packet from the rest of the network or transmit it. The router will attempt to send the packet through the network by the most efficient path.

S

server	Provides services to clients. This term may also refer to the computer on which the service is based.
SMTP	Simple Mail Transfer Protocol. A common protocol used to transfer e-mail messages.
SNMP	Simple Network Management Protocol
socket	The association of a port with an IP address, serving as an identification of sender or recipient.
stack	The software code that implements the protocol being used. In the case of the NOE modules it is TCP/IP.
STP	Shielded Twisted Pair. A type of cabling consisting of several strands of wire surrounded by foil shielding, twisted together.
subnet	A physical or logical network within an IP network that shares a network address with other portions of the network.
subnet mask	A bit mask used to identify or determine which bits in an IP address correspond to the network address and which bits correspond to the subnet portions of the address. The subnet mask is the network address plus the bits reserved for identifying the subnetwork.
switch	A network device that connects two or more separate network segments and allows traffic to be passed between them. A switch determines whether a frame should be blocked or transmitted based on its destination address.

T

TCP	Transmission Control Protocol.
TCP/IP	A protocol suite consisting of the Transmission Control Protocol and the Internet Protocol; the suite of communications protocols on which the Internet is based.

Transparent Factory	Transparent Factory is a Schneider Electric initiative to bring Internet technologies to the factory floor to "information enable" Schneider Products to provide easy "transparent" access to plant operational data over open networks with open tools. Interfacing with products from other manufacturers for similar access, customers can expect improved methods for monitoring and controlling factory processes at reduced costs.
Transparent Ready	A Schneider Electric product line based on universal Ethernet TCP/IP and Web technologies. These industrial automation products (Trademark Telemecanique) and electrical distribution products (Trademark Merlin Gerin) can be integrated into real-time data sharing systems with no need for interfaces. The product line includes Sensor and preactuator type field products (simple or intelligent), controllers and PLCs, HMI applications, and dedicated gateways and servers.

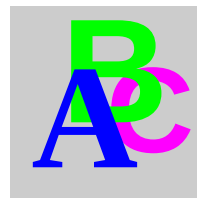
U

UDP	User Datagram Protocol. A protocol that transmits data over IP.
Uni-Te	Télemecanique unified application protocol (used in S7, Premium, and Micro PLC ranges).
URL	Uniform Resource Locator. The network address of a file.
UTP	Unshielded Twisted Pair. A type of cabling consisting of insulated cable strands that are twisted together in pairs.

W

Web	Worldwide interconnection of stations based on Internet protocols. The most famous one is HTTP (Web server).
WWW	World Wide Web. A hypertext-based, distributed information system in which clients and servers are freely available.

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