Where Automation Connects.

ProTalk®

PTQ-101S

Quantum/Unity Platform

IEC-60870-5-101 Slave
Communication Module

October 05, 2009

USER MANUAL

Information for ProTalk® Product Users

The statement "power, input and output (I/O) wiring must be in accordance with Class I, Division 2 wiring methods Article 501-10(b) of the National Electrical Code, NFPA 70 for installations in the U.S., or as specified in section 18-1J2 of the Canadian Electrical Code for installations within Canada and in accordance with the authority having jurisdiction".

The following or equivalent warnings shall be included:

A Warning - Explosion Hazard - Substitution of components may Impair Suitability for Class I, Division 2;
B Warning - Explosion Hazard - When in Hazardous Locations, Turn off Power before replacing Wiring Modules, and
C Warning - Explosion Hazard - Do not Disconnect Equipment unless Power has been switched Off or the Area is known to be Nonhazardous.
D Caution: The Cell used in this Device may Present a Fire or Chemical Burn Hazard if Mistreated. Do not Disassemble, Heat above 100°C (212°F) or Incinerate.

WARNING - EXPLOSION HAZARD - DO NOT DISCONNECT EQUIPMENT UNLESS POWER HAS BEEN SWITCHED OFF OR THE AREA IS KNOWN TO BE NON-HAZARDOUS.

AVERTISSEMENT - RISQUE D'EXPLOSION - AVANT DE DÉCONNECTER L'EQUIPMENT, COUPER LE COURANT OU S'ASSURER QUE L'EMPLACEMENT EST DÉSIGNÉ NON DANGEREUX.

CL I Div 2 GPs A, B, C, D

Temp Code T5

II 3 G

Ex nA IIC T5 X

0° C <= Ta <= 60° C

II - Equipment intended for above ground use (not for use in mines).

3 - Category 3 equipment, investigated for normal operation only.

G - Equipment protected against explosive gasses.

Warnings

North America Warnings

A Warning - Explosion Hazard - Substitution of components may impair suitability for Class I, Division 2.
B Warning - Explosion Hazard - When in Hazardous Locations, turn off power before replacing or rewiring modules.
Warning - Explosion Hazard - Do not disconnect equipment unless power has been switched off or the area is known to be nonhazardous.
C Suitable for use in Class I, division 2 Groups A, B, C and D Hazardous Locations or Non-Hazardous Locations.

ATEX Warnings and Conditions of Safe Usage:

Power, Input, and Output (I/O) wiring must be in accordance with the authority having jurisdiction

A Warning - Explosion Hazard - When in hazardous locations, turn off power before replacing or wiring modules.
B Warning - Explosion Hazard - Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.
C These products are intended to be mounted in an IP54 enclosure. The devices shall provide external means to prevent the rated voltage being exceeded by transient disturbances of more than 40%. This device must be used only with ATEX certified backplanes.
D DO NOT OPEN WHEN ENERGIZED.

Electrical Ratings

- Backplane Current Load: 800 mA @ 5 V DC; 3mA @ 24V DC
- Operating Temperature: 0 to 60°C (32 to 140°F)
- Storage Temperature: -40 to 85°C (-40 to 185°F)
- Shock: 30g Operational; 50g non-operational; Vibration: 5 g from 10 to 150 Hz
- Relative Humidity 5% to 95% (non-condensing)
- All phase conductor sizes must be at least 1.3 mm(squared) and all earth ground conductors must be at least 4mm(squared).

Markings:

ANSI / ISA	ISA 12.12.01 Class I Division 2, GPs A, B, C, D
CSA/cUL	C22.2 No. 213-1987
CSA CB Certified	IEC61010
ATEX	EN60079-0 Category 3, Zone 2 EN60079-15

243333

Important Notice:

CAUTION: THE CELL USED IN THIS DEVICE MAY PRESENT A FIRE OR CHEMICAL BURN HAZARD IF MISTREATED. DO NOT DISASSEMBLE, HEAT ABOVE 100°C (212°F) OR INCINERATE.

Maximum battery load = 200 µA.

Maximum battery charge voltage = 3.4 VDC.

Maximum battery charge current = 500 µA.

Maximum battery discharge current = 30 µA.

Your Feedback Please

We always want you to feel that you made the right decision to use our products. If you have suggestions, comments, compliments or complaints about the product, documentation, or support, please write or call us.

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PTQ-101S User Manual
October 05, 2009

ProSoft Technology® Product Documentation

In an effort to conserve paper, ProSoft Technology no longer includes printed manuals with our product shipments. User Manuals, Datasheets, Sample Ladder Files, and Configuration Files are provided on the enclosed CD-ROM, and are available at no charge from our web site: www.prosoft-technology.com

Printed documentation is available for purchase. Contact ProSoft Technology for pricing and availability.

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Latin America:	+1.281.298.9109

Contents

Guide to the PTQ-101S User Manual

Function		Section to Read	Details
Introduction (Must Do)	→	Start Here (page 9)	This Section introduces the customer to the module. Included are: package contents, system requirements, hardware installation, and basic configuration.
Diagnostic and Troubleshooting	→	Diagnostics and Troubleshooting (page 79)	This section describes Diagnostic and Troubleshooting procedures.
Reference Product Specifications Functional Overview	→	Reference (page 95) Functional Overview (page 98) Product Specifications (page 95)	These sections contain general references associated with this product, Specifications, and the Functional Overview.
Support, Service, and Warranty Index	→	Support, Service and Warranty (page 171)	This section contains Support, Service and Warranty information. Index of chapters.

1 Start Here

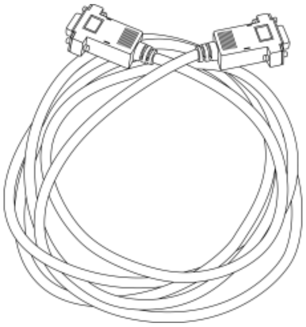
In This Chapter

This guide is intended to guide you through the ProTalk module setup process, from removing the module from the box to exchanging data with the processor. In doing this, you will learn how to:

- Set up the processor environment for the PTQ module
- View how the PTQ module exchanges data with the processor
- Edit and download configuration files from your PC to the PTQ module
- Monitor the operation of the PTQ module

1.1 Hardware and Software Requirements

1.1.1 ProTalk Module Carton Contents

	
ProTalk Module	Null Modem Serial Cable
1454-9F DB-9 Female to 9 Pos Screw Terminal adapter (Serial protocol modules only)	ProSoft Solutions CD

Note: The DB-9 Female to 5 Pos Screw Terminal adapter is not required on Ethernet modules and is therefore not included in the carton with these types of modules.

1.1.2 Quantum / Unity Hardware

This guide assumes that you are familiar with the installation and setup of the Quantum / Unity hardware. The following should be installed, configured, and powered up before proceeding:

- Quantum or Unity Processor
- Quantum rack
- Quantum power supply
- Quantum Modbus Plus Network Option Module (NOM Module) (optional)
- Quantum to PC programming hardware
- NOM Ethernet or Serial connection to PC

1.1.3 PC and PC Software

- Windows-based PC with at least one COM port
- Quantum programming software installed on machine
  or
- Concept™ PLC Programming Software version 2.6
  or
  ProWORX PLC Programming Software
  or
  UnityPro XL PLC Programming Software

Note: ProTalk modules are compatible with common Quantum / Unity programming applications, including Concept and UnityPro XL. For all other programming applications, please contact technical support.

1.2 Install ProSoft Configuration Builder Software

You must install the ProSoft Configuration Builder (PCB) software in order to configure the module. You can always get the newest version of ProSoft Configuration Builder from the ProSoft Technology web site.

To install ProSoft Configuration Builder from the ProSoft Web Site

1. Open your web browser and navigate to *http://www.prosoft-technology.com/pcb*
2. Click the **DOWNLOAD HERE** link to download the latest version of ProSoft Configuration Builder.
3. Choose **"SAVE"** or **"SAVE FILE"** when prompted.
4. Save the file to your Windows Desktop, so that you can find it easily when you have finished downloading.
5. When the download is complete, locate and open the file, and then follow the instructions on your screen to install the program.

If you do not have access to the Internet, you can install ProSoft Configuration Builder from the ProSoft Solutions CD-ROM, included in the package with your module.

To install ProSoft Configuration Builder from the Product CD-ROM

1 Insert the ProSoft Solutions Product CD-ROM into the CD-ROM drive of your PC. Wait for the startup screen to appear.
2 On the startup screen, click **PRODUCT DOCUMENTATION**. This action opens a Windows Explorer file tree window.
3 Click to open the **UTILITIES** folder. This folder contains all of the applications and files you will need to set up and configure your module.
4 Double-click the **SETUPCONFIGURATIONTOOL** folder, double-click the **"PCB_*.EXE"** file and follow the instructions on your screen to install the software on your PC. The information represented by the "*****" character in the file name is the PCB version number and, therefore, subject to change as new versions of PCB are released.

Note: Many of the configuration and maintenance procedures use files and other utilities on the CD-ROM. You may wish to copy the files from the Utilities folder on the CD-ROM to a convenient location on your hard drive.

2 Configuring the Processor with Concept

In This Chapter

The following steps are designed to ensure that the processor is able to transfer data successfully with the PTQ module. As part of this procedure, you will use Concept configuration software from Schneider Electric to create a project, add the PTQ module to the project, set up data memory for the project, and then download the project to the processor.

Important Note: Concept software does not report whether the PTQ module is present in the rack, and therefore is not able to report the health status of the module when the module is online with the Quantum processor. Please consider this when monitoring the status of the PTQ module.

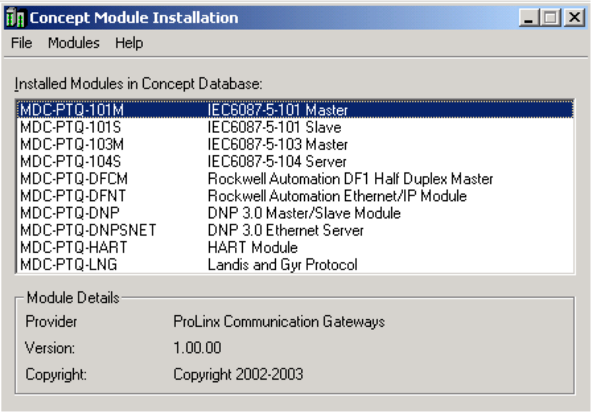
2.1 Information for Concept Version 2.6 Users

This guide uses Concept PLC Programming Software version 2.6 to configure the Quantum PLC. The ProTalk installation CD includes MDC module configuration files that help document the PTQ installation. Although not required, these files should be installed before proceeding to the next section.

2.1.1 Installing MDC Configuration Files

1 From a PC with Concept 2.6 installed, choose **START / PROGRAMS / CONCEPT / MODCONNECT TOOL**.

This action opens the Concept Module Installation dialog box.



Installed Modules in Concept Database:

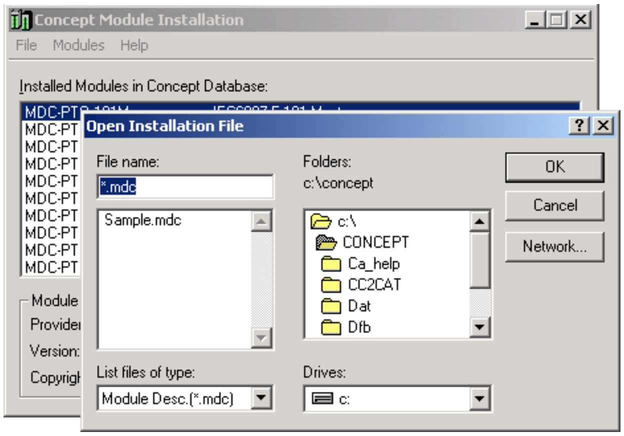
MDC-PTQ-101M	IEC6087-5-101 Master
MDC-PTQ-101S	IEC6087-5-101 Slave
MDC-PTQ-103M	IEC6087-5-103 Master
MDC-PTQ-104S	IEC6087-5-104 Server
MDC-PTQ-DFCM	Rockwell Automation DF1 Half Duplex Master
MDC-PTQ-DFNT	Rockwell Automation Ethernet/IP Module
MDC-PTQ-DNP	DNP 3.0 Master/Slave Module
MDC-PTQ-DNPSNET	DNP 3.0 Ethernet Server
MDC-PTQ-HART	HART Module
MDC-PTQ-LNG	Landis and Gyr Protocol

Module Details

Provider	ProLinx Communication Gateways
Version:	1.00.00
Copyright:	Copyright 2002-2003

2 Choose **FILE / OPEN INSTALLATION FILE.**

This action opens the Open Installation File dialog box:


Concept Module Installation
File
Modules
Help
Installed Modules in Concept Database:
Open Installation File
OK
Cancel
Network...

File name: *.mdc

Sample.mdc

Folders: c:\concept

c:\
CONCEPT
Ca_help
CC2CAT
Dat
Dfb

List files of type: Module Desc.(*.mdc)

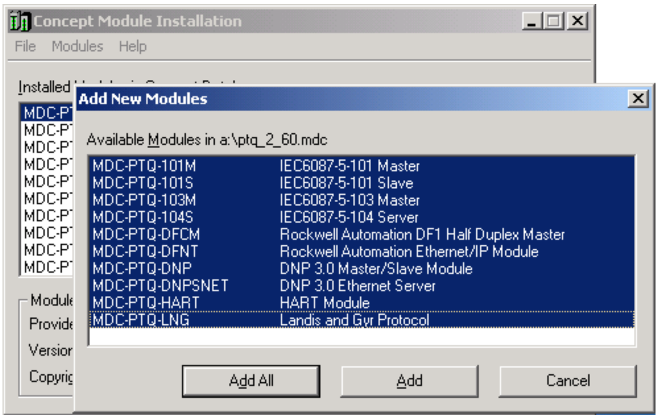
Drives: c:

3 If you are using a Quantum processor, you will need the MDC files. In the Open Installation File dialog box, navigate to the **MDC FILES** directory on the ProTalk CD.

4 Choose the MDC file and help file for your version of Concept:

- Concept 2.6 users: select PTQ_2_60.mdc and PTQMDC.hlp
- Concept 2.5 users: select PTQ_2_50.mdc and PTQMDC.hlp.

Select the files that go with the Concept version you are using, and then click **OK**. This action opens the add New Modules dialog box.



Available Modules in a:\ptq_2_60.mdc

MDC-PTQ-101M	IEC6087-5-101 Master
MDC-PTQ-101S	IEC6087-5-101 Slave
MDC-PTQ-103M	IEC6087-5-103 Master
MDC-PTQ-104S	IEC6087-5-104 Server
MDC-PTQ-DFCM	Rockwell Automation DF1 Half Duplex Master
MDC-PTQ-DFNT	Rockwell Automation Ethernet/IP Module
MDC-PTQ-DNP	DNP 3.0 Master/Slave Module
MDC-PTQ-DNPSNET	DNP 3.0 Ethernet Server
MDC-PTQ-HART	HART Module
MDC-PTQ-LNG	Landis and Gyr Protocol

5 Click the **ADD ALL** button. A series of message boxes may appear during this process. Click **YES** or **OK** for each message that appears.

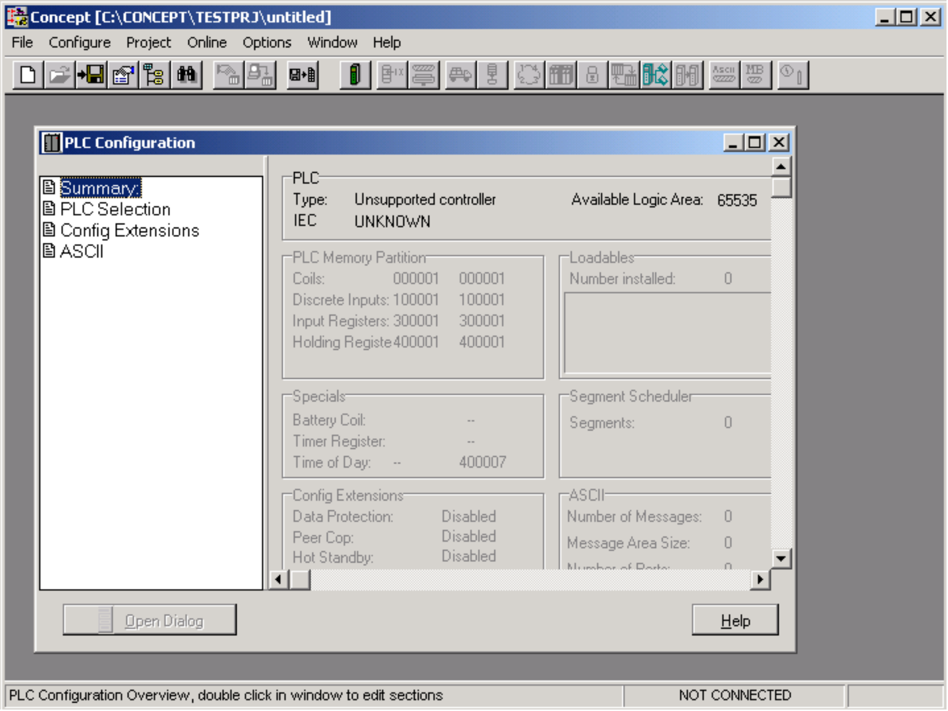
6 When the process is complete, open the File menu and choose Exit to save your changes.

2.2 Create a New Project

This phase of the setup procedure must be performed on a computer that has the Concept configuration software installed.

1 From your computer, choose **START / PROGRAMS / CONCEPT V2.6 XL.EN / CONCEPT**. This action opens the **CONCEPT** window.

2 Open the File menu, and then choose **NEW PROJECT**. This action opens the **PLC CONFIGURATION** dialog box.



PLC
Type: Unsupported controller
IEC UNKNOWN
Available Logic Area: 65535

PLC Memory Partition

Coils:	000001	000001
Discrete Inputs:	100001	100001
Input Registers:	300001	300001
Holding Registe	400001	400001

Loadables
Number installed: 0

Specials

Battery Coil:		--
Timer Register:		--
Time of Day:	--	400007

Segment Scheduler
Segments: 0

Config Extensions

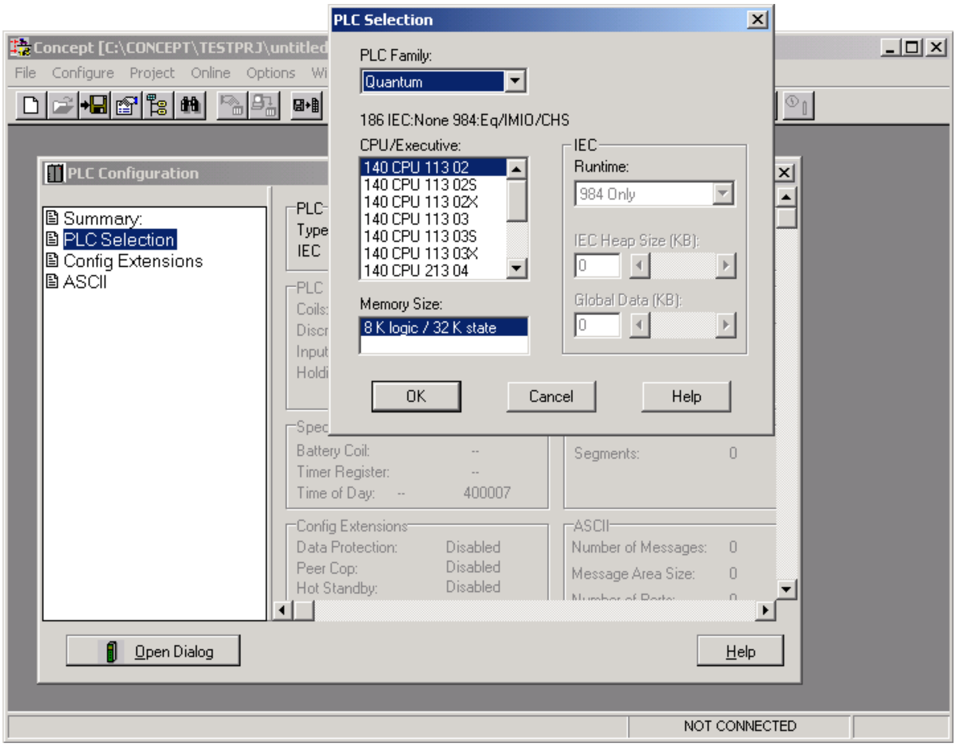
Data Protection:	Disabled
Peer Cop:	Disabled
Hot Standby:	Disabled

ASCII

Number of Messages:	0
Message Area Size:	0
Number of Ports:	0

PLC Configuration Overview, double click in window to edit sections
NOT CONNECTED

3 In the list of options on the left side of this dialog box, double-click the **PLC SELECTION** folder. This action opens the **PLC SELECTION** dialog box.



PLC Family: Quantum

186 IEC:None 984:Eq/IMIO/CHS

CPU/Executive:
140 CPU 113 02
140 CPU 113 02S
140 CPU 113 02X
140 CPU 113 03
140 CPU 113 03S
140 CPU 113 03X
140 CPU 213 04

Memory Size: 8 K logic / 32 K state

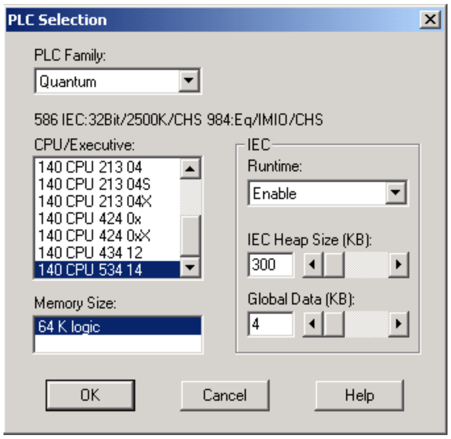
IEC
Runtime: 984 Only
IEC Heap Size (KB): 0
Global Data (KB): 0

Battery Coil: --
Timer Register: --
Time of Day: -- 400007
Segments: 0

Config Extensions
Data Protection: Disabled
Peer Cop: Disabled
Hot Standby: Disabled

ASCII
Number of Messages: 0
Message Area Size: 0

4 In the **CPU/EXECUTIVE** pane, use the scroll bar to locate and select the PLC to configure.



PLC Family: Quantum

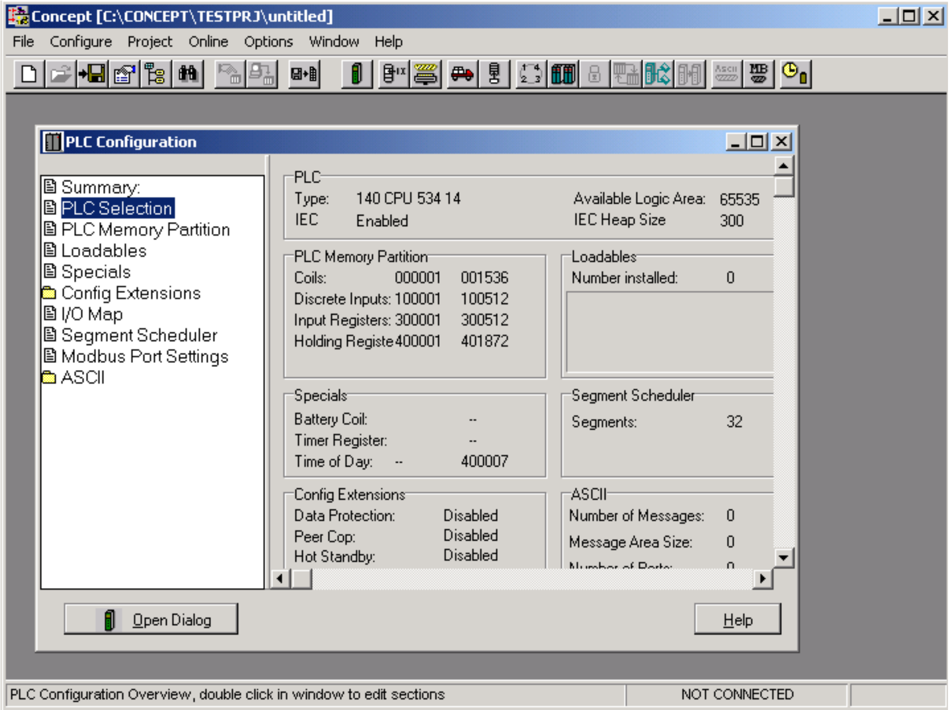
586 IEC:32Bit/2500K/CHS 984:Eq/IMIO/CHS

CPU/Executive:
140 CPU 213 04
140 CPU 213 04S
140 CPU 213 04X
140 CPU 424 0x
140 CPU 424 0xX
140 CPU 434 12
140 CPU 534 14

Memory Size: 64 K logic

IEC
Runtime: Enable
IEC Heap Size (KB): 300
Global Data (KB): 4

5 Click **OK.** This action opens the **PLC CONFIGURATION** dialog box, populated with the correct values for the PLC you selected.



PLC
Type: 140 CPU 534 14 Available Logic Area: 65535
IEC Enabled IEC Heap Size 300

PLC Memory Partition

Coils:	000001	001536
Discrete Inputs:	100001	100512
Input Registers:	300001	300512
Holding Registe	400001	401872

Loadables
Number installed: 0

Specials
Battery Coil: --
Timer Register: --
Time of Day: -- 400007

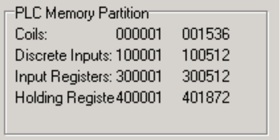
Segment Scheduler
Segments: 32

Config Extensions
Data Protection: Disabled
Peer Cop: Disabled
Hot Standby: Disabled

ASCII
Number of Messages: 0
Message Area Size: 0
Number of Ports: 0

PLC Configuration Overview, double click in window to edit sections
NOT CONNECTED

6 Make a note of the holding registers for the module. You will need this information when you modify your application. The Holding Registers are displayed in the PLC Memory Partition pane of the **PLC CONFIGURATION** dialog box.

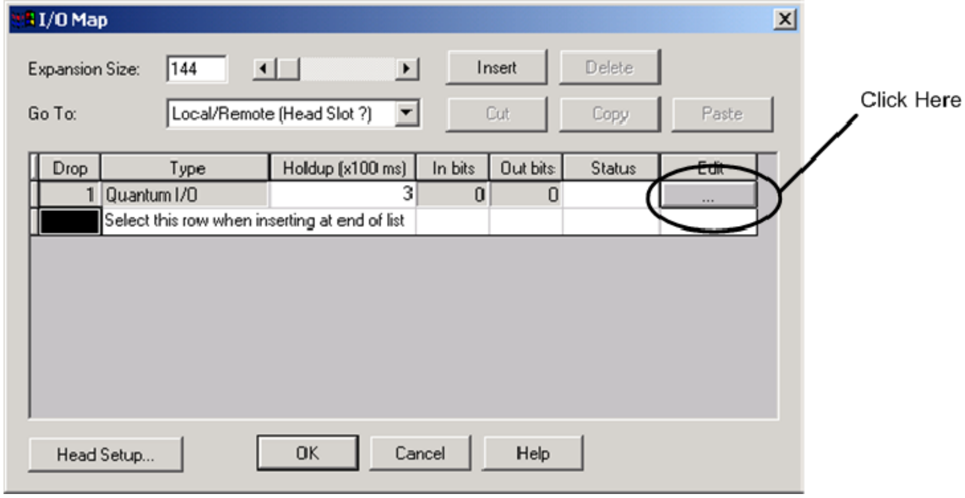


PLC Memory Partition

Coils:	000001	001536
Discrete Inputs:	100001	100512
Input Registers:	300001	300512
Holding Registe	400001	401872

2.3 Add the PTQ Module to the Project

1 In the list of options on the left side of the **PLC CONFIGURATION** dialog box, double-click **I/O MAP**. This action opens the **I/O MAP** dialog box.

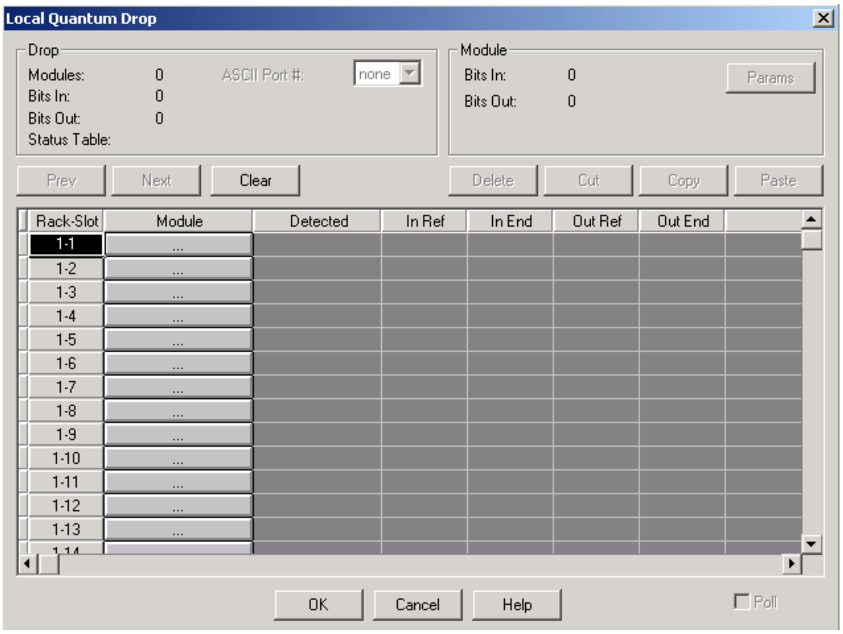


Expansion Size: 144

Go To: Local/Remote (Head Slot ?)

Drop	Type	Holdup (x100 ms)	In bits	Out bits	Status	Edit
1	Quantum I/O	3	0	0		...
	Select this row when inserting at end of list					

2 Click the **EDIT** button to open the **LOCAL QUANTUM DROP** dialog box. This dialog box is where you identify rack and slot locations.



Drop

Modules: 0

Bits In: 0

Bits Out: 0

Status Table:

ASCII Port #: none

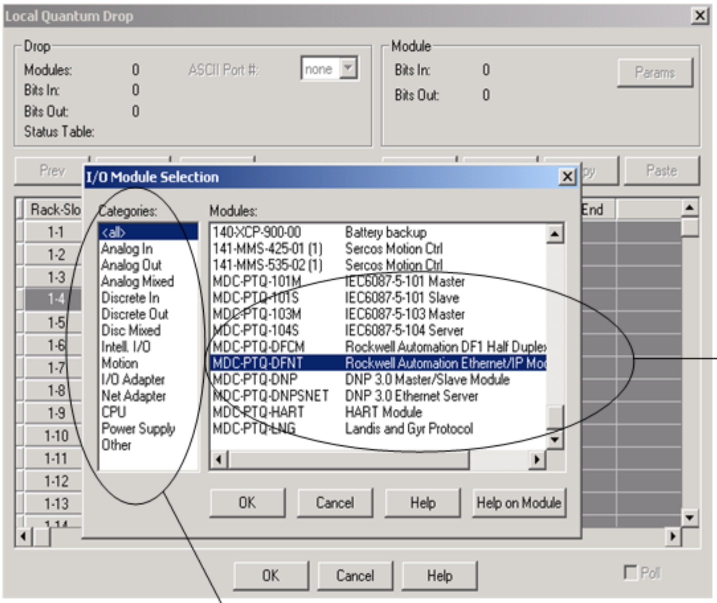
Module

Bits In: 0

Bits Out: 0

Rack-Slot	Module	Detected	In Ref	In End	Out Ref	Out End
1-1	...					
1-2	...					
1-3	...					
1-4	...					
1-5	...					
1-6	...					
1-7	...					
1-8	...					
1-9	...					
1-10	...					
1-11	...					
1-12	...					
1-13	...					
1-14						

3 Click the **MODULE** button next to the rack/slot position where the ProTalk module will be installed. This action opens the **I/O MODULE SELECTION** dialog box.



Modules: 0
Bits In: 0
Bits Out: 0
Status Table:
ASCII Port #: none

Module
Bits In: 0
Bits Out: 0

Categories:
<all>
Analog In
Analog Out
Analog Mixed
Discrete In
Discrete Out
Disc Mixed
Intell. I/O
Motion
I/O Adapter
Net Adapter
CPU
Power Supply
Other

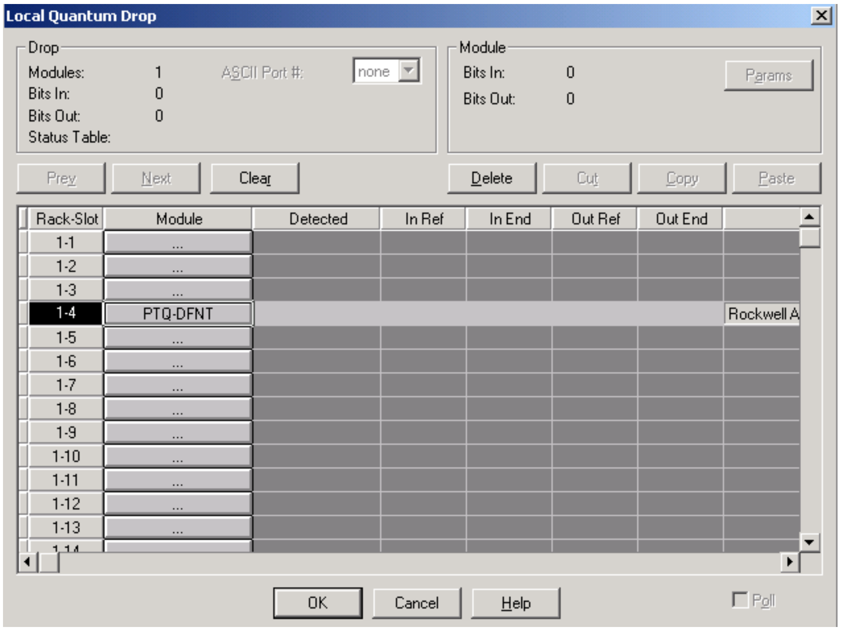
Modules:

140-XCP-900-00	Battery backup
141-MMS-425-01 (1)	Sercos Motion Ctrl
141-MMS-535-02 (1)	Sercos Motion Ctrl
MDC-PTQ-101M	IEC6087-5-101 Master
MDC-PTQ-101S	IEC6087-5-101 Slave
MDC-PTQ-103M	IEC6087-5-103 Master
MDC-PTQ-104S	IEC6087-5-104 Server
MDC-PTQ-DFCM	Rockwell Automation DF1 Half Duplex
MDC-PTQ-DFNT	Rockwell Automation Ethernet/IP Mo
MDC-PTQ-DNP	DNP 3.0 Master/Slave Module
MDC-PTQ-DNPSNET	DNP 3.0 Ethernet Server
MDC-PTQ-HART	HART Module
MDC-PTQ-LNG	Landis and Gyr Protocol

Select your ProTalk Q module here

Leave <all> highlighted

4 In the **MODULES** pane, use the scroll bar to locate and select the ProTalk module, and then click **OK.** This action copies the description of the ProTalk module next to the assigned rack and slot number of the **LOCAL QUANTUM DROP** dialog box.



Local Quantum Drop

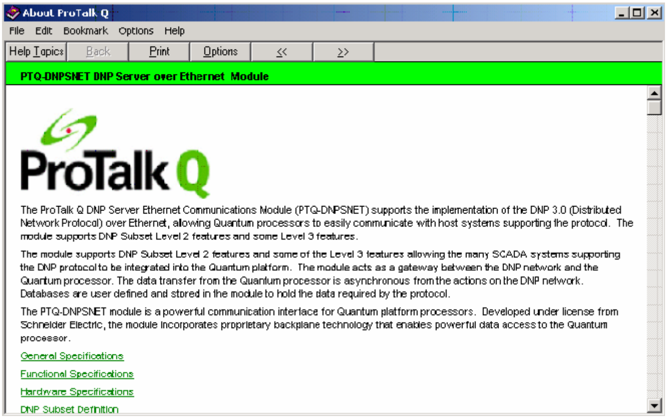
Drop
Modules: 1
Bits In: 0
Bits Out: 0
Status Table:
ASCII Port #: none

Module
Bits In: 0
Bits Out: 0

Rack-Slot	Module	Detected	In Ref	In End	Out Ref	Out End	
1-1	...						
1-2	...						
1-3	...						
1-4	PTQ-DFNT						Rockwell A
1-5	...						
1-6	...						
1-7	...						
1-8	...						
1-9	...						
1-10	...						
1-11	...						
1-12	...						
1-13	...						
1-14							

5 Repeat steps 3 through 5 for each ProTalk module you plan to install. When you have finished installing your ProTalk modules, click **OK** to save your settings. Click **YES** to confirm your settings.

Tip: Select a module, and then click the Help on Module button for help pages.



About ProTalk Q

PTQ-DNPSNET DNP Server over Ethernet Module

The ProTalk Q DNP Server Ethernet Communications Module (PTQ-DNPSNET) supports the implementation of the DNP 3.0 (Distributed Network Protocol) over Ethernet, allowing Quantum processors to easily communicate with host systems supporting the protocol. The module supports DNP Subset Level 2 features and some Level 3 features.

The module supports DNP Subset Level 2 features and some of the Level 3 features allowing the many SCADA systems supporting the DNP protocol to be integrated into the Quantum platform. The module acts as a gateway between the DNP network and the Quantum processor. The data transfer from the Quantum processor is asynchronous from the actions on the DNP network. Databases are user defined and stored in the module to hold the data required by the protocol.

The PTQ-DNPSNET module is a powerful communication interface for Quantum platform processors. Developed under license from Schneider Electric, the module incorporates proprietary backplane technology that enables powerful data access to the Quantum processor.

General Specifications

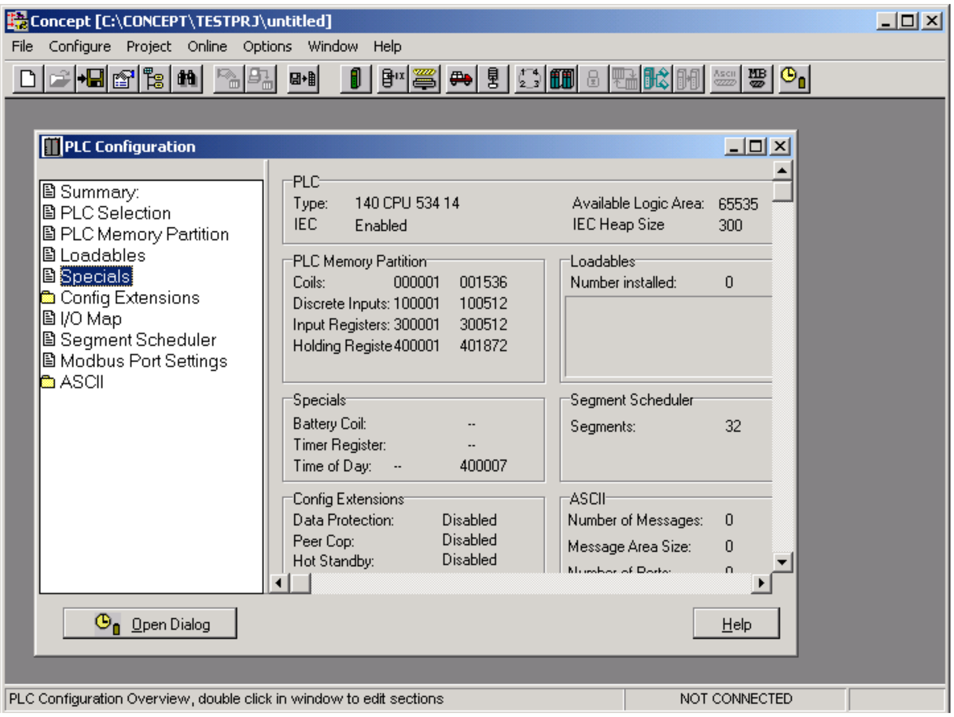
Functional Specifications

Hardware Specifications

DNP Subset Definition

2.4 Set up Data Memory in Project

1 In the list of options on the left side of the **PLC CONFIGURATION** dialog box, double-click **SPECIALS.**



PLC
Type: 140 CPU 534 14 Available Logic Area: 65535
IEC Enabled IEC Heap Size 300

PLC Memory Partition
Coils: 000001 001536
Discrete Inputs: 100001 100512
Input Registers: 300001 300512
Holding Registe 400001 401872

Loadables
Number installed: 0

Specials
Battery Coil: --
Timer Register: --
Time of Day: -- 400007

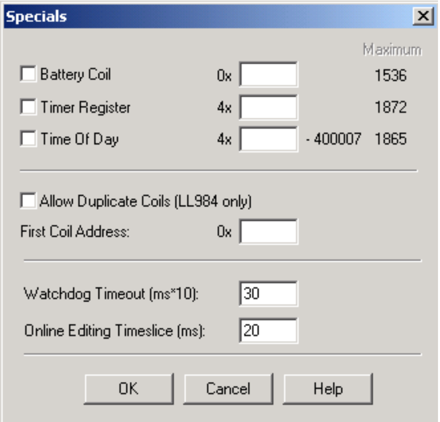
Segment Scheduler
Segments: 32

Config Extensions
Data Protection: Disabled
Peer Cop: Disabled
Hot Standby: Disabled

ASCII
Number of Messages: 0
Message Area Size: 0
Number of Ports: 0

PLC Configuration Overview, double click in window to edit sections NOT CONNECTED

2 This action opens the **SPECIALS** dialog box.



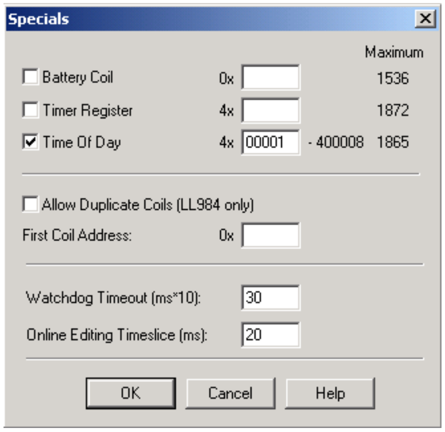
☐ Battery Coil 0x 1536
☐ Timer Register 4x 1872
☐ Time Of Day 4x - 400007 1865

☐ Allow Duplicate Coils (LL984 only)
First Coil Address: 0x

Watchdog Timeout (ms*10): 30
Online Editing Timeslice (ms): 20

Selecting the Time of Day

1 Select (check) the **TIME OF DAY** box, and then enter the value 00001 as shown in the following illustration. This value sets the first time of day register to 400001.



Specials

				Maximum
□ Battery Coil	0x			1536
□ Timer Register	4x			1872
☑ Time Of Day	4x	00001	- 400008	1865

□ Allow Duplicate Coils (LL984 only)

First Coil Address: 0x

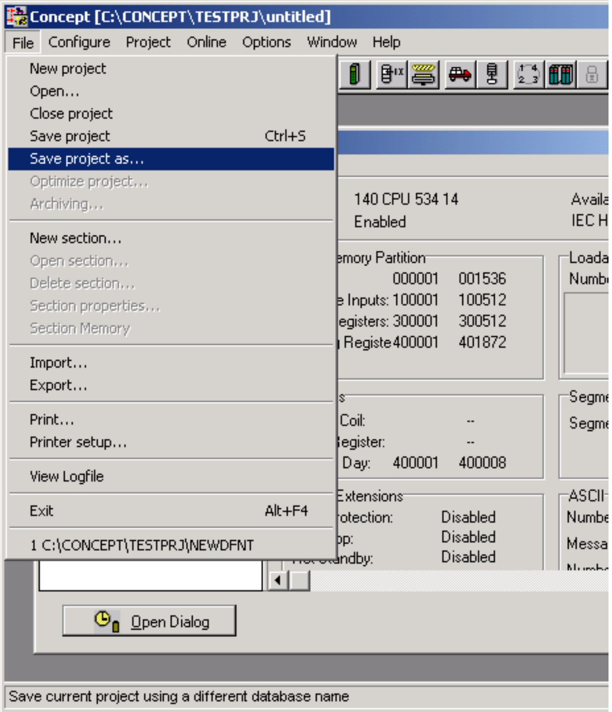
Watchdog Timeout (ms*10): 30

Online Editing Timeslice (ms): 20

2 Click **OK** to save your settings and close the **SPECIALS** dialog box.

Saving your project

1 In the **PLC CONFIGURATION** dialog box, choose **FILE / SAVE PROJECT AS.**



140 CPU 534 14
Enabled

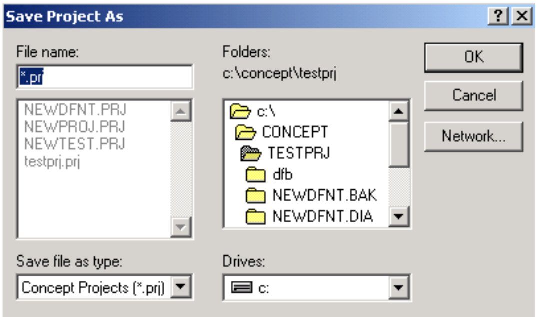
emory Partition
000001 001536
e Inputs: 100001 100512
egisters: 300001 300512
Registe 400001 401872

Coil: --
egister: --
Day: 400001 400008

Extensions
otection: Disabled
p: Disabled
ndby: Disabled

Save current project using a different database name

2 This action opens the **SAVE PROJECT AS** dialog box.



Save Project As

File name: *.prj

Folders: c:\concept\testprj

Save file as type: Concept Projects (*.prj)

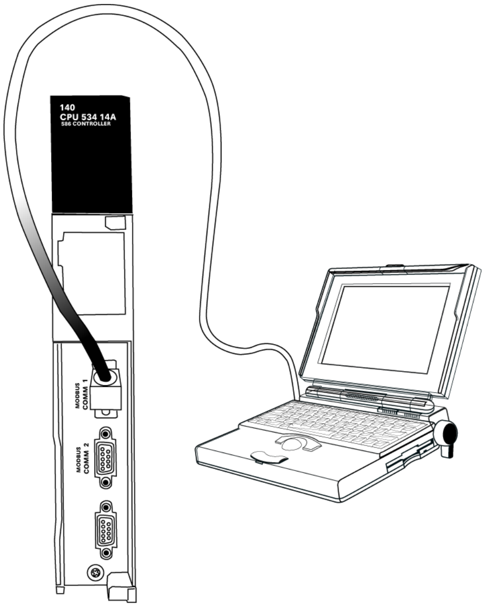
Drives: c:

3 Name the project, and then click **OK** to save the project to a file.

2.5 Download the Project to the Processor

Next, download (copy) the project file to the Quantum Processor.

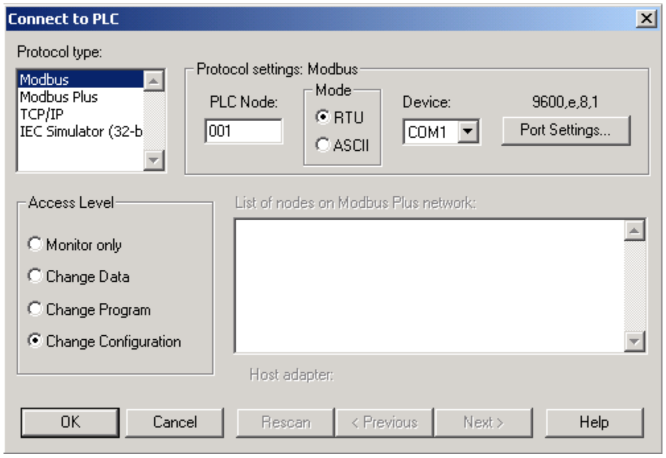
1 Use the null modem cable to connect your PC's serial port to the Quantum processor, as shown in the following illustration.



Note: You can use a Modbus Plus Network Option Module (NOM Module) module in place of the serial port if necessary.

2 Open the **PLC** menu, and then choose **CONNECT.**

3 In the **PLC CONFIGURATION** dialog box, open the **ONLINE** menu, and then choose **CONNECT.** This action opens the **CONNECT TO PLC** dialog box.


Connect to PLC

Protocol type:
Modbus
Modbus Plus
TCP/IP
IEC Simulator (32-b

Protocol settings: Modbus

PLC Node: 001

Mode
● RTU
○ ASCII

Device: COM1

9600,e,8,1

Access Level
○ Monitor only
○ Change Data
○ Change Program
● Change Configuration

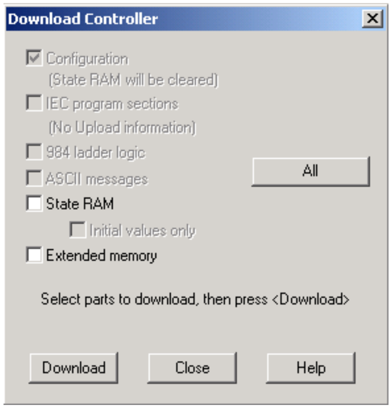
List of nodes on Modbus Plus network:

Host adapter:

4 Leave the default settings as shown and click **OK.**

Note: Click OK to dismiss any message boxes that appear during the connection process.

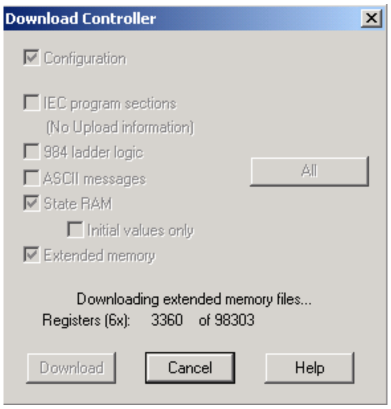
5 In the **PLC CONFIGURATION** window, open the **ONLINE** menu, and then choose **DOWNLOAD.** This action opens the **DOWNLOAD CONTROLLER** dialog box.


Download Controller

☑ Configuration
(State RAM will be cleared)
□ IEC program sections
(No Upload information)
□ 984 ladder logic
□ ASCII messages
□ State RAM
□ Initial values only
□ Extended memory

Select parts to download, then press <Download>

6 Click **ALL,** and then click **DOWNLOAD.** If a message box appears indicating that the controller is running, click **YES** to shut down the controller. The **DOWNLOAD CONTROLLER** dialog box displays the status of the download as shown in the following illustration.



☑ Configuration
□ IEC program sections
(No Upload information)
□ 984 ladder logic
□ ASCII messages
☑ State RAM
□ Initial values only
☑ Extended memory

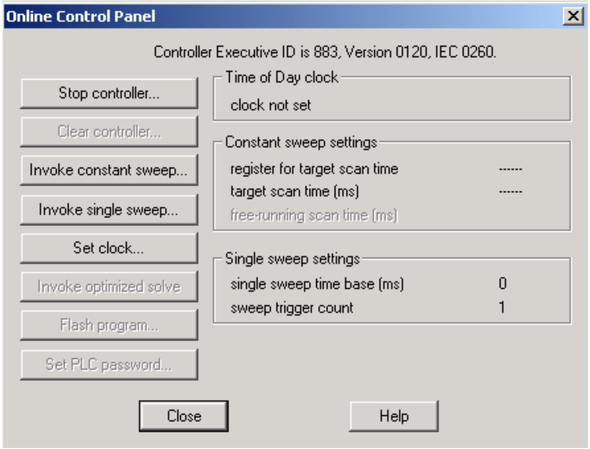
Downloading extended memory files...
Registers (6x): 3360 of 98303

7 When the download is complete, you will be prompted to restart the controller. Click **YES** to restart the controller.

2.6 Verify Successful Download

The final step is to verify that the configuration changes you made were received successfully by the module, and to make some adjustments to your settings.

1 In the **PLC CONFIGURATION** window, open the **ONLINE** menu, and then choose **ONLINE CONTROL PANEL**. This action opens the **ONLINE CONTROL PANEL** dialog box.



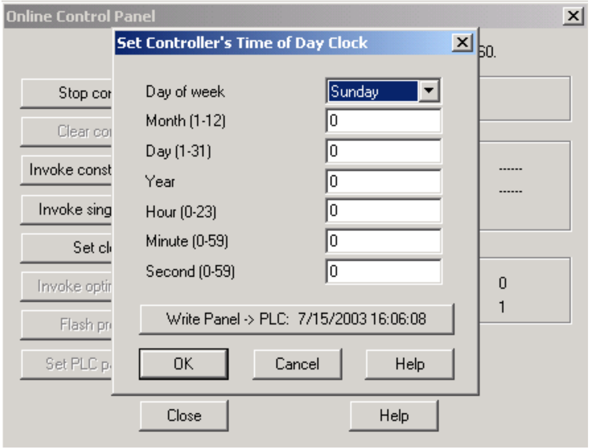
Controller Executive ID is 883, Version 0120, IEC 0260.

Time of Day clock
clock not set

Constant sweep settings
register for target scan time ------
target scan time (ms) ------
free-running scan time (ms)

Single sweep settings
single sweep time base (ms) 0
sweep trigger count 1

2 Click the **SET CLOCK** button to open the **SET CONTROLLER'S TIME OF DAY CLOCK** dialog box.



Online Control Panel

Set Controller's Time of Day Clock

Day of week: Sunday
Month (1-12): 0
Day (1-31): 0
Year: 0
Hour (0-23): 0
Minute (0-59): 0
Second (0-59): 0

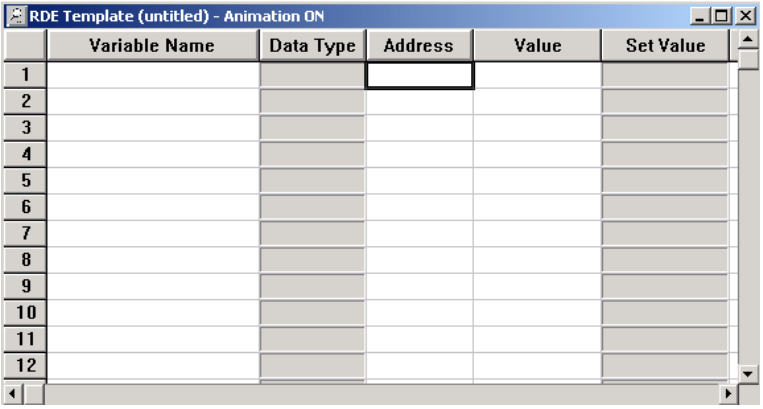
Write Panel -> PLC: 7/15/2003 16:06:08

3 Click the **WRITE PANEL** button. This action updates the date and time fields in this dialog box. Click **OK** to close this dialog box and return to the previous window.

4 Click **CLOSE** to close the **ONLINE CONTROL PANEL** dialog box.

5 In the **PLC CONFIGURATION** window, open the **ONLINE** menu, and then choose **REFERENCE DATA EDITOR.** This action opens the **REFERENCE DATA EDITOR** dialog box. On this dialog box, you will add preset values to data registers that will later be monitored in the ProTalk module.

6 Place the cursor over the first address field, as shown in the following illustration.

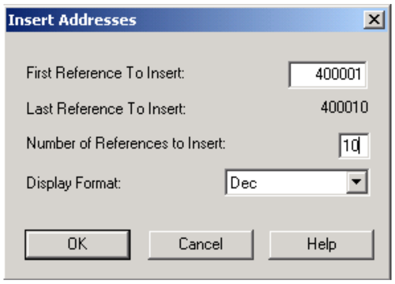


RDE Template (untitled) - Animation ON

	Variable Name	Data Type	Address	Value	Set Value
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					
11					
12					

7 In the **PLC CONFIGURATION** window, open the **TEMPLATES** menu, and then choose **INSERT ADDRESSES.** This action opens the Insert addresses dialog box.

8 On the **INSERT ADDRESSES** dialog box, enter the values shown in the following illustration, and then click **OK.**



Insert Addresses

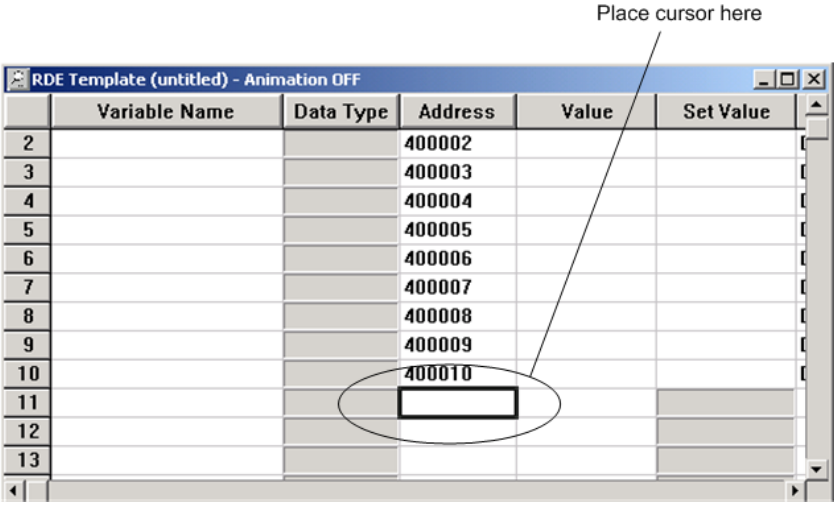
First Reference To Insert: 400001

Last Reference To Insert: 400010

Number of References to Insert: 10

Display Format: Dec

9 Notice that the template populates the address range, as shown in the following illustration. Place your cursor as shown in the first blank address field below the addresses you just entered.

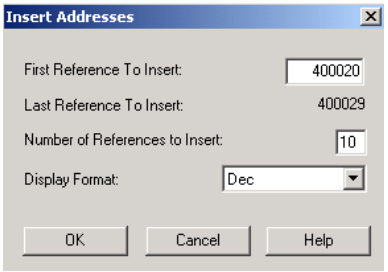


Place cursor here

RDE Template (untitled) - Animation OFF

	Variable Name	Data Type	Address	Value	Set Value
2			400002		
3			400003		
4			400004		
5			400005		
6			400006		
7			400007		
8			400008		
9			400009		
10			400010		
11					
12					
13					

10 Repeat steps 6 through 9, using the values in the following illustration:



Insert Addresses

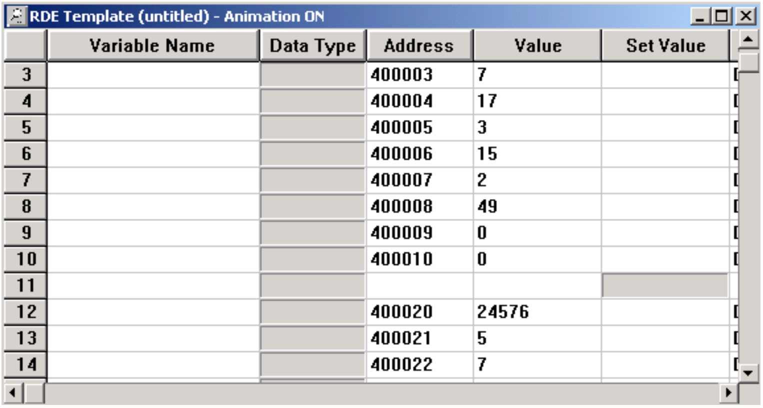
First Reference To Insert: 400020

Last Reference To Insert: 400029

Number of References to Insert: 10

Display Format: Dec

11 In the **PLC CONFIGURATION** window, open the **ONLINE** menu, and then choose **ANIMATE.** This action opens the **RDE TEMPLATE** dialog box, with animated values in the **VALUE** field.



	Variable Name	Data Type	Address	Value	Set Value
3			400003	7	
4			400004	17	
5			400005	3	
6			400006	15	
7			400007	2	
8			400008	49	
9			400009	0	
10			400010	0	
11					
12			400020	24576	
13			400021	5	
14			400022	7	

12 Verify that values shown are cycling, starting from address 400065 and up.
13 In the **PLC CONFIGURATION** window, open the **TEMPLATES** menu, and then choose **SAVE TEMPLATE AS**. Name the template **PTQCLOCK,** and then click **OK** to save the template.
14 In the **PLC CONFIGURATION** window, open the **ONLINE** menu, and then choose **DISCONNECT.** At the disconnect message, click **YES** to confirm your choice.

At this point, you have successfully

- Created and downloaded a Quantum project to the PLC
- Preset values in data registers that will later be monitored in the ProTalk module.

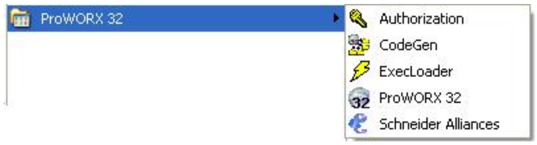
You are now ready to complete the installation and setup of the ProTalk module.

3 Configuring the Processor with ProWORX

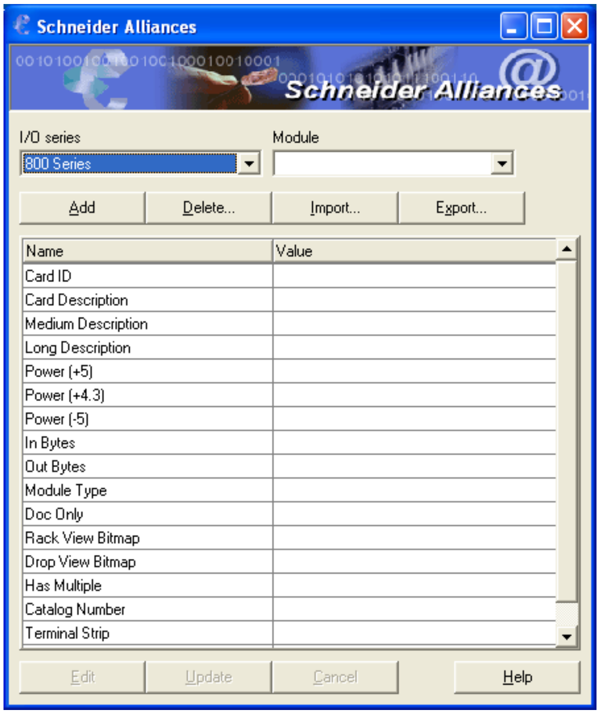
When you use ProWORX 32 software to configure the processor, use the example SAF file provided on the ProTalk Solutions CD-ROM.

Important Note: ProWORX software does not report whether the PTQ module is present in the rack, and therefore is not able to report the health status of the module when the module is online with the Quantum processor. Please consider this when monitoring the status of the PTQ module.

1 Run the **SCHNEIDER_ALLIANCES.EXE** application that is installed with the ProWORX 32 software:



2 Click on **IMPORT…**

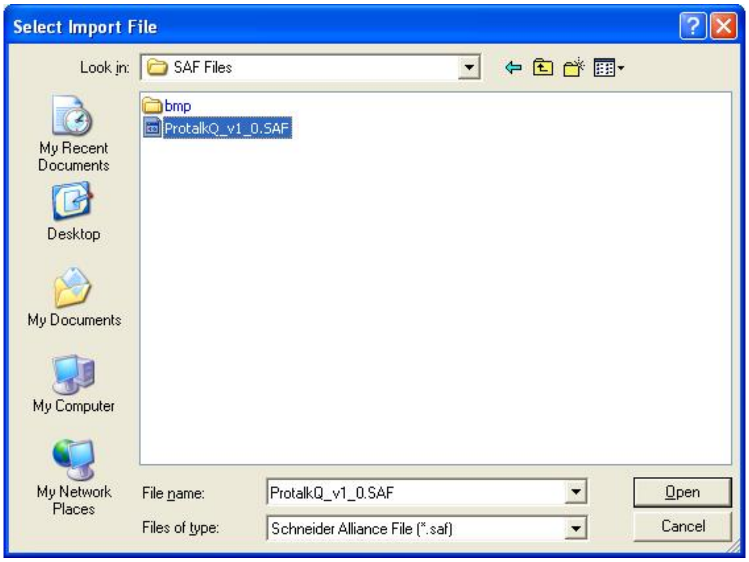


I/O series: 800 Series

Module:

Name	Value
Card ID	
Card Description	
Medium Description	
Long Description	
Power (+5)	
Power (+4.3)	
Power (-5)	
In Bytes	
Out Bytes	
Module Type	
Doc Only	
Rack View Bitmap	
Drop View Bitmap	
Has Multiple	
Catalog Number	
Terminal Strip	

3 Select the .SAF File that is located on the CD-ROM shipped with the PTQ module.

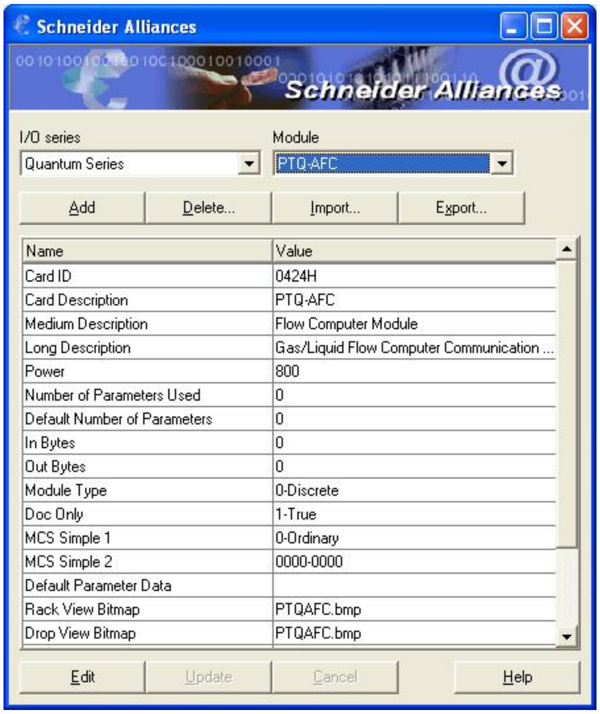


Look in: SAF Files

File name: ProtalkQ_v1_0.SAF

Files of type: Schneider Alliance File (*.saf)

4 After you click on **OPEN** you should see the PTQ modules imported (select **I/O SERIES** as **QUANTUM**):

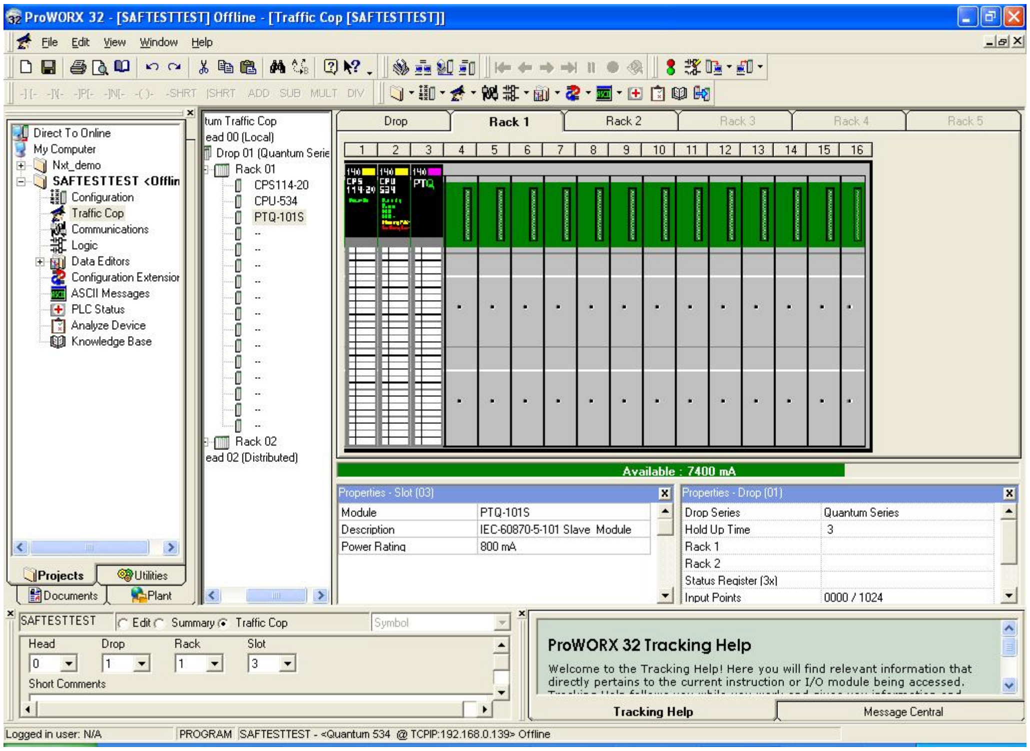


I/O series: Quantum Series

Module: PTQ-AFC

Name	Value
Card ID	0424H
Card Description	PTQ-AFC
Medium Description	Flow Computer Module
Long Description	Gas/Liquid Flow Computer Communication ...
Power	800
Number of Parameters Used	0
Default Number of Parameters	0
In Bytes	0
Out Bytes	0
Module Type	0-Discrete
Doc Only	1-True
MCS Simple 1	0-Ordinary
MCS Simple 2	0000-0000
Default Parameter Data	
Rack View Bitmap	PTQAFC.bmp
Drop View Bitmap	PTQAFC.bmp

Now you can close the Schneider alliances application and run the ProWORX 32 software. At the **TRAFFIC COP** section, select the PTQ module to be inserted at the slot:



Properties - Slot (03)

Module	PTQ-101S
Description	IEC-60870-5-101 Slave Module
Power Rating	800 mA

Properties - Drop (01)

Drop Series	Quantum Series
Hold Up Time	3
Rack 1	
Rack 2	
Status Register (3x)	
Input Points	0000 / 1024

SAFTESTTEST ○ Edit ○ Summary ● Traffic Cop Symbol

Head	Drop	Rack	Slot
0	1	1	3

Short Comments

ProWORX 32 Tracking Help

Welcome to the Tracking Help! Here you will find relevant information that directly pertains to the current instruction or I/O module being accessed.

Logged in user: N/A | PROGRAM | SAFTESTTEST - <Quantum 534 @ TCPIP:192.168.0.139> Offline

4 Configuring the Processor with UnityPro XL

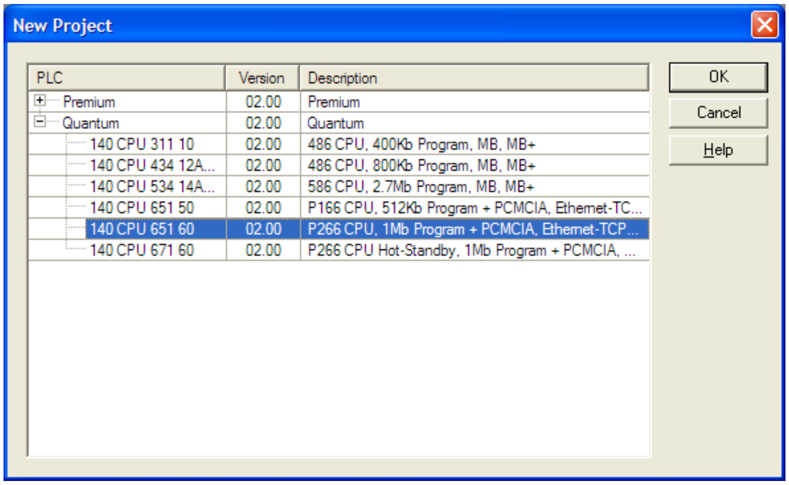
In This Chapter

The following steps are designed to ensure that the processor (Quantum or Unity) is able to transfer data successfully with the PTQ module. As part of this procedure, you will use UnityPro XL to create a project, add the PTQ module to the project, set up data memory for the project, and then download the project to the processor.

4.1 Create a New Project

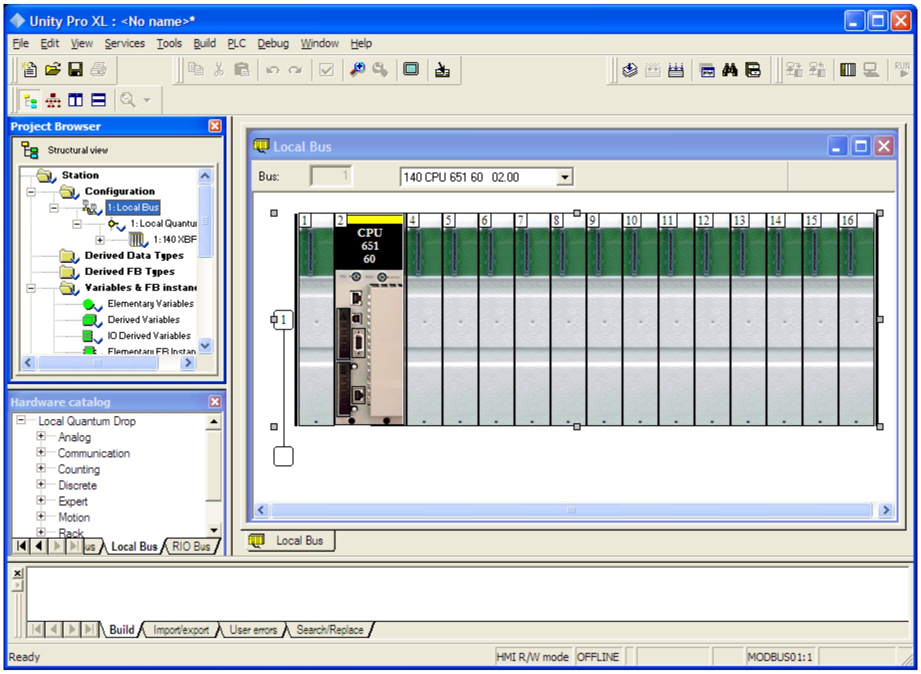
The first step is to open UnityPro XL and create a new project.

1 In the **New Project** dialog box, choose the CPU type. In the following illustration, the CPU is 140 CPU 651 60. Choose the processor type that matches your own hardware configuration, if it differs from the example. Click **OK** to continue.

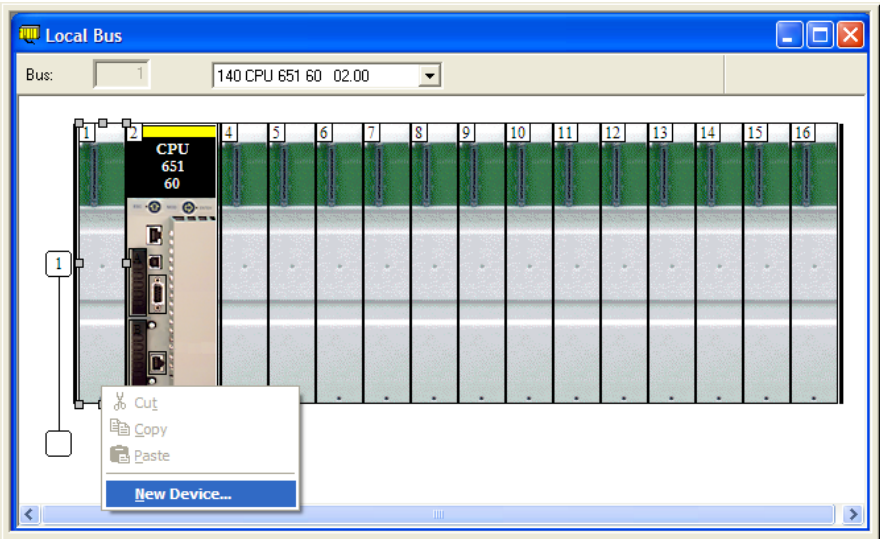


PLC	Version	Description
Premium	02.00	Premium
Quantum	02.00	Quantum
140 CPU 311 10	02.00	486 CPU, 400Kb Program, MB, MB+
140 CPU 434 12A...	02.00	486 CPU, 800Kb Program, MB, MB+
140 CPU 534 14A...	02.00	586 CPU, 2.7Mb Program, MB, MB+
140 CPU 651 50	02.00	P166 CPU, 512Kb Program + PCMCIA, Ethernet-TC...
140 CPU 651 60	02.00	P266 CPU, 1Mb Program + PCMCIA, Ethernet-TCP...
140 CPU 671 60	02.00	P266 CPU Hot-Standby, 1Mb Program + PCMCIA, ...

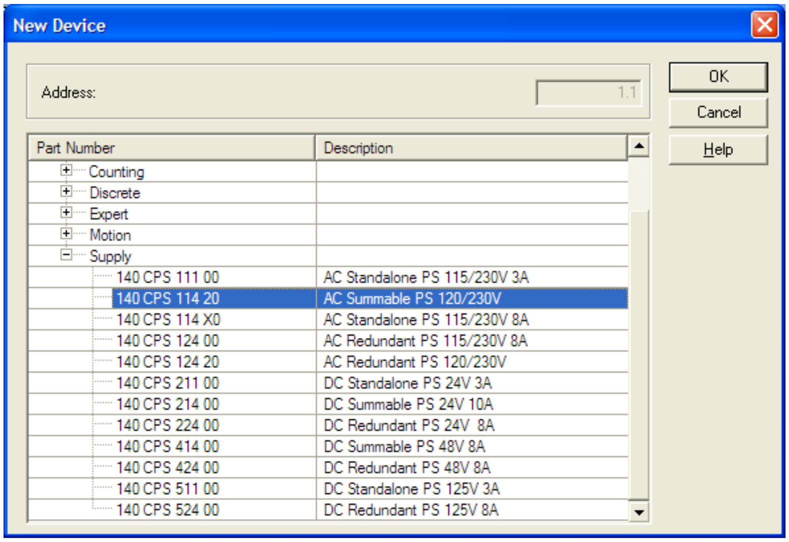
2 Next, add a power supply to the project. In the **PROJECT BROWSER**, expand the **CONFIGURATION** folder, and then double-click the **1:LOCALBUS** icon. This action opens a graphical window showing the arrangement of devices in your Quantum rack.



3 Select the rack position for the power supply, and then click the right mouse button to open a shortcut menu. On the shortcut menu, choose **NEW DEVICE**.



4 Expand the **SUPPLY** folder, and then select your power supply from the list. Click **OK** to continue.



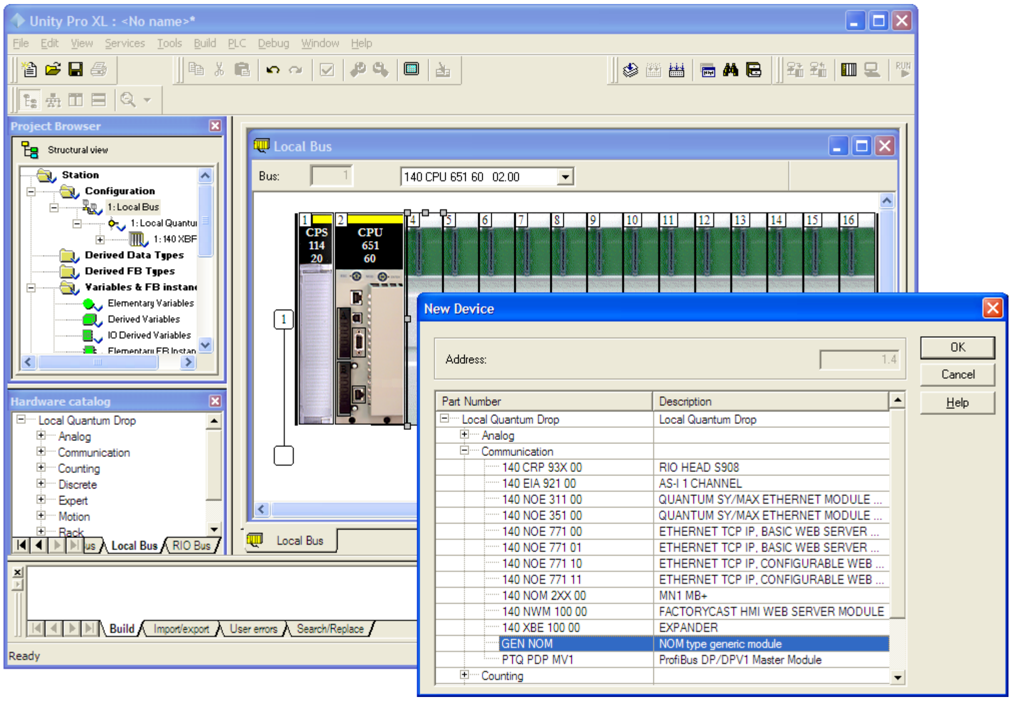
Address: 1.1

Part Number	Description
Counting	
Discrete	
Expert	
Motion	
Supply	
140 CPS 111 00	AC Standalone PS 115/230V 3A
140 CPS 114 20	AC Summable PS 120/230V
140 CPS 114 X0	AC Standalone PS 115/230V 8A
140 CPS 124 00	AC Redundant PS 115/230V 8A
140 CPS 124 20	AC Redundant PS 120/230V
140 CPS 211 00	DC Standalone PS 24V 3A
140 CPS 214 00	DC Summable PS 24V 10A
140 CPS 224 00	DC Redundant PS 24V 8A
140 CPS 414 00	DC Summable PS 48V 8A
140 CPS 424 00	DC Redundant PS 48V 8A
140 CPS 511 00	DC Standalone PS 125V 3A
140 CPS 524 00	DC Redundant PS 125V 8A

5 Repeat these steps to add any additional devices to your Quantum Rack.

4.2 Add the PTQ Module to the Project

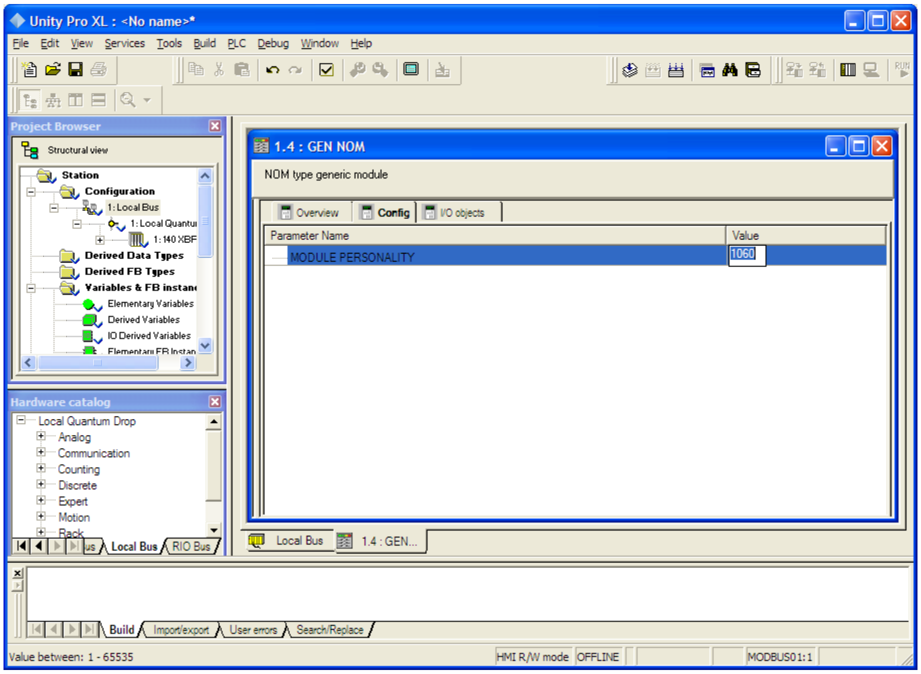
1 Expand the **COMMUNICATION** tree, and select **GEN NOM**. This module type provides extended communication capabilities for the Quantum system, and allows communication between the PLC and the PTQ module without requiring additional programming.



Address: 1.4

Part Number	Description
Local Quantum Drop	Local Quantum Drop
Analog	
Communication	
140 CRP 93X 00	RIO HEAD S908
140 EIA 921 00	AS-I 1 CHANNEL
140 NOE 311 00	QUANTUM SY/MAX ETHERNET MODULE ...
140 NOE 351 00	QUANTUM SY/MAX ETHERNET MODULE ...
140 NOE 771 00	ETHERNET TCP IP, BASIC WEB SERVER ...
140 NOE 771 01	ETHERNET TCP IP, BASIC WEB SERVER ...
140 NOE 771 10	ETHERNET TCP IP, CONFIGURABLE WEB ...
140 NOE 771 11	ETHERNET TCP IP, CONFIGURABLE WEB ...
140 NOM 2XX 00	MN1 MB+
140 NWM 100 00	FACTORYCAST HMI WEB SERVER MODULE
140 XBE 100 00	EXPANDER
GEN NOM	NOM type generic module
PTQ PDP MV1	ProfiBus DP/DPV1 Master Module
Counting	

2 Next, enter the module personality value. The correct value for ProTalk modules is 1060 decimal (0424 hex).



NOM type generic module

Parameter Name	Value
MODULE PERSONALITY	1060

Value between: 1 - 65535

3 Before you can save the project in UnityPro XL, you must validate the modifications. Open the **EDIT** menu, and then choose **VALIDATE.** If no errors are reported, you can save the project.

4 Save the project.

4.3 Build the Project

Whenever you update the configuration of your PTQ module or the processor, you must import the changed configuration from the module, and then build (compile) the project before downloading it to the processor.

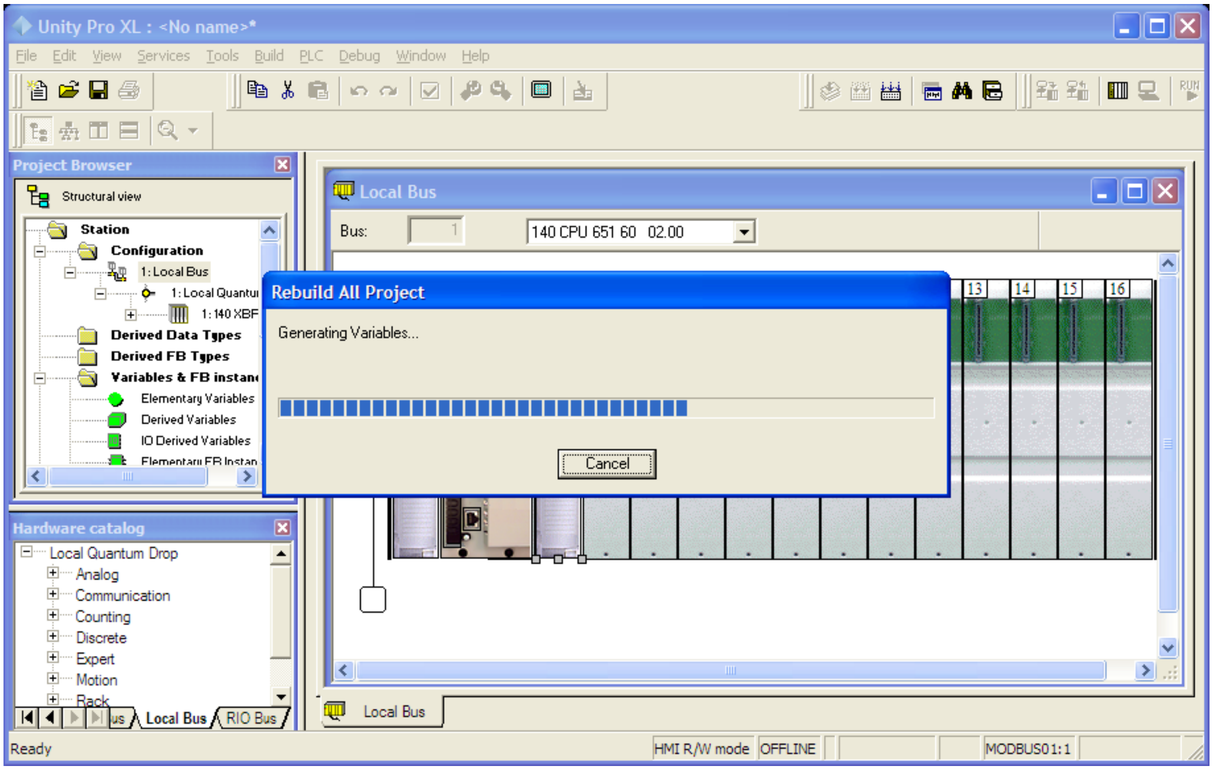
> Note: The following steps show you how to build the project in Unity Pro XL. This is not intended to provide detailed information on using Unity Pro XL, or debugging your programs. Refer to the documentation for your processor and for Unity Pro XL for specialized information.

To build (compile) the project:

1 Review the elements of the project in the **PROJECT BROWSER**.

2 When you are satisfied that you are ready to download the project, open the **BUILD** menu, and then choose **REBUILD ALL PROJECT**. This action builds (compiles) the project into a form that the processor can use to execute the instructions in the project file. This task may take several minutes, depending on the complexity of the project and the resources available on your PC.

3 As the project is built, Unity Pro XL reports its process in a **PROGRESS** dialog box, with details appearing in a pane at the bottom of the window. The following illustration shows the build process under way.



After the build process is completed successfully, the next step is to download the compiled project to the processor.

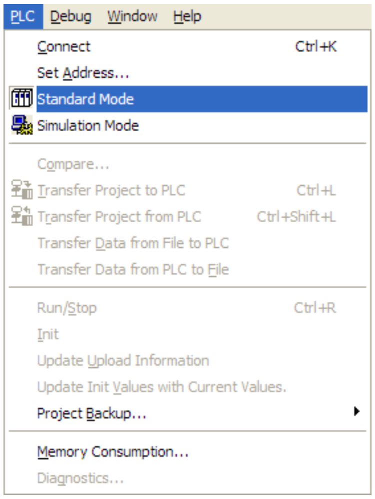
4.4 Connect Your PC to the Processor

The next step is to connect to the processor so that you can download the project file. The processor uses this project file to communicate over the backplane to modules identified in the project file.

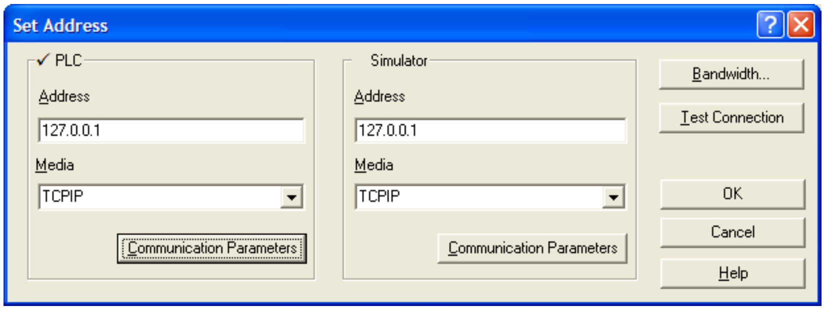
Note: If you have never connected from the PC to your processor before, you must verify that the necessary port drivers are installed and available to UnityPro XL.

To verify address and driver settings in UnityPro XL:

1 Open the **PLC** menu, and choose **STANDARD MODE**. This action turns off the PLC Simulator, and allows you to communicate directly with the Quantum or Unity hardware.


PLC
Debug
Window
Help
Connect Ctrl+K
Set Address...
Standard Mode
Simulation Mode
Compare...
Transfer Project to PLC Ctrl+L
Transfer Project from PLC Ctrl+Shift+L
Transfer Data from File to PLC
Transfer Data from PLC to File
Run/Stop Ctrl+R
Init
Update Upload Information
Update Init Values with Current Values.
Project Backup...
Memory Consumption...
Diagnostics...

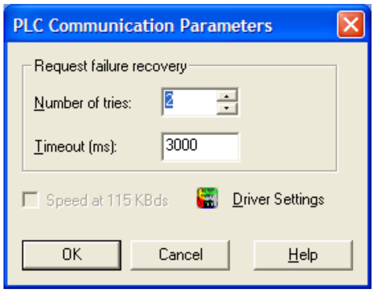
2 Open the **PLC** menu, and choose **SET ADDRESS...** This action opens the **SET ADDRESS** dialog box. Open the **MEDIA** dropdown list and choose the connection type to use (TCPIP or USB).


Set Address

✓ PLC
Address: 127.0.0.1
Media: TCPIP

Simulator
Address: 127.0.0.1
Media: TCPIP

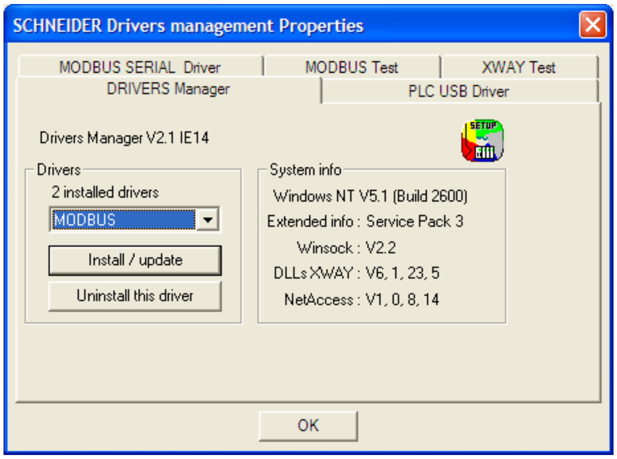
3 If the **MEDIA** dropdown list does not contain the connection method you wish to use, click the **COMMUNICATION PARAMETERS** button in the PLC area of the dialog box. This action opens the **PLC COMMUNICATION PARAMETERS** dialog box.


PLC Communication Parameters

Request failure recovery
Number of tries: 2
Timeout (ms): 3000

□ Speed at 115 KBds

4 Click the **DRIVER SETTINGS** button to open the **SCHNEIDER DRIVERS MANAGEMENT PROPERTIES** dialog box.



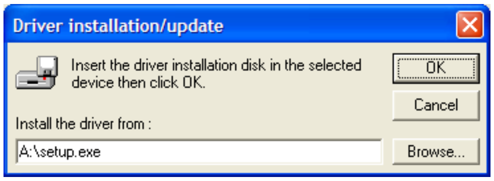
Drivers Manager V2.1 IE14

2 installed drivers

MODBUS

Windows NT V5.1 (Build 2600)
Extended info : Service Pack 3
Winsock : V2.2
DLLs XWAY : V6, 1, 23, 5
NetAccess : V1, 0, 8, 14

5 Click the **INSTALL/UPDATE** button to specify the location of the Setup.exe file containing the drivers to use. You will need your UnityPro XL installation disks for this step.



Insert the driver installation disk in the selected device then click OK.

Install the driver from :

A:\setup.exe

6 Click the **BROWSE** button to locate the Setup.exe file to execute, and then execute the setup program. After the installation, restart your PC if you are prompted to do so. Refer to your Schneider Electric documentation for more information on installing drivers for UnityPro XL.

4.4.1 Connecting to the Processor with TCPIP

The next step is to download (copy) the project file to the processor. The following steps demonstrate how to use an Ethernet cable connected from the Processor to your PC through an Ethernet hub or switch. Other connection methods may also be available, depending on the hardware configuration of your processor, and the communication drivers installed in UnityPro XL.

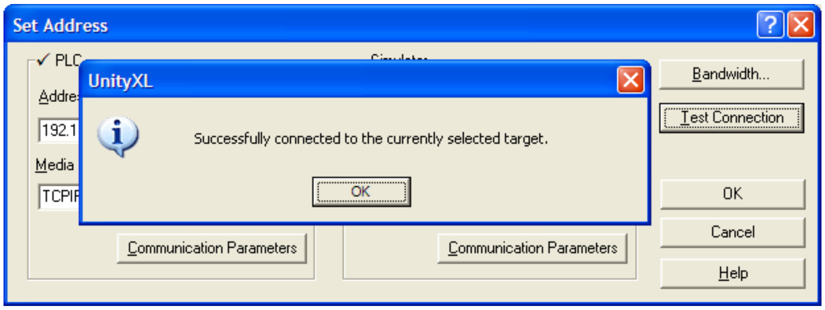
1 If you have not already done so, connect your PC and the processor to an Ethernet hub.

2 Open the **PLC** menu, and then choose **SET ADDRESS**.

- **Important:** Notice that the SET ADDRESS dialog box is divided into two areas. Enter the address and media type in the PLC area of the dialog box, not the SIMULATOR area.

3 Enter the IP address in the address field. In the **MEDIA** dropdown list, choose TCPIP.

4 Click the **TEST CONNECTION** button to verify that your settings are correct.



Set Address

✓ PLC

Address: 192.1

Media: TCPIP

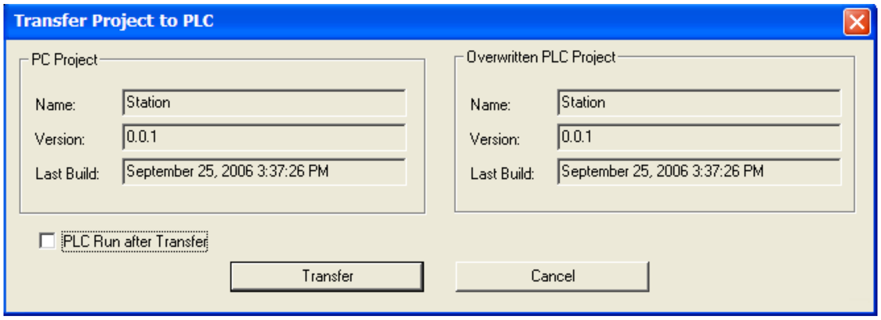
UnityXL

Successfully connected to the currently selected target.

4.5 Download the Project to the Processor

1 Open the **PLC** menu and then choose **CONNECT.** This action opens a connection between the Unity Pro XL software and the processor, using the address and media type settings you configured in the previous step.

2 On the **PLC** menu, choose **TRANSFER PROJECT TO PLC**. This action opens the **TRANSFER PROJECT TO PLC** dialog box. If you would like the PLC to go to "Run" mode immediately after the transfer is complete, select (check) the **PLC RUN AFTER TRANSFER** check box.



Transfer Project to PLC

PC Project		Overwritten PLC Project	
Name:	Station	Name:	Station
Version:	0.0.1	Version:	0.0.1
Last Build:	September 25, 2006 3:37:26 PM	Last Build:	September 25, 2006 3:37:26 PM

□ PLC Run after Transfer

3 Click the **TRANSFER** button to download the project to the processor. As the project is transferred, Unity Pro XL reports its process in a **PROGRESS** dialog box, with details appearing in a pane at the bottom of the window.

When the transfer is complete, place the processor in Run mode.

5 Setting Up the ProTalk Module

In This Chapter

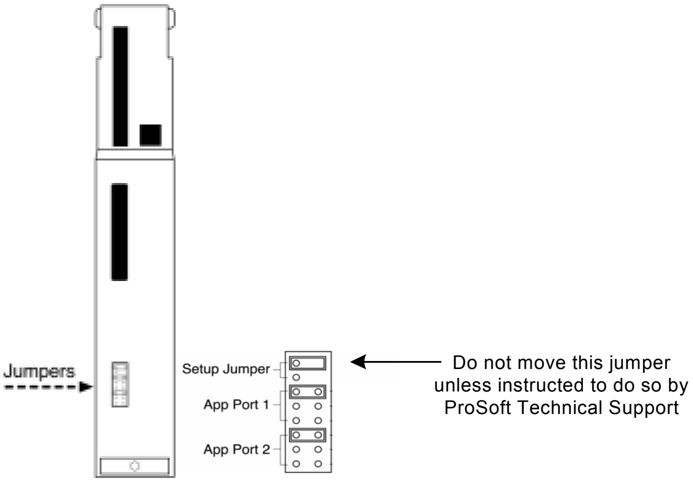
After you complete the following procedures, the ProTalk module will actively be transferring data bi-directionally with the processor.

5.1 Install the ProTalk Module in the Quantum Rack

5.1.1 Verify Jumper Settings

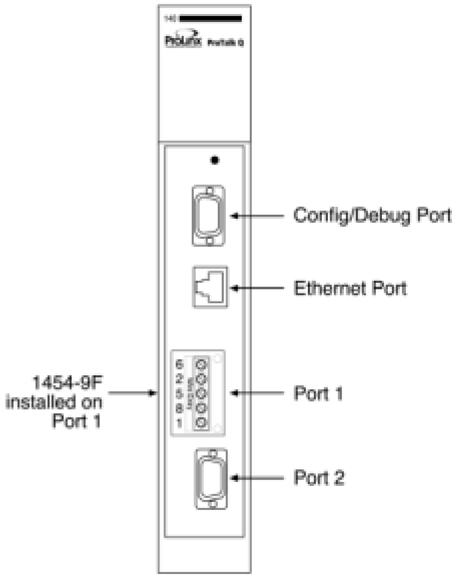
ProTalk modules are configured for RS-232 serial communications by default. To use RS-422 or RS-485, you must change the jumpers.

The jumpers are located on the back of the module as shown in the following illustration:


Jumpers
Setup Jumper
App Port 1
App Port 2
Do not move this jumper unless instructed to do so by ProSoft Technical Support

5.1.2 Inserting the 1454-9F connector

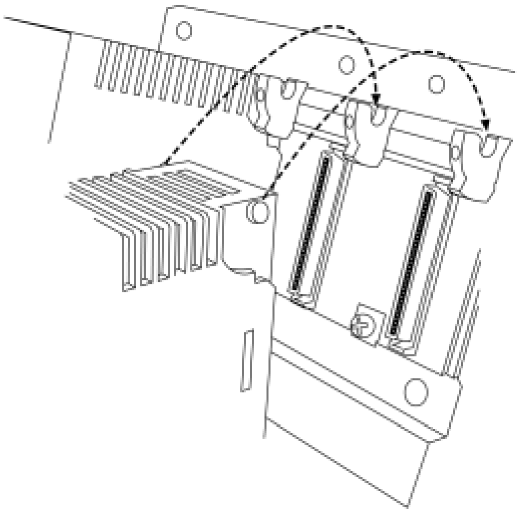
Insert the 1454-9F connector as shown. Wiring locations are shown in the table:



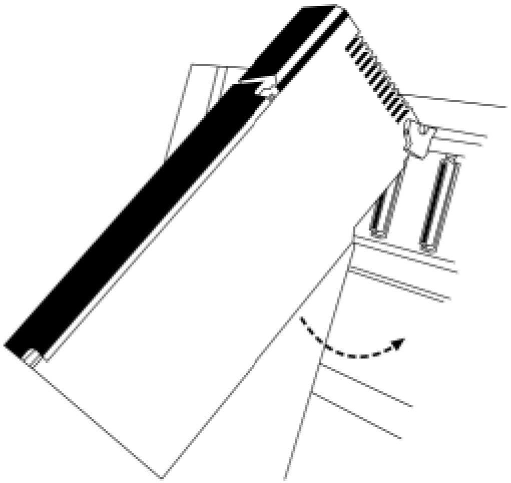
5.1.3 Install the ProTalk Module in the Quantum Rack

1 Place the Module in the Quantum Rack. The ProTalk module must be placed in the same rack as the processor.

2 Tilt the module at a 45° angle and align the pegs at the top of the module with slots on the backplane.



3 Push the module into place until it seats firmly in the backplane.

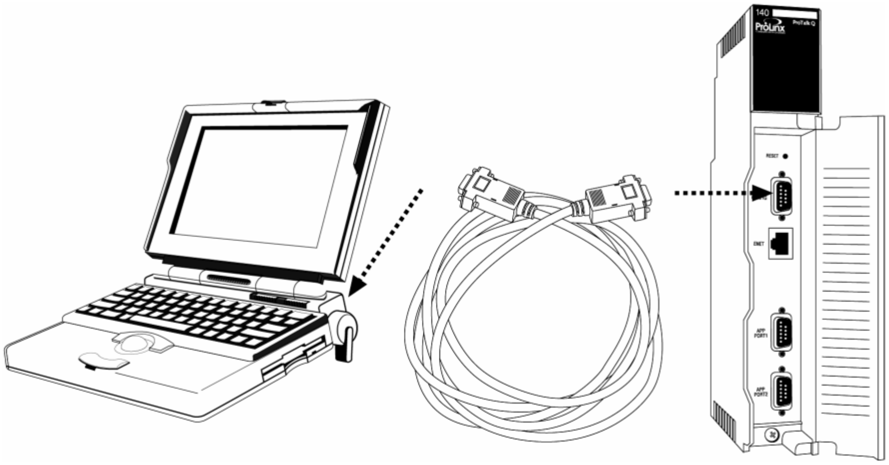


Caution: The PTQ module is hot-swappable, meaning that you can install and remove it while the rack is powered up. You should not assume that this is the case for all types of modules unless the user manual for the product explicitly states that the module is hot-swappable. Failure to observe this precaution could result in damage to the module and any equipment connected to it.

5.2 Connect the PC to the ProTalk Configuration/Debug Port

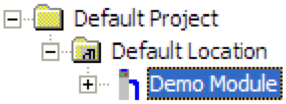
Make sure you have exited the Quantum programming software before performing these steps. This action will avoid serial port conflict.

Using the supplied Null Modem cable, connect your PC to the Configuration/Debug port on the ProTalk module as shown

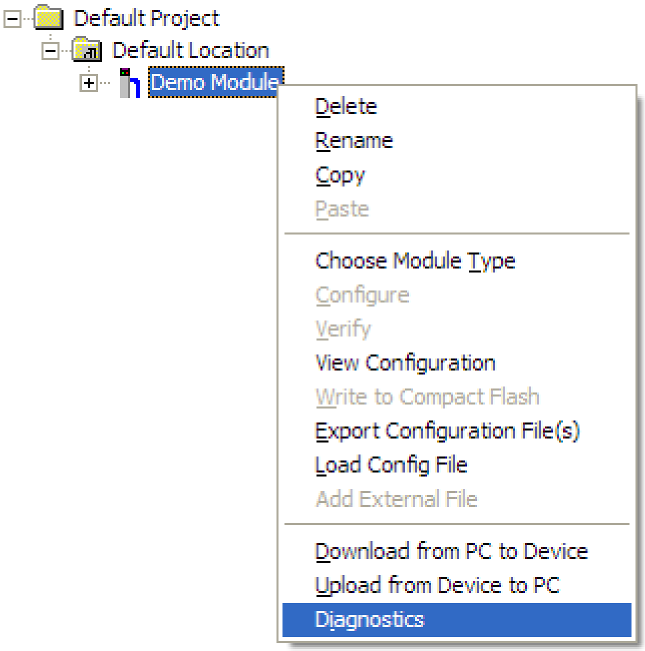


To connect to the module's Configuration/Debug serial port,

1 Start PCB, and then select the module to test. Click the right mouse button to open a shortcut menu.

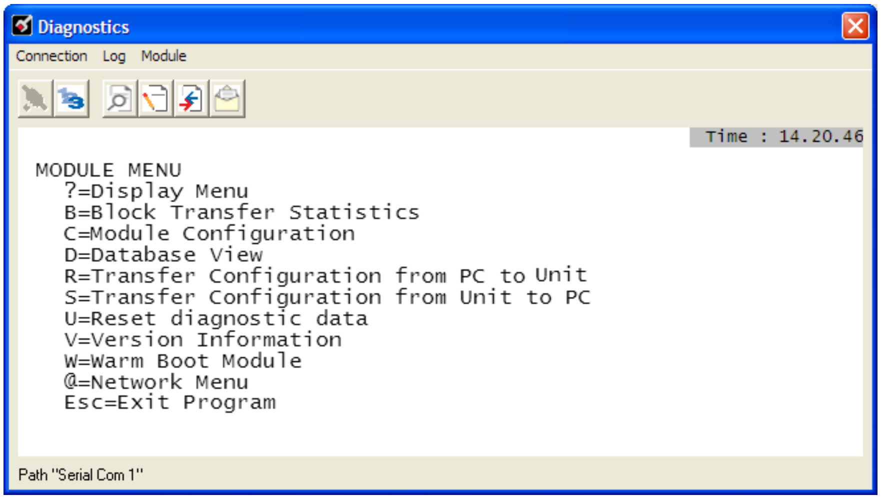


2 On the shortcut menu, choose **DIAGNOSTICS.**



This action opens the **DIAGNOSTICS** dialog box.

3 Press **[?]** to open the Main Menu.



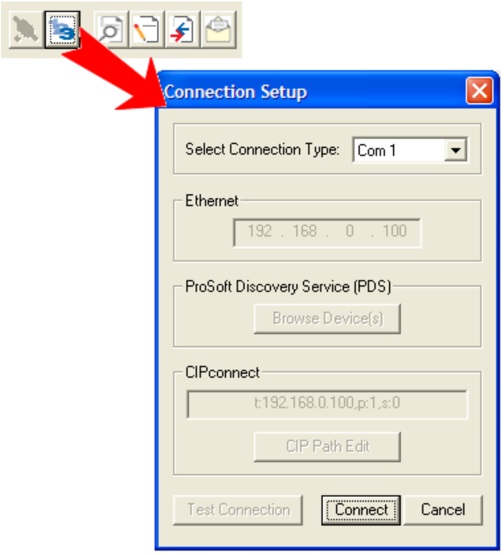
```
                                                      Time : 14.20.46

 MODULE MENU
   ?=Display Menu
   B=Block Transfer Statistics
   C=Module Configuration
   D=Database View
   R=Transfer Configuration from PC to Unit
   S=Transfer Configuration from Unit to PC
   U=Reset diagnostic data
   V=Version Information
   W=Warm Boot Module
   @=Network Menu
   Esc=Exit Program
```

Path "Serial Com 1"

Important: The illustrations of configuration/debug menus in this section are intended as a general guide, and may not exactly match the configuration/debug menus in your own module.

If there is no response from the module, follow these steps:

1 Click to configure the connection. On the Connection Setup dialog box, select a valid com port or other connection type supported by the module.



Select Connection Type: Com 1

Ethernet: 192 . 168 . 0 . 100

ProSoft Discovery Service (PDS)

CIPconnect: t:192.168.0.100,p:1,s:0

2 Verify that the null modem cable is connected properly between your computer's serial port and the module. A regular serial cable will not work.

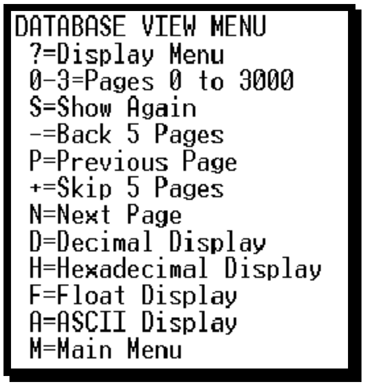
3 On computers with more than one serial port, verify that your communication program is connected to the same port that is connected to the module.

4 If you are still not able to establish a connection, contact ProSoft Technology for assistance.

5.3 Verify Communication Between the Processor and the Module

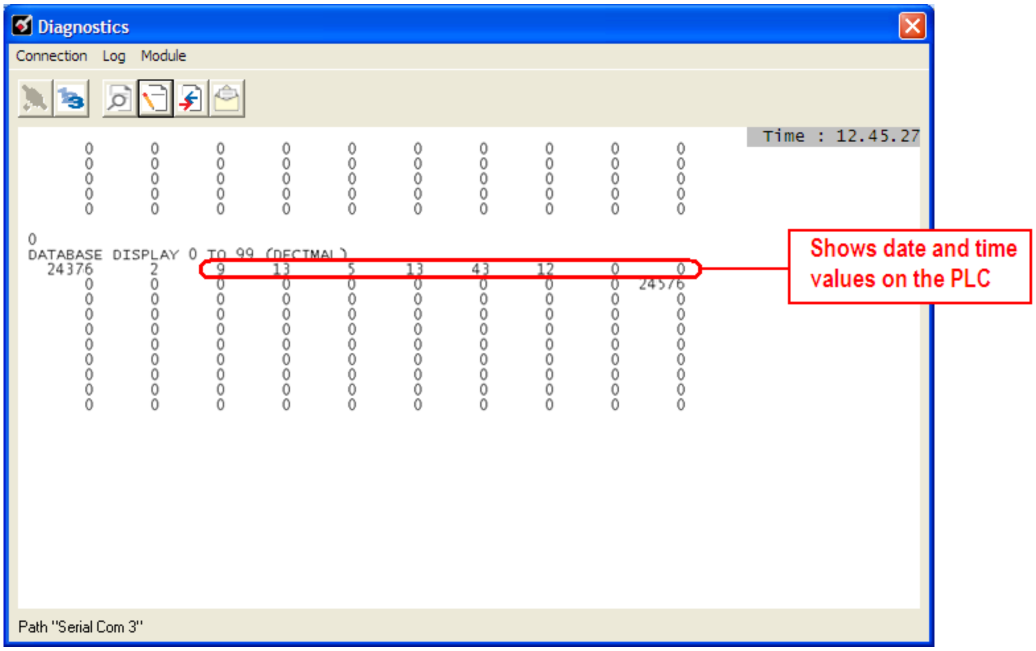
This procedure will verify that the clock values we entered in the processor's data memory (page 22) can be read into the ProTalk module.

1 From the **CONFIGURATION/DEBUG MENU,** type **[D],** then press **[?].** This action opens the **DATABASE VIEW MENU.**



```
DATABASE VIEW MENU
 ?=Display Menu
 0-3=Pages 0 to 3000
 S=Show Again
 -=Back 5 Pages
 P=Previous Page
 +=Skip 5 Pages
 N=Next Page
 D=Decimal Display
 H=Hexadecimal Display
 F=Float Display
 A=ASCII Display
 M=Main Menu
```

2 Type **[0]** (zero). This displays values present in the ProTalk database for 0 to 99.



```
                                                                  Time : 12.45.27
      0      0      0      0      0      0      0      0      0      0
      0      0      0      0      0      0      0      0      0      0
      0      0      0      0      0      0      0      0      0      0
      0      0      0      0      0      0      0      0      0      0
      0      0      0      0      0      0      0      0      0      0

0
DATABASE DISPLAY 0 TO 99 (DECIMAL)
  24376      2      9     13      5     13     43     12      0      0
      0      0      0      0      0      0      0      0      0  24576
      0      0      0      0      0      0      0      0      0      0
      0      0      0      0      0      0      0      0      0      0
      0      0      0      0      0      0      0      0      0      0
      0      0      0      0      0      0      0      0      0      0
      0      0      0      0      0      0      0      0      0      0
      0      0      0      0      0      0      0      0      0      0
      0      0      0      0      0      0      0      0      0      0
      0      0      0      0      0      0      0      0      0      0
```

Shows date and time values on the PLC

Value	Description
9	Month (September)
13	Day of the Month
5	Year (2005)
13	Hour (13:00 or 1:00 P.M.)
43	Minutes
12	Seconds

In this example, the register values read from the PLC indicate that the date and time returned is September, 13, 2005, 1:43:12 p.m.

3 Type **[0]** again. The values should be different from those shown in the previous view. For example, the minute and second values should be incrementing just as the values on the PLC are also incrementing.

At this point, you have successfully:

- Installed and set up the ProTalk module
- Verified Data Read access between the processor and the ProTalk module

You are now ready to proceed with implementation of your application.

6 Module Configuration

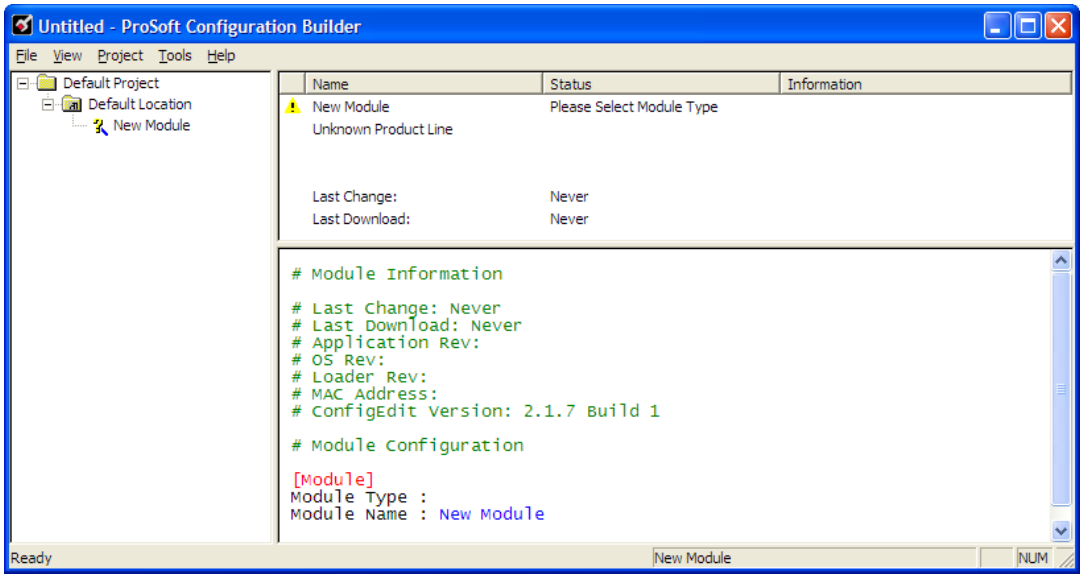
In This Chapter

6.1 Using ProSoft Configuration Builder

ProSoft Configuration Builder (PCB) provides a quick and easy way to manage module configuration files customized to meet your application needs. *PCB* is not only a powerful solution for new configuration files, but also allows you to import information from previously installed (known working) configurations to new projects.

6.1.1 Set Up the Project

To begin, start ProSoft Configuration Builder. If you have used other Windows configuration tools before, you will find the screen layout familiar. ProSoft Configuration Builder's window consists of a tree view on the left, an information pane and a configuration pane on the right side of the window. When you first start ProSoft Configuration Builder, the tree view consists of folders for Default Project and Default Location, with a Default Module in the Default Location folder. The following illustration shows the ProSoft Configuration Builder window with a new project.



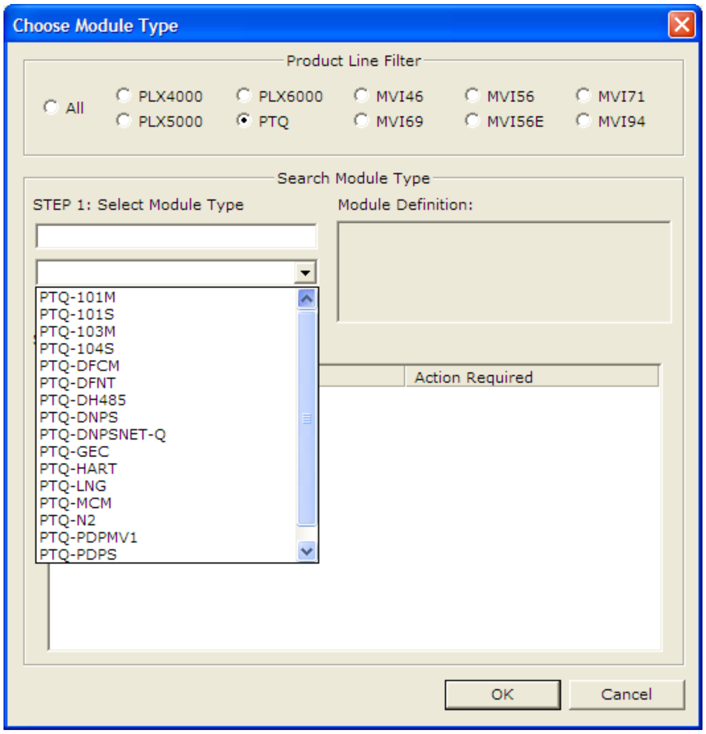
Name	Status	Information
New Module	Please Select Module Type	
Unknown Product Line		
Last Change:	Never	
Last Download:	Never	

```
# Module Information

# Last Change: Never
# Last Download: Never
# Application Rev:
# OS Rev:
# Loader Rev:
# MAC Address:
# ConfigEdit Version: 2.1.7 Build 1

# Module Configuration

[Module]
Module Type :
Module Name : New Module
```

Your first task is to add the PTQ-101S module to the project.

1 Use the mouse to select **DEFAULT MODULE** in the tree view, and then click the right mouse button to open a shortcut menu.

2 On the shortcut menu, choose **CHOOSE MODULE TYPE**. This action opens the **CHOOSE MODULE TYPE** dialog box.

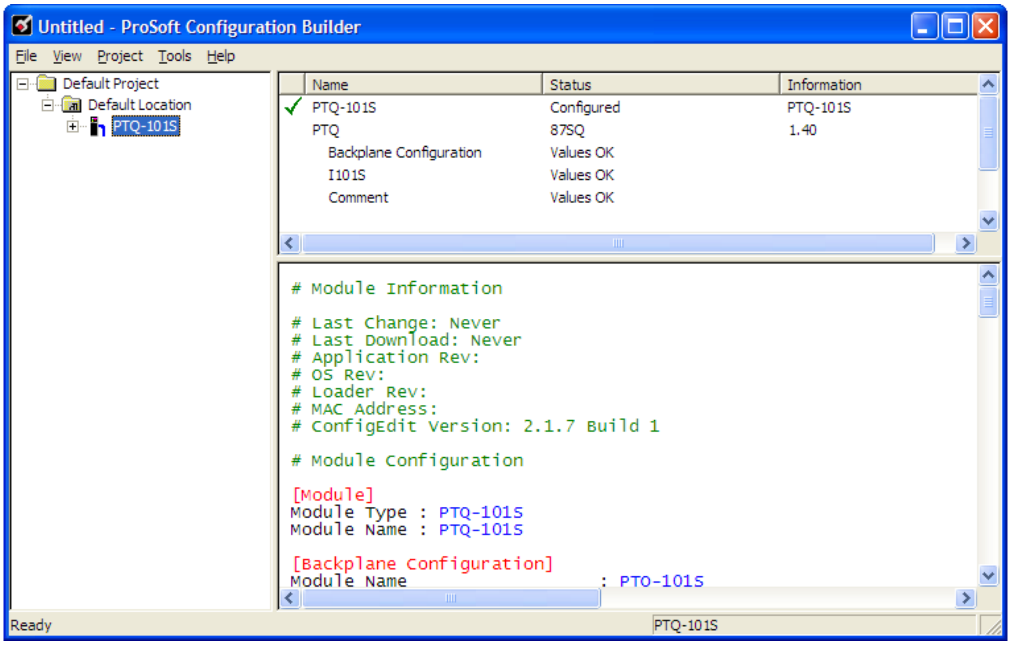


3 In the **PRODUCT LINE FILTER** area of the dialog box, select **PTQ.** In the **SELECT MODULE TYPE** dropdown list, select PTQ-101S, and then click **OK** to save your settings and return to the **PROSOFT CONFIGURATION BUILDER** window.

The next task is to set the module parameters.

6.1.2 Set Module Parameters

The next task is to configure module parameters. Notice that the contents of the information pane and the configuration pane changed when you added the PTQ-101S module to the project.


Untitled - ProSoft Configuration Builder
File View Project Tools Help
Ready

- Default Project
  - Default Location
    - PTQ-101S

	Name	Status	Information
✓	PTQ-101S	Configured	PTQ-101S
	PTQ	87SQ	1.40
	Backplane Configuration	Values OK	
	I101S	Values OK	
	Comment	Values OK	

```
# Module Information

# Last Change: Never
# Last Download: Never
# Application Rev:
# OS Rev:
# Loader Rev:
# MAC Address:
# ConfigEdit Version: 2.1.7 Build 1

# Module Configuration

[Module]
Module Type : PTQ-101S
Module Name : PTQ-101S

[Backplane Configuration]
Module Name                     : PTQ-101S
```

PTQ-101S

At this time, you may wish to rename the "Default Project" and "Default Location" folders in the tree view.

<u>*To rename an object:*</u>

1 Select the object, and then click the right mouse button to open a shortcut menu. From the shortcut menu, choose **RENAME.**
2 Type the name to assign to the object.
3 Click away from the object to save the new name.

To Configure module Parameters

1 Click on the plus sign next to the icon to expand module information.
2 Double-click the icon to open the **EDIT** dialog box.
3 To edit a parameter, select the parameter in the left pane and make your changes in the right pane.
4 Click **OK** to save your changes.

Printing a Configuration File

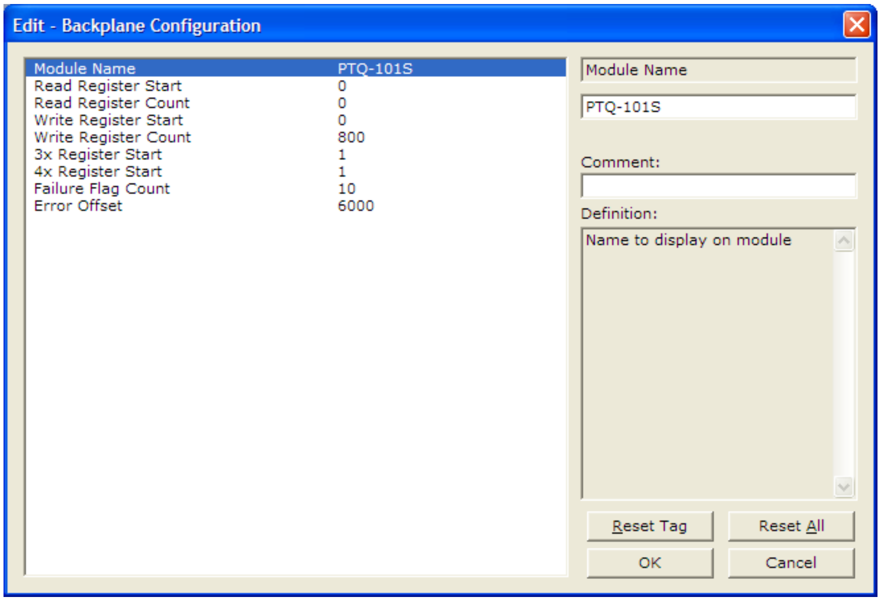
1 Select the **MODULE** icon, and then click the right mouse button to open a shortcut menu.
2 On the shortcut menu, choose **VIEW CONFIGURATION.** This action opens the **VIEW CONFIGURATION** window.

3 On the **VIEW CONFIGURATION** window, open the **FILE** menu, and choose **PRINT.** This action opens the **PRINT** dialog box.

4 On the **PRINT** dialog box, choose the printer to use from the dropdown list, select printing options, and then click **OK.**

6.2 [Backplane Configuration]

This section designates database addresses for input and output on the module and on the processor, and identifies the method of failure for the communications for the module if the processor is not in run mode.



Edit - Backplane Configuration

Module Name	PTQ-101S
Read Register Start	0
Read Register Count	0
Write Register Start	0
Write Register Count	800
3x Register Start	1
4x Register Start	1
Failure Flag Count	10
Error Offset	6000

Module Name

PTQ-101S

Comment:

Definition:

Name to display on module

6.2.1 Module Name

0 to 80 characters

This parameter assigns a name to the module that can be viewed using the configuration/debug port. Use this parameter to identify the module and the configuration file.

6.2.2 Read Register Start

0 to 4999

This parameter specifies the starting register in the module where data will be transferred from the module to the processor. Valid range for this parameter is 0 to 4999.

6.2.3 Read Register Count

0 to 4000

The Read Register Count parameter defines the size of the module's input database, up to a maximum value of 4000 words.

6.2.4 Write Register Start

0 to 4999

This parameter specifies the starting register in the module where the data will be transferred from the processor to the module. Valid range for this parameter is 0 to 4999.

6.2.5 Write Register Count

Range 0 to 4000

This parameter specifies the number of registers to transfer from the processor to the module. Valid entry for this parameter is 0 to 4000.

6.2.6 3x Register Start

1 to n

The 3x Register Start parameter defines the starting address in the processor's 3x (Quantum) or %iw (Unity) memory area to use for data being moved from the module. Take care to use a starting address that will accommodate the entire block from the module, but that will not overwrite data that is used for other purposes.

6.2.7 4x Register Start

1 to n

The 4x Register Start parameter defines the starting address in the processor's 4x (Quantum) or %iw (Unity) memory area to use for data being moved from the processor to the module. Take care to use a starting address that does not contain data in the processor's registers that is used for other purposes.

6.2.8 Failure Flag Count

0 through 65535

This parameter specifies the number of successive transfer errors that must occur before halting communication on the application port(s). If the parameter is set to 0, the application port(s) will continue to operate under all conditions. If the value is set larger than 0 (1 to 65535), communications will cease if the specified number of failures occur.

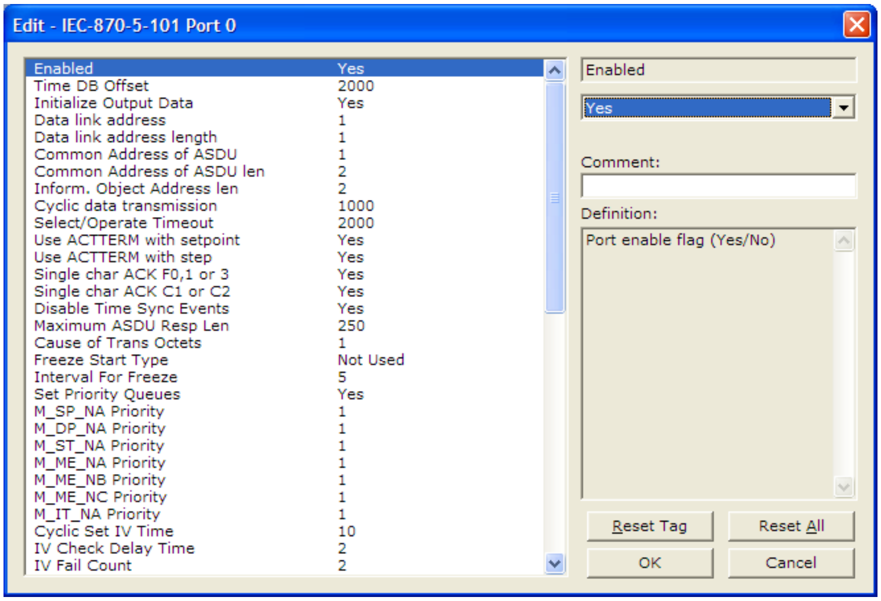
6.2.9 *Error Offset*

0 to 8899, -1 to disable

This parameter specifies the register location in the module's database where module status data will be stored. If a value less than 0 is entered, the data will not be stored in the database. If the value specified is in the range of 0 to 8966, the data will be placed in the modules database.

6.3 [IEC-870-5-101 Port 0]

This section provides information required to configure a slave application with the module.



Enabled	Yes
Time DB Offset	2000
Initialize Output Data	Yes
Data link address	1
Data link address length	1
Common Address of ASDU	1
Common Address of ASDU len	2
Inform. Object Address len	2
Cyclic data transmission	1000
Select/Operate Timeout	2000
Use ACTTERM with setpoint	Yes
Use ACTTERM with step	Yes
Single char ACK F0,1 or 3	Yes
Single char ACK C1 or C2	Yes
Disable Time Sync Events	Yes
Maximum ASDU Resp Len	250
Cause of Trans Octets	1
Freeze Start Type	Not Used
Interval For Freeze	5
Set Priority Queues	Yes
M_SP_NA Priority	1
M_DP_NA Priority	1
M_ST_NA Priority	1
M_ME_NA Priority	1
M_ME_NB Priority	1
M_ME_NC Priority	1
M_IT_NA Priority	1
Cyclic Set IV Time	10
IV Check Delay Time	2
IV Fail Count	2

Enabled

Yes

Comment:

Definition:

Port enable flag (Yes/No)

6.3.1 *Enabled*

Yes or No

This flag specifies if the port on the module will be utilized. If the parameter is set to No, the port will not be used. If the parameter is set to Yes, the port will be used supporting the 101S protocol.

6.3.2 *Time DB Offset*

g-1 or 0 to 3994

This parameter defines the location in the database where the time maintained for the IEC protocol is copied. This time is updated whenever a time synchronization command is received from the host and continually as the program runs. If the parameter is set to -1, the time will not be placed in the database.

6.3.3 Initialize Output Data

Yes or No

This parameter determines if the output data for the module should be initialized with values from the processor. If the value is set to No (0), the output data will be initialized to 0. If the value is set to Yes (1), the data will be initialized with data from the processor. Use of this option requires associated ladder logic to pass the data from the processor to the module.

6.3.4 Data link address

0 to 65535

This parameter defines the data link address for the device emulated on the module. This address identifies the module on the network along with the common address of ASDU.

6.3.5 Data Link address Length

0, 1 or 2

This parameter sets the number of octets used to define the data link address for the session. A value of 0 is only permitted when balanced mode is used.

6.3.6 Common Address of ASDU

0 to 65535

This parameter specifies the common address of the ASDU (section address) for access to data in the module. There is only one value entered for access to all data in the module.

6.3.7 Common address of ASDU Len

1 or 2

This parameter specifies the number of octets used for the common address of ASDU. This parameter must be set the same for all devices on the network.

6.3.8 Inform. Object address Len

1, 2 or 3

This parameter sets the number of octets used to specify the address for an information object in each sector for this session.

6.3.9 Cyclic Data Transmission

0 to 2^32

This parameter defines the number of milliseconds between cyclic updates. The range of values for this parameter permit update times of 1 millisecond to 49.7 days. If the parameter is set to 0, cyclic data reporting will be disabled.

6.3.10 Select/Operate Timeout

0 to 2^32

This parameter sets the number of milliseconds after a select command is received in which to wait for a valid execute command. The range of values for this parameter permits times of 1 millisecond to 49.7 days. If the parameter is set to 0, the feature will be disabled.

6.3.11 Use ACTTERM with Setpoint

Yes or No

This parameter determines if an ACTTERM will be sent. If the parameter is set to Yes, then setpoint commands will issue an ACTTERM when the command is complete. If the parameter is set to No, ACTCON is the last response to a setpoint command.

6.3.12 Use ACTTERM with step

Yes or No

This parameter determines if an ACTTERM will be sent. If the parameter is set to Yes, then step commands will issue an ACTTERM when the command is complete. If the parameter is set to No, ACTCON is the last response to a step command.

6.3.13 Single Char ACK F0, 1 or 3

Yes or No

If set to Y, a single character ACK (0xE5) will be sent instead of a fixed length ACK (secondary function code 0) in response to a primary link function code 0, 1 or 3 if there is no access demand for class 1 data (ACD=1). If set to N, the fixed length ACK will be sent.

6.3.14 Single char ACK C1 or C2

Yes or No

If set to Yes, a single character ACK (0xE5) will be sent instead of a fixed length NACK (secondary function code 9) when no response user data is available. If set to No, the fixed length NACK will be sent.

6.3.15 Disable Time Sync Events

Yes or No

If this parameter is set to Y, then the spontaneous time sync event messages are generated to indicate the change of hour. This feature can be used when the master receives the event timestamp with only minutes and milliseconds information for each event message (CP24 time type). If the parameter is set to N, the spontaneous time sync events will be generated.

6.3.16 Maximum ASDU Resp Len

25 to 252

Sets the maximum ASDU response message length (usually 252).

6.3.17 Cause of Trans Octets

1 or 2

Specifies the number of COT octets (1 or 2)

6.3.18 Freeze Start Type

D=Day, H=Hour, M=Minute, N=Not used

The Freeze Start Type parameter defines when the module starts sending the M_IT messages.

6.3.19 Interval for Freeze

0 to 65535

Freeze Start Type and Interval for Freeze are used if Mode A operation is to be used for the counter freeze operation. If they are not used, the module will operate in Mode D.

6.3.20 Set Priority Queues

0 or 1

Specifies whether the priority queue will be used. If set to 1, the priority queue will be used. If set to 0, each ASDU's events are stored in their own queue.

6.3.21 Cyclic Set IV Time

Minimum 3 times larger than IV Check Delay Time parameter

0 to disable

The Cyclic Set IV Time parameter determines how frequently the IV Checks will be performed. If the IV bit is ON for a number of times given by the IV Fail Count (page 61) parameter, the module will consider the point as invalid.

If the IV Fail Count parameter is zero, the feature will be disabled.

For more information on using this feature, refer to Using Monitor Points (page 119).

6.3.22 IV Check Delay Time

Value in Seconds

This feature allows the application to set the invalid (IV) quality bit of the protocol for all the monitored ASDU types supported. The Cyclic Set IV Time parameter must be at least 3 times larger than the IV Check Delay Time.

6.3.23 IV Fail Count

0 to disable

This feature allows the application to set the invalid (IV) quality bit of the protocol for all the monitored ASDU types supported. If you enable this feature, the processor can determine the individual IV quality bit status of each point you configured.

To disable this feature, set the IV Fail Count parameter to 0. If used, the Cyclic Set IV Time parameter must be at least 3 times larger than the IV Check Delay Time.

6.3.24 Event Scan Delay

1 to 65535

0 to disable

If set to 0, the feature will be disabled and the module will not generate any events. If set from 1 to 65535, the parameter represents the number of milliseconds between event scanning. This parameter defines how often the program will scan for new events in the databases.

6.3.25 Scan Events

Scan for Events

No Scanning

Defines whether events of this point type will be generated by the module. If "No Scanning", then events will not be generated. If "Scan for events", events will be scanned and generated on change.

6.3.26 Time Type

None, CP24 or CP56

This parameter defines the time format used with data events. 0=None, 1=CP24 and 2=CP56 time formats.

6.3.27 Use Balanced Mode

Yes or No

This parameter specifies if the port will use balanced mode. If balanced mode is used, only one controlled station will be permitted on the port. If unbalanced mode is used, multiple controlled stations can be used on a port. Select Yes to use balanced mode and No to use unbalanced mode.

6.3.28 Retry Count

0 to 255

In balanced mode, this parameter specifies the number of retries if a response is not received. In unbalanced mode, this parameter is ignored.

6.3.29 Response Timeout

0 to 65535

This parameter specifies the minimum number of milliseconds to wait for a response to a primary message. Do not set this parameter too small or timeout conditions may prevent successful data transmission. If the timeout is recognized, the message will be retransmitted up to the number of times specified in the Retry Count parameter. This parameter is only used in balance mode.

6.3.30 Baud Rate

This parameter specifies the baud rate to be used on the communication channel (port). Values from 110 to 38.4K are permitted.

6.3.31 Parity

NONE, ODD, EVEN

Parity is a simple error checking algorithm used in serial communication. This parameter specifies the type of parity checking to use.

All devices communicating through this port must use the same parity setting.

6.3.32 RTS On

0 to 65535 milliseconds

This parameter sets the number of milliseconds to delay after Ready To Send (RTS) is asserted before data will be transmitted.

6.3.33 RTS Off

0 to 65535 milliseconds

This parameter sets the number of milliseconds to delay after the last byte of data is sent before the RTS modem signal will be set low.

6.3.34 Minimum Delay

1 to 65535

This parameter specifies the minimum number of milliseconds to delay before sending the message (setting RTS high). This can be used when the serial network requires time for units to turn off their transmitters.

6.3.35 Receive Timeout

1 to 65535

This value represents the number of milliseconds to wait on a port from the time the first character is received until the last character in the longest message received on the port. This parameter should be set dependent on the baud rate. A value of 2000 should work with most applications.

6.3.36 Hardware Handshaking

None, RTS/CTS, DTR/DSR, Modem

Selects the hardware handshaking type. Typically RTS/CTS, DTR/DSR and Modem options are used for modems. RTS/CTS and DTR/DSR are normally used for leased modems. Modem can be used also for dial-up modems. When the messages must go out if the modem is not connected, the module will assert the DTR line which will cause the modem to dial the number in the modem's configuration. The module does not have the functionality to dial the number to be called for the modem. The module reconnects after 30 seconds of inactivity.

6.3.37 Backup Port Enabled

Yes or No

This parameter enables or disables the backup port (Port 2).

6.3.38 Backup Port Baud Rate

This parameter specifies the baud rate to be used on the communication channel (port). Values from 110 to 38.4K are permitted.

6.3.39 Backup Port Parity

NONE, ODD, EVEN

Parity is a simple error checking algorithm used in serial communication. This parameter specifies the type of parity checking to use.

All devices communicating through this port must use the same parity setting.

6.3.40 Backup Port RTS On

0 to 65535 milliseconds

This parameter sets the number of milliseconds to delay after Ready To Send (RTS) is asserted before data will be transmitted.

6.3.41 Backup Port RTS Off

0 to 65535 milliseconds

This parameter sets the number of milliseconds to delay after the last byte of data is sent before the RTS modem signal will be set low.

6.3.42 Backup Port Min Delay

1 to 65535

This parameter specifies the minimum number of milliseconds to delay before sending the message (setting RTS high). This can be used when the serial network requires time for units to turn off their transmitters.

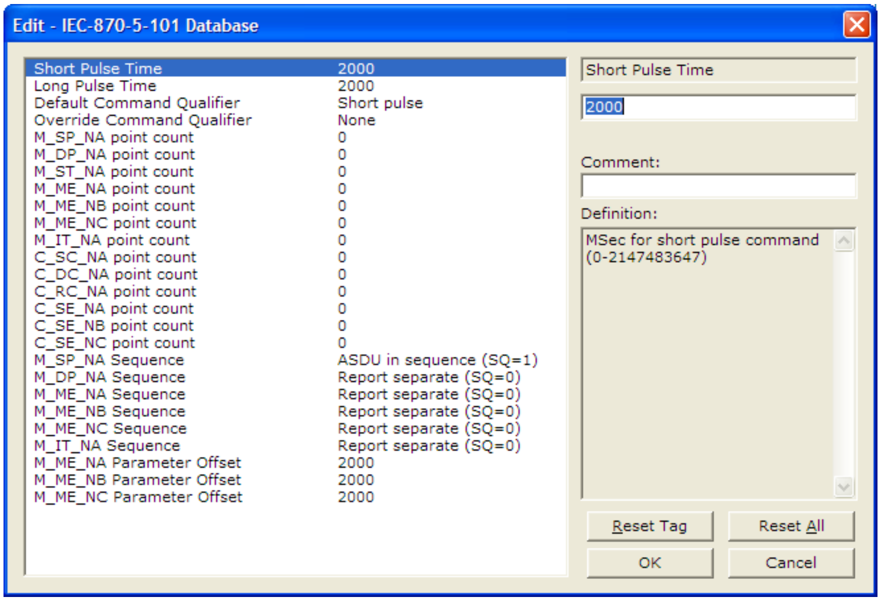
6.3.43 Backup Port Handshaking

None, RTS/CTS, DTR/DSR, Modem

Selects the hardware handshaking type. Typically RTS/CTS, DTR/DSR and Modem options are used for modems. RTS/CTS and DTR/DSR are normally used for leased modems. Modem can be used also for dial-up modems. When the messages must go out if the modem is not connected, the module will assert the DTR line which will cause the modem to dial the number in the modem’s configuration. The module does not have the functionality to dial the number to be called for the modem. The module reconnects after 30 seconds of inactivity.

6.4 [IEC-870-5-101 Database]

This section configures the IEC-870-5-101 Database.



Short Pulse Time	2000
Long Pulse Time	2000
Default Command Qualifier	Short pulse
Override Command Qualifier	None
M_SP_NA point count	0
M_DP_NA point count	0
M_ST_NA point count	0
M_ME_NA point count	0
M_ME_NB point count	0
M_ME_NC point count	0
M_IT_NA point count	0
C_SC_NA point count	0
C_DC_NA point count	0
C_RC_NA point count	0
C_SE_NA point count	0
C_SE_NB point count	0
C_SE_NC point count	0
M_SP_NA Sequence	ASDU in sequence (SQ=1)
M_DP_NA Sequence	Report separate (SQ=0)
M_ME_NA Sequence	Report separate (SQ=0)
M_ME_NB Sequence	Report separate (SQ=0)
M_ME_NC Sequence	Report separate (SQ=0)
M_IT_NA Sequence	Report separate (SQ=0)
M_ME_NA Parameter Offset	2000
M_ME_NB Parameter Offset	2000
M_ME_NC Parameter Offset	2000

Short Pulse Time

2000

Comment:

Definition:

MSec for short pulse command (0-2147483647)

6.4.1 Short Pulse Time

0 to 2^31-1

This parameter defines the number of milliseconds to be associated with a short pulse command. The valid range of numbers for this parameter are 0 to 2,147,483,647.

6.4.2 Long Pulse Time

0 to 2^31-1

This parameter defines the number of milliseconds to be associated with a long pulse command. The valid range of numbers for this parameter are 0 to 2,147,483,647.

6.4.3 Default Command Qualifier

S = short pulse

L = long pulse

P = persistent output

If the override is set to N, then the default command qualifier will be used when the qualifier for the command is set to 0.

6.4.4 Override Command Qualifier

N = No

S = short pulse

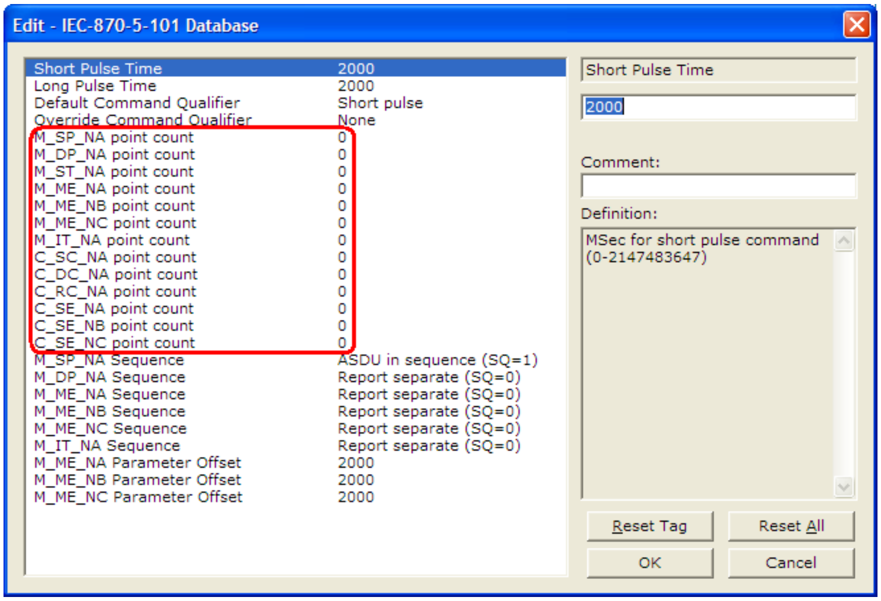
L = long pulse

P = persistent output

If the override value is set, it will always be used. For example, if it is set to a value (where value is P or S or L), all commands for the single and double points will be set to the state in the Override qualifier no matter what the qualifier is in the command.

6.4.5 Point Count

Point Count configuration ranges in the following configuration items are based on the assumption that you will be using only one of the available data types for your application. The number of point counts you configure will have an effect on module performance, in particular the accuracy of the module's internal clock.



Short Pulse Time	2000
Long Pulse Time	2000
Default Command Qualifier	Short pulse
Override Command Qualifier	None
M_SP_NA point count	0
M_DP_NA point count	0
M_ST_NA point count	0
M_ME_NA point count	0
M_ME_NB point count	0
M_ME_NC point count	0
M_IT_NA point count	0
C_SC_NA point count	0
C_DC_NA point count	0
C_RC_NA point count	0
C_SE_NA point count	0
C_SE_NB point count	0
C_SE_NC point count	0
M_SP_NA Sequence	ASDU in sequence (SQ=1)
M_DP_NA Sequence	Report separate (SQ=0)
M_ME_NA Sequence	Report separate (SQ=0)
M_ME_NB Sequence	Report separate (SQ=0)
M_ME_NC Sequence	Report separate (SQ=0)
M_IT_NA Sequence	Report separate (SQ=0)
M_ME_NA Parameter Offset	2000
M_ME_NB Parameter Offset	2000
M_ME_NC Parameter Offset	2000

Short Pulse Time

2000

Comment:

Definition:

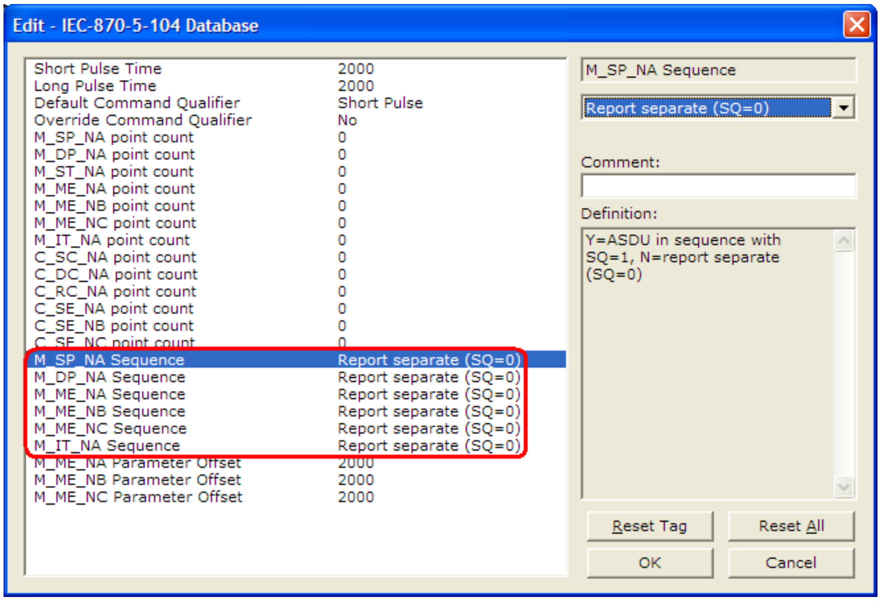
MSec for short pulse command (0-2147483647)

- **M_SP_NA point count:** This parameter specifies the number of point values assigned in monitored single-point database. Range is 0 to 1000.
- **M_DP_NA point count:** This parameter specifies the number of point values assigned in monitored dual-point database. Range is 0 to 1000.
- **M_ST_NA point count:** This parameter specifies the number of point values assigned in monitored step-point database. Range is 0 to 1000.
- **M_ME_NA point count:** This parameter specifies the number of point values assigned in monitored normalized-point database. Range is 0 to 1000.

- **M_ME_NB point count:** This parameter specifies the number of point values assigned in monitored scaled-point database. Range is 0 to 1000.
- **M_ME_NC point count:** This parameter specifies the number of point values assigned in monitored scaled short-float point database. Range is 0 to 50.
- **M_IT_NA point count:** This parameter specifies the number of point values assigned in monitored counter-point database. Range is 0 to 99.
- **C_SC_NA point count:** This parameter specifies the number of point values assigned in command single-point database. Range is 0 to 1000.
- **C_DC_NA point count:** This parameter specifies the number of point values assigned in command dual-point database. Range is 0 to 1000.
- **C_RC_NA point count:** This parameter specifies the number of point values assigned in command step-point database. Range is 0 to 1000.
- **C_SE_NA point count:** This parameter specifies the number of point values assigned in command normalized-point database. Range is 0 to 1000.
- **C_SE_NB point count:** This parameter specifies the number of point values assigned in command scaled-point database. Range is 0 to 1000.
- **C_SE_NC point count:** This parameter specifies the number of point values assigned in command short-float point database. Range is 0 to 50.

6.4.6 Sequence Flag

In order to save bandwidth, you can configure the module to use the Sequence Flag feature. If this feature is not selected, the module will send the object address and its value at every monitored response to the master.



Edit - IEC-870-5-104 Database

Short Pulse Time	2000
Long Pulse Time	2000
Default Command Qualifier	Short Pulse
Override Command Qualifier	No
M_SP_NA point count	0
M_DP_NA point count	0
M_ST_NA point count	0
M_ME_NA point count	0
M_ME_NB point count	0
M_ME_NC point count	0
M_IT_NA point count	0
C_SC_NA point count	0
C_DC_NA point count	0
C_RC_NA point count	0
C_SE_NA point count	0
C_SE_NB point count	0
C_SE_NC point count	0
M_SP_NA Sequence	Report separate (SQ=0)
M_DP_NA Sequence	Report separate (SQ=0)
M_ME_NA Sequence	Report separate (SQ=0)
M_ME_NB Sequence	Report separate (SQ=0)
M_ME_NC Sequence	Report separate (SQ=0)
M_IT_NA Sequence	Report separate (SQ=0)
M_ME_NA Parameter Offset	2000
M_ME_NB Parameter Offset	2000
M_ME_NC Parameter Offset	2000

M_SP_NA Sequence

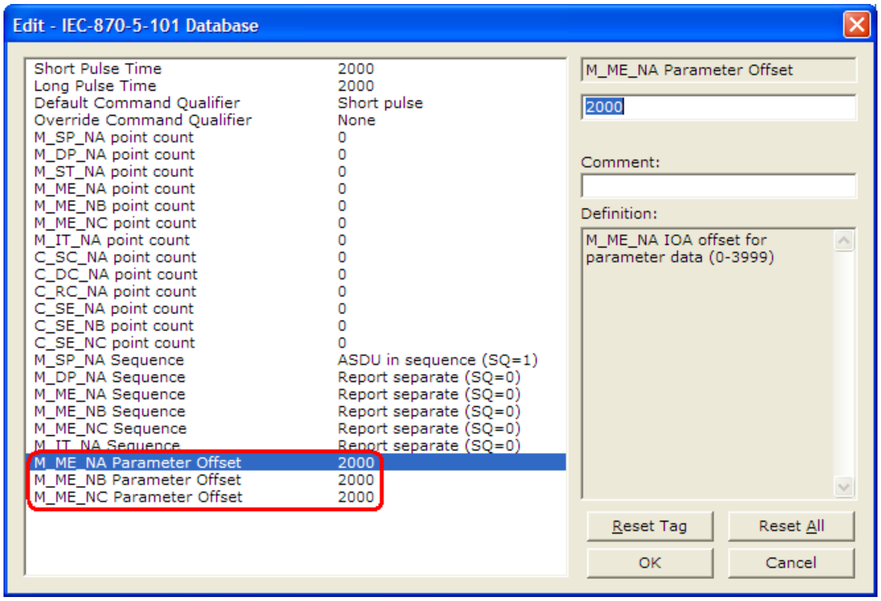
Report separate (SQ=0)

Comment:

Definition:
Y=ASDU in sequence with SQ=1, N=report separate (SQ=0)

If this parameter is selected, the module will turn the Sequence Flag on every monitored response sending the address for the first point along with all point values. The master assumes that all other points use information object addresses in a contiguous order (using the first point as the reference).

6.4.7 Parameter Offset



Short Pulse Time	2000
Long Pulse Time	2000
Default Command Qualifier	Short pulse
Override Command Qualifier	None
M_SP_NA point count	0
M_DP_NA point count	0
M_ST_NA point count	0
M_ME_NA point count	0
M_ME_NB point count	0
M_ME_NC point count	0
M_IT_NA point count	0
C_SC_NA point count	0
C_DC_NA point count	0
C_RC_NA point count	0
C_SE_NA point count	0
C_SE_NB point count	0
C_SE_NC point count	0
M_SP_NA Sequence	ASDU in sequence (SQ=1)
M_DP_NA Sequence	Report separate (SQ=0)
M_ME_NA Sequence	Report separate (SQ=0)
M_ME_NB Sequence	Report separate (SQ=0)
M_ME_NC Sequence	Report separate (SQ=0)
M_IT_NA Sequence	Report separate (SQ=0)
M_ME_NA Parameter Offset	2000
M_ME_NB Parameter Offset	2000
M_ME_NC Parameter Offset	2000

M_ME_NA Parameter Offset

2000

Comment:

Definition:

M_ME_NA IOA offset for parameter data (0-3999)

This parameter specifies the IOa offset to the parameter data for the normalized parameter data. The value entered is added to the Information Object address for the associated point to compute the parameter IOa address.

The Master may send a "Parameter of Measured Normalized" or "Parameter of Measured Scaled" command using the parameter IOa in order to change the deadband values for specific points.

Note: The Low Limit and High Limit values are always calculated based on the deadband value as described in the following table.

Point	Value
Threshold	Determined by the deadband set in the configuration file or altered by the write command.
Low	Last reported event value - threshold.
High	Last reported event value + threshold.

For example, if the PTQ-101S configuration sets two M_ME_Na points with IOa (Point #) of 600 and 601 and a M_ME_Na Parameter Offset value of 3000, it would result in the parameter points shown in the table.

6.5 [M_SP_NA_1]

This section defines the monitored single-point database for the slave device emulated. This information is sourced from the database and is transferred to the remote master unit. Each point in the database occupies 1 bit (1 = On, 0 = Off state).

This section takes the following parameters:

- Point #
- DB address
- Groups
- IV DB Bit

Each point is one bit and the DB address value corresponds to the bit offset in the database.

The Database address value should be located in a database area that is constantly being moved from the Quantum/Unity processor to the PTQ-101S module.

Refer to the Group Codes (page 156) section for a listing of Group Codes.

6.6 [M_DP_NA_1]

This section defines the monitored dual-point database for the slave device emulated. This information is sourced from the database and is transferred to the remote master unit. Each point in the database occupies two bits (00 = intermediate, 01 = off, 10 = on and 11 = intermediate).

This section takes the following parameters:

- Point #
- DB address
- Groups
- IV DB Bit

Each point is two bits and the DB address value corresponds to the bit offset in the database.

The Database address value should be located in a database area that is constantly being moved from the Quantum/Unity processor to the PTQ-101S module.

Refer to the Group Codes (page 156) section for a listing of Group Codes.

6.7 [M_ST_NA_1]

This section defines the monitored step database for the slave device emulated. This information is sourced from the database and is transferred to the remote master unit. Each point in the database occupies one byte.

This section takes the following parameters:

- Point #
- DB address
- Groups
- IV DB Bit

Each point is one byte and the DB address value corresponds to the byte offset in the database.

The Database address value should be located in a database area that is constantly being moved from the Quantum/Unity processor to the PTQ-101S module.

Refer to the Group Codes (page 156) section for a listing of Group Codes.

6.8 [M_ME_NA_1]

This section defines the monitored measured value, normalized database for the slave device emulated. This information is sourced from the database and is transferred to the remote master unit. Each point occupies a word position in the database. The IOa for the parameters are for each object and are determined by adding the Point # in the following section to the value of the M_ME_Na parameter offset parameter set in the previous section.

This section takes the following parameters:

- Point #
- DB address
- Groups
- Default Deadband
- IV DB Bit

Each point is one word and the DB address value corresponds to the word offset in the database.

The Database address value should be located in a database area that is constantly being moved from the Quantum/Unity processor to the PTQ-101S module.

Refer to the Group Codes (page 156) section for a listing of Group Codes.

6.9 [M_ME_NB_1]

This section defines the monitored measured value, scaled database for the slave device emulated. This information is sourced from the database and is transferred to the remote master unit. Each point occupies a word position in the database. The IOa for the parameters for each object are determined by adding the Point # in the following section to the value of the M_ME_NB parameter offset parameter set in the previous section.

This section takes the following parameters:

- Point #
- DB address
- Groups
- Default Deadband
- IV DB Bit

Each point is one word and the DB address value corresponds to the word offset in the database.

The Database address value should be located in a database area that is constantly being moved from the Quantum/Unity processor to the PTQ-101S module.

Refer to the Group Codes (page 156) section for a listing of Group Codes.

6.10 [M_ME_NC_1]

This section defines the monitored short-float point database for the slave device emulated. This information is sourced from the database and is transferred to the remote master unit. Each point occupies 4-byte positions in the database. The IOa for the parameters for each object are determined by adding the Point # in the following section to the value of the M_ME_NC Parameter Offset parameter set in the previous section.

This section takes the following parameters:

- Point #
- DB address
- Groups
- Default Deadband
- IV DB Bit

Each point is one word and the DB address value corresponds to the word offset in the database.

The Database address value should be located in a database area that is constantly being moved from the Quantum/Unity processor to the PTQ-101S module.

Refer to the Group Codes (page 156) section for a listing of Group Codes.

6.11 [M_IT_NA_1]

This section defines the monitored integrated totals (counter) database for the slave emulated. This information is sourced from the database and is transferred to the remote master unit. Each point occupies two words in the database (4 bytes).

This section takes the following parameters:

- Point #
- DB address
- Groups
- IV DB Bit

Each point is two words and the DB address value corresponds to the double-word offset in the database.

The Database address value should be located in a database area that is constantly being moved from the Quantum/Unity processor to the PTQ-101S module.

Refer to the Group Codes (page 156) section for a listing of Group Codes.

6.12 [C_SC_NA_1]

This section defines the single point command database for the slave emulated. This information is sourced from the remote master and is transferred to the database. Each point occupies a single bit position in the database. You can associate a command with a monitored single-point database value to coordinate the command/monitor operation. You must enter the correct Monitor Point # and Monitor DB address values in the table. If the Require Select parameter is not set to zero, a select command must be received before an execute command will be processed.

This section takes the following parameters:

- Point #
- DB address
- Monitor Point #
- Monitor DB addr
- Require Select

Each point is one bit and the DB address value corresponds to the bit offset in the database.

The database address should be located in a database area that is being constantly moved from the PTQ-101S to the Quantum/Unity processor.

6.13 [C_DC_NA_1]

This section defines the double point command database for the slave emulated. This information is sourced from the remote master and is transferred to the database. Each point occupies two bits in the database. You can associate a command with a monitored double point database value to coordinate the command/monitor operation. You must enter the correct Monitor Point # and Monitor DB addr values in the table. If the Require Select parameter is not set to zero, a select command must be received before an execute command will be processed.

This section takes the following parameters:

- Point #
- DB address
- Monitor Point #
- Monitor DB addr
- Require Select

Each point is two bits and the DB address value corresponds to the bit offset in the database.

The database address should be located in a database area that is being constantly moved from the PTQ-101S to the Quantum/Unity processor.

6.14 [C_RC_NA_1]

This section defines the step command database for the slave emulated. This information is sourced from the remote master and is transferred to the database. Each point occupies a byte in the database. The control value can be associated with a monitored point as described in the previous example.

This section takes the following parameters:

- Point #
- DB address
- Monitor Point #
- Monitor DB addr

Each point is one byte and the DB address value corresponds to the byte offset in the database.

The database address should be located in a database area that is being constantly moved from the PTQ-101S to the Quantum/Unity processor.

6.15 [C_SE_NA_1]

This section defines the normalized setpoint database for the slave emulated. This information is sourced from the remote master and is transferred to the database. Each point occupies a word position in the database. If the Require Select parameter is not set to zero, a select command must be received before an execute command will be processed.

This section takes the following parameters:

- Point #
- DB address
- Monitor Point #
- Monitor DB addr
- Require Select

Each point is one word and the DB address value corresponds to the word offset in the database.

The database address should be located in a database area that is being constantly moved from the PTQ-101S to the Quantum/Unity processor.

6.16 [C_SE_NB_1]

This section defines the scaled setpoint database for the slave emulated. This information is sourced from the remote master and is transferred to the database. If the Require Select parameter is not set to zero, a select command must be received before an execute command will be processed.

This section takes the following parameters:

- Point #
- DB address
- Monitor Point #
- Monitor DB addr
- Require Select

Each point is one word and the DB address value corresponds to the word offset in the database.

The database address should be located in a database area that is being constantly moved from the PTQ-101S to the Quantum/Unity processor.

6.17 [C_SE_NC_1]

This section defines the short-float setpoint database for the slave emulated. This information is sourced from the remote master and is transferred to the database. Each point occupies a double-word position in the database. If the Require Select parameter is not set to zero, a select command must be received before an execute command will be processed.

This section takes the following parameters:

- Point #
- DB address
- Monitor Point #
- Monitor DB addr
- Require Select

Each point is two words and the DB address value corresponds to the double-word offset in the database.

The database address should be located in a database area that is being constantly moved from the PTQ-101S to the Quantum/Unity processor.

Note:

Monitor Point # and Monitor DB Addr

You can also associate a monitor point with each command point. Therefore, every time the module responds to a command, it will include the monitor point with the information object address given by the Monitor Point # parameter. Its value will be copied from the database address location specified in the Monitor DB Address parameter.

Require Select

This parameter specifies if the point requires a "select" before an "Operation" command.

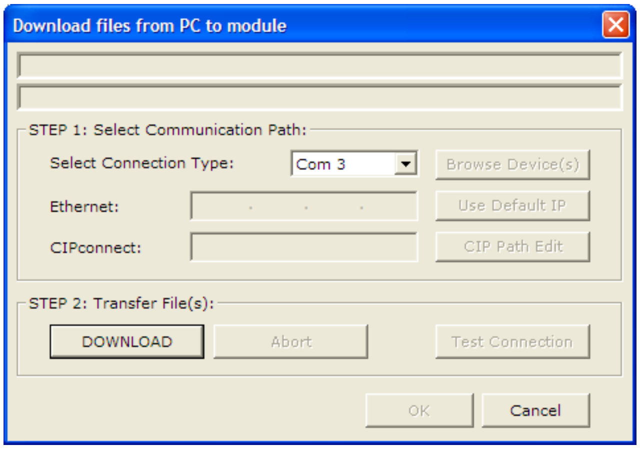
6.18 Download the Project to the Module

In order for the module to use the settings you configured, you must download (copy) the updated Project file from your PC to the module.

To Download the Project File

1 In the tree view in ProSoft Configuration Builder, click once to select the PTQ-101S module.

2 Open the **PROJECT** menu, and then choose **MODULE / DOWNLOAD.** The program will scan your PC for a valid com port (this may take a few seconds). When PCB has found a valid com port, the **DOWNLOAD** dialog box will open.



Download files from PC to module

STEP 1: Select Communication Path:

Select Connection Type: Com 3

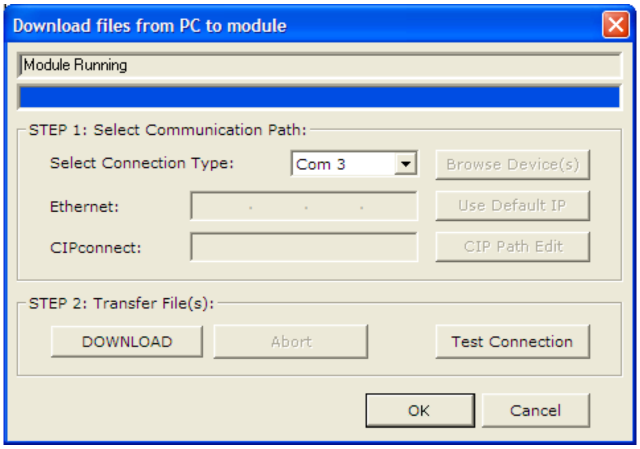
Ethernet:

CIPconnect:

STEP 2: Transfer File(s):

3 Choose the com port to use from the dropdown list, and then click the **DOWNLOAD** button.

The module will perform a platform check to read and load its new settings. When the platform check is complete, the status bar in the **DOWNLOAD** dialog box with the message *"Module Running*".



Download files from PC to module

Module Running

STEP 1: Select Communication Path:

Select Connection Type: Com 3

Ethernet:

CIPconnect:

STEP 2: Transfer File(s):

6.19 Writing to Compact Flash

Note: This command is only available for certain modules. For module types that do not support this feature, this command is disabled.

Use this command to write the module's boot-up files onto a compact flash card, using a compact flash card reader connected to your PC. This command creates all the necessary files for the module to boot up from the compact flash card.

This command launches a wizard that explains the purpose of the procedure, and then prompts you for a location to store the files. You can write the files directly to a compact flash card, or you can store the files in a folder and then copy or drag the files to a compact flash card later.

Tip: If you are configuring more than one module with the same parameters, or if you need to replace a module following a hardware failure, write the boot-up files to the compact flash card, and then replace the card in the module. Repeat this step to configure multiple modules.

7 Diagnostics and Troubleshooting

In This Chapter

The module provides information on diagnostics and troubleshooting in the following forms:

- Status data values are transferred from the module to the processor
- Data contained in the module can be viewed through the Configuration/Debug port attached to a terminal emulator
- LED status indicators on the front of the module provide information on the module's status

7.1 Error Status Table

The program maintains an error/status table that is transferred to the processor in each read block. You can use the error/status data to determine the "health" of the module. Refer to Error Codes (page 155) for data block structure.

7.1.1 Required Hardware

You can connect directly from your computer's serial port to the serial port on the module to view configuration information, perform maintenance, and send (upload) or receive (download) configuration files.

ProSoft Technology recommends the following minimum hardware to connect your computer to the module:

- 80486 based processor (Pentium preferred)
- 1 megabyte of memory
- At least one UART hardware-based serial communications port available. USB-based virtual UART systems (USB to serial port adapters) often do not function reliably, especially during binary file transfers, such as when uploading/downloading configuration files or module firmware upgrades.

7.1.2 The Configuration/Debug Menu

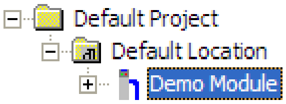
The Configuration and Debug menu for this module is arranged as a tree structure, with the Main Menu at the top of the tree, and one or more sub-menus for each menu command. The first menu you see when you connect to the module is the Main menu.

Because this is a text-based menu system, you enter commands by typing the command letter from your computer keyboard in the diagnostic window in ProSoft Configuration Builder (PCB). The module does not respond to mouse movements or clicks. The command executes as soon as you press the command letter — you do not need to press **[ENTER].** When you type a command letter, a new screen will be displayed in your terminal application.

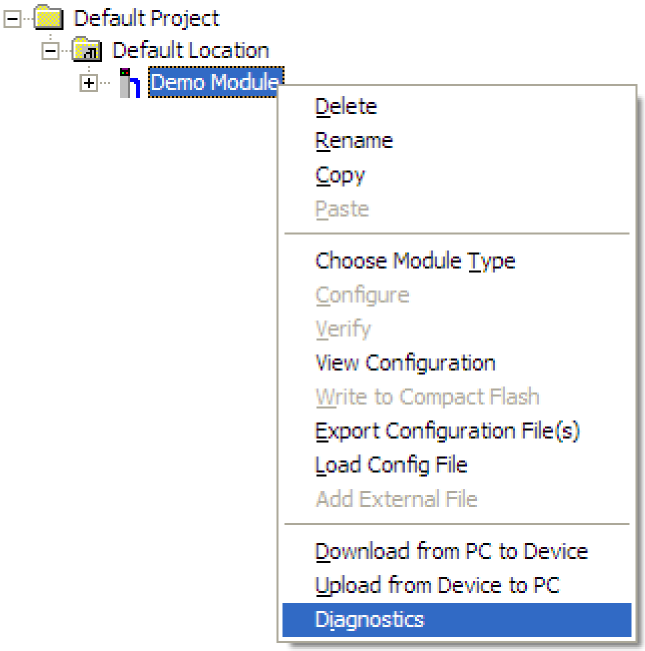
Using the Diagnostic Window in ProSoft Configuration Builder

To connect to the module's Configuration/Debug serial port,

1 Start PCB, and then select the module to test. Click the right mouse button to open a shortcut menu.

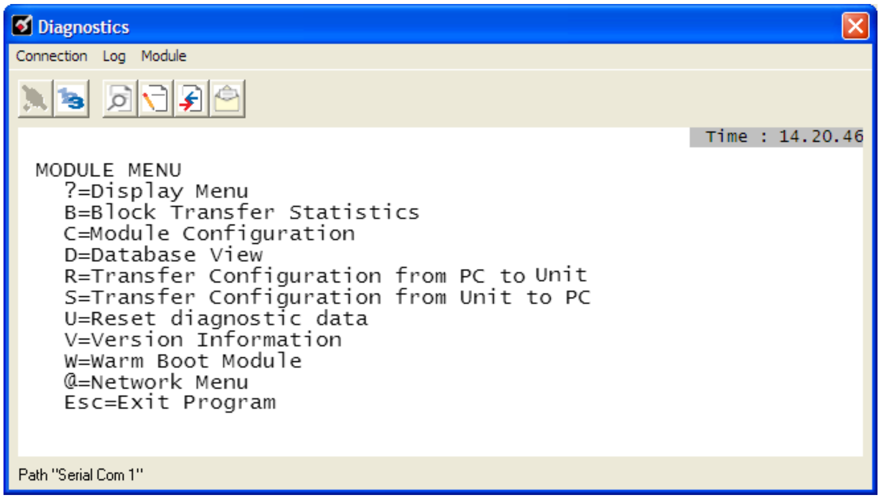


2 On the shortcut menu, choose **DIAGNOSTICS.**



This action opens the **DIAGNOSTICS** dialog box.

3 Press **[?]** to open the Main Menu.



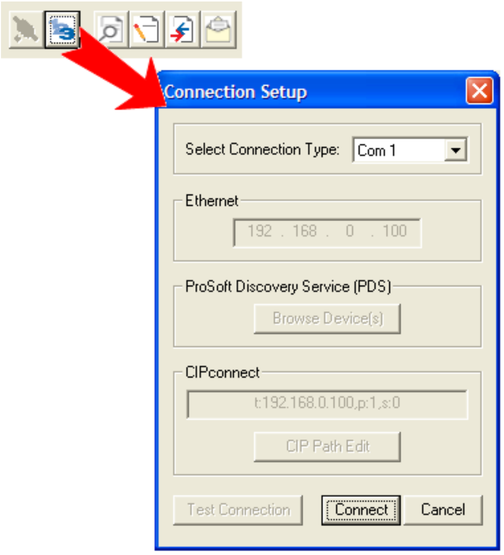
```
                                                     Time : 14.20.46
MODULE MENU
  ?=Display Menu
  B=Block Transfer Statistics
  C=Module Configuration
  D=Database View
  R=Transfer Configuration from PC to Unit
  S=Transfer Configuration from Unit to PC
  U=Reset diagnostic data
  V=Version Information
  W=Warm Boot Module
  @=Network Menu
  Esc=Exit Program
```

Path "Serial Com 1"

Important: The illustrations of configuration/debug menus in this section are intended as a general guide, and may not exactly match the configuration/debug menus in your own module.

If there is no response from the module, follow these steps:

1 Click to configure the connection. On the Connection Setup dialog box, select a valid com port or other connection type supported by the module.



2 Verify that the null modem cable is connected properly between your computer's serial port and the module. A regular serial cable will not work.

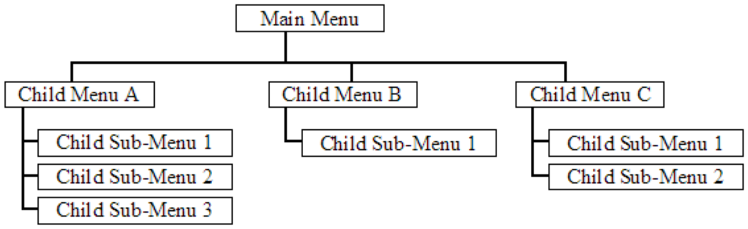
3 On computers with more than one serial port, verify that your communication program is connected to the same port that is connected to the module.

If you are still not able to establish a connection, contact ProSoft Technology for assistance.

Navigation

All of the sub-menus for this module contain commands to redisplay the menu or return to the previous menu. You can always return from a sub-menu to the next higher menu by pressing **[M]** on your keyboard.

The organization of the menu structure is represented in simplified form in the following illustration:



The remainder of this section shows you the menus available for this module, and briefly discusses the commands available to you.

Keystrokes

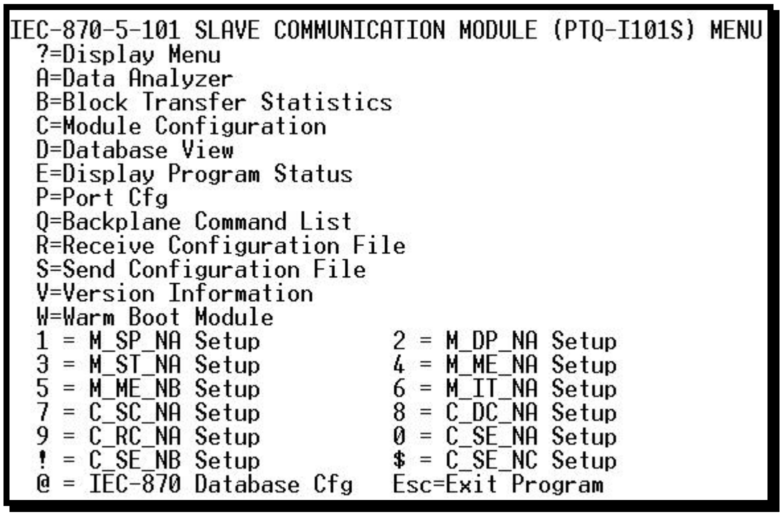
The keyboard commands on these menus are almost always non-case sensitive. You can enter most commands in lower case or capital letters.

The menus use a few special characters (**[?], [-], [+], [@]**) that must be entered exactly as shown. Some of these characters will require you to use the **[SHIFT], [CTRL]** or **[ALT]** keys to enter them correctly. For example, on US English keyboards, enter the **[?]** command as **[SHIFT][/].**

Also, take care to distinguish capital letter **[I]** from lower case letter **[L]** (L) and number **[1];** likewise for capital letter **[O]** and number **[0].** Although these characters look nearly the same on the screen, they perform different actions on the module.

7.1.3 Main Menu

When you first connect to the module from your computer, your terminal screen will be blank. To activate the main menu, press the **[?]** key on your computer's keyboard. If the module is connected properly, the following menu will appear.



```
IEC-870-5-101 SLAVE COMMUNICATION MODULE (PTQ-I101S) MENU
  ?=Display Menu
  A=Data Analyzer
  B=Block Transfer Statistics
  C=Module Configuration
  D=Database View
  E=Display Program Status
  P=Port Cfg
  Q=Backplane Command List
  R=Receive Configuration File
  S=Send Configuration File
  V=Version Information
  W=Warm Boot Module
  1 = M_SP_NA Setup          2 = M_DP_NA Setup
  3 = M_ST_NA Setup          4 = M_ME_NA Setup
  5 = M_ME_NB Setup          6 = M_IT_NA Setup
  7 = C_SC_NA Setup          8 = C_DC_NA Setup
  9 = C_RC_NA Setup          0 = C_SE_NA Setup
  ! = C_SE_NB Setup          $ = C_SE_NC Setup
  @ = IEC-870 Database Cfg   Esc=Exit Program
```

Caution: Some of the commands available to you from this menu are designed for advanced debugging and system testing only, and can cause the module to stop communicating with the processor or with other devices, resulting in potential data loss or other failures. Only use these commands if you are specifically directed to do so by ProSoft Technology Technical Support staff. Some of these command keys are not listed on the menu, but are active nevertheless. Please be careful when pressing keys so that you do not accidentally execute an unwanted command.

Opening the Data Analyzer Menu

Press **[A]** to open the Data Analyzer Menu. Use this command to view all bytes of data transferred on each port. Both the transmitted and received data bytes are displayed. Refer to Data Analyzer for more information about this menu.

Important: When in analyzer mode, program execution will slow down. Only use this tool during a troubleshooting session. Before disconnecting from the Config/Debug port, please press [S] to stop the data analyzer, and then press [M] to return to the main menu. This action will allow the module to resume its normal high speed operating mode.

Viewing Block Transfer Statistics

Press **[B]** from the Main Menu to view the Block Transfer Statistics screen.

Use this command to display the configuration and statistics of the backplane data transfer operations between the module and the processor. The information on this screen can help determine if there are communication problems between the processor and the module.

> Tip: To determine the number of blocks transferred each second, mark the numbers displayed at a specific time. Then some seconds later activate the command again. Subtract the previous numbers from the current numbers and divide by the quantity of seconds passed between the two readings.

Viewing module Configuration

Press **[C]** to view the module Configuration screen.

Use this command to display the current configuration and statistics for the module.

Opening the Database Menu

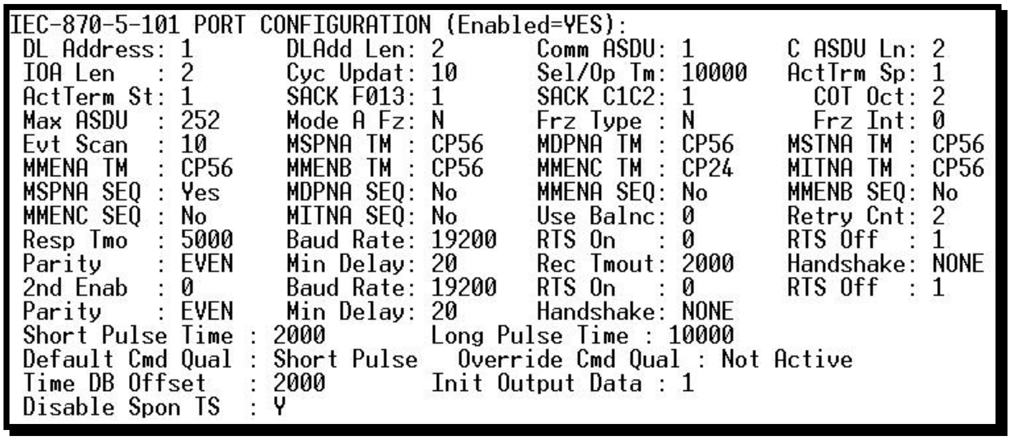
Press **[D]** to open the Database View menu. Use this menu command to view the current contents of the module's database.

Viewing Program Status

Press **[E]** from the Protocol Serial Menu to view the Program Status screen.

Opening the Port Configuration Menu

Press **[P]** from the Main Menu to open the Port Configuration menu. Use this command to view the port configuration information for each of the application ports.



```
IEC-870-5-101 PORT CONFIGURATION (Enabled=YES):
 DL Address: 1       DLAdd Len: 2       Comm ASDU: 1       C ASDU Ln: 2
 IOA Len    : 2      Cyc Updat: 10      Sel/Op Tm: 10000   ActTrm Sp: 1
 ActTerm St: 1       SACK F013: 1       SACK C1C2: 1         COT Oct: 2
 Max ASDU   : 252    Mode A Fz: N       Frz Type : N         Frz Int: 0
 Evt Scan   : 10     MSPNA TM : CP56    MDPNA TM : CP56    MSTNA TM : CP56
 MMENA TM   : CP56   MMENB TM : CP56    MMENC TM : CP24    MITNA TM : CP56
 MSPNA SEQ : Yes     MDPNA SEQ: No      MMENA SEQ: No      MMENB SEQ: No
 MMENC SEQ : No      MITNA SEQ: No      Use Balnc: 0       Retry Cnt: 2
 Resp Tmo   : 5000   Baud Rate: 19200   RTS On   : 0       RTS Off  : 1
 Parity     : EVEN   Min Delay: 20      Rec Tmout: 2000    Handshake: NONE
 2nd Enab   : 0      Baud Rate: 19200   RTS On   : 0       RTS Off  : 1
 Parity     : EVEN   Min Delay: 20      Handshake: NONE
 Short Pulse Time : 2000        Long Pulse Time : 10000
 Default Cmd Qual : Short Pulse   Override Cmd Qual : Not Active
 Time DB Offset   : 2000        Init Output Data : 1
 Disable Spon TS  : Y
```

Receiving the Configuration File

Press **[R]** to download (receive) the current configuration file from the module. For more information on receiving and sending configuration files, please see Uploading and Downloading the Configuration File.

Sending the Configuration File

Press **[S]** to upload (send) an updated configuration file to the module. For more information on receiving and sending configuration files, please see Uploading and Downloading the Configuration File.

Viewing Version Information

Press **[V]** to view Version information for the module.

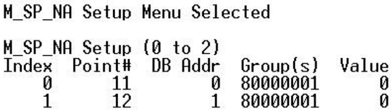
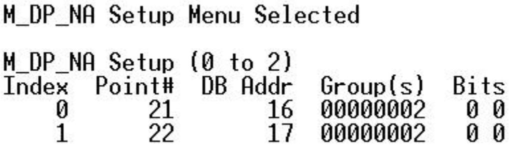
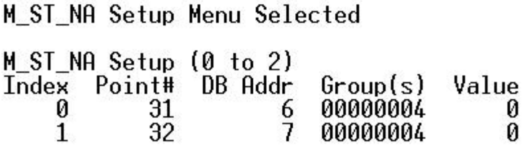
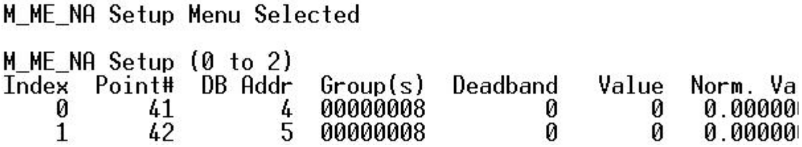
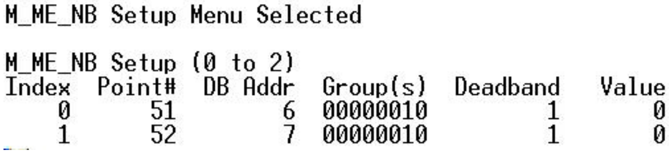
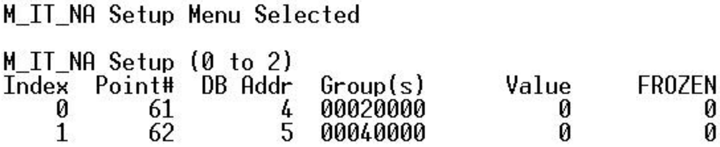
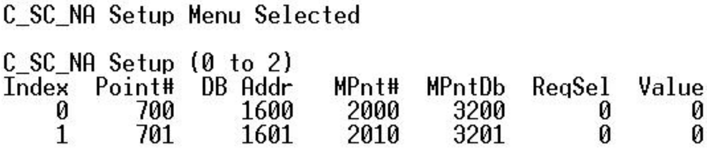
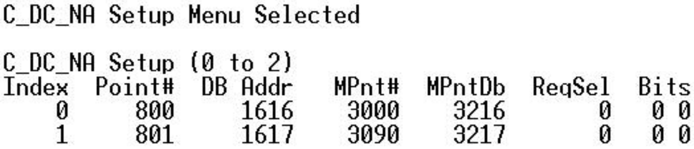
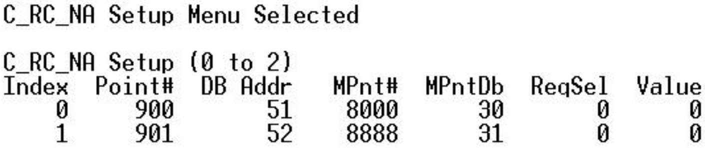
Use this command to view the current version of the software for the module, as well as other important values. You may be asked to provide this information when calling for technical support on the product.

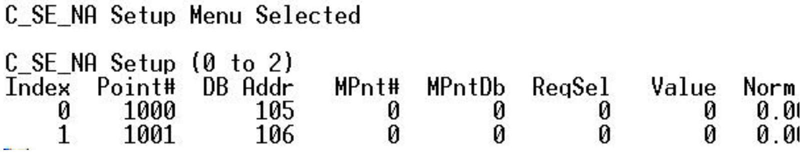
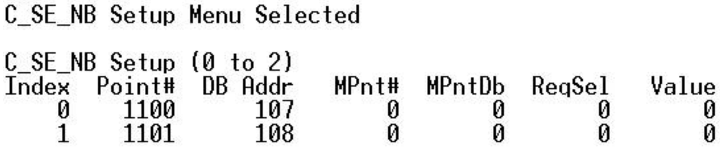
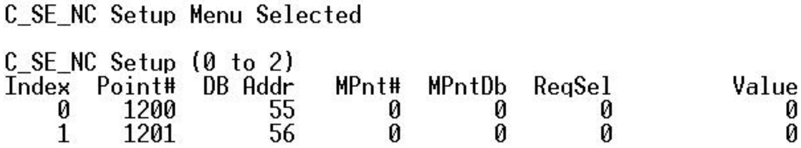
Values at the bottom of the display are important in determining module operation. The Program Scan Counter value is incremented each time a module's program cycle is complete.

Tip: Repeat this command at one-second intervals to determine the frequency of program execution.

Viewing Data Type Setup

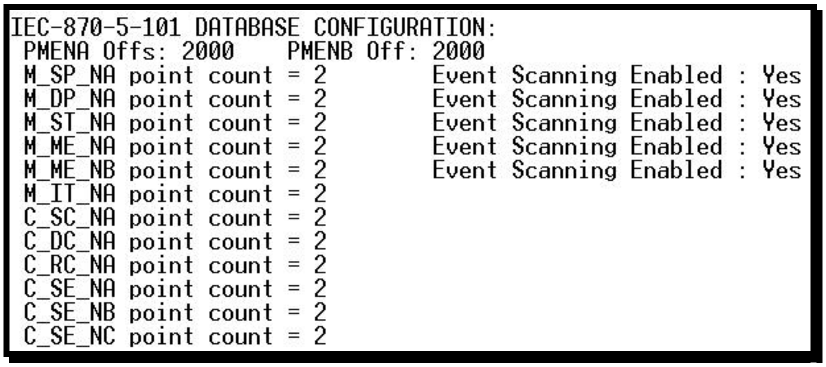
To view setup information for each data type, press the matching key from the Menu.

Key	Data Type	Screen Example
1	M_SP_NA	 M_SP_NA Setup Menu Selected M_SP_NA Setup (0 to 2) Index Point# DB Addr Group(s) Value 0 11 0 80000001 0 1 12 1 80000001 0
2	M_DP_NA	 M_DP_NA Setup Menu Selected M_DP_NA Setup (0 to 2) Index Point# DB Addr Group(s) Bits 0 21 16 00000002 0 0 1 22 17 00000002 0 0
3	M_ST_NA	 M_ST_NA Setup Menu Selected M_ST_NA Setup (0 to 2) Index Point# DB Addr Group(s) Value 0 31 6 00000004 0 1 32 7 00000004 0
4	M_ME_NA	 M_ME_NA Setup Menu Selected M_ME_NA Setup (0 to 2) Index Point# DB Addr Group(s) Deadband Value Norm. Va 0 41 4 00000008 0 0 0.00000 1 42 5 00000008 0 0 0.00000
5	M_ME_NB	 M_ME_NB Setup Menu Selected M_ME_NB Setup (0 to 2) Index Point# DB Addr Group(s) Deadband Value 0 51 6 00000010 1 0 1 52 7 00000010 1 0
6	M_IT_NA	 M_IT_NA Setup Menu Selected M_IT_NA Setup (0 to 2) Index Point# DB Addr Group(s) Value FROZEN 0 61 4 00020000 0 0 1 62 5 00040000 0 0
7	C_SC_NA	 C_SC_NA Setup Menu Selected C_SC_NA Setup (0 to 2) Index Point# DB Addr MPnt# MPntDb ReqSel Value 0 700 1600 2000 3200 0 0 1 701 1601 2010 3201 0 0
8	C_DC_NA	 C_DC_NA Setup Menu Selected C_DC_NA Setup (0 to 2) Index Point# DB Addr MPnt# MPntDb ReqSel Bits 0 800 1616 3000 3216 0 0 0 1 801 1617 3090 3217 0 0 0
9	C_RC_NA	 C_RC_NA Setup Menu Selected C_RC_NA Setup (0 to 2) Index Point# DB Addr MPnt# MPntDb ReqSel Value 0 900 51 8000 30 0 0 1 901 52 8888 31 0 0

Key	Data Type	Screen Example
0	C_SE_NA	 C_SE_NA Setup Menu Selected C_SE_NA Setup (0 to 2) Index Point# DB Addr MPnt# MPntDb ReqSel Value Norm 0 1000 105 0 0 0 0 0.0 1 1001 106 0 0 0 0 0.0
Shift 1	C_SE_NB	 C_SE_NB Setup Menu Selected C_SE_NB Setup (0 to 2) Index Point# DB Addr MPnt# MPntDb ReqSel Value 0 1100 107 0 0 0 0 1 1101 108 0 0 0 0
Shift 4	C_SE_NC	 C_SE_NC Setup Menu Selected C_SE_NC Setup (0 to 2) Index Point# DB Addr MPnt# MPntDb ReqSel Value 0 1200 55 0 0 0 0 1 1201 56 0 0 0 0

Viewing Database Configuration

Hold down the **[SHIFT]** key and press **[2]** from the Main menu. The IEC-870 Database Cfg screen appears:



```
IEC-870-5-101 DATABASE CONFIGURATION:
 PMENA Offs: 2000    PMENB Off: 2000
 M_SP_NA point count = 2       Event Scanning Enabled : Yes
 M_DP_NA point count = 2       Event Scanning Enabled : Yes
 M_ST_NA point count = 2       Event Scanning Enabled : Yes
 M_ME_NA point count = 2       Event Scanning Enabled : Yes
 M_ME_NB point count = 2       Event Scanning Enabled : Yes
 M_IT_NA point count = 2
 C_SC_NA point count = 2
 C_DC_NA point count = 2
 C_RC_NA point count = 2
 C_SE_NA point count = 2
 C_SE_NB point count = 2
 C_SE_NC point count = 2
```

Warm Booting the module

> Caution: Some of the commands available to you from this menu are designed for advanced debugging and system testing only, and can cause the module to stop communicating with the processor or with other devices, resulting in potential data loss or other failures. Only use these commands if you are specifically directed to do so by ProSoft Technology Technical Support staff. Some of these command keys are not listed on the menu, but are active nevertheless. Please be careful when pressing keys so that you do not accidentally execute an unwanted command.

Press **[W]** from the Main Menu to warm boot (restart) the module. This command will cause the program to exit and reload, refreshing configuration parameters that must be set on program initialization. Only use this command if you must force the module to re-boot.

Exiting the Program

Caution: Some of the commands available to you from this menu are designed for advanced debugging and system testing only, and can cause the module to stop communicating with the processor or with other devices, resulting in potential data loss or other failures. Only use these commands if you are specifically directed to do so by ProSoft Technology Technical Support staff. Some of these command keys are not listed on the menu, but are active nevertheless. Please be careful when pressing keys so that you do not accidentally execute an unwanted command.

Press **[Esc]** to restart the module and force all drivers to be loaded. The module will use the configuration stored in the module's Flash memory to configure the module.

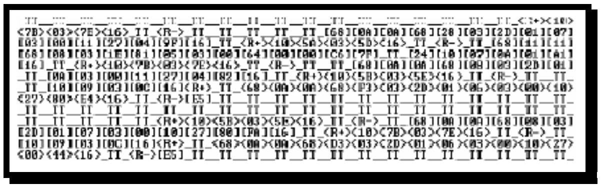
7.1.4 Data Analyzer

The data analyzer mode allows you to view all bytes of data transferred on each port. Both the transmitted and received data bytes are displayed. Use of this feature is limited without a thorough understanding of the protocol.

Note: The Port selection commands on the Data Analyzer menu differs very slightly in different modules, but the functionality is basically the same. Use the illustration above as a general guide only. Refer to the actual data analyzer menu on your module for the specific port commands to use.
Important: When in analyzer mode, program execution will slow down. Only use this tool during a troubleshooting session. Before disconnecting from the Config/Debug port, please press [S] to stop the data analyzer, and then press [M] to return to the main menu. This action will allow the module to resume its normal high speed operating mode.

Analyzing Data for the first application port

Press **[1]** to display I/O data for the first application port in the Data Analyzer. The following illustration shows an example of the Data Analyzer output.



```
_TT__TT__TT__TT__TT__TT__TT__TT__TT__TT__TT__TT__TT__TT__TT__TT__TT_<R+><10>
<7B><03><7E><16>_TT_<R->_TT__TT__TT__TT__TT_[68][0A][0A][68][28][03][2D][01][07]
[03][00][11][27][04][9F][16]_TT_<R+><10><5A><03><5D><16>_TT_<R->_TT_[68][11][11]
[68][08][03][1E][81][05][03][00][64][00][00][C6][7F]_TT_[24][10][07][0A][01][A1]
[16]_TT_<R+><10><7B><03><7E><16>_TT_<R->_TT__TT_[68][0A][0A][68][08][03][2D][01]
_TT_[0A][03][00][11][27][04][82][16]_TT_<R+><10><5B><03><5E><16>_TT_<R->_TT__TT_
_TT_[10][09][03][0C][16]<R+>_TT_<68><0A><0A><68><F3><03><2D><01><06><03><00><10>
<27><00><E4><16>_TT_<R->[E5]_TT__TT__TT__TT__TT__TT__TT__TT__TT__TT__TT__TT__TT_
_TT__TT__TT__TT__TT__TT__TT__TT__TT__TT__TT__TT__TT__TT__TT__TT__TT__TT__TT__TT_
_TT__TT__TT__TT__TT_<R+><10><5B><03><5E><16>_TT_<R->_TT_[68][0A][0A][68][08][03]
[2D][01][07][03][00][10][27][80][FA][16]_TT_<R+><10><7B><03><7E><16>_TT_<R->_TT_
[10][09][03][0C][16]<R+>_TT_<68><0A><0A><68><D3><03><2D><01><06><03><00><10><27>
<00><44><16>_TT_<R->[E5]_TT__TT__TT__TT__TT__TT__TT__TT__TT__TT__TT__TT__TT_
```

Analyzing Data for the second application port

Press **[2]** to display I/O data for the second application port in the Data Analyzer.

Displaying Timing Marks in the Data Analyzer

You can display timing marks for a variety of intervals in the data analyzer screen. These timing marks can help you determine communication-timing characteristics.

Key	Interval
[5]	1 milliseconds ticks
[6]	5 milliseconds ticks
[7]	10 milliseconds ticks
[8]	50 milliseconds ticks
[9]	100 milliseconds ticks
[0]	Turn off timing marks

Removing Timing Marks in the Data Analyzer

Press **[0]** to turn off timing marks in the Data Analyzer screen.

Viewing Data in Hexadecimal Format

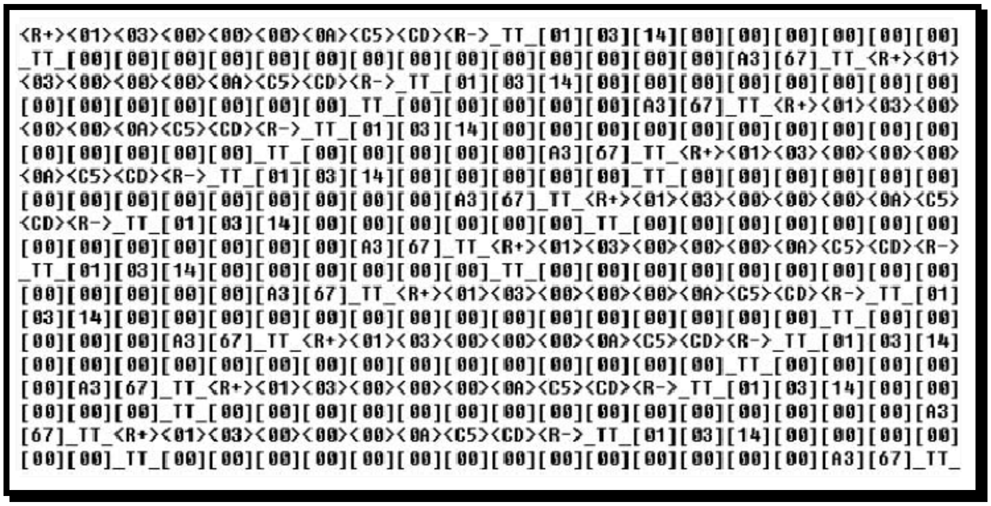
Press **[H]** to display the data on the current page in hexadecimal format.

Viewing Data in ASCII (Text) Format

Press **[A]** to display the data on the current page in ASCII format. This is useful for regions of the database that contain ASCII data.

Starting the Data Analyzer

Press **[B]** to start the data analyzer. After the key is pressed, all data transmitted and received on the currently selected port will be displayed. The following illustration shows an example.



```
<R+><01><03><00><00><00><0A><C5><CD><R->_TT_[01][03][14][00][00][00][00][00][00]
_TT_[00][00][00][00][00][00][00][00][00][00][00][00][00][00][A3][67]_TT_<R+><01>
<03><00><00><00><0A><C5><CD><R->_TT_[01][03][14][00][00][00][00][00][00][00][00]
[00][00][00][00][00][00][00]_TT_[00][00][00][00][00][A3][67]_TT_<R+><01><03><00>
<00><00><0A><C5><CD><R->_TT_[01][03][14][00][00][00][00][00][00][00][00][00][00]
[00][00][00][00][00]_TT_[00][00][00][00][00][A3][67]_TT_<R+><01><03><00><00><00>
<0A><C5><CD><R->_TT_[01][03][14][00][00][00][00][00]_TT_[00][00][00][00][00][00]
[00][00][00][00][00][00][00][00][00][A3][67]_TT_<R+><01><03><00><00><00><0A><C5>
<CD><R->_TT_[01][03][14][00][00][00][00][00][00]_TT_[00][00][00][00][00][00][00]
[00][00][00][00][00][00][00][A3][67]_TT_<R+><01><03><00><00><00><0A><C5><CD><R->
_TT_[01][03][14][00][00][00][00][00]_TT_[00][00][00][00][00][00][00][00][00][00]
[00][00][00][00][00][A3][67]_TT_<R+><01><03><00><00><00><0A><C5><CD><R->_TT_[01]
[03][14][00][00][00][00][00][00][00][00][00][00][00][00][00][00][00]_TT_[00][00]
[00][00][00][A3][67]_TT_<R+><01><03><00><00><00><0A><C5><CD><R->_TT_[01][03][14]
[00][00][00][00][00][00][00][00][00][00][00][00][00][00][00]_TT_[00][00][00][00]
[00][A3][67]_TT_<R+><01><03><00><00><00><0A><C5><CD><R->_TT_[01][03][14][00][00]
[00][00][00]_TT_[00][00][00][00][00][00][00][00][00][00][00][00][00][00][00][A3]
[67]_TT_<R+><01><03><00><00><00><0A><C5><CD><R->_TT_[01][03][14][00][00][00][00]
[00][00]_TT_[00][00][00][00][00][00][00][00][00][00][00][00][00][00][A3][67]_TT_
```

The Data Analyzer displays the following special characters:

Character	Definition
[ ]	Data enclosed in these characters represent data received on the port.
< >	Data enclosed in these characters represent data transmitted on the port.
<R+>	These characters are inserted when the RTS line is driven high on the port.

Character	Definition
<R->	These characters are inserted when the RTS line is dropped low on the port.
<CS>	These characters are displayed when the CTS line is recognized high.
_TT_	These characters are displayed when the timing mark interval has been reached. This parameter is user defined.

Stopping the Data Analyzer

Press **[S]** to stop the data analyzer. Use this option to freeze the display so the data can be analyzed. To restart the analyzer, press **[B].**

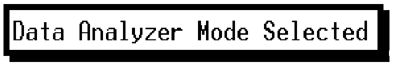
> Important: When in analyzer mode, program execution will slow down. Only use this tool during a troubleshooting session. Before disconnecting from the Config/Debug port, please press [S] to stop the data analyzer, and then press [M] to return to the main menu. This action will allow the module to resume its normal high speed operating mode.

Returning to the Main Menu

Press **[M]** to return to the Main Menu.

7.1.5 Data Analyzer Tips

From the main menu, press **[A]** for the "Data Analyzer". You should see the following text appear on the screen:



```
Data Analyzer Mode Selected
```

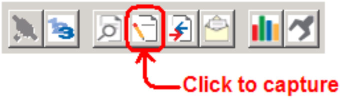
After the "Data Analyzer" mode has been selected, press **[?]** to view the Data Analyzer menu. From this menu, you can select the "Port", the "format", and the "ticks" that you can display the data in.

For most applications, HEX is the best format to view the data, and this does include ASCII based messages (because some characters will not display on HyperTerminal and by capturing the data in HEX, we can figure out what the corresponding ASCII characters are supposed to be).

The Tick value is a timing mark. The module will print a _TT for every xx milliseconds of no data on the line. Usually 10milliseconds is the best value to start with.

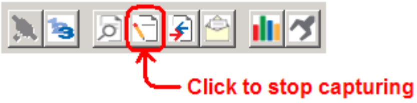
To save a capture file of your Diagnostics session

1 After you have selected the Port, Format, and Tick, we are now ready to start a capture of this data. Click the Log to File button at the bottom of the Diagnostics window.



Click to capture the Diagnostics session to a log file

2 When you have captured the data you want to save, click the Stop Logging button.

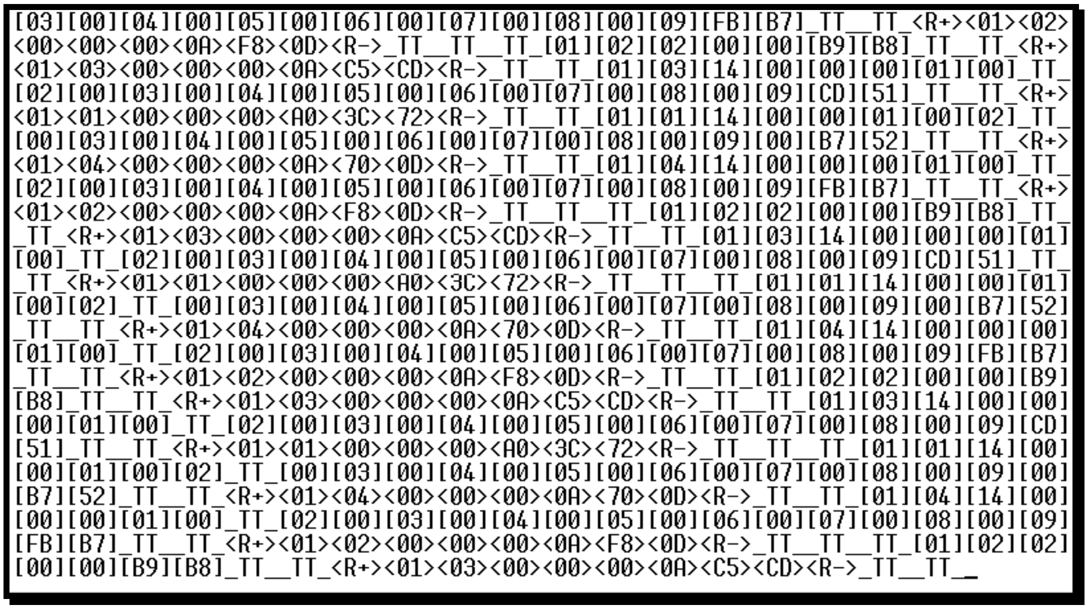


Click to stop capturing

You have now captured, and saved the file to your PC. This file can now be used in analyzing the communications traffic on the line, and assist in determining communication errors.

Now you have everything that shows up on the HyperTerminal screen being logged to a file called ProLinxLog.txt. This is the file that you will then be able to email to ProSoft Technical Support to assist with issues on the communications network.

To begin the display of the communications data, you will then want to press **[B]** to tell the module to start printing the communications traffic out on the debug port of the module. After you have pressed **[B],** you should see something like the following:



```
[03][00][04][00][05][00][06][00][07][00][08][00][09][FB][B7]_TT__TT_<R+><01><02>
<00><00><00><0A><F8><0D><R->_TT__TT__TT_[01][02][02][00][00][B9][B8]_TT__TT_<R+>
<01><03><00><00><00><0A><C5><CD><R->_TT__TT_[01][03][14][00][00][00][01][00]_TT_
[02][00][03][00][04][00][05][00][06][00][07][00][08][00][09][CD][51]_TT__TT_<R+>
<01><01><00><00><00><A0><3C><72><R->_TT__TT_[01][01][14][00][00][01][00][02]_TT_
[00][03][00][04][00][05][00][06][00][07][00][08][00][09][00][B7][52]_TT__TT_<R+>
<01><04><00><00><00><0A><70><0D><R->_TT__TT_[01][04][14][00][00][00][01][00]_TT_
[02][00][03][00][04][00][05][00][06][00][07][00][08][00][09][FB][B7]_TT__TT_<R+>
<01><02><00><00><00><0A><F8><0D><R->_TT__TT__TT_[01][02][02][00][00][B9][B8]_TT_
_TT_<R+><01><03><00><00><00><0A><C5><CD><R->_TT__TT_[01][03][14][00][00][00][01]
[00]_TT_[02][00][03][00][04][00][05][00][06][00][07][00][08][00][09][CD][51]_TT_
_TT_<R+><01><01><00><00><00><A0><3C><72><R->_TT__TT__TT_[01][01][14][00][00][01]
[00][02]_TT_[00][03][00][04][00][05][00][06][00][07][00][08][00][09][00][B7][52]
_TT__TT_<R+><01><04><00><00><00><0A><70><0D><R->_TT__TT_[01][04][14][00][00][00]
[01][00]_TT_[02][00][03][00][04][00][05][00][06][00][07][00][08][00][09][FB][B7]
_TT__TT_<R+><01><02><00><00><00><0A><F8><0D><R->_TT__TT_[01][02][02][00][00][B9]
[B8]_TT__TT_<R+><01><03><00><00><00><0A><C5><CD><R->_TT__TT_[01][03][14][00][00]
[00][01][00]_TT_[02][00][03][00][04][00][05][00][06][00][07][00][08][00][09][CD]
[51]_TT__TT_<R+><01><01><00><00><00><A0><3C><72><R->_TT__TT__TT_[01][01][14][00]
[00][01][00][02]_TT_[00][03][00][04][00][05][00][06][00][07][00][08][00][09][00]
[B7][52]_TT__TT_<R+><01><04><00><00><00><0A><70><0D><R->_TT__TT_[01][04][14][00]
[00][00][01][00]_TT_[02][00][03][00][04][00][05][00][06][00][07][00][08][00][09]
[FB][B7]_TT__TT_<R+><01><02><00><00><00><0A><F8><0D><R->_TT__TT__TT_[01][02][02]
[00][00][B9][B8]_TT__TT_<R+><01><03><00><00><00><0A><C5><CD><R->_TT__TT__
```

The <R+> means that the module is transitioning the communications line to a transmit state.

All characters shown in <> brackets are characters being sent out by the module.

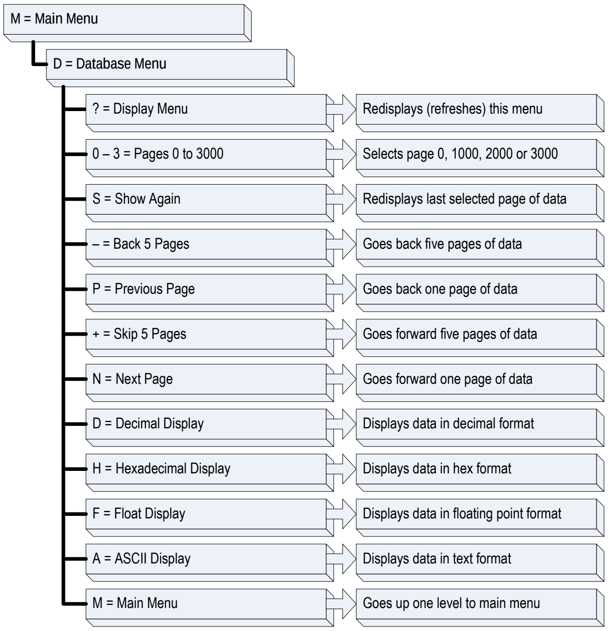
The <R-> shows when the module is done transmitting data, and is now ready to receive information back.

And finally, all characters shown in the [ ] brackets is information being received from another device by the module.

After taking a minute or two of traffic capture, you will now want to stop the "Data Analyzer". To do so, press the **[S]** key, and you will then see the scrolling of the data stop.

7.1.6 Database View Menu

Press **[D]** from the Main Menu to open the Database View menu. Use this menu command to view the current contents of the module's database. Press **[?]** to view a list of commands available on this menu.


M = Main Menu
D = Database Menu
? = Display Menu
Redisplays (refreshes) this menu
0 – 3 = Pages 0 to 3000
Selects page 0, 1000, 2000 or 3000
S = Show Again
Redisplays last selected page of data
– = Back 5 Pages
Goes back five pages of data
P = Previous Page
Goes back one page of data
+ = Skip 5 Pages
Goes forward five pages of data
N = Next Page
Goes forward one page of data
D = Decimal Display
Displays data in decimal format
H = Hexadecimal Display
Displays data in hex format
F = Float Display
Displays data in floating point format
A = ASCII Display
Displays data in text format
M = Main Menu
Goes up one level to main menu

Viewing Register Pages

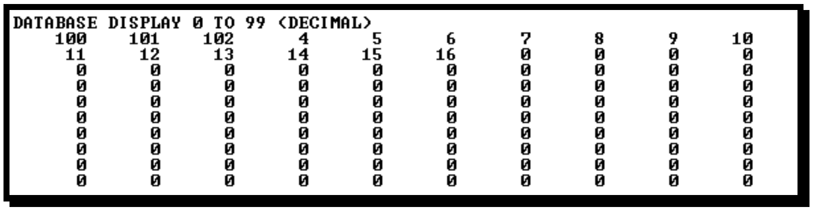
To view sets of register pages, use the keys described below:

Command	**Description**
[0]	Display registers 0 to 99
[1]	Display registers 1000 to 1099
[2]	Display registers 2000 to 2099

And so on. The total number of register pages available to view depends on your module's configuration.

Displaying the Current Page of Registers Again

Press **[S]** from the Database View menu to show the current page of registers again.



```
DATABASE DISPLAY 0 TO 99 (DECIMAL)
     100      101      102        4        5        6        7        8        9       10
      11       12       13       14       15       16        0        0        0        0
       0        0        0        0        0        0        0        0        0        0
       0        0        0        0        0        0        0        0        0        0
       0        0        0        0        0        0        0        0        0        0
       0        0        0        0        0        0        0        0        0        0
       0        0        0        0        0        0        0        0        0        0
       0        0        0        0        0        0        0        0        0        0
       0        0        0        0        0        0        0        0        0        0
       0        0        0        0        0        0        0        0        0        0
```

This screen displays the current page of 100 registers in the database.

Moving Back Through 5 Pages of Registers

Press **[-]** from the Database View menu to skip five pages back in the database to see the previous 100 registers of data.

Moving Forward Through 5 Pages of Registers

Press **[+]** from the Database View menu to skip five pages ahead in the database to see the next 100 registers of data.

Viewing the Previous 100 Registers of Data

Press **[P]** from the Database View menu to display the previous 100 registers of data.

Viewing the Next 100 Registers of Data

Press **[N]** from the Database View menu to select and display the next 100 registers of data.

Viewing Data in Decimal Format

Press **[D]** to display the data on the current page in decimal format.

Viewing Data in Hexadecimal Format

Press **[H]** to display the data on the current page in hexadecimal format.

Viewing Data in Floating Point Format

Press **[F]** from the Database View menu. Use this command to display the data on the current page in floating point format. The program assumes that the values are aligned on even register boundaries. If floating-point values are not aligned as such, they are not displayed properly.

Viewing Data in ASCII (Text) Format

Press **[A]** to display the data on the current page in ASCII format. This is useful for regions of the database that contain ASCII data.

Returning to the Main Menu

Press **[M]** to return to the Main Menu.

7.2 LED Status Indicators

The LEDs indicate the module's operating status as follows:

Module	Color	Status	Indication
DEBUG	Green	On	Data is being transferred between the module and a remote terminal using the Configuration/Debug port.
		Off	No data is being transferred on the Configuration/Debug port.
PRT1	Green	On	Data is being transferred between Port 1 and the master.
		Off	No data
PRT2	Green	On	Data is being transferred between Port 2 and the master
		Off	No data
CFG/ERR	Red	Off	The PTQ-101S is working normally.
		On	If the processor is placed on PROG mode the module assert the CFG ERR LED.
ERR1	Red	Off	The PTQ-101S is working normally.
		On	The PTQ-101S module program has recognized an application error.
ERR2	N/A		Not used in application
ERR3	N/A	On	Not used in application
Active	Green	On	The LED is on when the module recognizes a processor and is able to communicate if the [Backplane Data Movement] section specifies data transfer commands.
		Off	The LED is off when the module is unable to speak with the processor. The processor either absent or not running.
BAT	Red	Off	The battery voltage is OK and functioning.
		On	The battery voltage is low or the battery is not present. The battery LED will illuminate briefly upon the first installation of the module or if the unit has been un-powered for an extended period of time. This behavior is normal, however should the LED come on in a working installation please contact ProSoft Technology.

If your module is not operating, and the status LEDs are not illustrated in the table above, please call ProSoft Technology for technical assistance.

8 Reference

In This Chapter

8.1 Product Specifications

The PTQ IEC 60870-5-101 Slave Communication Module allows Schneider Electric Quantum/Unity compatible processors to interface easily with IEC 60870-5-101 protocol compatible hosts. The module's two powerful and highly configurable redundant ports allow the many SCADA host systems supporting the IEC protocol to be integrated into the Quantum/Unity platform.

The PTQ-101S module is the fastest and easiest way to add IEC 60870-5-101 protocol interface support to the Quantum/Unity platform. It is a single slot, backplane compatible solution for the Quantum/Unity platform. This module has two powerful and highly configurable IEC 60870-5-101 Slave ports, allowing the many SCADA and field devices supporting the IEC protocol to be integrated into the Quantum/Unity platform.

8.1.1 Standards

The standards used in developing the product are listed in the following table.

Publication	Title
IEC 60870-5-101	Companion Standard for Basic Telecontrol Tasks
IEC 60870-5-101 Amendment 1	Companion Standard for Basic Telecontrol Tasks
IEC 60870-5-1	Transmission Frame Formats
IEC 60870-5-2	Link Transmission Procedures
IEC 60870-5-3	General Structure of Application Data
IEC 60870-5-4	Definition and Coding of Application Information Elements
IEC 60870-5-5	Basic Application Functions

8.1.2 General Specifications

- Single Slot - Quantum backplane compatible
- The module is recognized as an Options module and has access to PLC memory for data transfer
- Configuration data is stored in non-volatile memory in the ProTalk module
- Up to six modules can be placed in a rack
- Local rack - The module must be placed in the same rack as processor
- Compatible with common Quantum programming tools: UnityPro XL, Concept, ProWORX
- Quantum data types supported: 3x, 4x
- High speed data transfer across backplane provides quick data update times
- Sample ladder file available

8.1.3 Hardware Specifications

Specification	Value
Backplane Current Load	800 mA @ 5 V
Operating Temperature	0 to 60°C (32 to 140°F)
Storage Temperature	-40 to 85°C (-40 to 185°F)
Relative Humidity	5% to 95% (non-condensing)
Vibration	Sine vibration 4-100 Hz in each of the 3 orthogonal axes
Shock	30G, 11 mSec. in each of the 3 orthogonal axes
LED Indicators	Module Status Backplane Transfer Status Serial Port Activity Serial Activity and Error Status
Configuration Serial Port (Debug)	DB-9M PC Compatible RS-232 only No hardware handshaking
Application Serial Ports (PRT1, PRT2)	DB-9M PC Compatible RS-232/422/485 jumper selectable RS-422/485 screw termination included RS-232 handshaking configurable 500V Optical isolation from backplane

8.1.4 Functional Specifications

The PTQ-101S module accepts commands from a master on the network. In addition, the module’s port can be configured to generate event or periodic unsolicited messages in either a spontaneous or cyclic fashion.

The module has 4000 words of user defined internal register space that are accessible to the protocol driver and to the Quantum processor memory. Any of the supported database types can be individually located (within the total database size limit of 4000 words) and each database point is mapped within the module and can be assigned to one or more Groups.

8.1.5 IEC supported data types

The supported datatypes are:

M_SP_NA	Monitored single-point database
M_DP_NA	Monitored dual-point database
M_ST_NA	Monitored step-point database
M_ME_NA	Monitored normalized-point database
M_ME_NB	Monitored scaled-point database
M_ME_NC	Monitored short-float point database
M_IT_NA	Monitored integrated total database
C_SC_NA	Command single-point database
C_DC_NA	Command dual-point database
C_RC_NA	Command step-point database
C_SE_NA	Command normalized-point database
C_SE_NB	Command scaled-point database
C_SE_NC	Command short-float point database

8.1.6 IEC 60870-5-101 Slave Specifications

The module accepts commands from a Master to read/write data stored in the module's internal registers. This data is and continuously transferred between the module and the processor's data registers. Functionality supported by the module includes:

- The IEC 60870-5-101 communication driver is built in accordance to the approved IEC specification
- Configurable for balanced or unbalanced mode
- Supports cyclic or spontaneous monitored messages
- Supports clock synchronization commands from a master or from the Quantum
- Event timestamping configurable by type
- Event queue supports 99 points for each data type
- Configurable data link address, Common ASDU address and Information Object Address
- Short and Long pulse duration configurable at module level
- Supports Group interrogation

An IEC Interoperability Document for the ProTalk is available which fully documents data types supported by the module

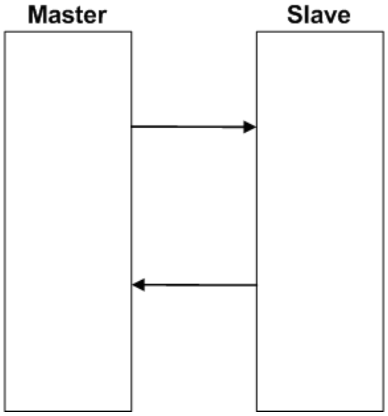
Redundant Slave Ports: The module supports a primary/secondary slave port configuration. In this mode, a single host polls the module via redundant physical layer connections. For example, if PRT 2 is connected to a satellite network and the network fails, PRT 3 could be used to communicate with the unit using landlines.

8.2 IEC-60870-5-101 Protocol Implementation

This section presents an overview of how the PTQ-101S works, while skipping the complex details of the protocol specification. If you require more information about the implementation of the protocol, refer to the protocol specification (IEC 60870-5-101 2003). For more information on the configuring and modifying the backplane implementation of the protocol with the PTQ-101S, refer to Customizing the Sample Configuration File.

The IEC-60870-5-101 protocol applies to telecontrol equipment and systems with coded bit serial data transmission for monitoring and controlling geographically widespread processes.

Any application using the IEC-60870-5-101 protocol will have a master (controlling station) and one or more slaves (controlled stations). The master will constantly monitor and control the data from each slave in the network.

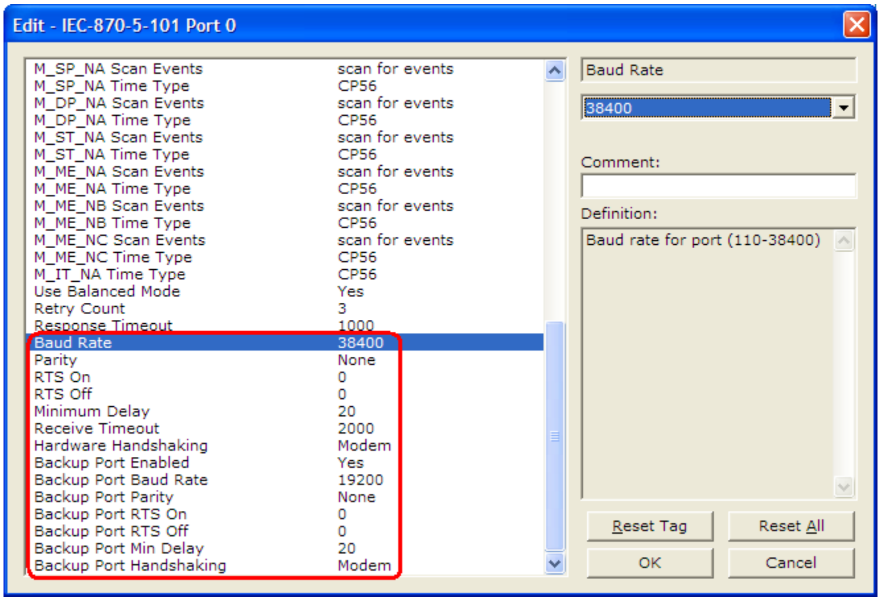


The PTQ-101S module works as a IEC-60870-5-101 slave. It can send monitor data, receive commands or generate events to the master unit, as explained in the following topics.

8.2.1 General Parameter Configuration

Communication Parameters

The following parameters should be configured for serial communication:



M_SP_NA Scan Events	scan for events
M_SP_NA Time Type	CP56
M_DP_NA Scan Events	scan for events
M_DP_NA Time Type	CP56
M_ST_NA Scan Events	scan for events
M_ST_NA Time Type	CP56
M_ME_NA Scan Events	scan for events
M_ME_NA Time Type	CP56
M_ME_NB Scan Events	scan for events
M_ME_NB Time Type	CP56
M_ME_NC Scan Events	scan for events
M_ME_NC Time Type	CP56
M_IT_NA Time Type	CP56
Use Balanced Mode	Yes
Retry Count	3
Response Timeout	1000
Baud Rate	38400
Parity	None
RTS On	0
RTS Off	0
Minimum Delay	20
Receive Timeout	2000
Hardware Handshaking	Modem
Backup Port Enabled	Yes
Backup Port Baud Rate	19200
Backup Port Parity	None
Backup Port RTS On	0
Backup Port RTS Off	0
Backup Port Min Delay	20
Backup Port Handshaking	Modem

Baud Rate

38400

Comment:

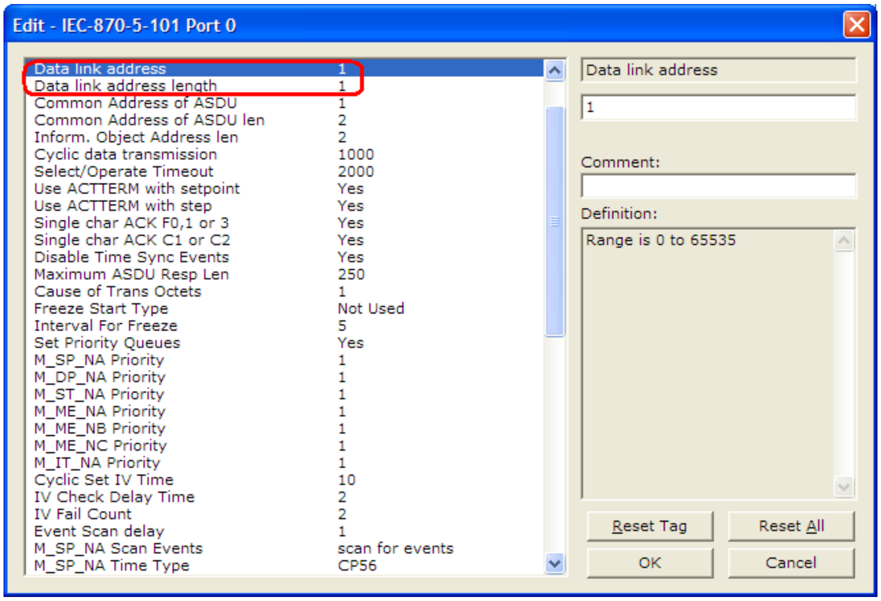
Definition:

Baud rate for port (110-38400)

Adjust these parameters for your application.

Data Link Configuration

The protocol specification document IEC 60870-5-2 specifies an unambiguous address (number) for each link. Each address may be unique within a specific system, or may be unique within a group of links sharing a common channel. The protocol specification defines that the Data Link Address may have 0, 1 or 2 octets. The first option should be used only during Balanced Mode.



Data link address	1
Data link address length	1
Common Address of ASDU	1
Common Address of ASDU len	2
Inform. Object Address len	2
Cyclic data transmission	1000
Select/Operate Timeout	2000
Use ACTTERM with setpoint	Yes
Use ACTTERM with step	Yes
Single char ACK F0,1 or 3	Yes
Single char ACK C1 or C2	Yes
Disable Time Sync Events	Yes
Maximum ASDU Resp Len	250
Cause of Trans Octets	1
Freeze Start Type	Not Used
Interval For Freeze	5
Set Priority Queues	Yes
M_SP_NA Priority	1
M_DP_NA Priority	1
M_ST_NA Priority	1
M_ME_NA Priority	1
M_ME_NB Priority	1
M_ME_NC Priority	1
M_IT_NA Priority	1
Cyclic Set IV Time	10
IV Check Delay Time	2
IV Fail Count	2
Event Scan delay	1
M_SP_NA Scan Events	scan for events
M_SP_NA Time Type	CP56

Data link address

1

Comment:

Definition:

Range is 0 to 65535

Configure the following parameter to set the number of octets to be used for the Data Link Address value. It is essential that the master unit also uses the same number of octets configured for the PTQ-101S.

- Data Link Address Length: 2

You must also configure the actual Data Link Address value using the following parameter:

- Data link address: 1

This value identifies the module's address in the network.

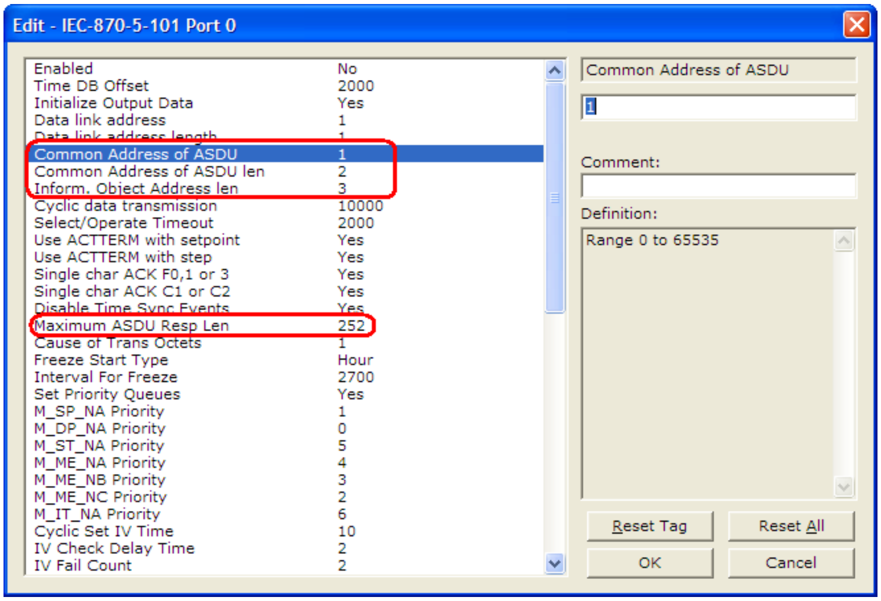
ASDU Configuration

The protocol specification document IEC 60870-5-3 describes the Basic Application Data Units that are used in the protocol. It also defines the Application Service Data Unit (ASDU) used by the protocol for data communication.

You can configure the number of bytes to be used for the following ASDU components:

Component	Abbreviation	Possible Number of Octets
Cause of Transmission	COT	1 or 2
Common Address of ASDU	CASDU	1 or 2
Information Object Address	IOA	1, 2 or 3

These parameters must be configured to match the master's configuration, as shown in the following example:



Enabled	No
Time DB Offset	2000
Initialize Output Data	Yes
Data link address	1
Data link address length	1
Common Address of ASDU	1
Common Address of ASDU len	2
Inform. Object Address len	3
Cyclic data transmission	10000
Select/Operate Timeout	2000
Use ACTTERM with setpoint	Yes
Use ACTTERM with step	Yes
Single char ACK F0,1 or 3	Yes
Single char ACK C1 or C2	Yes
Disable Time Sync Events	Yes
Maximum ASDU Resp Len	252
Cause of Trans Octets	1
Freeze Start Type	Hour
Interval For Freeze	2700
Set Priority Queues	Yes
M_SP_NA Priority	1
M_DP_NA Priority	0
M_ST_NA Priority	5
M_ME_NA Priority	4
M_ME_NB Priority	3
M_ME_NC Priority	2
M_IT_NA Priority	6
Cyclic Set IV Time	10
IV Check Delay Time	2
IV Fail Count	2

Common Address of ASDU

1

Comment:

Definition:

Range 0 to 65535

The Common Address of ASDU is the station address. The module only allows the addressing of the whole station (some devices allows different Common Addresses to identify particular station sectors). You should configure the Common ASDU Address with the following parameter:

- Common Address of ASDU: 1

You should also configure the maximum number of bytes that the module will support for each ASDU response to the master unit. The range lies between 25 and 252 bytes. You should verify the maximum number of bytes supported by the master because some IEC 60870-5-101 master devices only support messages with less than 252 bytes.

Configure the following parameter to set the maximum number of bytes to be transferred at every ASDU response.

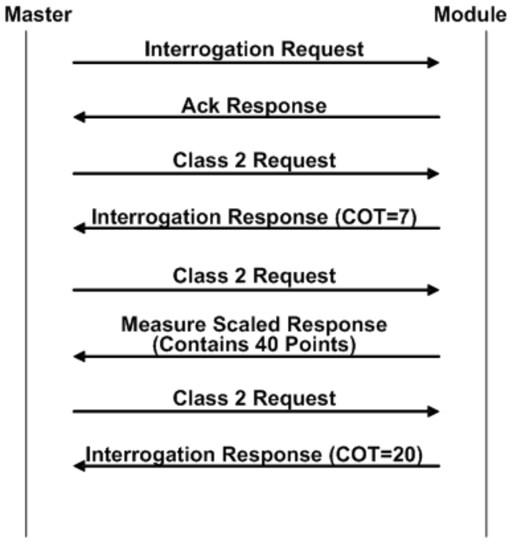
- Maximum ASDU Resp Len: 252

A value less than 252 can cause the module to break down the response to send all points using more response messages, with each message containing fewer bytes.

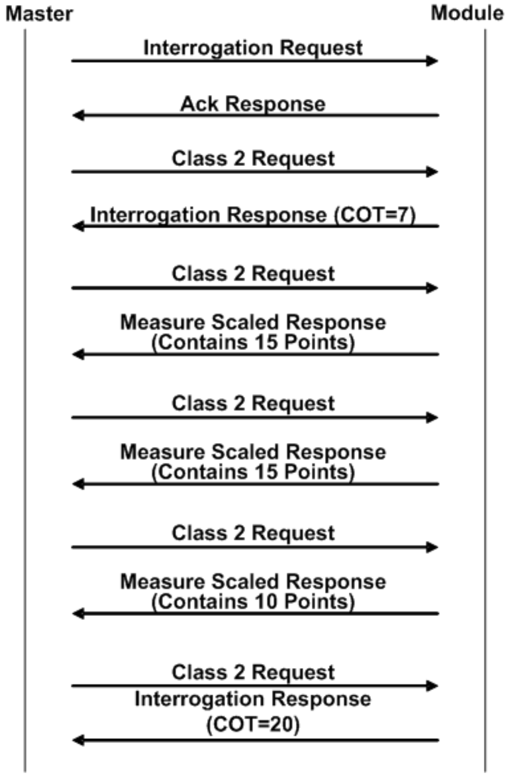
Example - Changing the ASDU Length:

Considering that the master sends a General Interrogation request to poll forty M_ME_NB points (measured scaled points in Unbalanced Mode):

If Maximum ASDU Resp Len = 252:


Master
Module
Interrogation Request
Ack Response
Class 2 Request
Interrogation Response (COT=7)
Class 2 Request
Measure Scaled Response (Contains 40 Points)
Class 2 Request
Interrogation Response (COT=20)

This example shows that the module sends all 40 measured scaled points in one single message, if the message is not greater than 252 bytes. However, some master devices may not support messages containing this number of bytes. If the master for a given application supports only 100 bytes, the following communication procedure would occur:


Master
Module
Interrogation Request
Ack Response
Class 2 Request
Interrogation Response (COT=7)
Class 2 Request
Measure Scaled Response (Contains 15 Points)
Class 2 Request
Measure Scaled Response (Contains 15 Points)
Class 2 Request
Measure Scaled Response (Contains 10 Points)
Class 2 Request
Interrogation Response (COT=20)

As shown in the previous diagram, the module sends out 15 messages (15 points, 15 points and 10 points) instead of sending the whole 40 points in one single message.

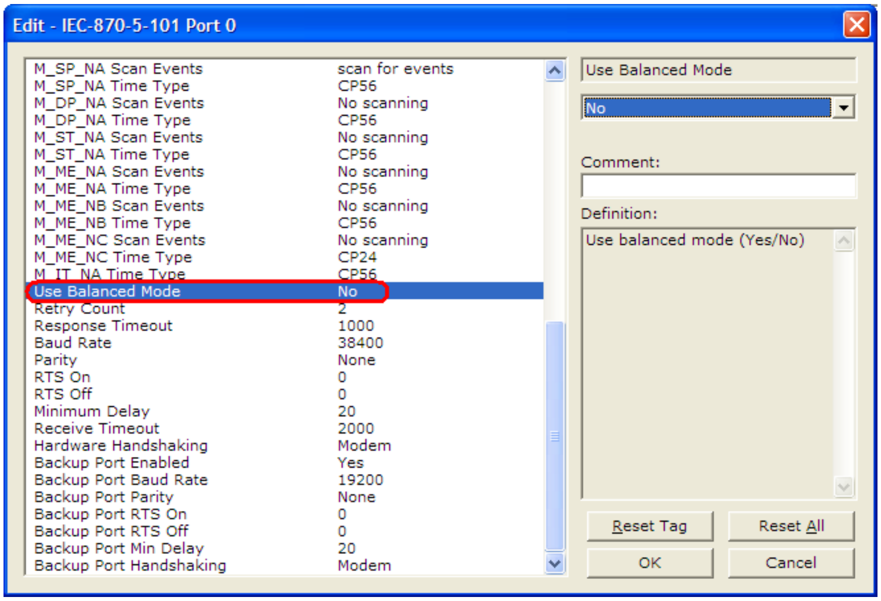
Note: This example shows the case where IOA Length = 3 bytes, COT Length = 2 bytes and CASDU Length = 2 bytes.

Important: If the database parser gets a point index that is not valid, the whole database is set as invalid and no points are reported. Because the index 0 is not valid (the protocol does not support this index value), the driver considers it invalid. For example, if you set the size of the ASDU to 1 and you set a value of 1000 for a point index, this is also invalid as the indexes can only go from 1 to 255.

Balanced and Unbalanced Modes

The module supports balanced and unbalanced modes. In balanced mode, each station may initiate message transfers. If the links from the master unit to several slaves share a common physical channel, then these links must be operated in an unbalanced mode to avoid the possibility of more than one device attempting to transmit on the channel at the same time.

Select the communication mode with the following parameter:



M_SP_NA Scan Events	scan for events
M_SP_NA Time Type	CP56
M_DP_NA Scan Events	No scanning
M_DP_NA Time Type	CP56
M_ST_NA Scan Events	No scanning
M_ST_NA Time Type	CP56
M_ME_NA Scan Events	No scanning
M_ME_NA Time Type	CP56
M_ME_NB Scan Events	No scanning
M_ME_NB Time Type	CP56
M_ME_NC Scan Events	No scanning
M_ME_NC Time Type	CP24
M_IT_NA Time Type	CP56
Use Balanced Mode	No
Retry Count	2
Response Timeout	1000
Baud Rate	38400
Parity	None
RTS On	0
RTS Off	0
Minimum Delay	20
Receive Timeout	2000
Hardware Handshaking	Modem
Backup Port Enabled	Yes
Backup Port Baud Rate	19200
Backup Port Parity	None
Backup Port RTS On	0
Backup Port RTS Off	0
Backup Port Min Delay	20
Backup Port Handshaking	Modem

Use Balanced Mode

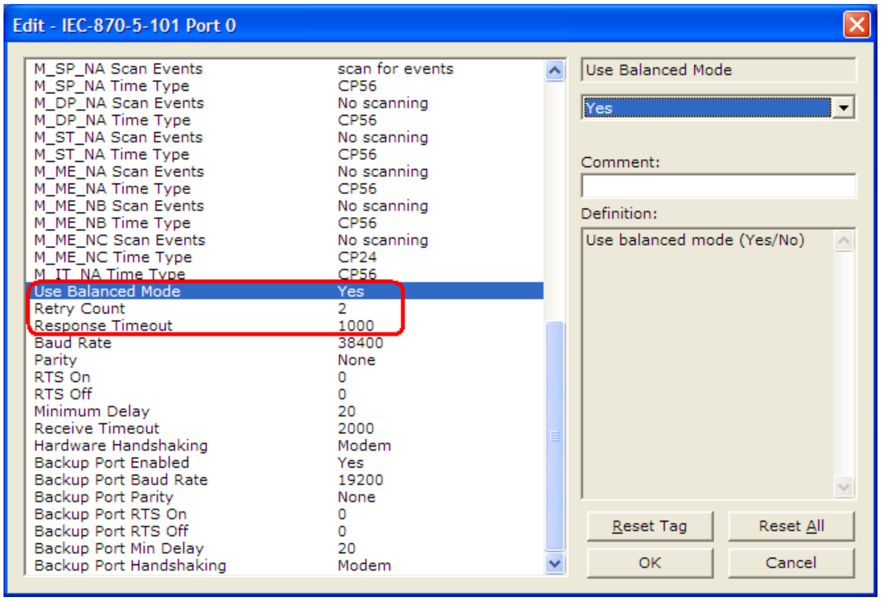
No

Comment:

Definition:

Use balanced mode (Yes/No)

To use balanced mode, configure the following parameters:



M_SP_NA Scan Events	scan for events
M_SP_NA Time Type	CP56
M_DP_NA Scan Events	No scanning
M_DP_NA Time Type	CP56
M_ST_NA Scan Events	No scanning
M_ST_NA Time Type	CP56
M_ME_NA Scan Events	No scanning
M_ME_NA Time Type	CP56
M_ME_NB Scan Events	No scanning
M_ME_NB Time Type	CP56
M_ME_NC Scan Events	No scanning
M_ME_NC Time Type	CP24
M_IT_NA Time Type	CP56
Use Balanced Mode	Yes
Retry Count	2
Response Timeout	1000
Baud Rate	38400
Parity	None
RTS On	0
RTS Off	0
Minimum Delay	20
Receive Timeout	2000
Hardware Handshaking	Modem
Backup Port Enabled	Yes
Backup Port Baud Rate	19200
Backup Port Parity	None
Backup Port RTS On	0
Backup Port RTS Off	0
Backup Port Min Delay	20
Backup Port Handshaking	Modem

Use Balanced Mode

Yes

Comment:

Definition:

Use balanced mode (Yes/No)

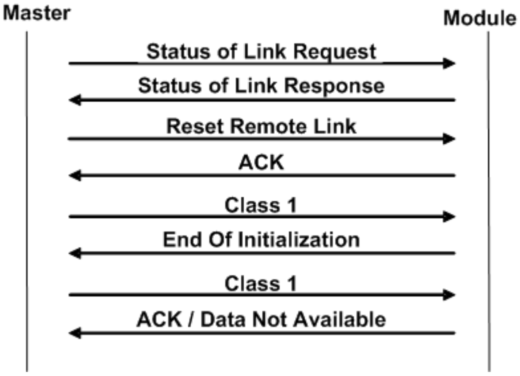
8.2.2 Module Initialization

After the module powers up, a specific initialization procedure occurs, depending on the communication mode you selected (Balanced or Unbalanced).

Unbalanced mode

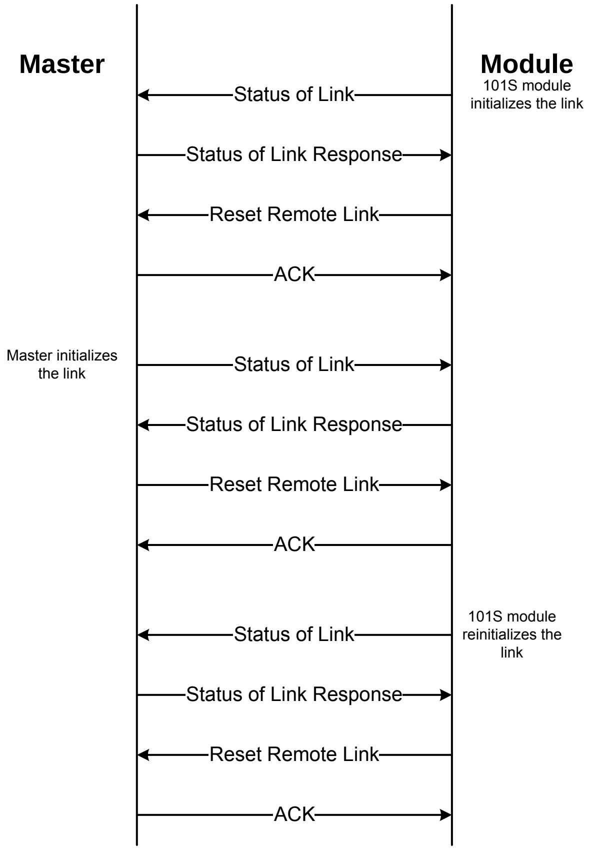
In order to start communications between the master and the slave units, the master tries to establish the link connection by transmitting repeated "Request Status of Link" at specific time out intervals. When the module’s link is available it will respond with a "Status of Link" response. Then, the master transmits a "Reset of Remote Link" message and the slave responds with an ACK response. Then the master sends two consecutive Class 1 requests. The slave responds the first Class 1 request with a "End of Initialization" response and the second Class 1 request with an Ack message.

The following illustration shows a typical initialization procedure for the unbalanced mode:



Balanced Mode

During balanced mode, the link must be initialized in both directions. The PTQ-101S module also always reinitializes the link after it receives an initialization request from the master. Therefore, the following initialization occurs during balanced mode, after PTQ-101S boots.



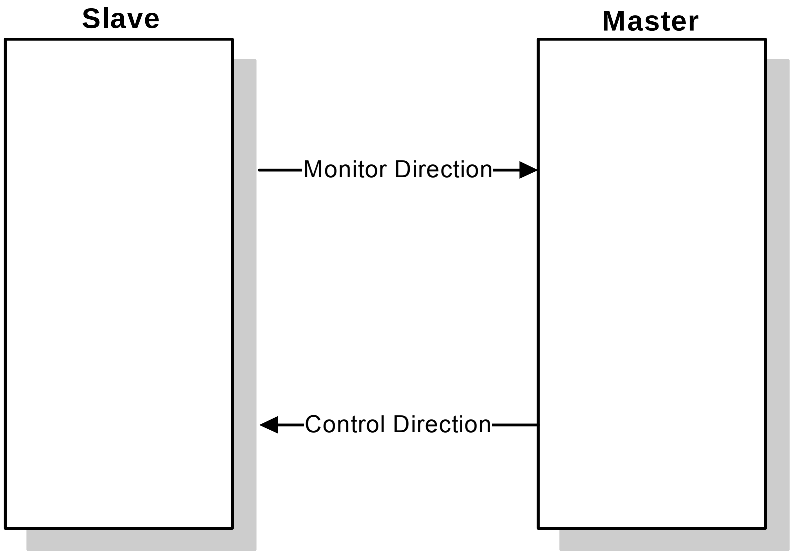
After the initialization procedure is completed, the master and the PTQ-101S start communicating. If during communication the master fails to respond to a message from the module, the PTQ-101S will retry for a configured number of times. If the master still fails to respond, the module will initialize the line again.

8.2.3 Monitor Direction and Control Direction

The protocol specification defines two directions of data: monitor direction and control direction. These directions are defined by the protocol specification as follows:

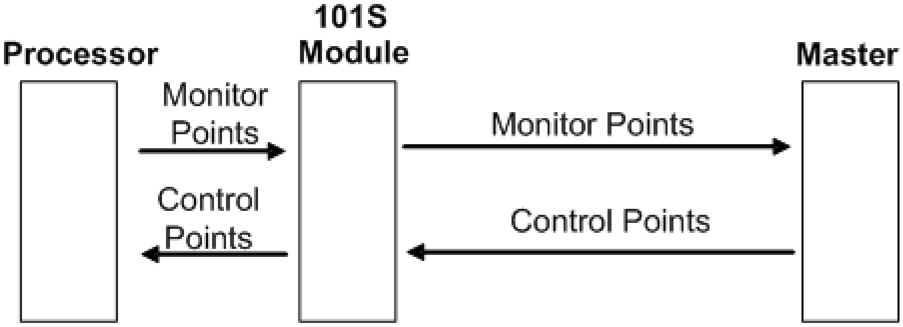
Monitor Direction: The direction of transmission from a slave to the master

Control Direction: The direction of transmission from the master to a slave



The points that are typically transferred from the slave to the master are also known as Monitor Points (or Monitor Information Objects). The points that are typically transferred from the master to the slave are also known as Control Points (or Command Information Objects).

For the PTQ-101S, the control and monitor points would be transferred as follows:

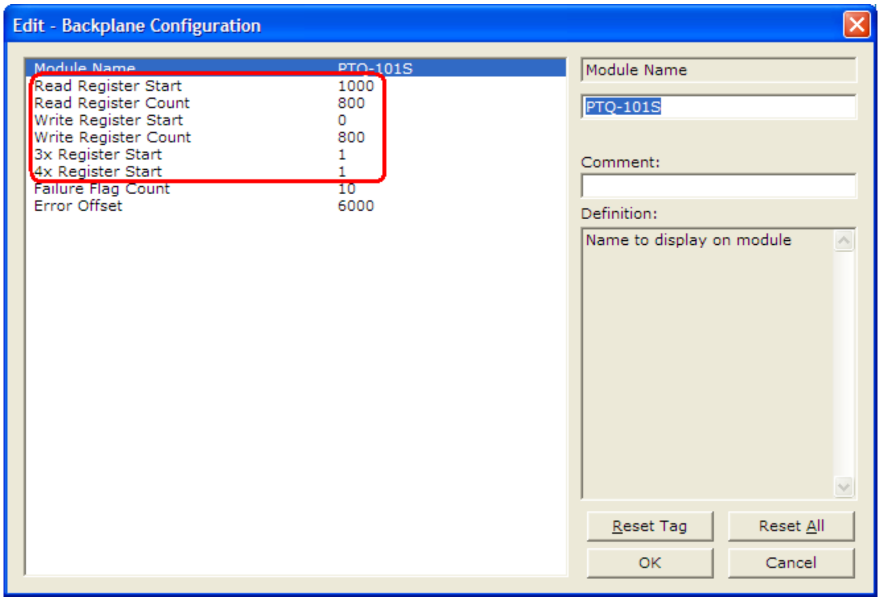


You must make sure that all points are configured in the correct location in the PTQ-101S module database in order to be properly updated from/to the processor.

8.2.4 Backplane Data Transfer

The current version of the PTQ-101S backplane driver (version 2.10 or newer), uses a Large I/O model, which differs from previous versions of the backplane driver in that it transfers all of the data in the Read and Write databases between the module and the processor on every scan.

The [Backplane Configuration] section of the configuration file defines the starting registers for read and write operations, as well as the number of registers to use for each data area.


Edit - Backplane Configuration

Module Name	PTQ-101S
Read Register Start	1000
Read Register Count	800
Write Register Start	0
Write Register Count	800
3x Register Start	1
4x Register Start	1
Failure Flag Count	10
Error Offset	6000

Module Name

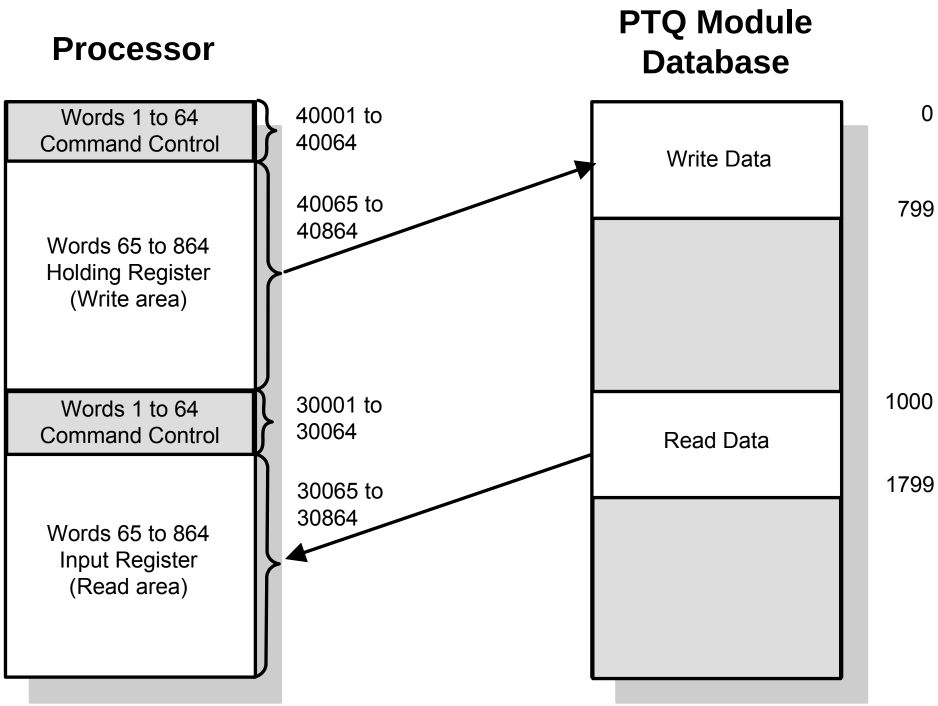
PTQ-101S

Comment:

Definition:

Name to display on module

The values in the example configuration file section above are illustrated in the following diagram.


Processor
PTQ Module Database
Words 1 to 64 Command Control
Words 65 to 864 Holding Register (Write area)
Words 1 to 64 Command Control
Words 65 to 864 Input Register (Read area)
40001 to 40064
40065 to 40864
30001 to 30064
30065 to 30864
Write Data
Read Data
0
799
1000
1799

The module transfers the entire read and write areas at the end of every processor scan. The module will hold the processor scan for a certain period of time, which allows the module to transfer the entire read and write areas. This means that the larger the read and write areas, the longer the processor scan time will be. Refer to Module Performance (page 157) for more detailed information on determining scan times.

Note: The diagram above shows the memory addresses for a Quantum/Unity processor. If you are deploying the PTQ-101S with a Unity processor, substitute %MW for read only data, and %IW for read/write data.

Data Exchange

The module transfers all the configured read or write data at the end of each processor scan. You can configure up to 4000 words in each direction. The more data you configure, the longer the processor scan will be.

Words 0 through 63 in each read/write block are reserved for command control. Refer to Command Control (page 110) for more information on command control blocks. The following table shows the relationship between the processor memory and the module database areas.

Note: Refer to Backplane Data Transfer (page 108) for the example configuration values that are used in the following tables.

Module Database	Quantum/Unity Register	Unity Register	Description
Read Data	3x	%IW	Input Register
Write Data	4x	%MW	Holding Register

The data mapping in the following example shows the relationship between processor and PTQ-101S memory addresses, assuming a 4x register start value of 40001 and a PTQ-101S database start value of 0.

Processor Memory Address	Module Database Address
40065	0
40066	1
40067	2
40068	3
40069	4
…	…
40164	99

The data mapping in the following example shows the relationship between processor and PTQ-101S memory addresses, assuming a 3x register start value of 30001 and a PTQ-101S database start value of 2000.

Processor Memory Address	Module Database Address
30065	2000
30066	2001
30067	2002
30068	2003
30069	2004
…	…
30164	2099

8.2.5 Command Control Block

The first 64 words of each block are reserved for command control. Each command control block has a Block ID number (shown in parentheses below) that identifies the command control instruction. The PTQ-101S module supports the following command control blocks:

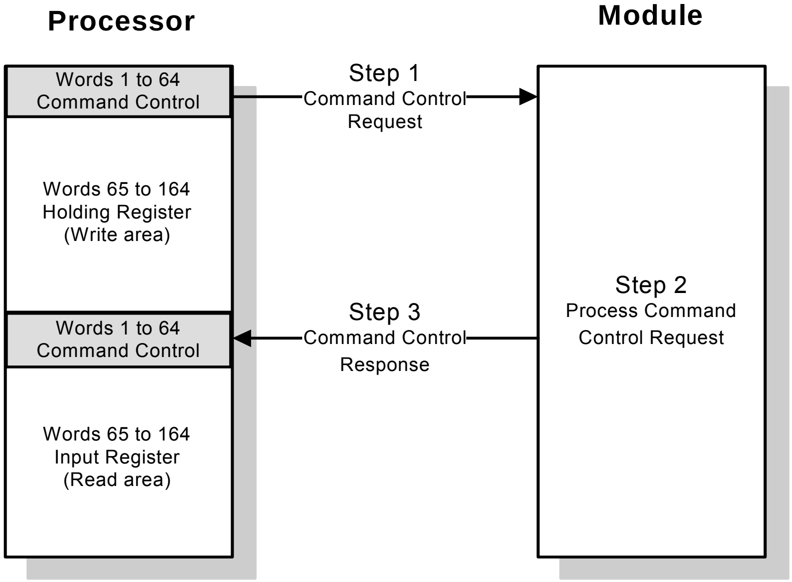
- Event Messages (9958) (page 112)
- Read Module's Time to Processor (9970) (page 114)
- Set Module's Time Using Processor Time (9971) (page 115)
- Warm Boot (9998) or Cold Boot (9999) (page 115, page 87)

The value in word 0 of this 64 word block is the block sequence number. This number identifies whether the contents of the block have changed. This is the actual trigger to send the control request to the module.

Processor logic must be built to handle the command control functionality. The logic would typically follow these steps:

1 Move the block request to output command control area.
2 Move a new value to the output block sequence number.
3 If the input block sequence number equals the output block sequence number + 1, copy the block response to appropriate variables in the module's memory.

Note: Command Control blocks are not copied to the module database. You must define variables in the module's main memory, and use processor logic to process the command control request.



The following table shows the contents of the command control area when a command control block such as 9970 (Read Module's Time to Processor) is issued.

Note: The diagram above shows the memory addresses for a Quantum/Unity processor. If you are deploying the PTQ-101S with a Unity processor, substitute %MW for read only data, and %IW for read/write data.
Note: The processor memory locations in the example tables below use the 3x register start and 4x register start values defined in Backplane Data Transfer (page 108). You can configure any valid 3x and 4x start address that is not used by other processes.

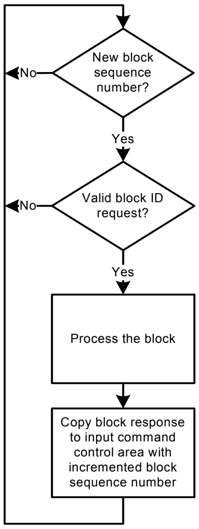
Command Control Word	Description
40001	Output sequence number
40002	Block ID
40003	Block request word 1
40004	Block request word 2
40005	Block request word 3

Command Control Word	Description
…	…
40064	Block request word 62

The following table shows the results of the PTQ-101S response to the command control block.

Command Control Word	Description
30001	Input sequence number
30002	Block ID
30003	Block response word 1
30004	Block response word 2
30005	Block response word 3
…	…
30064	Block response word 62

The module recognizes that there is a new block request when it identifies that the block sequence number has changed. if the block ID is valid, the module will process the block and copy the response to the input command control area (3x for Quantum/Unity or %IW for Unity). The module will increment the block sequence number by one, as shown in the following illustration.


New block sequence number?
No
Yes
Valid block ID request?
No
Yes
Process the block
Copy block response to input command control area with incremented block sequence number

Event Messages (9958)

If a value of 9958 is placed in the control register, event messages are sent from the processor to the module. Refer to Events for more information.

The module supports a buffer queue of 99 events per data type. When the queue is full, the module will delete the older event in the queue if a new event is received.

The following table shows the block format for write.

Block Format for Write

Word Offset in Block	Data Field(s)	Description
0	Sequence Number	This number triggers the request for the module. When this number changes, the module will process the command control request.
1	Block ID	This field contains the value of 9958 identifying the block type to the module.
2	Event Count	Number of events present in the block. Valid Values: 1 to 4.
3	Event #1	Event data to add to event message queue.
18	Event #2	Event data to add to event message queue.
33	Event #3	Event data to add to event message queue.
48	Event #4	Event data to add to event message queue.

The structure of each event record in the block is shown in the following table.

Word Offset in Event Record	Data Field(s)	Description
0	DB Index	This is the index for the point in the module's database. This corresponds to the order of point definition for the module data types. This is not the point address for the event. For example, to refer to the third configured point, enter a value of 2 (first event is 0).
1	ASDU	This is the ASDU data type for the event message. Valid entries for this field are as follows: 1=single-point 3=double-point 5=step 9=normalized 11=scaled 15=integrated total
2	Qualifier	This is the qualifier code for the event message. This parameter is only used for ASDU types 5, 9, 11 and 15. Refer to the IEC Protocol Specification for a full listing of valid qualifier codes for one of these ASDU types.
3	Year	This field contains the four-digit year for this event.
4	Month	This field contains the month value for the event. Valid Values: 1 to 12
5	Day	This field contains the day value for the event. Valid Values: 1 to 31
6	Hour	This field contains the hour value for the event. Valid Values: 0 to 23
7	Minute	This field contains the minute value for the event. Valid Values: 0 to 59
8	Seconds and Milliseconds	This field contains the seconds and milliseconds value for the event. Valid Values: 0 to 59,999 (59 seconds and 999 milliseconds).
9 to 14	Data	These words contain the data for the event. For single- and double-point, step, and measured value events, the first word is used. For integrated total events, the first two words are used.

Block Format for Read

Word Offset in Block	Data Field(s)	Description
0	Sequence Number	This is the sequence number received by the module, incremented by one, after the request is processed.
1	Block ID	This word will contain the value of 9958

Read Module's Time to Processor (9970)

If a value of 9970 is placed in the control register, the processor will read the module's current time.

Block Format for Write

The following table shows the block format for write:

Word Offset in Block	Data Field(s)	Description
0	Sequence Number	This number triggers the request for the module. When this number changes, the module will process the command control request.
1	Block ID	This field contains the value of 9970 identifying the block type to the module.

Block Format for Read

The module responds to a valid 9970 request with a block containing the requested date and time. The block format is shown in the following table.

Word Offset in Block	Data Field(s)	Description
0	Sequence Number	This is the sequence number received by the module, incremented by one, after the request is processed.
1	Block ID	This word will contain the value of 9970.
2	Year	This field contains the four-digit year for the new time value.
3	Month	This field contains the month value for the new time. Valid Values: 1 to 12.
4	Day	This field contains the day value for the new time. Valid Values: 1 to 31.
5	Hour	This field contains the hour value for the new time. Valid Values: 0 to 23
6	Minute	This field contains the minute value for the new time. Valid Values: 0 to 59.
7	Seconds	This field contains the second value for the new time. Valid Values: 0 to 59.
8	Milliseconds	This field contains the millisecond value for the new time. Valid Values: 0 to 999.

Set Module's Time Using Processor Time (9971)

If a value of 9971 is placed in the control register, Module time is set using the processor's time. The following table shows the block format for write.

Block Format for Write

Word Offset in Block	Data Field(s)	Description
0	Write Block ID	This word will contain the value of 9971.
1	Year	This field contains the four-digit year for the new time value.
2	Month	This field contains the month value for the new time. Valid Values: 1 to 12.
3	Day	This field contains the day value for the new time. Valid Values: 1 to 31.
4	Hour	This field contains the hour value for the new time. Valid Values: 0 to 23
5	Minute	This field contains the minute value for the new time. Valid Values: 0 to 59.
6	Seconds	This field contains the second value for the new time. Valid Values: 0 to 59.
7	Milliseconds	This field contains the millisecond value for the new time. Valid Values: 0 to 999.

Block Format for Read

Word Offset in Block	Data Field(s)	Description
0	Sequence Number	This is the sequence number received by the module, incremented by one, after the request is processed.
1	Block ID	This word will contain the value of 9971

Warm Boot (9998) or Cold Boot (9999)

If the processor places a value of 9998 in this register, the module will perform a warm-boot operation. If the processor places a value of 9999 in this register, the module will perform a cold-boot operation. In this application module, both of these operations perform the same function. They exit the program and then restart the program. Many of the program parameters set in the user configuration must be set at program initialization and cannot be set while the program is running. Therefore, both functions operate the same way.

Block Format for Write

Word Offset in Block	Data Field(s)	Description
0	Sequence Number	This number triggers the request for the module. When this number changes, the module will process the command control request.
1	Block ID	This word will contain the value of 9998 (Warm Boot) or 9999 (Cold Boot)

The logic must set the values of the sequence number and block ID for one processor scan only.

Refer to Implementing Ladder to Support Special Functions (page 116) for sample code that handles these command control blocks.

8.2.6 Implementing Ladder to Support Special Functions

In order to use Special Functions (Command Control), you must implement some form of control logic. The following section uses structured text language to illustrate how a typical function might be implemented.

Example: Rebooting the Module.

```
(*
Reboot Logic Example--------------------------------
MyTrigger is a variable that triggers this logic
OutputControl variable array starts at register 4000001


The first instruction guarantees that the processor requests this
block for only one scan.

The second instructions sets the Block Number (9999 = ColdBoot) and
then sets the sequence number to 1.
*)

IF (MyTrigger=0) THEN
     OutputControl[1] :=0;
END_IF;


IF (MyTrigger=9999) THEN
     OutputControl[2] :=MyTrigger;
     OutputControl[1] :=1;
     MyTrigger :=0;
END_IF;
```

Example: Retrieving the time of day from the module.

```
(*
Block 9970 Logic Example--------------------------------
This logic shows an example on how to request a block 9970 from the module
(Read Module’s Time) and read the response to the processor.
Assumptions:
MyTrigger is a variable that triggers this logic
OutputControl variable array starts at register 4000001
InputControl variable array starts at register 3000001
MyTime variables store the date and time values to be read from the module
*)

(*
Sets the Block Number (9970=Read Module’s Time) and then increments the output
sequence number(OutputControl[1]) by one. Once the module reads a new output
sequence number from the processor it will process this request. So remember
that the actual trigger is moving a new output block sequence number value to
the module. Moving the block number (9970)
is not the trigger to request this task from the module.
MyTrigger is set to -1 as an indication that the logic is waiting for the
response from the module.
*)


IF (MyTrigger=9970) THEN
        OutputControl[2] :=MyTrigger;
        OutputControl[1] :=OutputControl[1]+1;
        MyTrigger :=-1;
END_IF;

(*
Once the request was processed the module will send the block response and
increment the received output sequence number by 1. So the output sequence
number is one less than the input sequence number the module has sent a new
block. Once the block is received the processor logic copies the received data
to the appropriate variables. The logic also clears the trigger for the next
request.
*)

IF (InputControl[2]=9970)AND(OutputControl[1]+1=InputControl[1]) THEN
          MyYear :=InputControl[3];
          MyMonth :=InputControl[4];
          MyDay :=InputControl[5];
          MyHour :=InputControl[6];
          MyMinute :=InputControl[7];
          MySecond :=InputControl[8];
          MyMilisecond :=InputControl[9];
          MyTrigger :=0;
END_IF;
```

Example: Setting the time of day to the module.

```
(*
Block 9971 Logic Example--------------------------------
This logic shows an example on how to request a block 9971 from the module
(Read Module’s
Time).
Assumptions:
MyTrigger is a variable that triggers this logic
OutputControl variable array starts at register 4000001
InputControl variable array starts at register 3000001
MyTime variables store the date and time values to be written to the module
*)

(*
Sets the Block Number (9971=Write Module’s Time) and then increments the output
sequence number(OutputControl[1]) by one. Once the module reads a new output
sequence number from the processor it will process this request. So remember
that the actual trigger is moving a new output block sequence number value to
the module. Moving the block number (9970) is not the trigger to request this
task from the module. MyTrigger is set to -1 as an indication that the logic is
waiting for the response from the module.
*)


IF (MyTrigger=9971) THEN
        OutputControl[2] :=MyTrigger;
        OutputControl[3] :=MyYear;
        OutputControl[4] :=MyMonth;
        OutputControl[5] :=MyDay;
        OutputControl[6] :=MyHour;
        OutputControl[7] :=MyMinute;
        OutputControl[8] :=MySecond;
        OutputControl[9] :=MyMilisecond;
        OutputControl[1] :=OutputControl[1]+1;
        MyTrigger :=-1;
END_IF;

(*
Once the request was processed the module will send the block response and
increment the received output sequence number by 1. So the output sequence
number is one less than the input sequence number the module has sent a new
block.
*)

IF (InputControl[2]=9971)AND(OutputControl[1]+1=InputControl[1]) THEN
          MyTrigger :=0;
END_IF;
```

8.2.7 Using Monitor Points

The following monitor points are supported by the PTQ-101S module:

Symbol	Description	Data Size in Database	Addressing Type
M-SP-NA	Monitored Single-Points	1 bit	Bit
M-DP-NA	Monitored Dual-Points	2 bits	Bit
M-ST-NA	Monitored Step-Points	1 byte	Byte
M-ME-NA	Monitored Measured Normalized-Points	1 word	Word
M-ME-NB	Monitored Measured Scaled-Points	1 word	Word
M-ME-NC	Monitored Measured Short Floating Points	2 words	Double-Word
M-IT-NA	Monitored Counter-Points	2 words	Double-Word

Each monitor point is identified by its Information Object Address (it should be unique for each Common ASDU Address in the network). For each monitor point, configure the following parameters:

Point # - The information object address of the point. It identifies the point in the network.

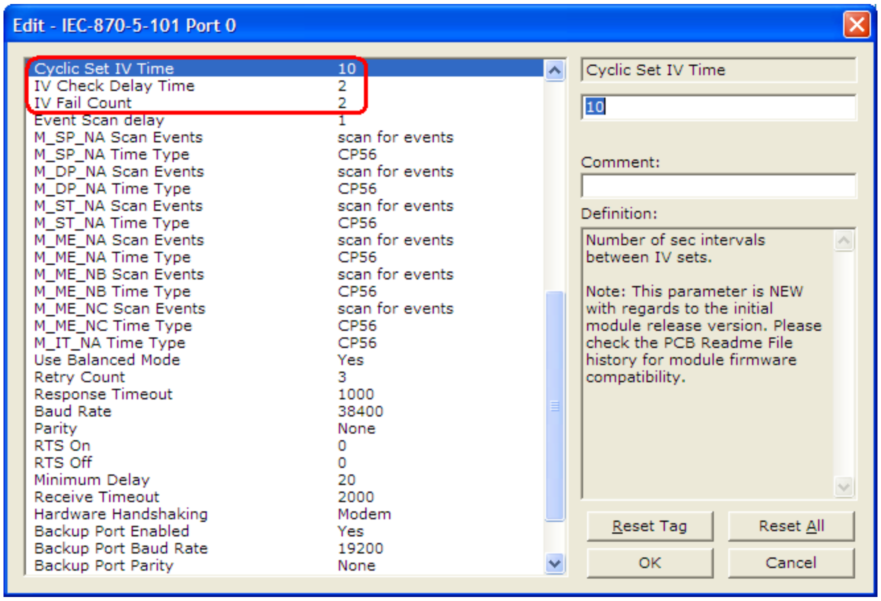
DB Address - The database location in the PTQ-101S module associated with the point. You must associate each point to a database address in the PTQ-101S module. The interpretation of this parameter depends on the point type configured. For example, for an M_SP_NA point, this value represents the bit address. For a M_ME_NA point, this value represents the Word address.

Group(s) - This is the group definition for the point. It sets how the point will be polled by the master (cyclic or group interrogation). It can also be used to enable or disable the event generation for one specific point. The group parameter is discussed in the Data Communication section.

Deadband - Sets the deadband for each Measured point. If the value changes from more than the configured deadband , the module will generate an event for this point.

IV DB Bit - This feature allows the application to set the invalid (IV) quality bit of the protocol for all the monitored ASDU types supported. If you enable this feature, the processor can determine the individual IV quality bit status of each point you configured.

The following parameters must be configured in order to use this feature:



Cyclic Set IV Time	10
IV Check Delay Time	2
IV Fail Count	2
Event Scan delay	1
M_SP_NA Scan Events	scan for events
M_SP_NA Time Type	CP56
M_DP_NA Scan Events	scan for events
M_DP_NA Time Type	CP56
M_ST_NA Scan Events	scan for events
M_ST_NA Time Type	CP56
M_ME_NA Scan Events	scan for events
M_ME_NA Time Type	CP56
M_ME_NB Scan Events	scan for events
M_ME_NB Time Type	CP56
M_ME_NC Scan Events	scan for events
M_ME_NC Time Type	CP56
M_IT_NA Time Type	CP56
Use Balanced Mode	Yes
Retry Count	3
Response Timeout	1000
Baud Rate	38400
Parity	None
RTS On	0
RTS Off	0
Minimum Delay	20
Receive Timeout	2000
Hardware Handshaking	Modem
Backup Port Enabled	Yes
Backup Port Baud Rate	19200
Backup Port Parity	None

Cyclic Set IV Time

10

Comment:

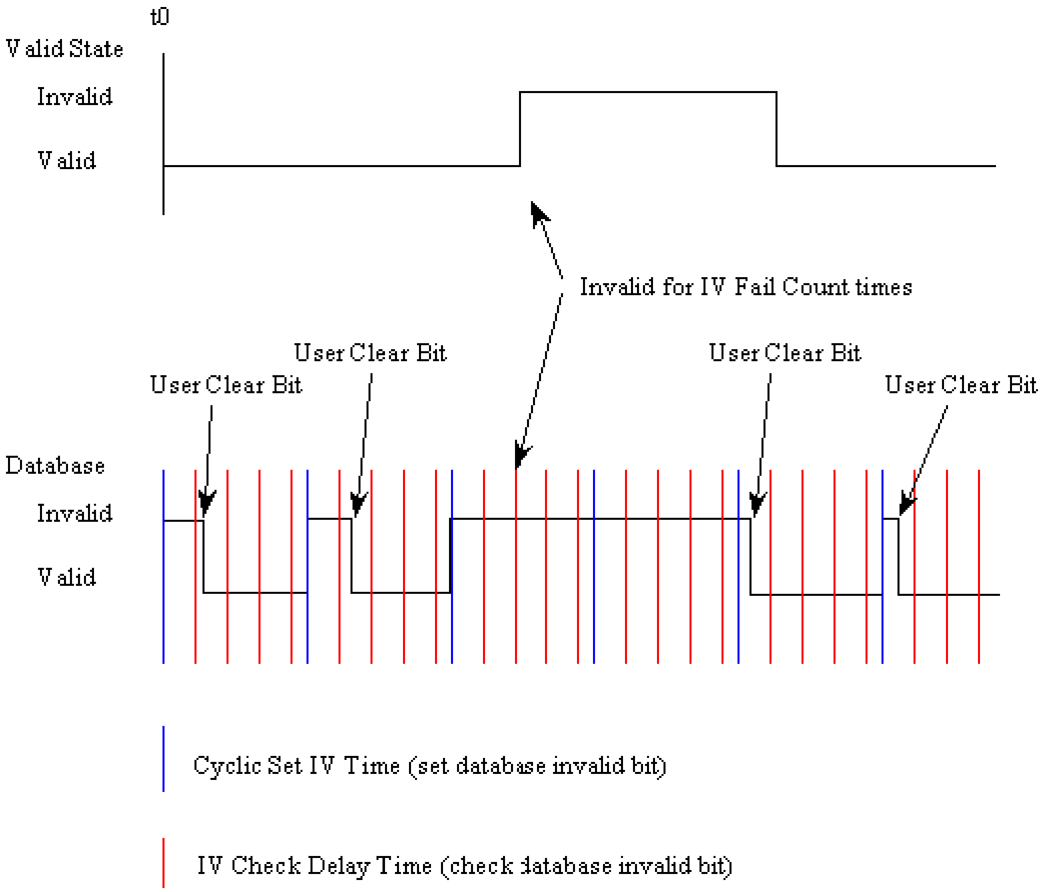
Definition:

Number of sec intervals between IV sets.

Note: This parameter is NEW with regards to the initial module release version. Please check the PCB Readme File history for module firmware compatibility.

To disable this feature, set the IV Fail Count parameter to 0. If used, the Cyclic Set IV Time parameter must be at least 3 times larger than the IV Check Delay Time.

The Cyclic Set IV Time parameter must be set to determine how frequently the IV Checks will be performed. If the IV bit is ON for a number of times given by the IV Fail Count parameter the module will consider the point as invalid. The following illustration shows how these parameters are implemented:


t0
Valid State
Invalid
Valid
Invalid for IV Fail Count times
User Clear Bit
User Clear Bit
User Clear Bit
User Clear Bit
Database
Invalid
Valid
Cyclic Set IV Time (set database invalid bit)
IV Check Delay Time (check database invalid bit)

If the IV bit field is absent or set to 0, the invalid quality state for the point will always be reported as valid.

If a database bit address (1 to 64000) is present, the application may consider the point with an invalid flag if the previous logic checks the IV bit as 1 during consecutive IV Check Delay scans. The IV bits would have to be reset to 0 to set the point to valid state.

The IV DB bit defined for each point can be unique or many points may share the same bit. The last case could be used when the points on an I/O module are to be considered as one set. In this case only a single bit is required. For a point that is the result of a computation, the valid quality state could be set for each point individually.

Monitor Data Transfer

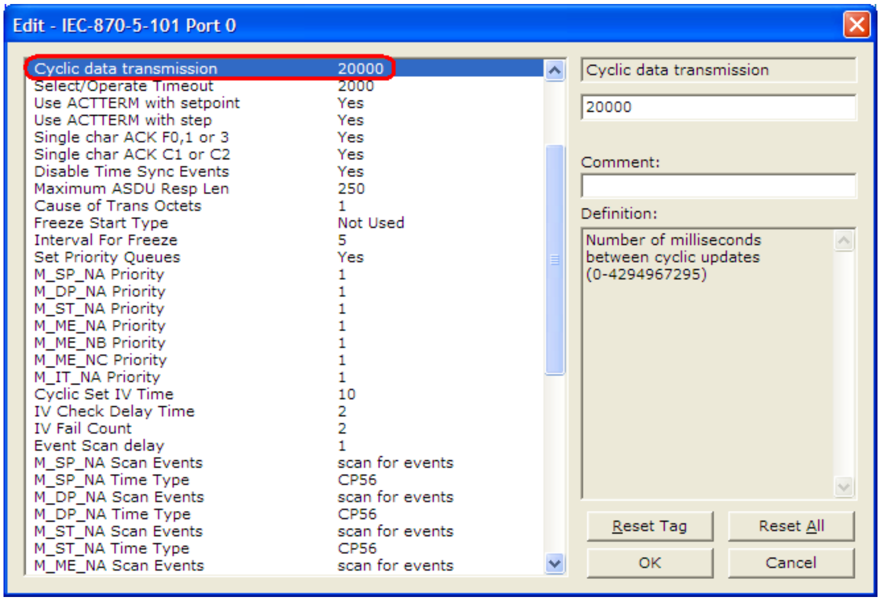
In unbalanced mode the polling procedure is initiated from the master unit through Class 1 and Class 2 requests. In general, ASDUs containing the causes of transmission periodic/cyclic are assigned to be transmitted with class 2 requests and all time tagged or spontaneously transmitted ASDUs are assigned to be transmitted through class 1 requests. Other ASDUs with other causes of transmission of low priority such as background scan may also be assigned to class 2 requests.

Typically, you should properly configure the group code for each monitor point to define how the master will poll for the point. The group codes are defined as follows:

The Group parameter is defined as follows:

Group Code	Description
0x00000001	Interrogated by general interrogation (station or global)
0x00000002	Interrogated by group 1 interrogation
0x00000004	Interrogated by group 2 interrogation
0x00000008	Interrogated by group 3 interrogation
0x00000010	Interrogated by group 4 interrogation
0x00000020	Interrogated by group 5 interrogation
0x00000040	Interrogated by group 6 interrogation
0x00000080	Interrogated by group 7 interrogation
0x00000100	Interrogated by group 8 interrogation
0x00000200	Interrogated by group 9 interrogation
0x00000400	Interrogated by group 10 interrogation
0x00000800	Interrogated by group 11 interrogation
0x00001000	Interrogated by group 12 interrogation
0x00002000	Interrogated by group 13 interrogation
0x00004000	Interrogated by group 14 interrogation
0x00008000	Interrogated by group 15 interrogation
0x00010000	Interrogated by group 16 interrogation
0x00020000	Interrogated by general counter request
0x00040000	Interrogated by group 1 counter request
0x00080000	Interrogated by group 2 counter request
0x00100000	Interrogated by group 3 counter request
0x00200000	Interrogated by group 4 counter request
0x40000000	Disable event scanning of this point
0x80000000	Periodic/cyclic data returned from unit

The module will periodically send all points configured for periodic/cyclic poll (0x80000000) at every x milliseconds, where x is configured with the following parameter:



Cyclic data transmission	20000
Select/Operate Timeout	2000
Use ACTTERM with setpoint	Yes
Use ACTTERM with step	Yes
Single char ACK F0,1 or 3	Yes
Single char ACK C1 or C2	Yes
Disable Time Sync Events	Yes
Maximum ASDU Resp Len	250
Cause of Trans Octets	1
Freeze Start Type	Not Used
Interval For Freeze	5
Set Priority Queues	Yes
M_SP_NA Priority	1
M_DP_NA Priority	1
M_ST_NA Priority	1
M_ME_NA Priority	1
M_ME_NB Priority	1
M_ME_NC Priority	1
M_IT_NA Priority	1
Cyclic Set IV Time	10
IV Check Delay Time	2
IV Fail Count	2
Event Scan delay	1
M_SP_NA Scan Events	scan for events
M_SP_NA Time Type	CP56
M_DP_NA Scan Events	scan for events
M_DP_NA Time Type	CP56
M_ST_NA Scan Events	scan for events
M_ST_NA Time Type	CP56
M_ME_NA Scan Events	scan for events

Cyclic data transmission

20000

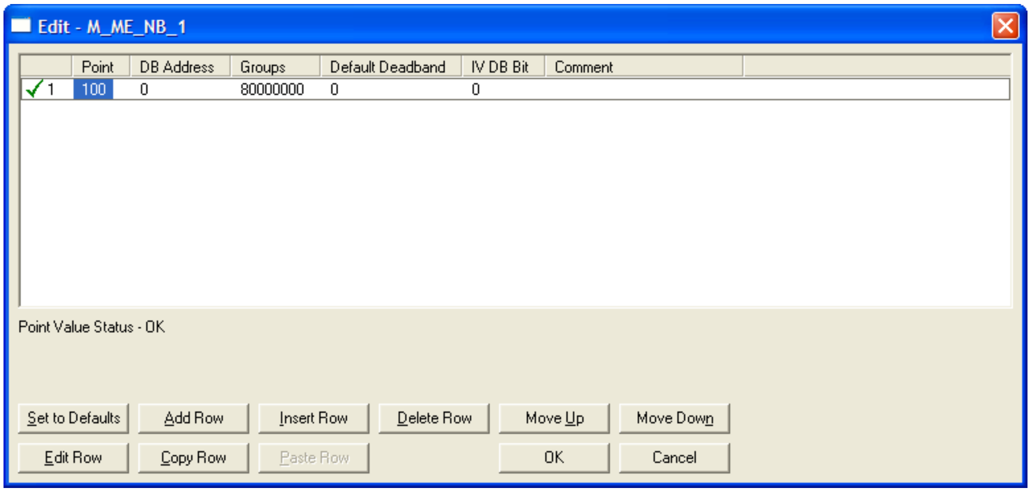
Comment:

Definition:

Number of milliseconds between cyclic updates (0-4294967295)

Example - Periodic Monitor Polling:

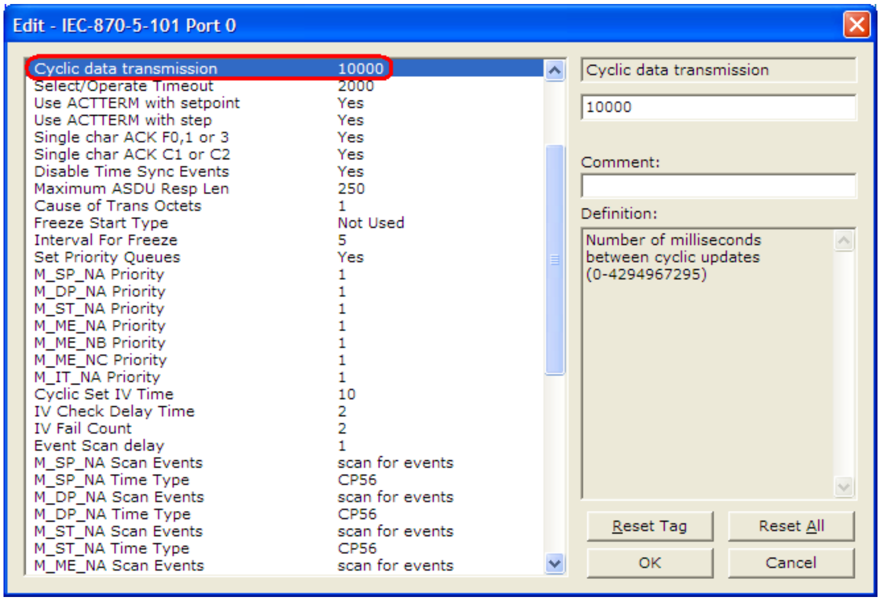
If the following point is configured for monitor polling:



	Point	DB Address	Groups	Default Deadband	IV DB Bit	Comment
✓ 1	100	0	80000000	0	0	

Point Value Status - OK

If you configure the periodic polling for 10 seconds (10000 milliseconds) as follows:



Edit - IEC-870-5-101 Port 0

Cyclic data transmission	10000
Select/Operate Timeout	2000
Use ACTTERM with setpoint	Yes
Use ACTTERM with step	Yes
Single char ACK F0,1 or 3	Yes
Single char ACK C1 or C2	Yes
Disable Time Sync Events	Yes
Maximum ASDU Resp Len	250
Cause of Trans Octets	1
Freeze Start Type	Not Used
Interval For Freeze	5
Set Priority Queues	Yes
M_SP_NA Priority	1
M_DP_NA Priority	1
M_ST_NA Priority	1
M_ME_NA Priority	1
M_ME_NB Priority	1
M_ME_NC Priority	1
M_IT_NA Priority	1
Cyclic Set IV Time	10
IV Check Delay Time	2
IV Fail Count	2
Event Scan delay	1
M_SP_NA Scan Events	scan for events
M_SP_NA Time Type	CP56
M_DP_NA Scan Events	scan for events
M_DP_NA Time Type	CP56
M_ST_NA Scan Events	scan for events
M_ST_NA Time Type	CP56
M_ME_NA Scan Events	scan for events

Cyclic data transmission

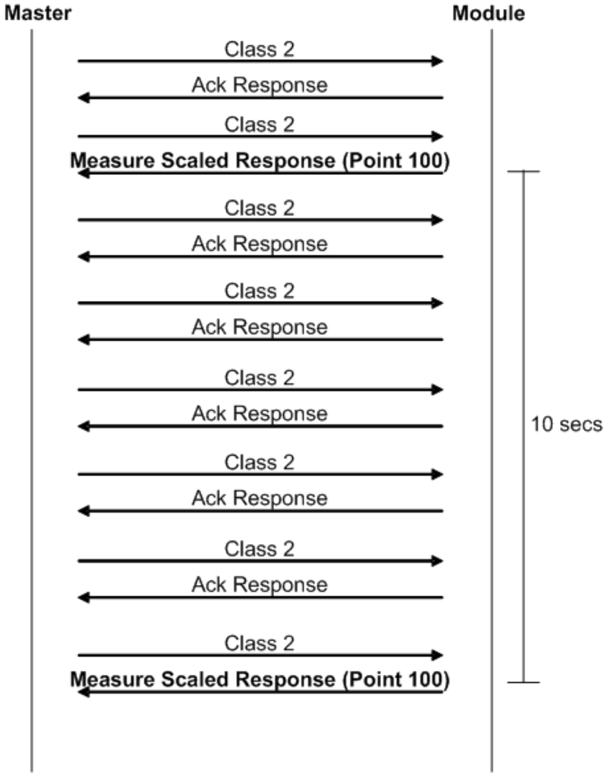
10000

Comment:

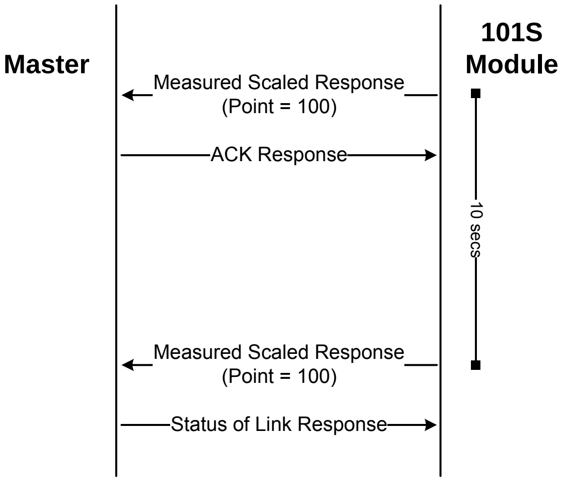
Definition:

Number of milliseconds between cyclic updates (0-4294967295)

The following illustration shows the communication procedure for unbalanced mode:



The following illustration shows the communication procedure for balanced mode:



Therefore, the point configured for a cyclic poll is periodically reported to the master.

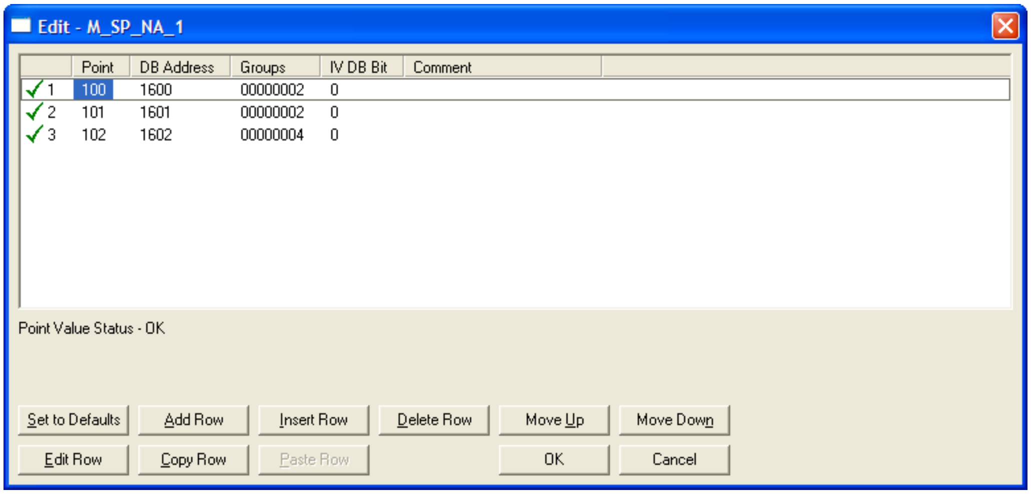
You may also create groups of points allowing the master to poll certain points more frequently than other points. The master may send requests for different groups as follows:

- General Interrogation (station)
- General Interrogation for Group 1
- General Interrogation for Group 2
- …
- General Interrogation for Group 16

Example - General Interrogation

If the following points are configured for General Interrogation:

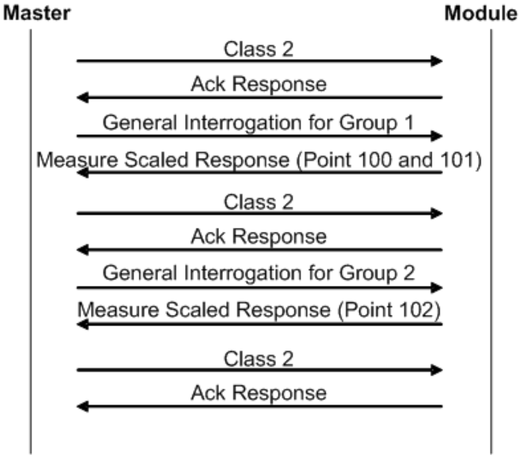
If you configure the following data points:



Edit - M_SP_NA_1

	Point	DB Address	Groups	IV DB Bit	Comment
✓ 1	100	1600	00000002	0	
✓ 2	101	1601	00000002	0	
✓ 3	102	1602	00000004	0	

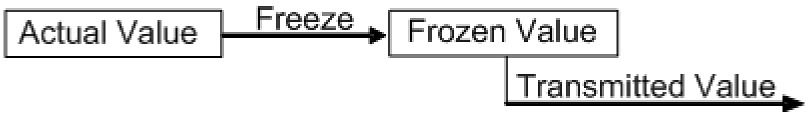
Point Value Status - OK


Master
Module
Class 2
Ack Response
General Interrogation for Group 1
Measure Scaled Response (Point 100 and 101)
Class 2
Ack Response
General Interrogation for Group 2
Measure Scaled Response (Point 102)
Class 2
Ack Response

This feature allows you to separate the points into different groups according to the priority level that these should be reported to the master. In the example above, points 100 and 101 would be returned with a General Interrogation for Group 1 and point 102 would be returned with a General Interrogation for Group 2:

Counter Points

There are four modes of acquisition of integrated totals (M_IT_NA points) defined by the protocol specification. The actual values may be memorized (copied) periodically to frozen values by a freeze command received from the master or initiated locally within the module.



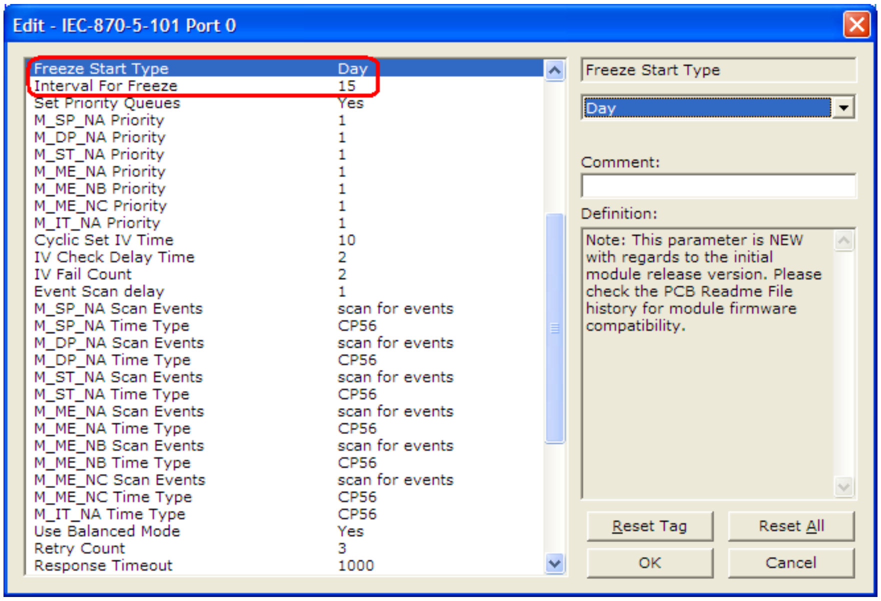
The module supports the following modes:

Mode A - Local freeze with spontaneous transmission

Mode D - Counter interrogation commands from the master initiate the freeze operation and the frozen values are reported spontaneously.

Example - Mode A

To use Mode A, configure the following parameters:



Edit - IEC-870-5-101 Port 0

Freeze Start Type	Day
Interval For Freeze	15
Set Priority Queues	Yes
M_SP_NA Priority	1
M_DP_NA Priority	1
M_ST_NA Priority	1
M_ME_NA Priority	1
M_ME_NB Priority	1
M_ME_NC Priority	1
M_IT_NA Priority	1
Cyclic Set IV Time	10
IV Check Delay Time	2
IV Fail Count	2
Event Scan delay	1
M_SP_NA Scan Events	scan for events
M_SP_NA Time Type	CP56
M_DP_NA Scan Events	scan for events
M_DP_NA Time Type	CP56
M_ST_NA Scan Events	scan for events
M_ST_NA Time Type	CP56
M_ME_NA Scan Events	scan for events
M_ME_NA Time Type	CP56
M_ME_NB Scan Events	scan for events
M_ME_NB Time Type	CP56
M_ME_NC Scan Events	scan for events
M_ME_NC Time Type	CP56
M_IT_NA Time Type	CP56
Use Balanced Mode	Yes
Retry Count	3
Response Timeout	1000

Freeze Start Type

Day

Comment:

Definition:

Note: This parameter is NEW with regards to the initial module release version. Please check the PCB Readme File history for module firmware compatibility.

Freeze Start Type

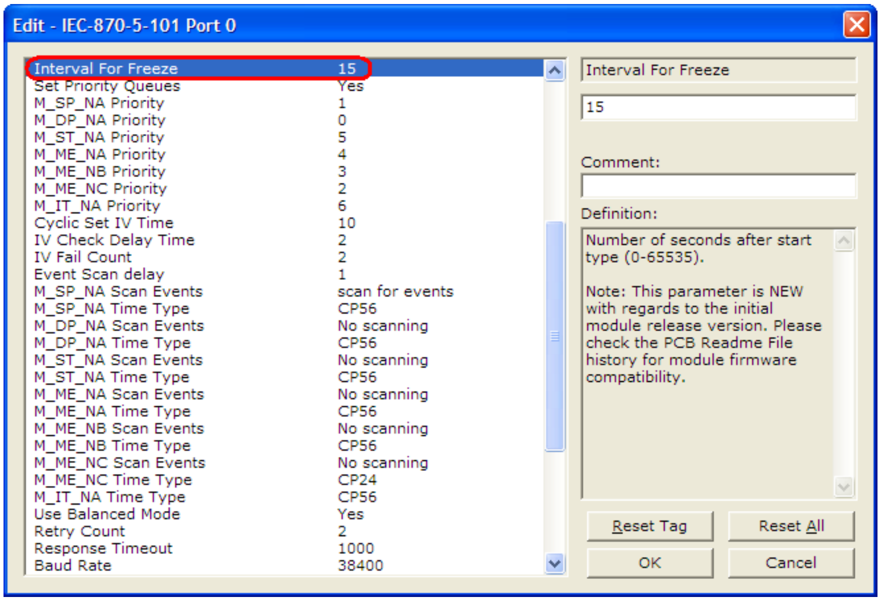
The Freeze Start Type parameter defines when the module starts sending the M_IT messages.

Example I - Freeze Start Type

If the module powers up with the following date and time clock:

03/25/2004 18:07:42

If you configure the Interval For Freeze parameter as follows:



Edit - IEC-870-5-101 Port 0

Interval For Freeze	15
Set Priority Queues	Yes
M_SP_NA Priority	1
M_DP_NA Priority	0
M_ST_NA Priority	5
M_ME_NA Priority	4
M_ME_NB Priority	3
M_ME_NC Priority	2
M_IT_NA Priority	6
Cyclic Set IV Time	10
IV Check Delay Time	2
IV Fail Count	2
Event Scan delay	1
M_SP_NA Scan Events	scan for events
M_SP_NA Time Type	CP56
M_DP_NA Scan Events	No scanning
M_DP_NA Time Type	CP56
M_ST_NA Scan Events	No scanning
M_ST_NA Time Type	CP56
M_ME_NA Scan Events	No scanning
M_ME_NA Time Type	CP56
M_ME_NB Scan Events	No scanning
M_ME_NB Time Type	CP56
M_ME_NC Scan Events	No scanning
M_ME_NC Time Type	CP24
M_IT_NA Time Type	CP56
Use Balanced Mode	Yes
Retry Count	2
Response Timeout	1000
Baud Rate	38400

Interval For Freeze

15

Comment:

Definition:

Number of seconds after start type (0-65535).

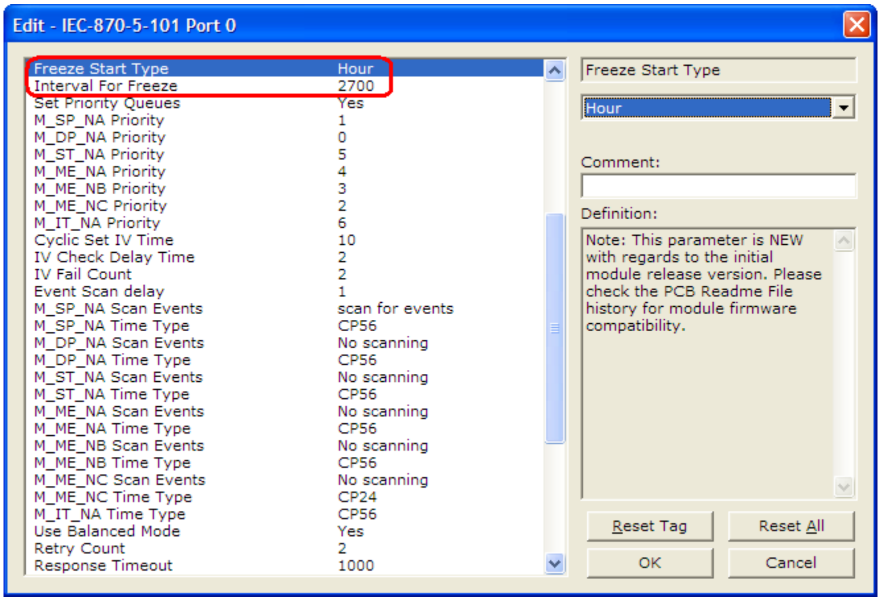
Note: This parameter is NEW with regards to the initial module release version. Please check the PCB Readme File history for module firmware compatibility.

The module would send the counter messages every 15 seconds. The module would start sending the messages depending on the Freeze Start Type parameter as follows:

Freeze Start Type	Time to Start Sending Messages
D	03/26/2004 00:00:00
H	03/25/2004 19:00:00
M	03/25/2004 18:08:00

Example II - Freeze Start Type

If the module should send the counter points on the hourly turn around time and also 45 minutes later, the Mode A parameters should be configured as follows:



Freeze Start Type	Hour
Interval For Freeze	2700
Set Priority Queues	Yes
M_SP_NA Priority	1
M_DP_NA Priority	0
M_ST_NA Priority	5
M_ME_NA Priority	4
M_ME_NB Priority	3
M_ME_NC Priority	2
M_IT_NA Priority	6
Cyclic Set IV Time	10
IV Check Delay Time	2
IV Fail Count	2
Event Scan delay	1
M_SP_NA Scan Events	scan for events
M_SP_NA Time Type	CP56
M_DP_NA Scan Events	No scanning
M_DP_NA Time Type	CP56
M_ST_NA Scan Events	No scanning
M_ST_NA Time Type	CP56
M_ME_NA Scan Events	No scanning
M_ME_NA Time Type	CP56
M_ME_NB Scan Events	No scanning
M_ME_NB Time Type	CP56
M_ME_NC Scan Events	No scanning
M_ME_NC Time Type	CP24
M_IT_NA Time Type	CP56
Use Balanced Mode	Yes
Retry Count	2
Response Timeout	1000

Freeze Start Type

Hour

Comment:

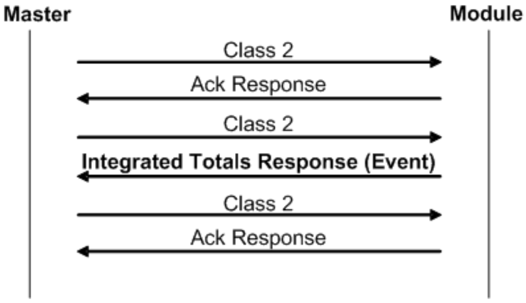
Definition:

Note: This parameter is NEW with regards to the initial module release version. Please check the PCB Readme File history for module firmware compatibility.

So the module would send events as follows (Hours:Minutes:Seconds):

```
17:00:00
17:45:00
18:00:00
18:45:00
19:00:00
19:45:00
…
```

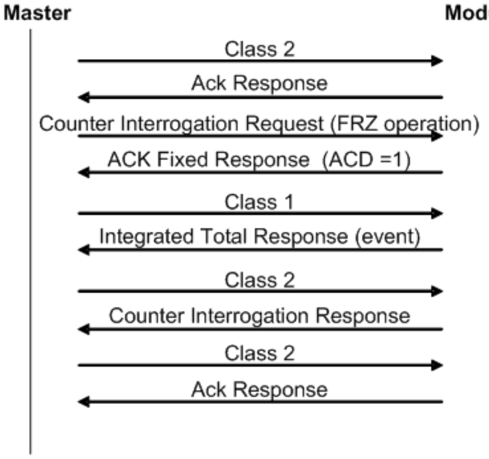
The following illustration shows a typical communication example when the Mode A is selected during unbalanced mode operation:



Mode D

To select the Mode D. configure the Freeze Start Type parameter as ""Not Used". For this mode the master would periodically send Counter Interrogation Commands to perform the freeze operation. After the values are frozen the module will return the counter points as events. The counter points must be properly configured for counter interrogation groups for Mode D operation.

The following illustration shows a typical communication example when the Mode D is selected during unbalanced mode operation:


Master
Module
Class 2
Ack Response
Counter Interrogation Request (FRZ operation)
ACK Fixed Response (ACD =1)
Class 1
Integrated Total Response (event)
Class 2
Counter Interrogation Response
Class 2
Ack Response

Monitor Points Addressing

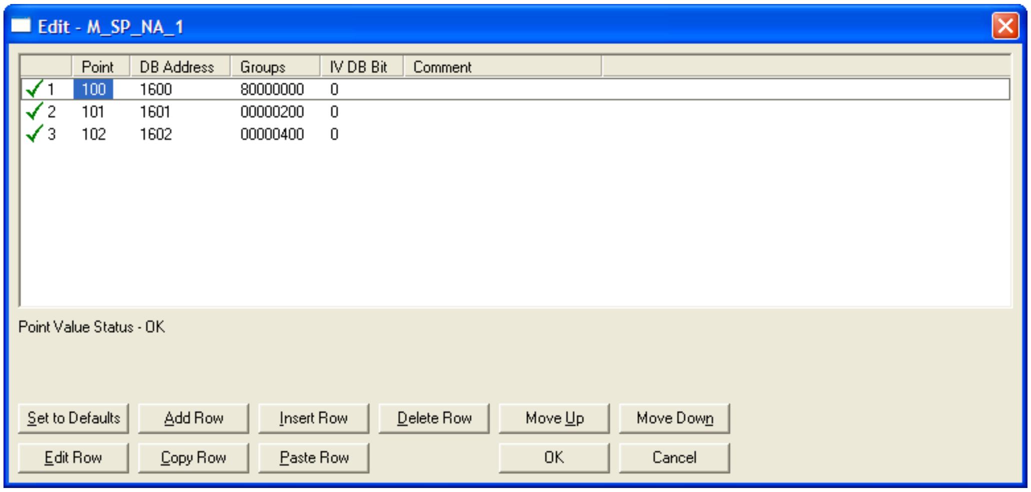
As discussed before, the monitor points must be configured in a database area in the PTQ-101S module.

The monitor data types are described in the following table.

Data Type	Data Size	Addressing Type
M_SP_NA	1 bit	Bit
M_DP_NA	2 bits	Bit
M_ST_NA	1 byte	Byte
M_ME_NA	1 word	Word
M_ME_NB	1 word	Word
M_ME_NC	2 word	Double-Word
M_IT_NA	2 word	Double-Word

M_SP_NA and M_DP_NA

The monitored single-point (1 bit) and monitored double-point (2 bits) types both occupy bit-addressing. For example, if you configured the following points:



	Point	DB Address	Groups	IV DB Bit	Comment
✓ 1	100	1600	80000000	0	
✓ 2	101	1601	00000200	0	
✓ 3	102	1602	00000400	0	

Point Value Status - OK

These points would be used as follows:

Inf. Object Address	**Module Database Address**
100	Bit 0 of word 100
101	Bit 1 of word 100
102	Bit 2 of word 100

The monitored double-point uses two bits with bit-addressing. It typically represents the ON/OFF states where:

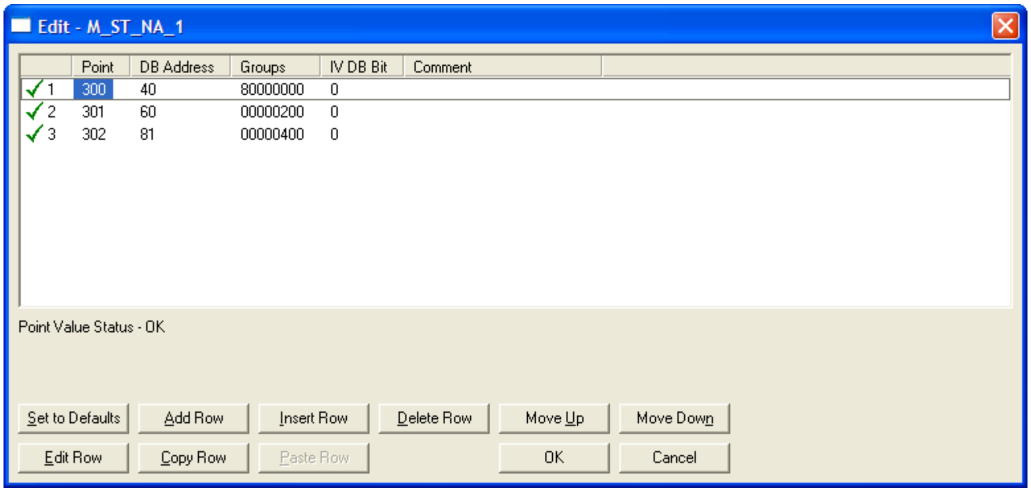
01 = OFF

10 = ON

M_ST_NA

The monitored step-point uses one byte with byte-addressing.

For example, if you configured the following points:



	Point	DB Address	Groups	IV DB Bit	Comment
✓ 1	300	40	80000000	0	
✓ 2	301	60	00000200	0	
✓ 3	302	81	00000400	0	

Point Value Status - OK

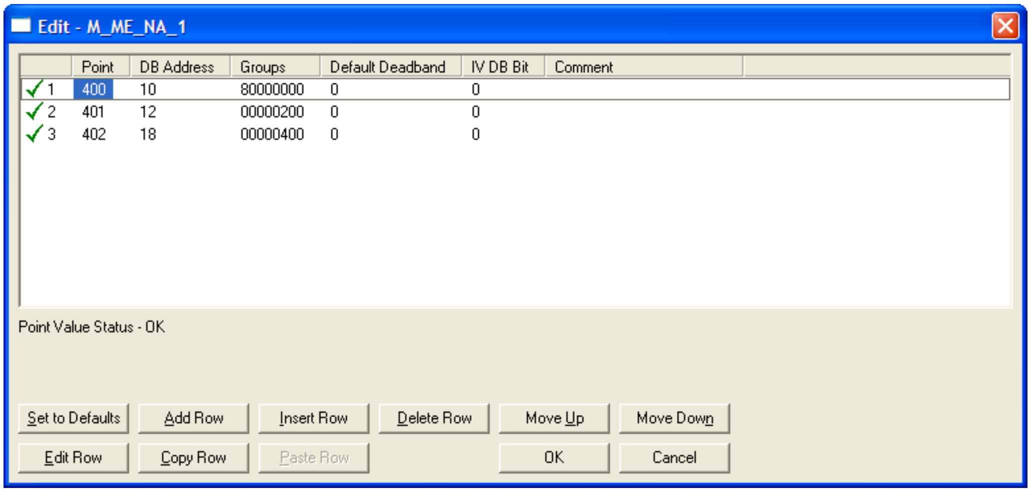
These points would be used as follows:

Inf. Object Address	**Module Database Address**
300	Low Byte of word 20
301	Low Byte of word 30
302	High Byte of word 40

M_ME_NA and M_ME_NB

The monitored measured normalized and measured scaled points occupy one word with word-addressing.

For example, if you configured the following points:



Edit - M_ME_NA_1

	Point	DB Address	Groups	Default Deadband	IV DB Bit	Comment
✓ 1	400	10	80000000	0	0	
✓ 2	401	12	00000200	0	0	
✓ 3	402	18	00000400	0	0	

Point Value Status - OK

These points would be used as follows:

Inf. Object Address	**PTQ-101S Module Database Address**
400	Word 10
401	Word 12
402	Word 18

The monitored measured normalized points use a data representation defined by the protocol specification, where each bit represents a value as follows:

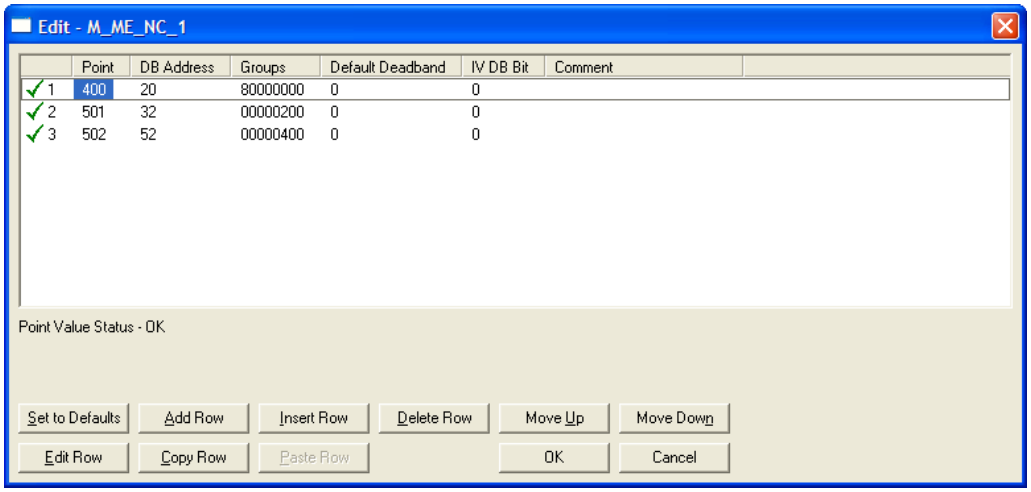
Bit	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Value	S	2^{-1}	2^{-2}	2^{-3}	2^{-4}	2^{-5}	2^{-6}	2^{-7}	2^{-8}	2^{-9}	2^{-10}	2^{-11}	2^{-12}	2^{-13}	2^{-14}	2^{-15}

Example: a value of 4000hex is interpreted as 0.5

M_ME_NC and M_IT_NA

The monitored measured short floating point and monitored integrated total points occupy two words with double-word addressing.

For example, if you configured the following points:



Edit - M_ME_NC_1

	Point	DB Address	Groups	Default Deadband	IV DB Bit	Comment
✓ 1	400	20	80000000	0	0	
✓ 2	501	32	00000200	0	0	
✓ 3	502	52	00000400	0	0	

Point Value Status - OK

These points would be used as follows:

Inf. Object Address	Module Database Address
500	Words 40 and 41
501	Words 64 and 65
502	Word 104 and 105

8.2.8 Using Control (Command) Points

The following command points are supported by the module:

Symbol	Description	Data Size in Database	Addressing Type
C-SC-NA	Single-Point Command	1 bit	Bit
C-DC-NA	Dual-Point Command	2 bits	Bit
C-RC-NA	Step-Point Command	1 byte	Byte
C-SE-NA	Measured Normalized Point Command	1 word	Word
C-SE-NB	Measured Scaled-Point Command	1 word	Word
C-SE-NC	Measured Short-Floating Point Command	2 words	Double-Word

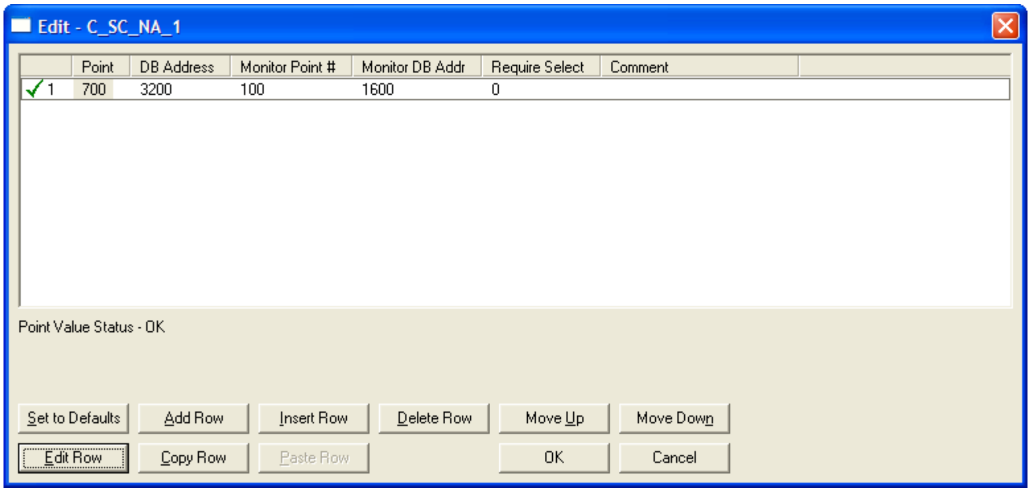
Each command point is identified by its Information Object Address (it should be unique for each Common ASDU Address in the network). For each monitor point, configure the following parameters:

Point # - This is the information object address of the point. It identifies the point in the network.

DB Address - This is the database location in the PTQ-101S module associated with the point. You must associate each point to a database address in the PTQ-101S. The interpretation of this parameter depends on the point type configured. For example, for an C_SC_NA point, this value represents the bit address. For a C_SE_NA point, this value represents the byte address.

Monitor Point # & Monitor DB Address- You can (optionally) configure a monitor point to be sent by the module when it receives the command for that specific point.

Example - Monitor Point Configuration for Command Points:


Edit - C_SC_NA_1

	Point	DB Address	Monitor Point #	Monitor DB Addr	Require Select	Comment
✓ 1	700	3200	100	1600	0	

Point Value Status - OK

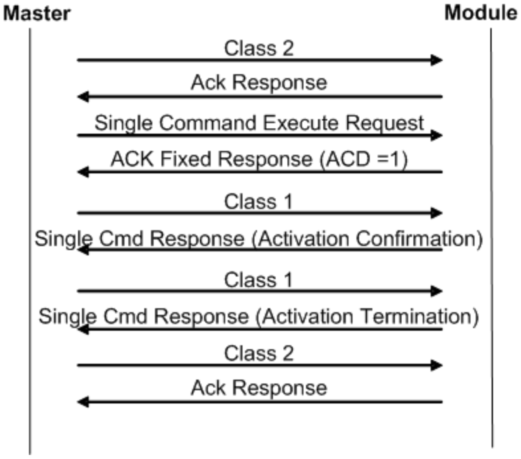
So every time the module receives a command for single-command point 700 it would send a response containing a monitored single-point (information object address 100 with the value at bit-address 1600).

Require Select - This parameter configures the point to require a Select request before the Operate command.

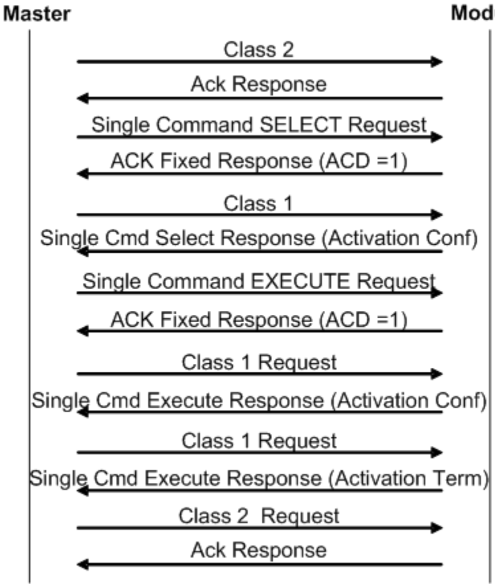
Control Data Transfer

The control communication typically occurs when the master sends a command request to update the module's command points.

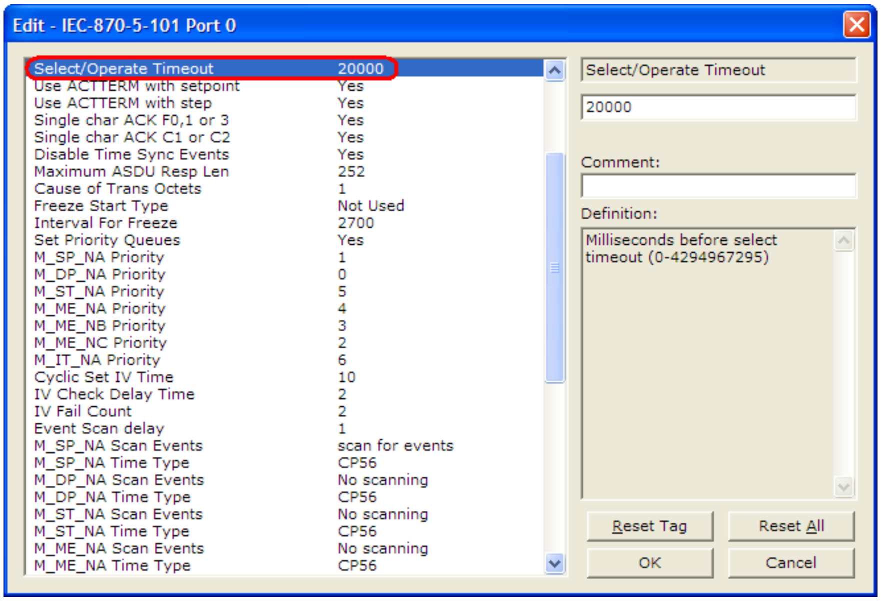
The following illustration shows a typical command communication between the master and module during unbalanced operation.


Master
Module
Class 2
Ack Response
Single Command Execute Request
ACK Fixed Response (ACD =1)
Class 1
Single Cmd Response (Activation Confirmation)
Class 1
Single Cmd Response (Activation Termination)
Class 2
Ack Response

Some of the command points may be configured to be selected before executed. The following illustration shows a typical command communication between the master and module during unbalanced operation with a SELECT operation.


Master
Module
Class 2
Ack Response
Single Command SELECT Request
ACK Fixed Response (ACD =1)
Class 1
Single Cmd Select Response (Activation Conf)
Single Command EXECUTE Request
ACK Fixed Response (ACD =1)
Class 1 Request
Single Cmd Execute Response (Activation Conf)
Class 1 Request
Single Cmd Execute Response (Activation Term)
Class 2 Request
Ack Response

Refer to the following parameter to configure the select/operate timeout period. After the module receives the SELECT operation it will wait for this period of time for the EXECUTE operation. If the module does not receive an EXECUTE operation within this period of time it will require another SELECT operation before the EXECUTE operation.


Edit - IEC-870-5-101 Port 0

Select/Operate Timeout	20000
Use ACTTERM with setpoint	Yes
Use ACTTERM with step	Yes
Single char ACK F0,1 or 3	Yes
Single char ACK C1 or C2	Yes
Disable Time Sync Events	Yes
Maximum ASDU Resp Len	252
Cause of Trans Octets	1
Freeze Start Type	Not Used
Interval For Freeze	2700
Set Priority Queues	Yes
M_SP_NA Priority	1
M_DP_NA Priority	0
M_ST_NA Priority	5
M_ME_NA Priority	4
M_ME_NB Priority	3
M_ME_NC Priority	2
M_IT_NA Priority	6
Cyclic Set IV Time	10
IV Check Delay Time	2
IV Fail Count	2
Event Scan delay	1
M_SP_NA Scan Events	scan for events
M_SP_NA Time Type	CP56
M_DP_NA Scan Events	No scanning
M_DP_NA Time Type	CP56
M_ST_NA Scan Events	No scanning
M_ST_NA Time Type	CP56
M_ME_NA Scan Events	No scanning
M_ME_NA Time Type	CP56

Select/Operate Timeout

20000

Comment:

Definition:

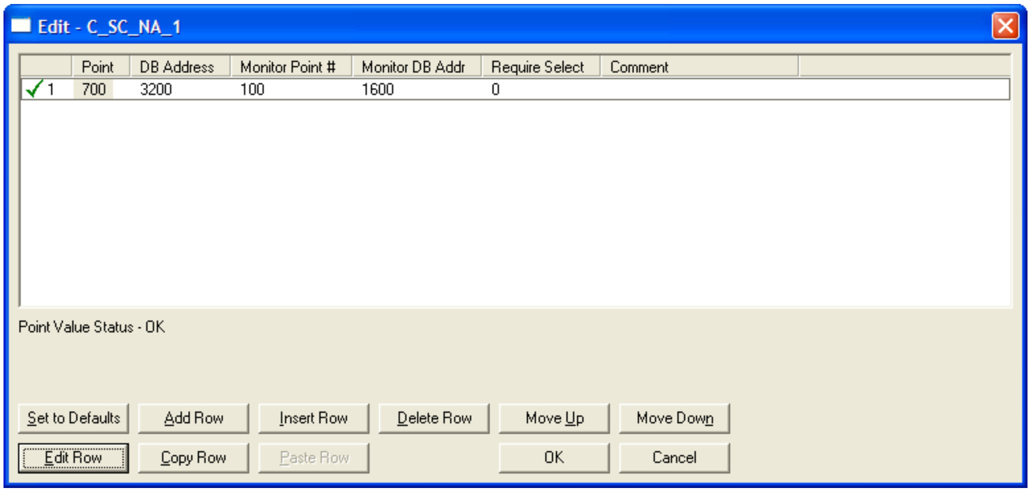
Milliseconds before select timeout (0-4294967295)

Command Points Addressing

As discussed before, the command points must be configured in a database area that is updated at the module. You must associate each point to a database address in the PTQ-101S module. The interpretation of this parameter depends on the point type configured.

C_SC_NA and C_DC_NA

The single-point command and dual-point command points use one bit with bit-addressing. For example, if you configure the following points:



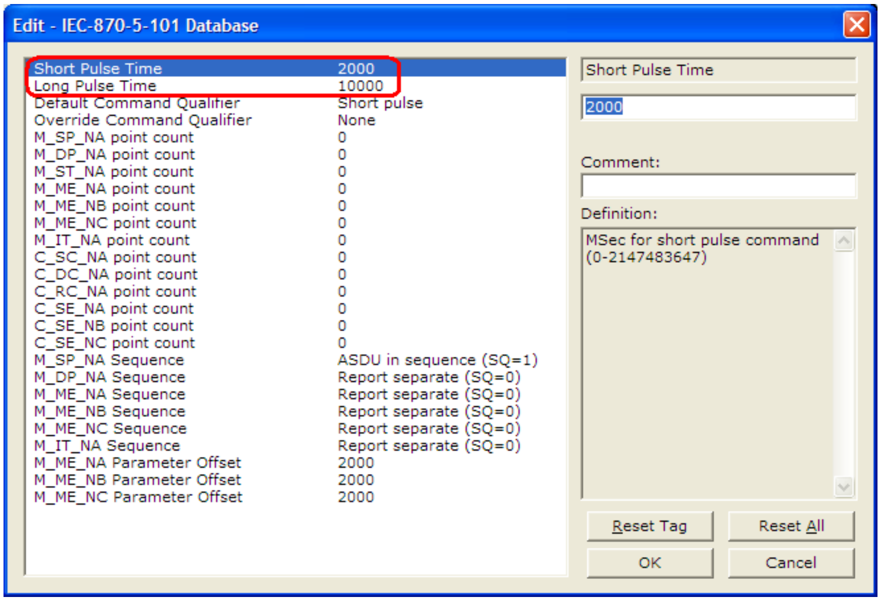
	Point	DB Address	Monitor Point #	Monitor DB Addr	Require Select	Comment
✓ 1	700	3200	100	1600	0	

Point Value Status - OK

These points would be used as follows:

Inf. Object Address	Module Database Address
100	Bit 0 of word 100
101	Bit 1 of word 100
102	Bit 2 of word 100

The protocol specification defines a qualifier value that is set by the master to determine the duration of the pulse (short, long or persistent). Configure the parameters below to set the duration of the short and long pulses:



Short Pulse Time	2000
Long Pulse Time	10000
Default Command Qualifier	Short pulse
Override Command Qualifier	None
M_SP_NA point count	0
M_DP_NA point count	0
M_ST_NA point count	0
M_ME_NA point count	0
M_ME_NB point count	0
M_ME_NC point count	0
M_IT_NA point count	0
C_SC_NA point count	0
C_DC_NA point count	0
C_RC_NA point count	0
C_SE_NA point count	0
C_SE_NB point count	0
C_SE_NC point count	0
M_SP_NA Sequence	ASDU in sequence (SQ=1)
M_DP_NA Sequence	Report separate (SQ=0)
M_ME_NA Sequence	Report separate (SQ=0)
M_ME_NB Sequence	Report separate (SQ=0)
M_ME_NC Sequence	Report separate (SQ=0)
M_IT_NA Sequence	Report separate (SQ=0)
M_ME_NA Parameter Offset	2000
M_ME_NB Parameter Offset	2000
M_ME_NC Parameter Offset	2000

Short Pulse Time

2000

Comment:

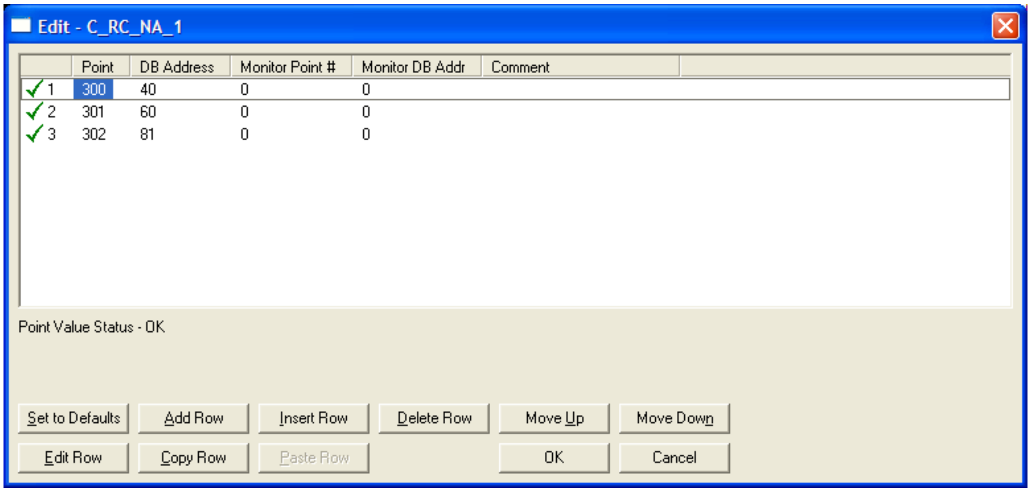
Definition:

MSec for short pulse command (0-2147483647)

C_RC_NA

The step-point command uses one byte with byte-addressing.

For example, if you configured the following points:



	Point	DB Address	Monitor Point #	Monitor DB Addr	Comment
✓ 1	300	40	0	0	
✓ 2	301	60	0	0	
✓ 3	302	81	0	0	

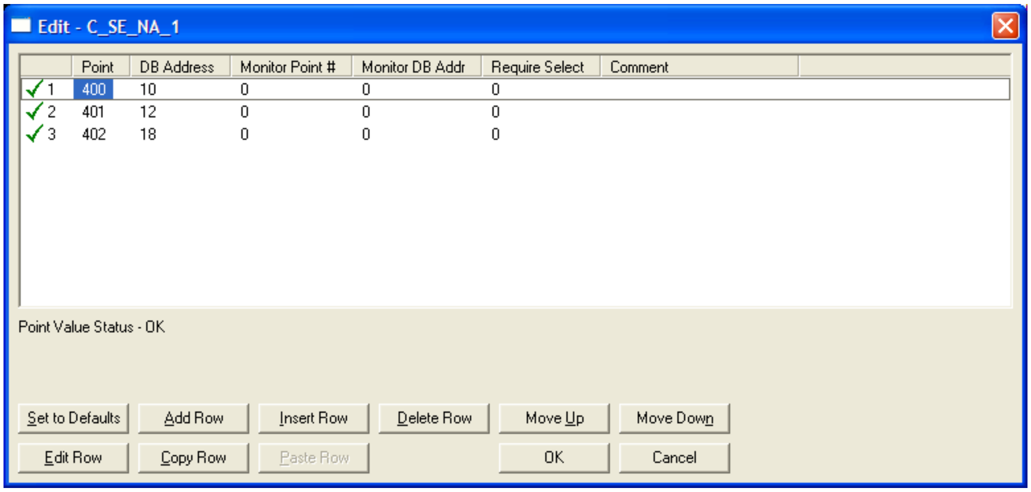
Point Value Status - OK

These points would be used as follows:

Inf. Object Address	Module Database Address
300	Low Byte of word 20
301	Low Byte of word 30
302	High Byte of word 40

C_SE_NA and C_SE_NB

The measured normalized point command uses one word with word-addressing. For example, if you configured the following points:



	Point	DB Address	Monitor Point #	Monitor DB Addr	Require Select	Comment
✓ 1	400	10	0	0	0	
✓ 2	401	12	0	0	0	
✓ 3	402	18	0	0	0	

Point Value Status - OK

These points would be used as follows:

Inf. Object Address	PTQ-101S Module Database Address
400	Word 10
401	Word 12
402	Word 18

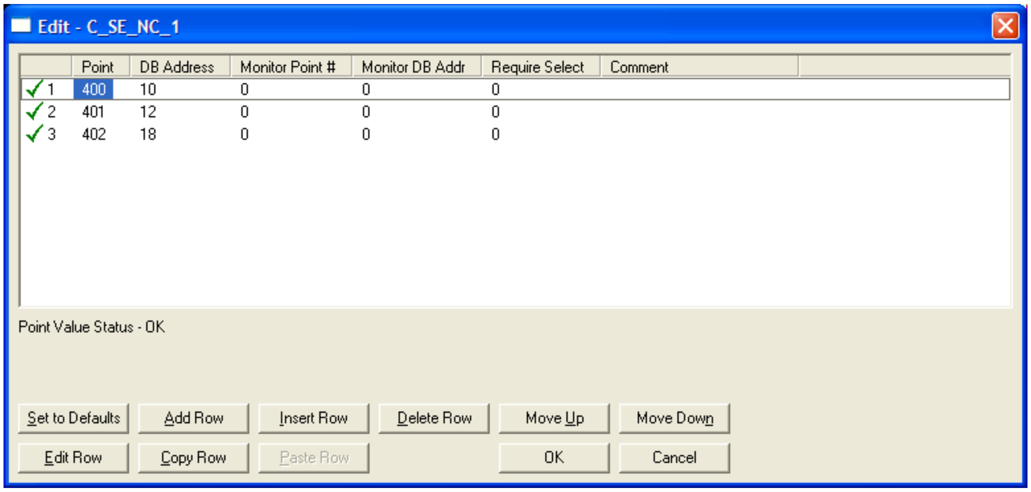
The measured normalized points use a data representation defined by the protocol specification, where each bit represents a value as follows:

Bit	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
Value	S	2^{-1}	2^{-2}	2^{-3}	2^{-4}	2^{-5}	2^{-6}	2^{-7}	2^{-8}	2^{-9}	2^{-10}	2^{-11}	2^{-12}	2^{-13}	2^{-14}	2^{-15}

Example: a value of 4000hex is interpreted as 0.5

C_SE_NC

The measured short floating point command uses two words with double-word addressing. For example, if you configured the following points:



	Point	DB Address	Monitor Point #	Monitor DB Addr	Require Select	Comment
✓ 1	400	10	0	0	0	
✓ 2	401	12	0	0	0	
✓ 3	402	18	0	0	0	

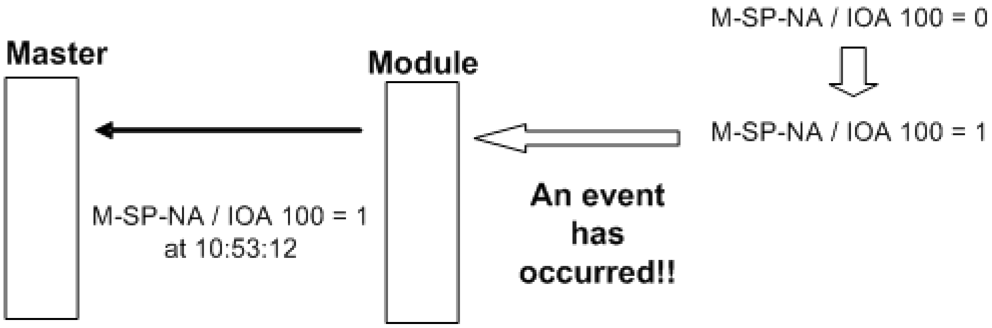
Point Value Status - OK

These points would be used as follows:

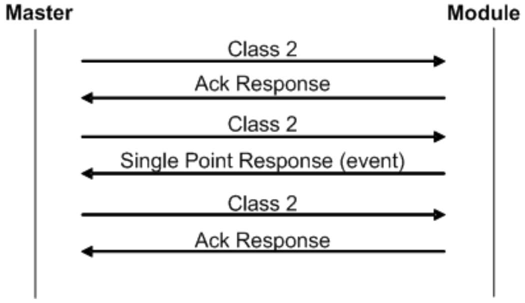
Inf. Object Address	PTQ-101S Module Database Address
400	Words 5 and 6
401	Words 6 and 7
402	Words 9 and 10

8.2.9 Events

In order to improve the communication efficiency, most applications will require the master to periodically poll for data changes with a higher priority than polling for monitor data. Every time data change occurs, the slave should send this information, typically with the date and time information on when the data change occurred.



The following illustration shows the event communication between the master and the module during unbalanced mode:



The module can queue up to 99 events per data type. When the queue is full, the oldest event will be deleted each time a new event is added to the queue. You must configure the master to poll the event queue frequently enough to avoid losing events.

The events can be returned for Class 1 or Class 2 requests according to the data type as follows:

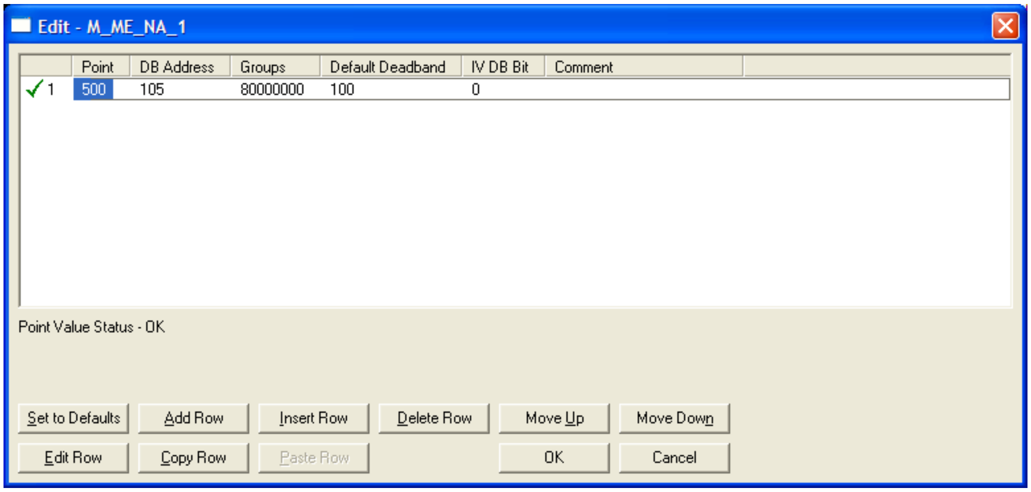
Data Type	**Class Request**
M_SP_NA	Class 1
M_DP_NA	Class 1
M_ST_NA	Class 1
M_ME_NA	Class 2
M_ME_NB	Class 2
M_ME_NC	Class 2
M_IT_NA	Class 1

Note: In response to a Class 2 poll the module may respond with Class 1 data when there is no Class 2 data available. So eventually the events for M_SP_NA, M_DP_NA and M_ST_NA points may also be sent during a Class 2 response.

Deadbands

A deadband is a range of values within which the module will avoid generating events. The monitored measured points (M_ME_NA and M_ME_NB) will only generate events if the measurement varies by more than the configured deadband value.

For example, if the following point is configured:



Edit - M_ME_NA_1

	Point	DB Address	Groups	Default Deadband	IV DB Bit	Comment
✓ 1	500	105	80000000	100	0	

Point Value Status - OK

So, if the current value for this point is 130, it would only generate events if:

NEW VALUE is less or equal than 30

OR

NEW VALUE is greater or equal than 230.

You can set the deadband for each monitored measured point through the configuration file.

The master may also dynamically change the deadband for each monitored point. The master may send one of the following commands:

Type	Command
110	Parameter of Measured Normalized Data (M_ME_NA)
111	Parameter of Measured Scaled Data (M_ME_NB)
112	Parameter of Measured Short Floating Point (M_ME_NC)

The protocol specification explains that the qualifier value for these commands should be configured as:

Bits	Value	Description
1 to 6	0	Not Used
	1	Threshold Value (Deadband)
	2	Smoothing Factor (filter time constant) - Not Supported
	3	Low Limit Transmission of Measured Value
	4	High Limit Transmission of Measured Value
	5..31	Reserved

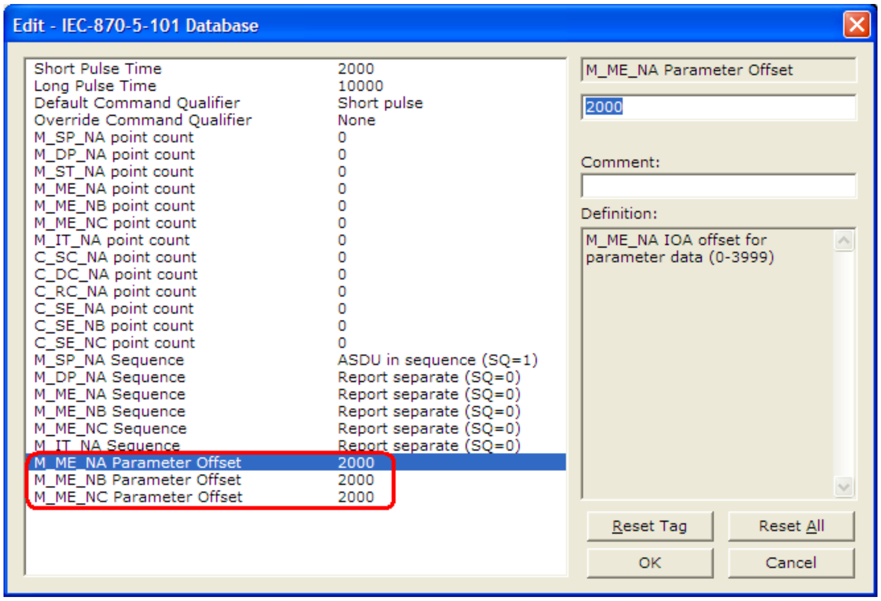
Bits	Value	Description
7	0	No Change
	1	Change
8	0	Operation
	1	Not in Operation

The module calculates the Low Limit and High Limit values using the formula below (so these values cannot be changed dynamically)

Low Limit = (LAST REPORTED VALUE) - Deadband

High Limit = (LAST REPORTED VALUE) + Deadband

These commands must be sent to a specific Information Object Address. The module associates each monitor measured point with a parameter point through the following configuration parameters:


Edit - IEC-870-5-101 Database

Short Pulse Time	2000
Long Pulse Time	10000
Default Command Qualifier	Short pulse
Override Command Qualifier	None
M_SP_NA point count	0
M_DP_NA point count	0
M_ST_NA point count	0
M_ME_NA point count	0
M_ME_NB point count	0
M_ME_NC point count	0
M_IT_NA point count	0
C_SC_NA point count	0
C_DC_NA point count	0
C_RC_NA point count	0
C_SE_NA point count	0
C_SE_NB point count	0
C_SE_NC point count	0
M_SP_NA Sequence	ASDU in sequence (SQ=1)
M_DP_NA Sequence	Report separate (SQ=0)
M_ME_NA Sequence	Report separate (SQ=0)
M_ME_NB Sequence	Report separate (SQ=0)
M_ME_NC Sequence	Report separate (SQ=0)
M_IT_NA Sequence	Report separate (SQ=0)
M_ME_NA Parameter Offset	2000
M_ME_NB Parameter Offset	2000
M_ME_NC Parameter Offset	2000

M_ME_NA Parameter Offset

2000

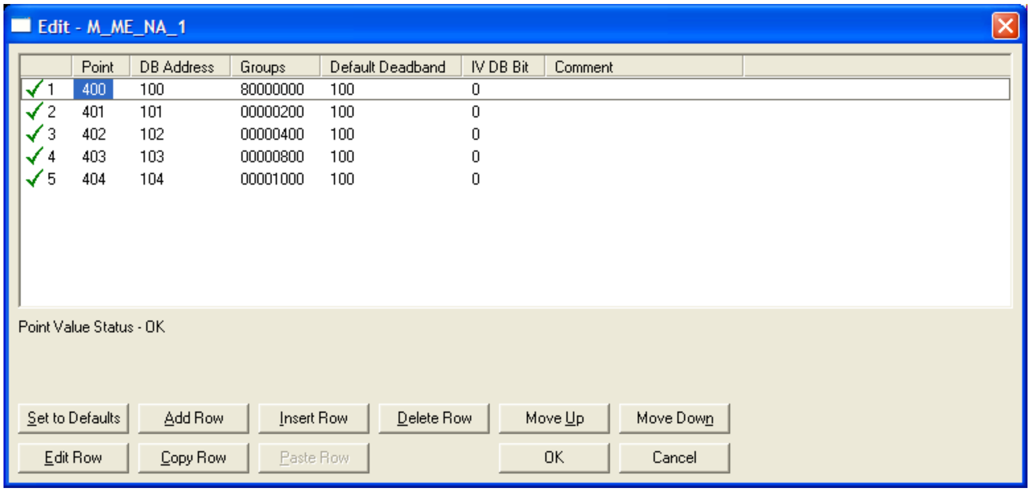
Comment:

Definition:

M_ME_NA IOA offset for parameter data (0-3999)

Example - Parameter Data for Monitored Points:

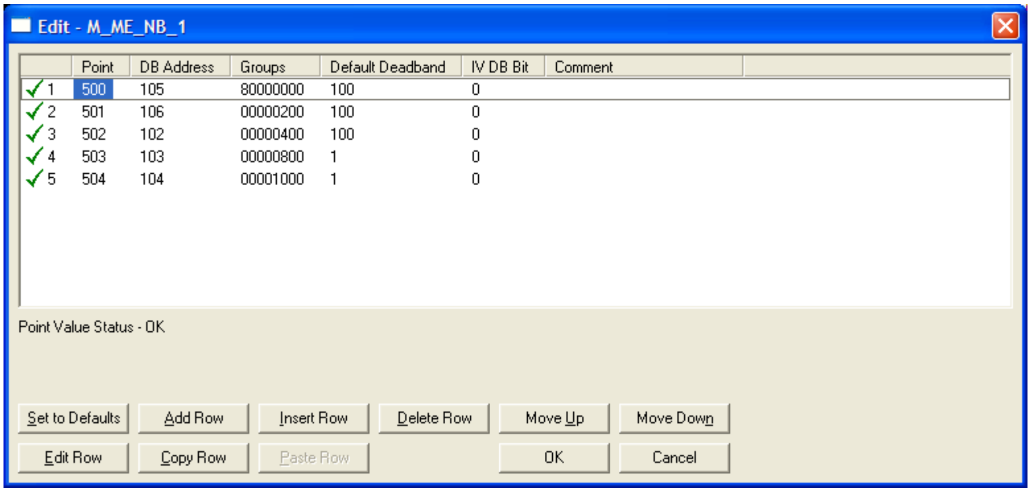
If the following monitored measured points are configured:



Edit - M_ME_NA_1

	Point	DB Address	Groups	Default Deadband	IV DB Bit	Comment
✓ 1	400	100	80000000	100	0	
✓ 2	401	101	00000200	100	0	
✓ 3	402	102	00000400	100	0	
✓ 4	403	103	00000800	100	0	
✓ 5	404	104	00001000	100	0	

Point Value Status - OK

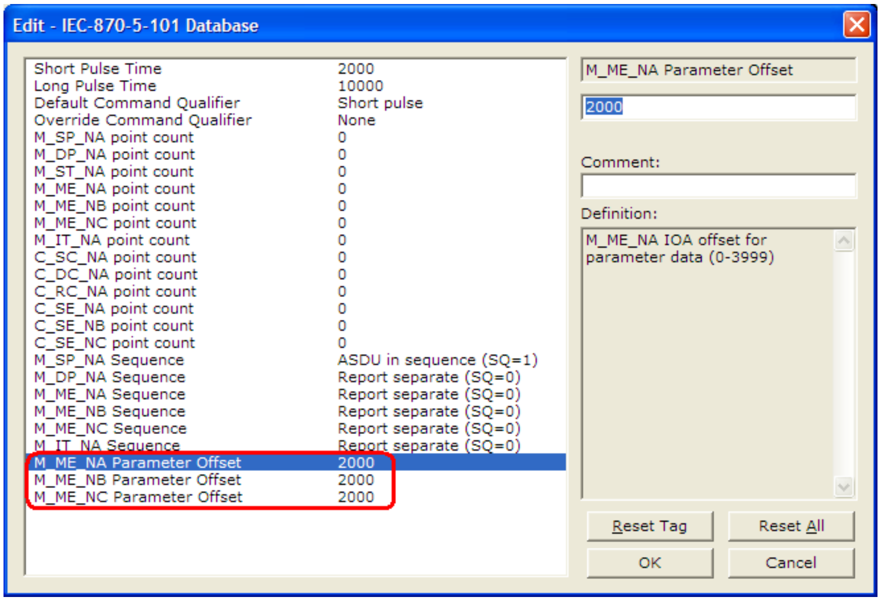


Edit - M_ME_NB_1

	Point	DB Address	Groups	Default Deadband	IV DB Bit	Comment
✓ 1	500	105	80000000	100	0	
✓ 2	501	106	00000200	100	0	
✓ 3	502	102	00000400	100	0	
✓ 4	503	103	00000800	1	0	
✓ 5	504	104	00001000	1	0	

Point Value Status - OK

And if the parameter points are configured as follows:



Edit - IEC-870-5-101 Database

Short Pulse Time	2000
Long Pulse Time	10000
Default Command Qualifier	Short pulse
Override Command Qualifier	None
M_SP_NA point count	0
M_DP_NA point count	0
M_ST_NA point count	0
M_ME_NA point count	0
M_ME_NB point count	0
M_ME_NC point count	0
M_IT_NA point count	0
C_SC_NA point count	0
C_DC_NA point count	0
C_RC_NA point count	0
C_SE_NA point count	0
C_SE_NB point count	0
C_SE_NC point count	0
M_SP_NA Sequence	ASDU in sequence (SQ=1)
M_DP_NA Sequence	Report separate (SQ=0)
M_ME_NA Sequence	Report separate (SQ=0)
M_ME_NB Sequence	Report separate (SQ=0)
M_ME_NC Sequence	Report separate (SQ=0)
M_IT_NA Sequence	Report separate (SQ=0)
M_ME_NA Parameter Offset	2000
M_ME_NB Parameter Offset	2000
M_ME_NC Parameter Offset	2000

M_ME_NA Parameter Offset

2000

Comment:

Definition:

M_ME_NA IOA offset for parameter data (0-3999)

It would imply that the parameter points would be configured as follows:

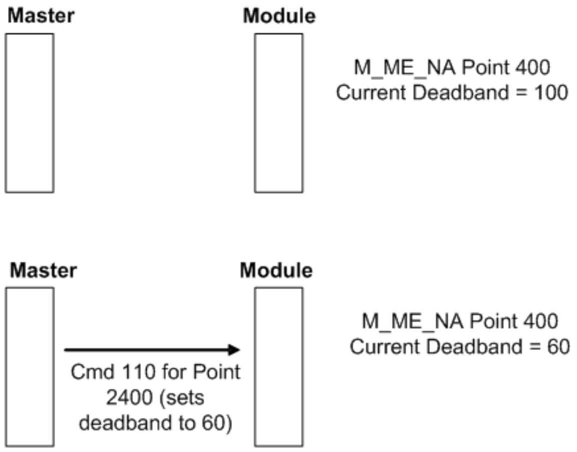
M_ME_NA

Monitored Measured Normalized Point	Associated Parameter Point
400	2400
401	2401
402	2402
403	2403
404	2404

M_ME_NB

Monitored Measured Normalized Point	Associated Parameter Point
500	2500
501	2501
502	2502
503	2503
504	2504

So, in order to send change the deadband for the M_ME_NA point 400, the master would send a command type 110 to point 2400:



Controlling the Generation of Events

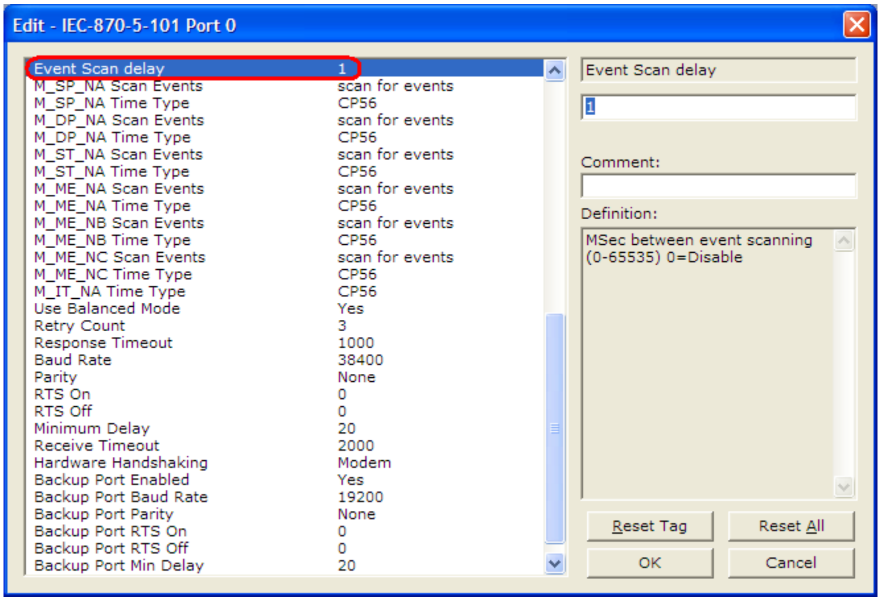
Some applications may require that only some points should generate events.Other applications may require that all configured points should generate events.

The module offers considerable flexibility for event control. You can control how events will be generated at 3 different levels:

1 General (All Points)
2 Data Type Level
3 Point Level

General (All Points)

You can control how frequently the module will scan the database for events using the following configuration parameter:


Edit - IEC-870-5-101 Port 0

Event Scan delay	1
M_SP_NA Scan Events	scan for events
M_SP_NA Time Type	CP56
M_DP_NA Scan Events	scan for events
M_DP_NA Time Type	CP56
M_ST_NA Scan Events	scan for events
M_ST_NA Time Type	CP56
M_ME_NA Scan Events	scan for events
M_ME_NA Time Type	CP56
M_ME_NB Scan Events	scan for events
M_ME_NB Time Type	CP56
M_ME_NC Scan Events	scan for events
M_ME_NC Time Type	CP56
M_IT_NA Time Type	CP56
Use Balanced Mode	Yes
Retry Count	3
Response Timeout	1000
Baud Rate	38400
Parity	None
RTS On	0
RTS Off	0
Minimum Delay	20
Receive Timeout	2000
Hardware Handshaking	Modem
Backup Port Enabled	Yes
Backup Port Baud Rate	19200
Backup Port Parity	None
Backup Port RTS On	0
Backup Port RTS Off	0
Backup Port Min Delay	20

Event Scan delay

1

Comment:

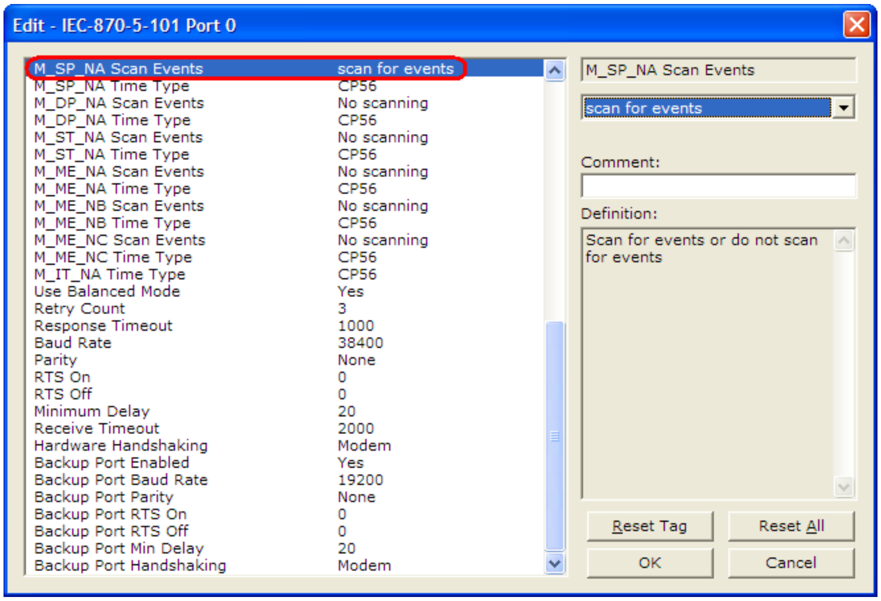
Definition:

MSec between event scanning (0-65535) 0=Disable

If this parameter is set to 0, the module will not generate events for any points. A non-zero value will configure how frequently the module will scan for events in the database.

Data Type Level

You can configure whether a data type should generate events. Each data type has a configuration parameter to control the generation of events:


Edit - IEC-870-5-101 Port 0

M_SP_NA Scan Events	scan for events
M_SP_NA Time Type	CP56
M_DP_NA Scan Events	No scanning
M_DP_NA Time Type	CP56
M_ST_NA Scan Events	No scanning
M_ST_NA Time Type	CP56
M_ME_NA Scan Events	No scanning
M_ME_NA Time Type	CP56
M_ME_NB Scan Events	No scanning
M_ME_NB Time Type	CP56
M_ME_NC Scan Events	No scanning
M_ME_NC Time Type	CP56
M_IT_NA Time Type	CP56
Use Balanced Mode	Yes
Retry Count	3
Response Timeout	1000
Baud Rate	38400
Parity	None
RTS On	0
RTS Off	0
Minimum Delay	20
Receive Timeout	2000
Hardware Handshaking	Modem
Backup Port Enabled	Yes
Backup Port Baud Rate	19200
Backup Port Parity	None
Backup Port RTS On	0
Backup Port RTS Off	0
Backup Port Min Delay	20
Backup Port Handshaking	Modem

M_SP_NA Scan Events

scan for events

Comment:

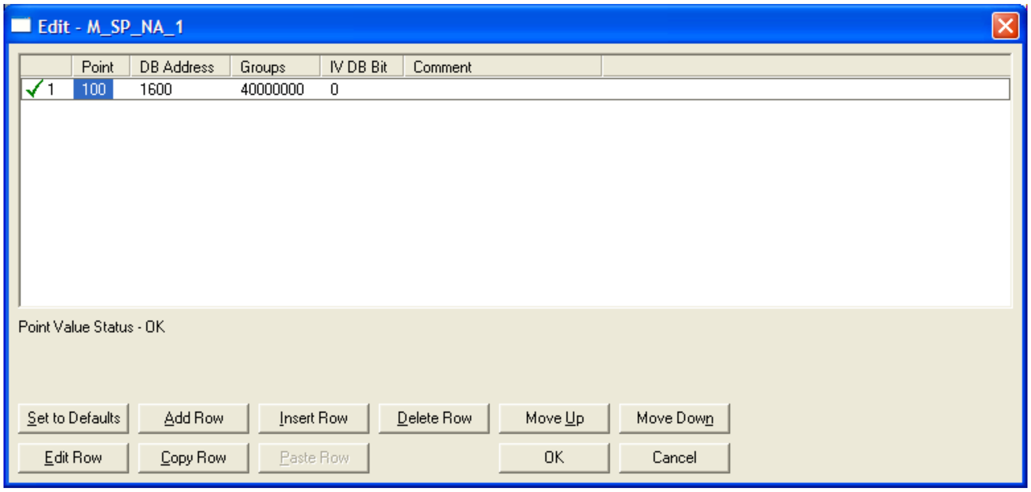
Definition:

Scan for events or do not scan for events

In the example above, only the M_SP_NA points would generate events.

Point Level

You can configure whether each point should generate events using the Group field for each point configuration. To disable event generation for a specific port, set the value to 40000000.



	Point	DB Address	Groups	IV DB Bit	Comment
✓ 1	100	1600	40000000	0	

Point Value Status - OK

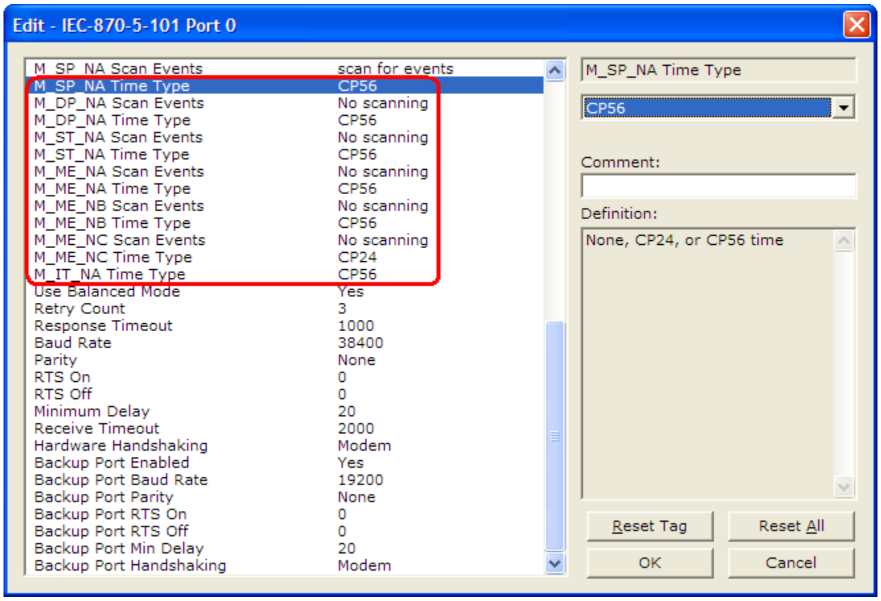
Time Information

Each event may also carry the date and time information when it occurred. The module supports the CP56 and CP24 time formats (as defined in the protocol specification).

The CP56 time format contains the milliseconds, seconds, minute, hour, day, month and year when the event has occurred.

The CP24 time format contains the milliseconds and minutes when the event has occurred.

The module may also be configured to not send any time information with each event for certain data types. The following parameters may be used to control the time information for each data type:



Edit - IEC-870-5-101 Port 0

M_SP_NA Scan Events	scan for events
M_SP_NA Time Type	CP56
M_DP_NA Scan Events	No scanning
M_DP_NA Time Type	CP56
M_ST_NA Scan Events	No scanning
M_ST_NA Time Type	CP56
M_ME_NA Scan Events	No scanning
M_ME_NA Time Type	CP56
M_ME_NB Scan Events	No scanning
M_ME_NB Time Type	CP56
M_ME_NC Scan Events	No scanning
M_ME_NC Time Type	CP24
M_IT_NA Time Type	CP56
Use Balanced Mode	Yes
Retry Count	3
Response Timeout	1000
Baud Rate	38400
Parity	None
RTS On	0
RTS Off	0
Minimum Delay	20
Receive Timeout	2000
Hardware Handshaking	Modem
Backup Port Enabled	Yes
Backup Port Baud Rate	19200
Backup Port Parity	None
Backup Port RTS On	0
Backup Port RTS Off	0
Backup Port Min Delay	20
Backup Port Handshaking	Modem

M_SP_NA Time Type

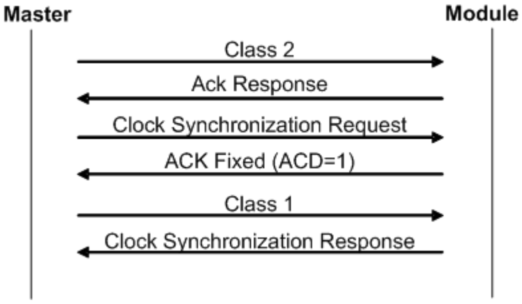
CP56

Comment:

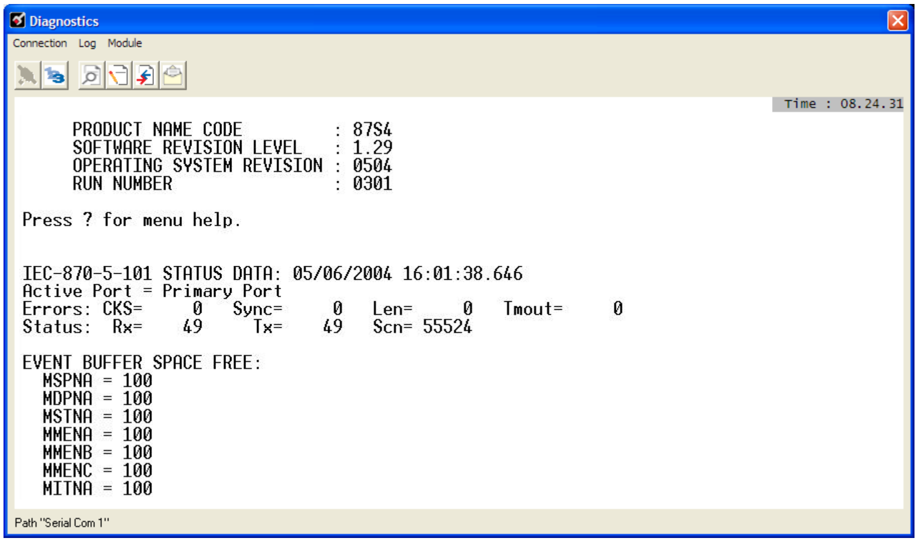
Definition:

None, CP24, or CP56 time

The master should periodically send a Time Synchronization command to the module in order to synchronize its date and time information. This is a very important step in order to make sure that the master and the slave are both using the same time information.



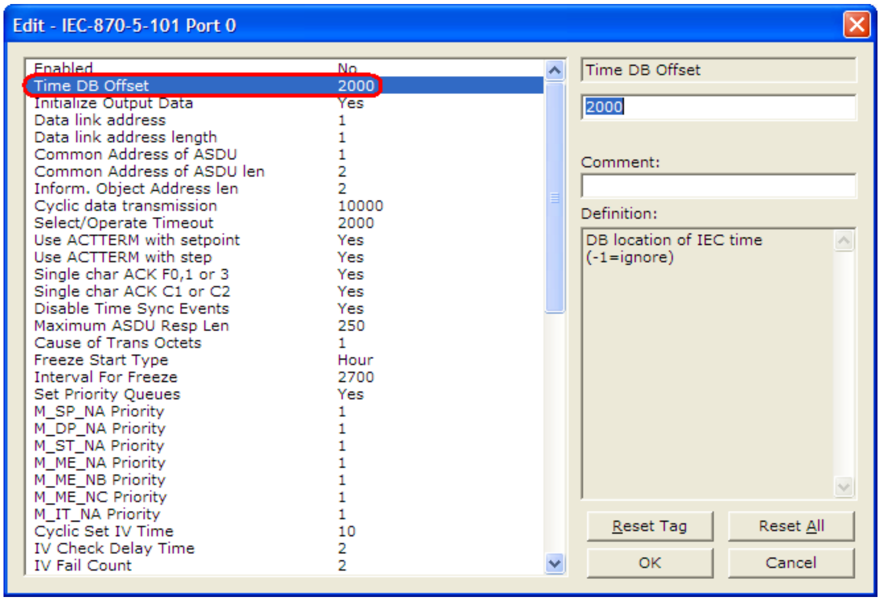
You can check the current date and time using the debug menu. Press **[E]** at the main menu to view the Module Status Data screen:



```
     PRODUCT NAME CODE          : 87S4
     SOFTWARE REVISION LEVEL    : 1.29
     OPERATING SYSTEM REVISION  : 0504
     RUN NUMBER                 : 0301

Press ? for menu help.


IEC-870-5-101 STATUS DATA: 05/06/2004 16:01:38.646
Active Port = Primary Port
Errors: CKS=     0   Sync=     0   Len=      0   Tmout=     0
Status:  Rx=    49     Tx=    49   Scn= 55524

EVENT BUFFER SPACE FREE:
  MSPNA = 100
  MDPNA = 100
  MSTNA = 100
  MMENA = 100
  MMENB = 100
  MMENC = 100
  MITNA = 100
```

Path "Serial Com 1"

You can also configure the module to copy the date and time information to the module database with the following parameter:



Enabled	No
Time DB Offset	2000
Initialize Output Data	Yes
Data link address	1
Data link address length	1
Common Address of ASDU	1
Common Address of ASDU len	2
Inform. Object Address len	2
Cyclic data transmission	10000
Select/Operate Timeout	2000
Use ACTTERM with setpoint	Yes
Use ACTTERM with step	Yes
Single char ACK F0,1 or 3	Yes
Single char ACK C1 or C2	Yes
Disable Time Sync Events	Yes
Maximum ASDU Resp Len	250
Cause of Trans Octets	1
Freeze Start Type	Hour
Interval For Freeze	2700
Set Priority Queues	Yes
M_SP_NA Priority	1
M_DP_NA Priority	1
M_ST_NA Priority	1
M_ME_NA Priority	1
M_ME_NB Priority	1
M_ME_NC Priority	1
M_IT_NA Priority	1
Cyclic Set IV Time	10
IV Check Delay Time	2
IV Fail Count	2

Time DB Offset

2000

Comment:

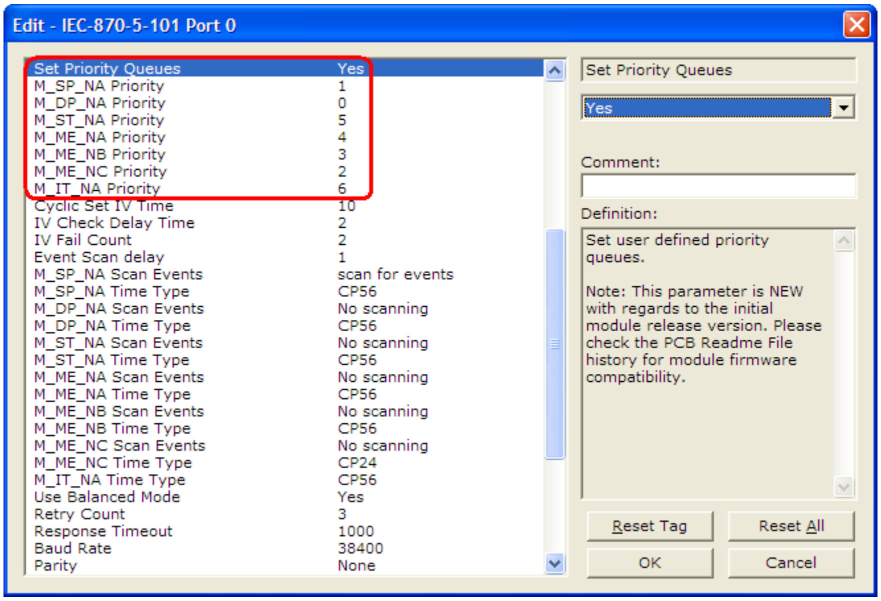
Definition:

DB location of IEC time
(-1=ignore)

As the module sends events to the master (serial modules) or client (ethernet modules), it also sends a Clock Synchronization response (spontaneous COT) every hour for the transmission of the clock time to the master (serial modules) or client (ethernet modules).

Event Priority

Event Priority permits ASDUs that generate events to be placed in priority queues that are set by the user. The configuration file contains the following parameters to support this feature:



```
Set Priority Queues      Yes
M_SP_NA Priority         1
M_DP_NA Priority         0
M_ST_NA Priority         5
M_ME_NA Priority         4
M_ME_NB Priority         3
M_ME_NC Priority         2
M_IT_NA Priority         6
Cyclic Set IV Time       10
IV Check Delay Time      2
IV Fail Count            2
Event Scan delay         1
M_SP_NA Scan Events      scan for events
M_SP_NA Time Type        CP56
M_DP_NA Scan Events      No scanning
M_DP_NA Time Type        CP56
M_ST_NA Scan Events      No scanning
M_ST_NA Time Type        CP56
M_ME_NA Scan Events      No scanning
M_ME_NA Time Type        CP56
M_ME_NB Scan Events      No scanning
M_ME_NB Time Type        CP56
M_ME_NC Scan Events      No scanning
M_ME_NC Time Type        CP24
M_IT_NA Time Type        CP56
Use Balanced Mode        Yes
Retry Count              3
Response Timeout         1000
Baud Rate                38400
Parity                   None
```

Set Priority Queues

Yes

Comment:

Definition:

Set user defined priority queues.

Note: This parameter is NEW with regards to the initial module release version. Please check the PCB Readme File history for module firmware compatibility.

The Set Priority Queues parameter must be enabled for this feature to be used. Each of the ASDU’s affected by this feature must be assigned a unique priority index from 0 to 6. Events of the ASDU with a priority of 0 will always be reported before any others when they are present.

Example - Event Priority

If the module is configured with the example values above, and the event queue contains the events generated in the following order:

Event Order	ASDU
1	M_SP_NA
2	M_SP_NA
3	M_DP_NA
4	M_ST_NA
5	M_DP_NA
6	M_SP_NA

The module will respond to a class one data request from the controlling station by returning the data in the event queue in the order shown in the following table.

Packet Order	Content
1	M_DP_NA events 3 and 5
2	M_SP_NA events 1, 2 and 6
3	M_ST_NA event 4

Note that the events are packed into messages in order to maximize the efficiency of the network. The following warning must be considered when deciding to use this feature: Because events from the highest priority queues are always reported when present before lower priority queues, events in the lower queues may be lost due to buffer overflow.

If this feature is not utilized, each ASDU's events are stored in their own queue. The module will report each queue containing events in a round-robin fashion with all the data for each ASDU being packed. This methodology limits the possibility of a buffer overflowing and still maximizes the use of bandwidth on the communication channel.

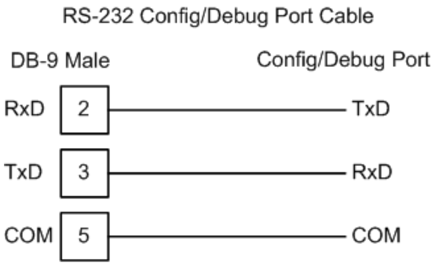
8.3 Cable Connections

The application ports on the PTQ-101S module support RS-232, RS-422, and RS-485 interfaces. Please inspect the module to ensure that the jumpers are set correctly to correspond with the type of interface you are using.

Note: When using RS-232 with radio modem applications, some radios or modems require hardware handshaking (control and monitoring of modem signal lines). Enable this in the configuration of the module by setting the UseCTS parameter to 1.

8.3.1 RS-232 Configuration/Debug Port

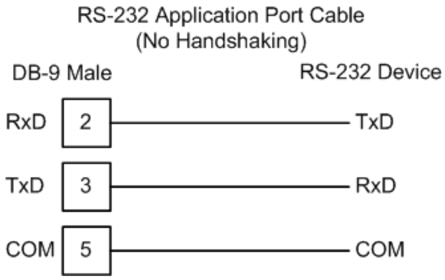
This port is physically a DB-9 connection. This port permits a PC based terminal emulation program to view configuration and status data in the module and to control the module. The cable for communications on this port is shown in the following diagram:



The Ethernet port on this module (if present) is inactive.

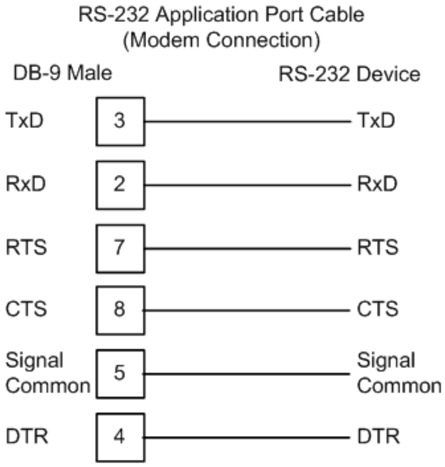
8.3.2 RS-232 Application Port(s)

When the RS-232 interface is selected, the use of hardware handshaking (control and monitoring of modem signal lines) is user definable. If no hardware handshaking will be used, the cable to connect to the port is as shown below:



RS-232: Modem Connection

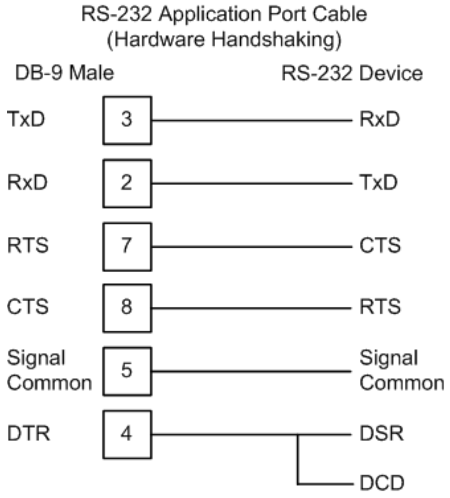
This type of connection is required between the module and a modem or other communication device.



The "Use CTS Line" parameter for the port configuration should be set to 'Y' for most modem applications.

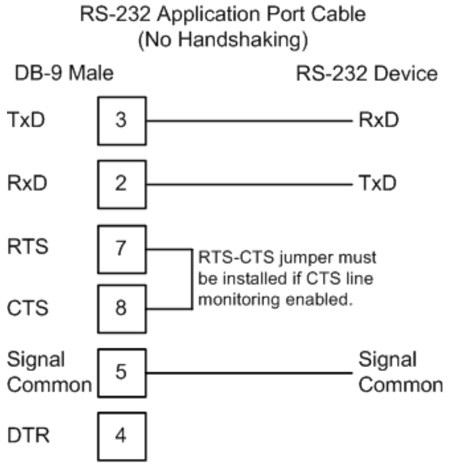
RS-232: Null Modem Connection (Hardware Handshaking)

This type of connection is used when the device connected to the module requires hardware handshaking (control and monitoring of modem signal lines).



RS-232: Null Modem Connection (No Hardware Handshaking)

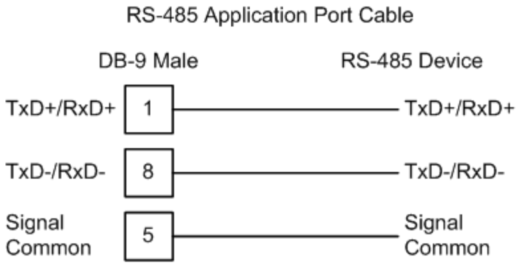
This type of connection can be used to connect the module to a computer or field device communication port.


RS-232 Application Port Cable
(No Handshaking)
DB-9 Male
RS-232 Device
TxD
3
RxD
RxD
2
TxD
RTS
7
CTS
8
RTS-CTS jumper must be installed if CTS line monitoring enabled.
Signal Common
5
Signal Common
DTR
4

Note: If the port is configured with the "Use CTS Line" set to 'Y', then a jumper is required between the RTS and the CTS line on the module connection.

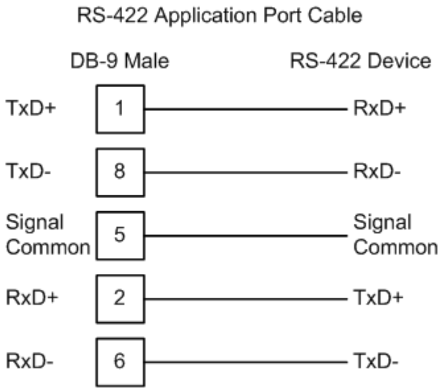
8.3.3 RS-485 Application Port(s)

The RS-485 interface requires a single two or three wire cable. The Common connection is optional and dependent on the RS-485 network. The cable required for this interface is shown below:



Note: Terminating resistors are generally not required on the RS-485 network, unless you are experiencing communication problems that can be attributed to signal echoes or reflections. In this case, install a 120-ohm terminating resistor on the RS-485 line.

8.3.4 RS-422



RS-485 and RS-422 Tip

If communication in the RS-422/RS-485 mode does not work at first, despite all attempts, try switching termination polarities. Some manufacturers interpret +/- and A/B polarities differently.

8.4 PTQ-101S Error Status Table

This section contains a listing of the PTQ-101S module's status data area. This file is located at the PTQ-101S database starting at address 4000. You may also configure an additional area using the "Error Offset" parameter.

Offset	Parameter	Description
4000	Scan Count	This status value contains a counter incremented on each scan of the module's main loop.
4001 to 4002	Product Name	This two-word data area contains the text values representing the product name.
4003 to 4004	Revision	This two-word data area contains the text values for the revision number.
4005 to 4006	Op Sys #	This two-word data area contains the text values for the operating system number.
4007 to 4008	Run Number	This two-word data area contains the text values for the run number.
4009	Read Blk Cnt	This word contains the total number of block read operations successfully executed.
4010	Write Blk Cnt	This word contains the total number of block write operations successfully executed.
4011	Parse Blk Cnt	This word contains the total number of write blocks successfully parsed.
4012	Error Blk Cnt	This word contains the total number of block transfer errors.
4013	Port Selected	This parameter determines which port on the module is being utilized. If the value is set to 0, the primary port is being used. If the value is set to 1, the backup port is being utilized.
4014	Bad CKS	This word contains the total number of frames received by the module that contain a bad check-sum values in the message.
4015	Sync Errors	This word contains the total number of frames received by the module that have synchronization errors. Each frame in the protocol has a specific header that must be received in a fixed sequence. If this header is not received correctly, this word will be incremented, and the frame will be discarded.
4016	Length Errors	This word contains the total number of frames received by the module that do not have the correct length.
4017	Timeout	This word contains the total number of frames received by the module that were not received within the specified receive timeout parameter.
4018	RX Frames	This word contains the total number of frames received by the module.
4019	TX Frames	This word contains the total number of frames transmitted by the module.
4020	MSP Event Buffer	This parameter shows the number of events available in the event buffer for M_SP_NA points.
4021	MDP Event Buffer	This parameter shows the number of events available in the event buffer for M_DP_NA points
4022	MST Event Buffer	This parameter shows the number of events available in the event buffer for M_ST_NA points

Offset	Parameter	Description
4023	MMENA Event Buffer	This parameter shows the number of events available in the event buffer for M_ME_NA points
4024	MMENB Event Buffer	This parameter shows the number of events available in the event buffer for M_ME_NB points
4025	MMENC Event Buffer	This parameter shows the number of events available in the event buffer for M_ME_NC points.
4026	MIT Event Buffer	This parameter shows the number of events available in the event buffer for M_IT_NA points

8.5 Group Codes

Note that the highest bit assigns the point to the cyclic data group. This data will be cyclically reported to the master at the frequency set in the configuration value "Cyclic Data Transmission" Parameter.

Group Code	Description
0x00000001	Interrogated by general interrogation (station or global)
0x00000002	Interrogated by group 1 interrogation
0x00000004	Interrogated by group 2 interrogation
0x00000008	Interrogated by group 3 interrogation
0x00000010	Interrogated by group 4 interrogation
0x00000020	Interrogated by group 5 interrogation
0x00000040	Interrogated by group 6 interrogation
0x00000080	Interrogated by group 7 interrogation
0x00000100	Interrogated by group 8 interrogation
0x00000200	Interrogated by group 9 interrogation
0x00000400	Interrogated by group 10 interrogation
0x00000800	Interrogated by group 11 interrogation
0x00001000	Interrogated by group 12 interrogation
0x00002000	Interrogated by group 13 interrogation
0x00004000	Interrogated by group 14 interrogation
0x00008000	Interrogated by group 15 interrogation
0x00010000	Interrogated by group 16 interrogation
0x00020000	Interrogated by general counter request
0x00040000	Interrogated by group 1 counter request
0x00080000	Interrogated by group 2 counter request
0x00100000	Interrogated by group 3 counter request
0x00200000	Interrogated by group 4 counter request
0x40000000	Disable event scanning of this point
0x80000000	Periodic/cyclic data returned from unit

If the highest bit (bit 31) is set, data will be produced by the driver for the specified point at the rate set for periodic data generation. Bit 30 (0x40000000) enables scanning of this point for event generation. If the bit is clear and the data type is set for scanning, events will be generated for the point. If the bit is set, events will not be generated for the point. This feature can be used to select which points will generate events for the controlling station and can get rid of event data that is not important to the application

8.6 Module Performance

Note: The following module performance test results are based on conditions in the ProSoft Technology test lab. Your results will depend on your own module configuration, protocol communication traffic and operating conditions. Your times may be faster or slower than the examples provided here.

This test consisted of measuring the processor scan delay caused by the use of a PTQ module in a Quantum /Schneider rack. The periods shown in the following tables are expressed as milliseconds and show the maximum processor scan time measured during the test. For each test, the column expressed as "Number of Words" refers to the number of words configured for both read and write areas. For example, for a test with number of words = 100, the parameters were configured as follows:

Read Register Count = Write Register Count = 100

Note: There was no protocol communication during this test.

8.6.1 Hardware Configuration

This test was performed with the following hardware:

- 10-slot rack
- CPS 114 20 power supply

The following processors were used for this test:

- UNITY: CPU65160, CPU3110, CPU53414A.
- QUANTUM: CPU53414A
- Six modules PTQ-101S (firmware version 1.38, backplane driver version 2.14)

Results for Unity Processors

Note: Results are expressed as milliseconds and refer to maximum processor scan rate measured.

CPU651 60 Unity Processor

Number of Words	**Number of Modules**						
	0	**1**	**2**	**3**	**4**	**5**	**6**
100 words	4	6	7	9	11	13	15
1000 words	4	11	19	26	34	41	48
2000 words	4	17	31	44	58	71	85
4000 words	4	30	55	81	108	132	157

CPU31110 Unity Processor

Number of Words	Number of Modules		
	0	**1**	**2**
100 words	1	3	4
1000 words	1	8	14
2000 words	1	14	25
4000 words	1	23	45

CPU534-14A Unity Processor

Number of Words	Number of Modules						
	0	**1**	**2**	**3**	**4**	**5**	**6**
100 words	1	3	5	7	9	10	12
1000 words	1	7	14	20	26	32	39
2000 words	1	13	24	35	46	57	68
4000 words	1	19	44	65	86	107	127

Results for Quantum Processors

CPU534-14A Quantum Processor

Number of Words	Number of Modules						
	0	**1**	**2**	**3**	**4**	**5**	**6**
100 words	0.6	2.8	4.5	6.3	8.5	10.1	12.0
1000 words	0.6	7.1	13.2	19.6	25.5	32.1	38.0
2000 words	0.6	11.9	22.9	34.0	44.9	55.8	66.5
4000 words	0.6	21.5	42.1	62.6	83.1	103.7	124.1

8.7 PTQ-101S Database Design Forms

This section contains a set of forms that can be used to design the databases required by the module.

8.7.1 Form for data types M_SP_NA_1, M_DP_NA_1, M_ST_NA_1 and M_IT_NA_1

Point Number	**Database Address**	**Group Assignment**

8.7.2 Form for data types M_ME_NA_1 and M_ME_NB_1

Point Number	Database Address	Group Assignment	Default Deadband

8.7.3 Forms for all command data types except C_RC_NA_1

Point Number	Database Address	Monitor Point #	Monitor Database Address	Require Select

8.7.4 Form for C_RC_NA_1 data type

Point Number	**Database Address**	**Monitor Point #**	**Monitor Database Address**

8.8 IEC 60870-5-101 Slave Interoperability Document

This companion standard presents sets of parameters and alternatives from which subsets have to be selected to implement particular telecontrol systems. Certain parameter values, such as the number of octets in the COMMON ADDRESS of ASDUs represent mutually exclusive alternatives. This means that only one value of the defined parameters is admitted per system. Other parameters, such as the listed set of different process information in command and in monitor direction allow the specification of the complete set or subsets, as appropriate for given applications. This clause summarizes the parameters of the previous clauses to facilitate a suitable selection for a specific application. If a system is composed of equipment originating from different manufacturers it is necessary that all partners agree on the selected parameters.

Note: In addition, the full specification of a system may require individual selection of certain parameters for certain parts of the system, such as the individual selection of scaling factors for individually addressable measured values.

The selected parameters should be marked in the white boxes as follows:

☐ Function or ASDU is not used

☒ Function or ASDU is used as standardized (default)

A black check box indicates that the option cannot be selected in this companion standard.

Network Configuration

(Network-specific parameter)

☒ Point-to-point ☒ Multipoint-party line

☒ Multiple point-to-point ☒ Multipoint-star

Physical Layer

(Network-specific parameter)

Transmission speed (control direction)

Unbalanced interchange Unbalanced interchange Balanced interchange

circuit V.24/V.28 circuit V.24/V.28 circuit X.24/X.27

Standard Recommended if >1 200 bit/s

☐ 100 bit/s ☒ 2400 bit/s ☒ 2400 bit/s ☐
56000 bit/s

☐ 200 bit/s ☒ 4800 bit/s ☒ 4800 bit/s ☐
64000 bit/s

☒ 300 bit/s ☒ 9600 bit/s ☒ 9600 bit/s

☒ 600 bit/s ☒ 19200 bit/s

☒ 1200 bit/s ☒ 38400 bit/s

Transmission speed (monitor direction)

Unbalanced interchange Unbalanced interchange Balanced interchange

circuit V.24/V.28 circuit V.24/V.28 circuit X.24/X.27

Standard Recommended if >1 200 bit/s

☐ 100 bit/s ☒ 2400 bit/s ☒ 2400 bit/s ☐ 56000 bit/s

☐ 200 bit/s ☒ 4800 bit/s ☒ 4800 bit/s ☐ 64000 bit/s

☒ 300 bit/s ☒ 9600 bit/s ☒ 9600 bit/s

☒ 600 bit/s ☒ 19200 bit/s

☒ 1200 bit/s ☒ 38400 bit/s

Link Layer

(Network-specific parameter)

Frame format FT 1.2, single character 1 and the fixed time out interval are used exclusively in this companion standard.

Link transmission procedure Address field of link

☒ Balanced transmission ☒ Not present (balanced transmission only)

☒ Unbalanced transmission ☒ One octet

☒ Two octets

☒ Structured

Frame length

☒ Unstructured

255 Maximum length L (number of octets) See Note 3.

Application Layer

Transmission mode for application data

Mode 1 (Least significant octet first), as defined in clause 4.10 of IEC 60870-5-4, is used exclusively in this companion standard.

Common address of ASDU

(System-specific parameter)

☒ One octet ☒ Two octets

Information object address

(System-specific parameter)

One octet ☒ structured

☒ Two octets ☒ unstructured

☒ Three octets

Cause of transmission

(System-specific parameter)

☒ One octet S Two octets (with originator address)

Selection of standard ASDUs

Process information in monitor direction

(Station-specific parameter)

☒ <1> := Single-point information M_SP_NA_1

☒ <2> := Single-point information with time tag M_SP_TA_1

☒ <3> := Double-point information M_DP_NA_1

☒ <4> := Double-point information with time tag M_DP_TA_1

☒ <5> := Step position information M_ST_NA_1

☒ <6> := Step position information with time tag M_ST_TA_1

□ <7> := Bitstring of 32 bit M_BO_NA_1

□ <8> := Bitstring of 32 bit with time tag M_BO_TA_1

☒ <9> := Measured value, normalized value
M_ME_NA_1

☒ <10> := Measured value, normalized value with time tag M_ME_TA_1

☒ <11> := Measured value, scaled value M_ME_NB_1

☒ <12> := Measured value, scaled value with time tag M_ME_TB_1

☒ <13> := Measured value, short floating point value
M_ME_NC_I

☒ <14> := Measured value, short floating point value with time tag
M_ME_TC_1

☒ <15> := Integrated totals M_IT_NA_1

☒ <16> := Integrated totals with time tag M_IT_TA_1

□ <17> := Event of protection equipment with time tag M_EP_TA_1

□ <18> := Packed start events of protection equipment with time tag
M_EP_TB_1

□ <19> := Packed output circuit information of protection equipment with time tag M_EP_TC_1

□ <20> := Packed single-point information with status change detection M_PS_NA_1

□ <21> := Measured value, normalized value without quality description M_ME_ND_1

☒ <30> := Single-point information with time tag CP56Time2a M_SP_TB_1

☒ <31> := Double-point information with time tag CP56Time2A M_DP_TB_1

☒ <32> := Step position information with time tag CP56Time2A M_ST_TB_1

□ <33> := Bitstring of 32 bit with time tag CP56Time2A M_BO_TB_1

☒ <34> := Measured value, normalized value with time tag CP56Time2A M_ME_TD_1

☒ <35> := Measured value, scaled value with time tag CP56Time2A M_ME_TE_1

□ <36> := Measured value, short floating point value with time tag CP56Time2A M_ME_TF_1

☒ <37> := Integrated totals with time tag CP56Time2A M_IT_TB_1

□ <38> := Event of protection equipment with time tag CP56Time2A M_EP_TD_1

□ <39> := Packed start events of protection equipment with time tag CP56time2A M_EP_TE_1

□ <40> := Packed output circuit information of protection equipment with time tag CP56Time2a M_EP_TF_1

Process information in control direction

(Station-specific parameter)

☒	<45>	:= Single command	C_SC_NA_1
☒	<46>	:= Double command	C_DC_NA_1
☒	<47>	:= Regulating step command	C_RC_NA_1
☒	<48>	:= Set point command, normalized value	C_SE_NA_1
☒	<49>	:= Set point command, scaled value	C_SE_NB_1
☒	<50>	:= Set point command, short floating point value	C_SE_NC_1
□	<51>	:= Bitstring of 32 bit	C_BO_NA_1

System information in monitor direction

(Station-specific parameter)

☒ <70> := End of initialization M_EI_NA_1

System information in control direction

(Station-specific parameter)

☒ <100> := Interrogation command C_IC_NA_1

☒ <101> := Counter interrogation command C_CI_NA_1

☒ <102> := Read command C_RD_NA_1

☒ <103> := Clock synchronization command C_CS_NA_1

☒ <104> := Test command C_TS_NB_1

☒ <105> := Reset process command C_RP_NC_1

☒ <106> := Delay acquisition command [Note 1]
C_CD_NA_1

Parameter in control direction

(Station-specific parameter)

☒ <110> := Parameter of measured value, normalized value P_ME_NA_1

☒ <111> := Parameter of measured value, scaled value P_ME_NB_1

□ <112> := Parameter of measured value, short floating point value
P_ME_NC_1

□ <113> := Parameter activation P_AC_NA_1

File transfer

(Station-specific parameter)

□ <120> := File ready F_FR_NA_1

□ <121> := Section ready F_SR_NA_1

□ <122> := Call directory, select file, call file, call section F_SC_NA_1

□ <123> := Last section, last segment F_LS_NA_1

□ <124> := Ack file, ack section F_AF_NA_1

□ <125> := Segment F_SG_NA_1

□ <126> := Directory F_DR_TA_1

Basic Application Functions

Station initialization

(Station-specific parameter)

☒ Remote initialization

General Interrogation

(System- or station-specific parameter)

☒ global

☒ group 1

☒ group 2

☒ group 3

☒ group 4

☒ group 5

☒ group 6

☒ group 7

☒ group 8

☒ group 9

☒ group 10

☒ group 11

☒ group 12

☒ group 13

☒ group l4

☒ group 15

☒ group 16

Addresses per group have to be defined

Clock synchronization

(Station-specific parameter)

☒ Clock synchronization

Command transmission

(Object-specific parameter)

☒ Direct command transmission ☒ Select and execute command

☒ Direct set point command transmission ☒ Select and execute set point command

☒ C_SE_ACTTERM used Note 2

☒ No additional definition

☒ Short pulse duration (duration determined by a system parameter in the outstation) Note 4

☒ Long pulse duration (duration determined by a system parameter in the outstation) Note 4

☒ Persistent output

Transmission of Integrated totals

(Station- or object-specific parameter)

☒ Counter request ☒ General request counter

☒ Counter freeze without reset ☒ Request counter group 1

□ Counter freeze with reset ☒ Request counter group 2

□ Counter reset ☒ Request counter group 3

☒ Request counter group 4

Addresses per group have to be defined

Parameter loading

(Object-specific parameter)

☒ Threshold value

□ Smoothing factor

☒ Low limit for transmission of measured value

☒ High limit for transmission of measured value

Parameter activation

(Object-specific parameter)

□ Act/deact of persistent cyclic or periodic transmission of the addressed object

File transfer

(Station-specific parameter)

□ File transfer in monitor direction

□ File transfer in control direction

Note 1: Delay acquisition command supports Load Delay only.

Note 2: C_SE_ACTTERM may be enabled or disabled at time of installation.

Note 3: The ASDU length can be configured by the user (between 25 and 252).

Note 4: Only applies to C_SC_NA_1 and C_DC_NA_1 commands.

Note 5: The low limits and high limit values are calculated based on the Deadband values as follows:

Low Limit: Last reported event value - threshold

High Limit: Last reported event value + threshold

9 Support, Service & Warranty

In This Chapter

ProSoft Technology, Inc. (ProSoft) is committed to providing the most efficient and effective support possible. Before calling, please gather the following information to assist in expediting this process:

1. Product Version Number
2. System architecture
3. Network details

If the issue is hardware related, we will also need information regarding:

1. Module configuration and contents of file
   - Module Operation
   - Configuration/Debug status information
   - LED patterns
2. Information about the processor and user data files as viewed through and LED patterns on the processor.
3. Details about the serial devices interfaced, if any.

9.1 How to Contact Us: Technical Support

Internet	Web Site: www.prosoft-technology.com/support E-mail address: support@prosoft-technology.com

Asia Pacific

+603.7724.2080, support.asia@prosoft-technology.com
Languages spoken include: Chinese, English

Europe (location in Toulouse, France)

+33 (0) 5.34.36.87.20, support.EMEA@prosoft-technology.com
Languages spoken include: French, English

North America/Latin America (excluding Brasil) (location in California)

+1.661.716.5100, support@prosoft-technology.com
Languages spoken include: English, Spanish
For technical support calls within the United States, an after-hours answering system allows pager access to one of our qualified technical and/or application support engineers at any time to answer your questions.

Brasil (location in Sao Paulo)

+55-11-5084-5178, eduardo@prosoft-technology.com
Languages spoken include: Portuguese, English

9.2 Return Material Authorization (RMA) Policies and Conditions

The following RMA Policies and Conditions (collectively, "RMA Policies") apply to any returned Product. These RMA Policies are subject to change by ProSoft without notice. For warranty information, see "Limited Warranty". In the event of any inconsistency between the RMA Policies and the Warranty, the Warranty shall govern.

9.2.1 All Product Returns:

a) In order to return a Product for repair, exchange or otherwise, the Customer must obtain a Returned Material Authorization (RMA) number from ProSoft and comply with ProSoft shipping instructions.
b) In the event that the Customer experiences a problem with the Product for any reason, Customer should contact ProSoft Technical Support at one of the telephone numbers listed above (page 171). A Technical Support Engineer will request that you perform several tests in an attempt to isolate the problem. If after completing these tests, the Product is found to be the source of the problem, we will issue an RMA.
c) All returned Products must be shipped freight prepaid, in the original shipping container or equivalent, to the location specified by ProSoft, and be accompanied by proof of purchase and receipt date. The RMA number is to be prominently marked on the outside of the shipping box. Customer agrees to insure the Product or assume the risk of loss or damage in transit. Products shipped to ProSoft using a shipment method other than that specified by ProSoft or shipped without an RMA number will be returned to the Customer, freight collect. Contact ProSoft Technical Support for further information.
d) A 10% restocking fee applies to all warranty credit returns whereby a Customer has an application change, ordered too many, does not need, and so on.

9.2.2 Procedures for Return of Units Under Warranty:

A Technical Support Engineer must approve the return of Product under ProSoft's Warranty:

a) A replacement module will be shipped and invoiced. A purchase order will be required.
b) Credit for a product under warranty will be issued upon receipt of authorized product by ProSoft at designated location referenced on the Return Material Authorization.

9.2.3 Procedures for Return of Units Out of Warranty:

a) Customer sends unit in for evaluation
b) If no defect is found, Customer will be charged the equivalent of $100 USD, plus freight charges, duties and taxes as applicable. A new purchase order will be required.

c) If unit is repaired, charge to Customer will be 30% of current list price (USD) plus freight charges, duties and taxes as applicable. A new purchase order will be required or authorization to use the purchase order submitted for evaluation fee.

The following is a list of non-repairable units:

- 3150 - All
- 3750
- 3600 - All
- 3700
- 3170 - All
- 3250
- 1560 - Can be repaired, only if defect is the power supply
- 1550 - Can be repaired, only if defect is the power supply
- 3350
- 3300
- 1500 - All

9.3 LIMITED WARRANTY

This Limited Warranty ("Warranty") governs all sales of hardware, software and other products (collectively, "Product") manufactured and/or offered for sale by ProSoft, and all related services provided by ProSoft, including maintenance, repair, warranty exchange, and service programs (collectively, "Services"). By purchasing or using the Product or Services, the individual or entity purchasing or using the Product or Services ("Customer") agrees to all of the terms and provisions (collectively, the "Terms") of this Limited Warranty. All sales of software or other intellectual property are, in addition, subject to any license agreement accompanying such software or other intellectual property.

9.3.1 What Is Covered By This Warranty

a) *Warranty On New Products*: ProSoft warrants, to the original purchaser, that the Product that is the subject of the sale will (1) conform to and perform in accordance with published specifications prepared, approved and issued by ProSoft, and (2) will be free from defects in material or workmanship; provided these warranties only cover Product that is sold as new. This Warranty expires three years from the date of shipment (the "Warranty Period"). If the Customer discovers within the Warranty Period a failure of the Product to conform to specifications, or a defect in material or workmanship of the Product, the Customer must promptly notify ProSoft by fax, email or telephone. In no event may that notification be received by ProSoft later than 39 months. Within a reasonable time after notification, ProSoft will correct any failure of the Product to conform to specifications or any defect in material or workmanship of the Product, with either new or used replacement parts. Such repair, including both parts and labor, will be performed at ProSoft's expense. All warranty service will be performed at service centers designated by ProSoft.

b) *Warranty On Services*: Materials and labor performed by ProSoft to repair a verified malfunction or defect are warranteed in the terms specified above for new Product, provided said warranty will be for the period remaining on the original new equipment warranty or, if the original warranty is no longer in effect, for a period of 90 days from the date of repair.

9.3.2 What Is Not Covered By This Warranty

a) ProSoft makes no representation or warranty, expressed or implied, that the operation of software purchased from ProSoft will be uninterrupted or error free or that the functions contained in the software will meet or satisfy the purchaser's intended use or requirements; the Customer assumes complete responsibility for decisions made or actions taken based on information obtained using ProSoft software.

b) This Warranty does not cover the failure of the Product to perform specified functions, or any other non-conformance, defects, losses or damages caused by or attributable to any of the following: (i) shipping; (ii) improper installation or other failure of Customer to adhere to ProSoft's specifications or instructions; (iii) unauthorized repair or maintenance; (iv) attachments, equipment, options, parts, software, or user-created programming (including, but not limited to, programs developed with any IEC 61131-3, "C" or any variant of "C" programming languages) not furnished by ProSoft; (v) use of the Product for purposes other than those for which it was designed; (vi) any other abuse, misapplication, neglect or misuse by the Customer; (vii) accident, improper testing or causes external to the Product such as, but not limited to, exposure to extremes of temperature or humidity, power failure or power surges; or (viii) disasters such as fire, flood, earthquake, wind and lightning.

c) The information in this Agreement is subject to change without notice. ProSoft shall not be liable for technical or editorial errors or omissions made herein; nor for incidental or consequential damages resulting from the furnishing, performance or use of this material. The user guide included with your original product purchase from ProSoft contains information protected by copyright. No part of the guide may be duplicated or reproduced in any form without prior written consent from ProSoft.

9.3.3 Disclaimer Regarding High Risk Activities

Product manufactured or supplied by ProSoft is not fault tolerant and is not designed, manufactured or intended for use in hazardous environments requiring fail-safe performance including and without limitation: the operation of nuclear facilities, aircraft navigation of communication systems, air traffic control, direct life support machines or weapons systems in which the failure of the product could lead directly or indirectly to death, personal injury or severe physical or environmental damage (collectively, "high risk activities"). ProSoft specifically disclaims any express or implied warranty of fitness for high risk activities.

9.3.4 Intellectual Property Indemnity

Buyer shall indemnify and hold harmless ProSoft and its employees from and against all liabilities, losses, claims, costs and expenses (including attorney's fees and expenses) related to any claim, investigation, litigation or proceeding (whether or not ProSoft is a party) which arises or is alleged to arise from Buyer's acts or omissions under these Terms or in any way with respect to the Products. Without limiting the foregoing, Buyer (at its own expense) shall indemnify and hold harmless ProSoft and defend or settle any action brought against such Companies to the extent based on a claim that any Product made to Buyer specifications infringed intellectual property rights of another party. ProSoft makes no warranty that the product is or will be delivered free of any person's claiming of patent, trademark, or similar infringement. The Buyer assumes all risks (including the risk of suit) that the product or any use of the product will infringe existing or subsequently issued patents, trademarks, or copyrights.

a) Any documentation included with Product purchased from ProSoft is protected by copyright and may not be duplicated or reproduced in any form without prior written consent from ProSoft.
b) ProSoft's technical specifications and documentation that are included with the Product are subject to editing and modification without notice.
c) Transfer of title shall not operate to convey to Customer any right to make, or have made, any Product supplied by ProSoft.
d) Customer is granted no right or license to use any software or other intellectual property in any manner or for any purpose not expressly permitted by any license agreement accompanying such software or other intellectual property.
e) Customer agrees that it shall not, and shall not authorize others to, copy software provided by ProSoft (except as expressly permitted in any license agreement accompanying such software); transfer software to a third party separately from the Product; modify, alter, translate, decode, decompile, disassemble, reverse-engineer or otherwise attempt to derive the source code of the software or create derivative works based on the software; export the software or underlying technology in contravention of applicable US and international export laws and regulations; or use the software other than as authorized in connection with use of Product.
f) **Additional Restrictions Relating To Software And Other Intellectual Property**

   In addition to compliance with the Terms of this Warranty, Customers purchasing software or other intellectual property shall comply with any license agreement accompanying such software or other intellectual property. Failure to do so may void this Warranty with respect to such software and/or other intellectual property.

9.3.5 Disclaimer of all Other Warranties

The Warranty set forth in What Is Covered By This Warranty (page 173) are in lieu of all other warranties, express or implied, including but not limited to the implied warranties of merchantability and fitness for a particular purpose.

9.3.6 Limitation of Remedies **

In no event will ProSoft or its Dealer be liable for any special, incidental or consequential damages based on breach of warranty, breach of contract, negligence, strict tort or any other legal theory. Damages that ProSoft or its Dealer will not be responsible for included, but are not limited to: Loss of profits; loss of savings or revenue; loss of use of the product or any associated equipment; loss of data; cost of capital; cost of any substitute equipment, facilities, or services; downtime; the claims of third parties including, customers of the Purchaser; and, injury to property.

** Some areas do not allow time limitations on an implied warranty, or allow the exclusion or limitation of incidental or consequential damages. In such areas, the above limitations may not apply. This Warranty gives you specific legal rights, and you may also have other rights which vary from place to place.

9.3.7 Time Limit for Bringing Suit

Any action for breach of warranty must be commenced within 39 months following shipment of the Product.

9.3.8 No Other Warranties

Unless modified in writing and signed by both parties, this Warranty is understood to be the complete and exclusive agreement between the parties, suspending all oral or written prior agreements and all other communications between the parties relating to the subject matter of this Warranty, including statements made by salesperson. No employee of ProSoft or any other party is authorized to make any warranty in addition to those made in this Warranty. The Customer is warned, therefore, to check this Warranty carefully to see that it correctly reflects those terms that are important to the Customer.

9.3.9 Allocation of Risks

This Warranty allocates the risk of product failure between ProSoft and the Customer. This allocation is recognized by both parties and is reflected in the price of the goods. The Customer acknowledges that it has read this Warranty, understands it, and is bound by its Terms.

9.3.10 Controlling Law and Severability

This Warranty shall be governed by and construed in accordance with the laws of the United States and the domestic laws of the State of California, without reference to its conflicts of law provisions. If for any reason a court of competent jurisdiction finds any provisions of this Warranty, or a portion thereof, to be unenforceable, that provision shall be enforced to the maximum extent permissible and the remainder of this Warranty shall remain in full force and effect. Any cause of action with respect to the Product or Services must be instituted in a court of competent jurisdiction in the State of California.

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