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'EQUIPEMENT, 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.
C Warning - Explosion Hazard - Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous.
D 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:

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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

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1 Start Here

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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

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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

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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.

2. Choose **FILE / OPEN INSTALLATION FILE**. This action opens the Open Installation File dialog box:

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.

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.
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 Selection Dialog Box](image1)

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

![CPU/EXECUTIVE Pane](image2)
5 Click **OK**. This action opens the **PLC CONFIGURATION** dialog box, populated with the correct values for the PLC you selected.

![PLC Configuration Dialog Box](image)

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.

![Holding Registers](image)
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.

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

![I/O Module Selection Dialog Box]

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.

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.
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.

2. This action opens the SPECIALS dialog box.
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.

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

![Save Project As dialog box](image)

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.

![Null modem cable connection](image)

**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 dialog box]

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 dialog box]
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.

![Download Controller Dialog Box](image)

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.

![Online Control Panel Dialog Box](image)
2 Click the **SET CLOCK** button to open the **SET CONTROLLER’S TIME OF DAY CLOCK** dialog box.

![SET Controller’s Time of Day Clock](image)

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.

![Reference Data Editor](image)

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 dialog box]

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.

![GDE Template (untitled) - Animation OFF]

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

![RDE Template Animation](image)

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:

   ![ProWORX 32 interface]

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

![Select Import File](image1)

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

![Schneider Alliance](image2)
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:
4 Configuring the Processor with UnityPro XL

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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.
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.

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

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.

![Build Process Illustration](image)

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.

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 (TCP/IP or USB).

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

![SCHNEIDER Drivers management Properties](image)

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.

![Driver installation/update](image)

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.

![Test Connection Screenshot](image1)

### 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 Screenshot](image2)

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

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- Verify Communication Between the Processor and the Module.....48

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:
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.

![Main Menu](image1)

**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.

![Connection Setup](image2)

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.

<table>
<thead>
<tr>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Month (September)</td>
</tr>
<tr>
<td>13</td>
<td>Day of the Month</td>
</tr>
<tr>
<td>5</td>
<td>Year (2005)</td>
</tr>
<tr>
<td>13</td>
<td>Hour (13:00 or 1:00 P.M.)</td>
</tr>
<tr>
<td>43</td>
<td>Minutes</td>
</tr>
<tr>
<td>12</td>
<td>Seconds</td>
</tr>
</tbody>
</table>
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

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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.
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.

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

**To rename an object:**

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 module 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.

#### 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 module's database.

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

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

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.

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.

- **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.

![Sequence Flag Feature](image)

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

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.

<table>
<thead>
<tr>
<th>Point</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Threshold</td>
<td>Determined by the deadband set in the configuration file or altered by the write command.</td>
</tr>
<tr>
<td>Low</td>
<td>Last reported event value - threshold.</td>
</tr>
<tr>
<td>High</td>
<td>Last reported event value + threshold.</td>
</tr>
</tbody>
</table>

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 I/Oa 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 I/Oa 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.

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 dialog box](image)
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

- Error Status Table ................................................................................. 79
- LED Status Indicators............................................................................ 94

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.

![Default Project
Default Location
Demo Module](image)

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

![Default Project
Default Location
Demo Module](image)

Choose Module Type
Configure
Verify
View Configuration
Write to Compact Flash
Export Configuration File(s)
Load Config File
Add External File

- Download from PC to Device
- Upload from Device to PC
- Diagnostics

This action opens the **DIAGNOSTICS** dialog box.
3 Press [?] to open the Main Menu.

**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.

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):
DI Addr: 1 DLAddr Len: 2 Comm ASDU: 1 C ASDU Ln: 2
IOA Len : 2 Cyc Updt: 10 Sel/Op Tm: 10000 ActTrm Sp: 1
ActForm St: 1 Sock F013: 1 SOCK CIC2: 1 CDT Oct: 2
Max ASDU : 252 Mode A Ez: N Ez Type : N Ez Int: 0
Event Scn: 10 MSPNA TM : CP56 MDPNA TM : CP56 MSTNA TM : CP56
MNENM TM : CP56 MNENM TM : CP56 MMENC TM : CP24 MNITM TM : CP56
MSPNA SEQ: Yes MDPNA SEQ: No MNENMSEQ: No MNENB SEQ: No
MNENC SEQ : No MNITM 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 Twout: 2000 Handshake: NONE
2nd Enab : 0 Baud Rate: 19200 RTS On: 0 RTS Off: 1
Parity : EVEN Min Delay: 20 Handshake: NONE
Short Pulse Tm : 2000 Long Pulse Tm : 10000
Default Cmd Qual: Short Pulse Override Cmd Qual: Not Active
Time DB Offset : 2000 Init Output Data : 1
Disable Sprot 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.

<table>
<thead>
<tr>
<th>Key</th>
<th>Data Type</th>
<th>Screen Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M_SP NA</td>
<td>M_SP NA Setup Menu Selected</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M_SP NA Setup (0 to 2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Index Point# DB Addr Group(s) Value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 11 0 08000000001 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 12 1 08000000001 0</td>
</tr>
<tr>
<td>2</td>
<td>M_DP NA</td>
<td>M_DP NA Setup Menu Selected</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M_DP NA Setup (0 to 2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Index Point# DB Addr Group(s) Bits</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 21 16 00000000 0 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 22 17 00000000 0 0</td>
</tr>
<tr>
<td>3</td>
<td>M_ST NA</td>
<td>M_ST NA Setup Menu Selected</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M_ST NA Setup (0 to 2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Index Point# DB Addr Group(s) Value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 31 6 00000004 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 32 7 00000004 0</td>
</tr>
<tr>
<td>4</td>
<td>M_ME NA</td>
<td>M_ME NA Setup Menu Selected</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M_ME NA Setup (0 to 2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Index Point# DB Addr Group(s) Deadband Value Norm. Va</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 41 4 00000000 0 0 0 0.0000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 42 5 00000000 0 0 0 0.0000</td>
</tr>
<tr>
<td>5</td>
<td>M_ME NB</td>
<td>M_ME NB Setup Menu Selected</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M_ME NB Setup (0 to 2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Index Point# DB Addr Group(s) Deadband Value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 51 6 00000010 1 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 52 7 00000010 1 0</td>
</tr>
<tr>
<td>6</td>
<td>M_IT NA</td>
<td>M_IT NA Setup Menu Selected</td>
</tr>
<tr>
<td></td>
<td></td>
<td>M_IT NA Setup (0 to 2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Index Point# DB Addr Group(s) Value FROZEN</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 61 4 00000000 0 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 62 5 00000000 0 0</td>
</tr>
<tr>
<td>7</td>
<td>C_SC NA</td>
<td>C_SC NA Setup Menu Selected</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C_SC NA Setup (0 to 2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Index Point# DB Addr MPnt# MPntDb ReqSel Value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 700 1600 2000 3200 0 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 701 1601 2010 3201 0 0</td>
</tr>
<tr>
<td>8</td>
<td>C_DC NA</td>
<td>C_DC NA Setup Menu Selected</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C_DC NA Setup (0 to 2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Index Point# DB Addr MPnt# MPntDb ReqSel Bits</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 800 1616 3000 3216 0 0 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 801 1617 3090 3217 0 0 0</td>
</tr>
<tr>
<td>9</td>
<td>C_RC NA</td>
<td>C_RC NA Setup Menu Selected</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C_RC NA Setup (0 to 2)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Index Point# DB Addr MPnt# MPntDb ReqSel Value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>0 900 51 8000 30 0 0</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 901 52 8888 31 0 0</td>
</tr>
</tbody>
</table>
Viewing Database Configuration

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

![Database Configuration Screen]

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.

![Data Analyzer Example](image)

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.
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.

The Data Analyzer displays the following special characters:

<table>
<thead>
<tr>
<th>Character</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>[ ]</td>
<td>Data enclosed in these characters represent data received on the port.</td>
</tr>
<tr>
<td>&lt;&gt;</td>
<td>Data enclosed in these characters represent data transmitted on the port.</td>
</tr>
<tr>
<td>&lt;R+&gt;</td>
<td>These characters are inserted when the RTS line is driven high on the port.</td>
</tr>
</tbody>
</table>

```
[R+]<O1><O3><O0><O0><O0><O0><O0><O5><CD><R->_TT_[O1][O3][14][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0][O0]```
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 10 milliseconds 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.
When you have captured the data you want to save, click the Stop Logging button.

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:

```
0110010510010610010810010910810710010110110210101310141015101610010710010810010910110151
011010310010410010510010610010710010810010910110151
0110210010310010410010510010610010710010810010910110151
0110310010410010510010610010710010810010910110151
0110410010410010510010610010710010810010910110151
0110510010410010510010610010710010810010910110151
0110610010410010510010610010710010810010910110151
0110710010410010510010610010710010810010910110151
0110810010410010510010610010710010810010910110151
0110910010410010510010610010710010810010910110151

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.

---

### Viewing Register Pages

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

<table>
<thead>
<tr>
<th>Command</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>[0]</td>
<td>Display registers 0 to 99</td>
</tr>
<tr>
<td>[1]</td>
<td>Display registers 1000 to 1099</td>
</tr>
<tr>
<td>[2]</td>
<td>Display registers 2000 to 2099</td>
</tr>
</tbody>
</table>

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.

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:

<table>
<thead>
<tr>
<th>Module</th>
<th>Color</th>
<th>Status</th>
<th>Indication</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEBUG</td>
<td>Green</td>
<td>On</td>
<td>Data is being transferred between the module and a remote terminal using the Configuration/Debug port.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Off</td>
<td>No data is being transferred on the Configuration/Debug port.</td>
</tr>
<tr>
<td>PRT1</td>
<td>Green</td>
<td>On</td>
<td>Data is being transferred between Port 1 and the master.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Off</td>
<td>No data</td>
</tr>
<tr>
<td>PRT2</td>
<td>Green</td>
<td>On</td>
<td>Data is being transferred between Port 2 and the master.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Off</td>
<td>No data</td>
</tr>
<tr>
<td>CFG/ERR</td>
<td>Red</td>
<td>Off</td>
<td>The PTQ-101S is working normally.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On</td>
<td>If the processor is placed on PROG mode the module assert the CFG ERR LED.</td>
</tr>
<tr>
<td>ERR1</td>
<td>Red</td>
<td>Off</td>
<td>The PTQ-101S is working normally.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On</td>
<td>The PTQ-101S module program has recognized an application error.</td>
</tr>
<tr>
<td>ERR2</td>
<td>N/A</td>
<td>Not used in application</td>
<td></td>
</tr>
<tr>
<td>ERR3</td>
<td>N/A</td>
<td>Not used in application</td>
<td></td>
</tr>
<tr>
<td>Active</td>
<td>Green</td>
<td>On</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Off</td>
<td>The LED is off when the module is unable to speak with the processor. The processor either absent or not running.</td>
</tr>
<tr>
<td>BAT</td>
<td>Red</td>
<td>Off</td>
<td>The battery voltage is OK and functioning.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>On</td>
<td>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.</td>
</tr>
</tbody>
</table>

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

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- Group Codes ................................................................................ 156
- Module Performance ...................................................................... 157
- PTQ-101S Database Design Forms ............................................... 159
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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.

<table>
<thead>
<tr>
<th>Publication</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC 60870-5-101</td>
<td>Companion Standard for Basic Telecontrol Tasks</td>
</tr>
<tr>
<td>IEC 60870-5-101 Amendment 1</td>
<td>Companion Standard for Basic Telecontrol Tasks</td>
</tr>
<tr>
<td>IEC 60870-5-1</td>
<td>Transmission Frame Formats</td>
</tr>
<tr>
<td>IEC 60870-5-2</td>
<td>Link Transmission Procedures</td>
</tr>
<tr>
<td>IEC 60870-5-3</td>
<td>General Structure of Application Data</td>
</tr>
<tr>
<td>IEC 60870-5-4</td>
<td>Definition and Coding of Application Information Elements</td>
</tr>
<tr>
<td>IEC 60870-5-5</td>
<td>Basic Application Functions</td>
</tr>
</tbody>
</table>
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

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

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:

<table>
<thead>
<tr>
<th>Datatype</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>M_SP_NA</td>
<td>Monitored single-point database</td>
</tr>
<tr>
<td>M_DP_NA</td>
<td>Monitored dual-point database</td>
</tr>
<tr>
<td>M_ST_NA</td>
<td>Monitored step-point database</td>
</tr>
<tr>
<td>M_ME_NA</td>
<td>Monitored normalized-point database</td>
</tr>
<tr>
<td>M_ME_NB</td>
<td>Monitored scaled-point database</td>
</tr>
<tr>
<td>M_ME_NC</td>
<td>Monitored short-float point database</td>
</tr>
<tr>
<td>M_IT_NA</td>
<td>Monitored integrated total database</td>
</tr>
<tr>
<td>C_SC_NA</td>
<td>Command single-point database</td>
</tr>
<tr>
<td>C_DC_NA</td>
<td>Command dual-point database</td>
</tr>
<tr>
<td>C_RC_NA</td>
<td>Command step-point database</td>
</tr>
<tr>
<td>C_SE_NA</td>
<td>Command normalized-point database</td>
</tr>
<tr>
<td>C_SE_NB</td>
<td>Command scaled-point database</td>
</tr>
<tr>
<td>C_SE_NC</td>
<td>Command short-float point database</td>
</tr>
</tbody>
</table>

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:

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.

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:

<table>
<thead>
<tr>
<th>Component</th>
<th>Abbreviation</th>
<th>Possible Number of Octets</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cause of Transmission</td>
<td>COT</td>
<td>1 or 2</td>
</tr>
<tr>
<td>Common Address of ASDU</td>
<td>CASDU</td>
<td>1 or 2</td>
</tr>
<tr>
<td>Information Object Address</td>
<td>IOA</td>
<td>1, 2 or 3</td>
</tr>
</tbody>
</table>
These parameters must be configured to match the master's configuration, as shown in the following example:

![Edit - IEC-61850-5-101 Port 0](image)

The Common Address of ASDU is the station address. The module only allows the addressing of the whole station (some devices allow 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:

```plaintext
Master: 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)
Module:
```
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:

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:

To use balanced mode, configure the following parameters:
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.

![Diagram of Balanced Mode Initialization](image)

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

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.

<table>
<thead>
<tr>
<th>Module Database</th>
<th>Quantum/Unity Register</th>
<th>Unity Register</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read Data</td>
<td>3x</td>
<td>%IW</td>
<td>Input Register</td>
</tr>
<tr>
<td>Write Data</td>
<td>4x</td>
<td>%MW</td>
<td>Holding Register</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Processor Memory Address</th>
<th>Module Database Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>40065</td>
<td>0</td>
</tr>
<tr>
<td>40066</td>
<td>1</td>
</tr>
<tr>
<td>40067</td>
<td>2</td>
</tr>
<tr>
<td>40068</td>
<td>3</td>
</tr>
<tr>
<td>40069</td>
<td>4</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>40164</td>
<td>99</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Processor Memory Address</th>
<th>Module Database Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>30065</td>
<td>2000</td>
</tr>
<tr>
<td>30066</td>
<td>2001</td>
</tr>
<tr>
<td>30067</td>
<td>2002</td>
</tr>
<tr>
<td>30068</td>
<td>2003</td>
</tr>
<tr>
<td>30069</td>
<td>2004</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>30164</td>
<td>2099</td>
</tr>
</tbody>
</table>

### 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.

<table>
<thead>
<tr>
<th>Command Control Word</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>40001</td>
<td>Output sequence number</td>
</tr>
<tr>
<td>40002</td>
<td>Block ID</td>
</tr>
<tr>
<td>40003</td>
<td>Block request word 1</td>
</tr>
<tr>
<td>40004</td>
<td>Block request word 2</td>
</tr>
<tr>
<td>40005</td>
<td>Block request word 3</td>
</tr>
</tbody>
</table>
The following table shows the results of the PTQ-101S response to the command control block.

<table>
<thead>
<tr>
<th>Command Control Word</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>30001</td>
<td>Input sequence number</td>
</tr>
<tr>
<td>30002</td>
<td>Block ID</td>
</tr>
<tr>
<td>30003</td>
<td>Block response word 1</td>
</tr>
<tr>
<td>30004</td>
<td>Block response word 2</td>
</tr>
<tr>
<td>30005</td>
<td>Block response word 3</td>
</tr>
<tr>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>30064</td>
<td>Block response word 62</td>
</tr>
</tbody>
</table>

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.

**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

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

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

<table>
<thead>
<tr>
<th>Word Offset in Event Record</th>
<th>Data Field(s)</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>DB Index</td>
<td>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).</td>
</tr>
<tr>
<td>1</td>
<td>ASDU</td>
<td>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</td>
</tr>
<tr>
<td>2</td>
<td>Qualifier</td>
<td>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.</td>
</tr>
<tr>
<td>3</td>
<td>Year</td>
<td>This field contains the four-digit year for this event.</td>
</tr>
<tr>
<td>4</td>
<td>Month</td>
<td>This field contains the month value for the event. Valid Values: 1 to 12</td>
</tr>
<tr>
<td>5</td>
<td>Day</td>
<td>This field contains the day value for the event. Valid Values: 1 to 31</td>
</tr>
<tr>
<td>6</td>
<td>Hour</td>
<td>This field contains the hour value for the event. Valid Values: 0 to 23</td>
</tr>
<tr>
<td>7</td>
<td>Minute</td>
<td>This field contains the minute value for the event. Valid Values: 0 to 59</td>
</tr>
<tr>
<td>8</td>
<td>Seconds and Milliseconds</td>
<td>This field contains the seconds and milliseconds value for the event. Valid Values: 0 to 59,999 (59 seconds and 999 milliseconds).</td>
</tr>
<tr>
<td>9 to 14</td>
<td>Data</td>
<td>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.</td>
</tr>
</tbody>
</table>
**Block Format for Read**

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

**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:

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

**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.

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

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

**Block Format for Read**

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

**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**

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

Reference Reference
Quantum/Unity Platform
User Manual
IEC-60870-5-101 Slave Communication Module
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.**

```plaintext
(*
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[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
  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.
*)

  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[3] := MyYear;
  OutputControl[4] := MyMonth;
  OutputControl[6] := MyHour;
  OutputControl[7] := MyMinute;
  OutputControl[8] := MySecond;
  OutputControl[9] := MyMilisecond;
  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:

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

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:

![Parameter Configuration Screen]

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:

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:

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

Example - Periodic Monitor Polling:
If the following point is configured for monitor polling:
If you configure the periodic polling for 10 seconds (10000 milliseconds) as follows:

The following illustration shows the communication procedure for unbalanced mode:

![Communication Procedure Diagram](image-url)
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:

```
<table>
<thead>
<tr>
<th>Point</th>
<th>DB Address</th>
<th>Group</th>
<th>IV DB E</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>100</td>
<td>1000</td>
<td>00000002</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>101</td>
<td>1011</td>
<td>00000002</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>102</td>
<td>1022</td>
<td>00000004</td>
<td>0</td>
</tr>
</tbody>
</table>
```

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:
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:

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:

<table>
<thead>
<tr>
<th>Freeze Start Type</th>
<th>Time to Start Sending Messages</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>03/26/2004 00:00:00</td>
</tr>
<tr>
<td>H</td>
<td>03/25/2004 19:00:00</td>
</tr>
<tr>
<td>M</td>
<td>03/25/2004 18:08:00</td>
</tr>
</tbody>
</table>
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:

![Image of software interface]

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:

![Communication Example Diagram]

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.

<table>
<thead>
<tr>
<th>Data Type</th>
<th>Data Size</th>
<th>Addressing Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>M_SP_NA</td>
<td>1 bit</td>
<td>Bit</td>
</tr>
<tr>
<td>M_DP_NA</td>
<td>2 bits</td>
<td>Bit</td>
</tr>
<tr>
<td>M_ST_NA</td>
<td>1 byte</td>
<td>Byte</td>
</tr>
<tr>
<td>M_ME_NA</td>
<td>1 word</td>
<td>Word</td>
</tr>
<tr>
<td>M_ME_NB</td>
<td>1 word</td>
<td>Word</td>
</tr>
<tr>
<td>M_ME_NC</td>
<td>2 word</td>
<td>Double-Word</td>
</tr>
<tr>
<td>M_IT_NA</td>
<td>2 word</td>
<td>Double-Word</td>
</tr>
</tbody>
</table>
**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:

<table>
<thead>
<tr>
<th>Object Address</th>
<th>Module Database Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>Bit 0 of word 100</td>
</tr>
<tr>
<td>101</td>
<td>Bit 1 of word 100</td>
</tr>
<tr>
<td>102</td>
<td>Bit 2 of word 100</td>
</tr>
</tbody>
</table>

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:
These points would be used as follows:

<table>
<thead>
<tr>
<th>Inf. Object Address</th>
<th>Module Database Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>Low Byte of word 20</td>
</tr>
<tr>
<td>301</td>
<td>Low Byte of word 30</td>
</tr>
<tr>
<td>302</td>
<td>High Byte of word 40</td>
</tr>
</tbody>
</table>

**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:

```
Inf. Object Address  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:

<table>
<thead>
<tr>
<th>Bit</th>
<th>Value</th>
<th>16</th>
<th>15</th>
<th>14</th>
<th>13</th>
<th>12</th>
<th>11</th>
<th>10</th>
<th>9</th>
<th>8</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2^1</td>
<td>2^2</td>
<td>2^3</td>
<td>2^4</td>
<td>2^5</td>
<td>2^6</td>
<td>2^7</td>
<td>2^8</td>
<td>2^9</td>
<td>2^10</td>
<td>2^11</td>
<td>2^12</td>
<td>2^13</td>
<td>2^14</td>
<td>2^15</td>
<td></td>
</tr>
</tbody>
</table>

**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:

![Image showing point values and addresses]

These points would be used as follows:

<table>
<thead>
<tr>
<th>Inf. Object Address</th>
<th>Module Database Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>500</td>
<td>Words 40 and 41</td>
</tr>
<tr>
<td>501</td>
<td>Words 64 and 65</td>
</tr>
<tr>
<td>502</td>
<td>Word 104 and 105</td>
</tr>
</tbody>
</table>

8.2.8 Using Control (Command) Points

The following command points are supported by the module:

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

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:**

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.
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.

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.
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:

<table>
<thead>
<tr>
<th>Inf. Object Address</th>
<th>Module Database Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>Bit 0 of word 100</td>
</tr>
<tr>
<td>101</td>
<td>Bit 1 of word 100</td>
</tr>
<tr>
<td>102</td>
<td>Bit 2 of word 100</td>
</tr>
</tbody>
</table>
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:

![Database Configuration]

C_RC_NA

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

For example, if you configured the following points:

![Point Configuration]

These points would be used as follows:

<table>
<thead>
<tr>
<th>Inf. Object Address</th>
<th>Module Database Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>300</td>
<td>Low Byte of word 20</td>
</tr>
<tr>
<td>301</td>
<td>Low Byte of word 30</td>
</tr>
<tr>
<td>302</td>
<td>High Byte of word 40</td>
</tr>
</tbody>
</table>
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:

![Image of point configuration table]

These points would be used as follows:

<table>
<thead>
<tr>
<th>Inf. Object Address</th>
<th>PTQ-101S Module Database Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>Word 10</td>
</tr>
<tr>
<td>401</td>
<td>Word 12</td>
</tr>
<tr>
<td>402</td>
<td>Word 18</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Bit</th>
<th>16</th>
<th>15</th>
<th>14</th>
<th>13</th>
<th>12</th>
<th>11</th>
<th>10</th>
<th>9</th>
<th>8</th>
<th>7</th>
<th>6</th>
<th>5</th>
<th>4</th>
<th>3</th>
<th>2</th>
<th>1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value</td>
<td>S</td>
<td>2^{-1}</td>
<td>2^{-2}</td>
<td>2^{-3}</td>
<td>2^{-4}</td>
<td>2^{-5}</td>
<td>2^{-6}</td>
<td>2^{-7}</td>
<td>2^{-8}</td>
<td>2^{-9}</td>
<td>2^{-10}</td>
<td>2^{-11}</td>
<td>2^{-12}</td>
<td>2^{-13}</td>
<td>2^{-14}</td>
<td>2^{-15}</td>
</tr>
</tbody>
</table>

**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:

![Edit - C_SE_NC_1](image)

These points would be used as follows:

<table>
<thead>
<tr>
<th>Inf. Object Address</th>
<th>PTQ-101S Module Database Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
<td>Words 5 and 6</td>
</tr>
<tr>
<td>401</td>
<td>Words 6 and 7</td>
</tr>
<tr>
<td>402</td>
<td>Words 9 and 10</td>
</tr>
</tbody>
</table>

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.

![Diagram](image)
The following illustration shows the event communication between the master and the module during unbalanced mode:

```
<table>
<thead>
<tr>
<th>Master</th>
<th>Module</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Class 2</td>
</tr>
<tr>
<td></td>
<td>Ack Response</td>
</tr>
<tr>
<td></td>
<td>Class 2</td>
</tr>
<tr>
<td></td>
<td>Single Point Response (event)</td>
</tr>
<tr>
<td></td>
<td>Class 2</td>
</tr>
<tr>
<td></td>
<td>Ack Response</td>
</tr>
</tbody>
</table>
```

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:

<table>
<thead>
<tr>
<th>Data Type</th>
<th>Class Request</th>
</tr>
</thead>
<tbody>
<tr>
<td>M_SP_NA</td>
<td>Class 1</td>
</tr>
<tr>
<td>M_DP_NA</td>
<td>Class 1</td>
</tr>
<tr>
<td>M_ST_NA</td>
<td>Class 1</td>
</tr>
<tr>
<td>M_ME_NA</td>
<td>Class 2</td>
</tr>
<tr>
<td>M_ME_NB</td>
<td>Class 2</td>
</tr>
<tr>
<td>M_ME_NC</td>
<td>Class 2</td>
</tr>
<tr>
<td>M_IT_NA</td>
<td>Class 1</td>
</tr>
</tbody>
</table>

**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:

![Image of configuration screen](image)

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:

<table>
<thead>
<tr>
<th>Type</th>
<th>Command</th>
</tr>
</thead>
<tbody>
<tr>
<td>110</td>
<td>Parameter of Measured Normalized Data (M_ME_NA)</td>
</tr>
<tr>
<td>111</td>
<td>Parameter of Measured Scaled Data (M_ME_NB)</td>
</tr>
<tr>
<td>112</td>
<td>Parameter of Measured Short Floating Point (M_ME_NC)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Bits</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td>Not Used</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td>Threshold Value (Deadband)</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td>Smoothing Factor (filter time constant) - Not Supported</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td>Low Limit Transmission of Measured Value</td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>High Limit Transmission of Measured Value</td>
</tr>
<tr>
<td>5..31</td>
<td></td>
<td>Reserved</td>
</tr>
</tbody>
</table>
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:

<table>
<thead>
<tr>
<th>Bits</th>
<th>Value</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>0</td>
<td>No Change</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Change</td>
</tr>
<tr>
<td>8</td>
<td>0</td>
<td>Operation</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>Not in Operation</td>
</tr>
</tbody>
</table>
**Example - Parameter Data for Monitored Points:**

If the following monitored measured points are configured:

```
<table>
<thead>
<tr>
<th>Point</th>
<th>DB Address</th>
<th>Groups</th>
<th>Default Deadband</th>
<th>M/DB Bit</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>401</td>
<td>101</td>
<td>00000000</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>402</td>
<td>102</td>
<td>00000000</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>403</td>
<td>103</td>
<td>00000000</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>4</td>
<td>404</td>
<td>104</td>
<td>00000000</td>
<td>100</td>
<td>0</td>
</tr>
</tbody>
</table>
```

Point Value Status - OK
And if the parameter points are configured as follows:

![Parameter Configuration](image)

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

<table>
<thead>
<tr>
<th>M_ME_NA</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitored Measured Normalized Point</td>
<td>Associated Parameter Point</td>
</tr>
<tr>
<td>400</td>
<td>2400</td>
</tr>
<tr>
<td>401</td>
<td>2401</td>
</tr>
<tr>
<td>402</td>
<td>2402</td>
</tr>
<tr>
<td>403</td>
<td>2403</td>
</tr>
<tr>
<td>404</td>
<td>2404</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>M_ME_NB</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitored Measured Normalized Point</td>
<td>Associated Parameter Point</td>
</tr>
<tr>
<td>500</td>
<td>2500</td>
</tr>
<tr>
<td>501</td>
<td>2501</td>
</tr>
<tr>
<td>502</td>
<td>2502</td>
</tr>
<tr>
<td>503</td>
<td>2503</td>
</tr>
<tr>
<td>504</td>
<td>2504</td>
</tr>
</tbody>
</table>
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:

![Configuration Parameter](image)

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:

![Data Type Configuration](image)

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 Level Configuration](image)

**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:

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:

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

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:

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:

<table>
<thead>
<tr>
<th>Event Order</th>
<th>ASDU</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M_SP_NA</td>
</tr>
<tr>
<td>2</td>
<td>M_SP_NA</td>
</tr>
<tr>
<td>3</td>
<td>M_DP_NA</td>
</tr>
<tr>
<td>4</td>
<td>M_ST_NA</td>
</tr>
<tr>
<td>5</td>
<td>M_DP_NA</td>
</tr>
<tr>
<td>6</td>
<td>M_SP_NA</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Packet Order</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>M_DP_NA events 3 and 5</td>
</tr>
<tr>
<td>2</td>
<td>M_SP_NA events 1, 2 and 6</td>
</tr>
<tr>
<td>3</td>
<td>M_ST_NA event 4</td>
</tr>
</tbody>
</table>
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:

![RS-232 Config/Debug Port Cable 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 Application Port Cable
(No Handshaking)

```
<table>
<thead>
<tr>
<th>DB-9 Male</th>
<th>RS-232 Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>RxD</td>
<td>TxD</td>
</tr>
<tr>
<td>TxD</td>
<td>RxD</td>
</tr>
<tr>
<td>COM</td>
<td>COM</td>
</tr>
</tbody>
</table>
```

**RS-232: Modem Connection**

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

RS-232 Application Port Cable
(Modem Connection)

```
<table>
<thead>
<tr>
<th>DB-9 Male</th>
<th>RS-232 Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>TxD</td>
<td>TxD</td>
</tr>
<tr>
<td>RxD</td>
<td>RxD</td>
</tr>
<tr>
<td>RTS</td>
<td>RTS</td>
</tr>
<tr>
<td>CTS</td>
<td>CTS</td>
</tr>
<tr>
<td>Signal</td>
<td>Signal</td>
</tr>
<tr>
<td>Common</td>
<td>Common</td>
</tr>
<tr>
<td>DTR</td>
<td>DTR</td>
</tr>
</tbody>
</table>
```

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).

<table>
<thead>
<tr>
<th>DB-9 Male</th>
<th>RS-232 Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>TxD</td>
<td>3</td>
</tr>
<tr>
<td>RxD</td>
<td>2</td>
</tr>
<tr>
<td>RTS</td>
<td>7</td>
</tr>
<tr>
<td>CTS</td>
<td>8</td>
</tr>
<tr>
<td>Signal Common</td>
<td>5</td>
</tr>
<tr>
<td>DTR</td>
<td>4</td>
</tr>
</tbody>
</table>

**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.

<table>
<thead>
<tr>
<th>DB-9 Male</th>
<th>RS-232 Device</th>
</tr>
</thead>
<tbody>
<tr>
<td>TxD</td>
<td>3</td>
</tr>
<tr>
<td>RxD</td>
<td>2</td>
</tr>
<tr>
<td>RTS</td>
<td>7</td>
</tr>
<tr>
<td>CTS</td>
<td>8</td>
</tr>
<tr>
<td>Signal Common</td>
<td>5</td>
</tr>
<tr>
<td>DTR</td>
<td>4</td>
</tr>
</tbody>
</table>

**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:

![RS-485 Application Port Cable Diagram](image)

**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-422 Application Port Cable Diagram](image)

**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.

<table>
<thead>
<tr>
<th>Offset</th>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4000</td>
<td>Scan Count</td>
<td>This status value contains a counter incremented on each scan of the module's main loop.</td>
</tr>
<tr>
<td>4001 to</td>
<td>Product Name</td>
<td>This two-word data area contains the text values representing the product name.</td>
</tr>
<tr>
<td>4002</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4003 to</td>
<td>Revision</td>
<td>This two-word data area contains the text values for the revision number.</td>
</tr>
<tr>
<td>4004</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4005 to</td>
<td>Op Sys #</td>
<td>This two-word data area contains the text values for the operating system number.</td>
</tr>
<tr>
<td>4006</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4007 to</td>
<td>Run Number</td>
<td>This two-word data area contains the text values for the run number.</td>
</tr>
<tr>
<td>4008</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4009</td>
<td>Read Blk Cnt</td>
<td>This word contains the total number of block read operations successfully executed.</td>
</tr>
<tr>
<td>4010</td>
<td>Write Blk Cnt</td>
<td>This word contains the total number of block write operations successfully executed.</td>
</tr>
<tr>
<td>4011</td>
<td>Parse Blk Cnt</td>
<td>This word contains the total number of block blocks successfully parsed.</td>
</tr>
<tr>
<td>4012</td>
<td>Error Blk Cnt</td>
<td>This word contains the total number of block transfer errors.</td>
</tr>
<tr>
<td>4013</td>
<td>Port Selected</td>
<td>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.</td>
</tr>
<tr>
<td>4014</td>
<td>Bad CKS</td>
<td>This word contains the total number of frames received by the module that contain a bad check-sum values in the message.</td>
</tr>
<tr>
<td>4015</td>
<td>Sync Errors</td>
<td>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.</td>
</tr>
<tr>
<td>4016</td>
<td>Length Errors</td>
<td>This word contains the total number of frames received by the module that do not have the correct length.</td>
</tr>
<tr>
<td>4017</td>
<td>Timeout</td>
<td>This word contains the total number of frames received by the module that were not received within the specified receive timeout parameter.</td>
</tr>
<tr>
<td>4018</td>
<td>RX Frames</td>
<td>This word contains the total number of frames received by the module.</td>
</tr>
<tr>
<td>4019</td>
<td>TX Frames</td>
<td>This word contains the total number of frames transmitted by the module.</td>
</tr>
<tr>
<td>4020</td>
<td>MSP Event Buffer</td>
<td>This parameter shows the number of events available in the event buffer for M_SP_NA points.</td>
</tr>
<tr>
<td>4021</td>
<td>MDP Event Buffer</td>
<td>This parameter shows the number of events available in the event buffer for M_DP_NA points.</td>
</tr>
<tr>
<td>4022</td>
<td>MST Event Buffer</td>
<td>This parameter shows the number of events available in the event buffer for M_ST_NA points.</td>
</tr>
</tbody>
</table>
### Offset Parameter Description

<table>
<thead>
<tr>
<th>Offset</th>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4023</td>
<td>MMENA Event Buffer</td>
<td>This parameter shows the number of events available in the event buffer for M_ME_NA points</td>
</tr>
<tr>
<td>4024</td>
<td>MMENB Event Buffer</td>
<td>This parameter shows the number of events available in the event buffer for M_ME_NB points</td>
</tr>
<tr>
<td>4025</td>
<td>MMENC Event Buffer</td>
<td>This parameter shows the number of events available in the event buffer for M_ME_NC points</td>
</tr>
<tr>
<td>4026</td>
<td>MIT Event Buffer</td>
<td>This parameter shows the number of events available in the event buffer for M_IT_NA points</td>
</tr>
</tbody>
</table>

#### 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.

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

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.

<table>
<thead>
<tr>
<th>CPU651 60 Unity Processor</th>
<th>Number of Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of Words</strong></td>
<td>0</td>
</tr>
<tr>
<td>100 words</td>
<td>4</td>
</tr>
<tr>
<td>1000 words</td>
<td>4</td>
</tr>
<tr>
<td>2000 words</td>
<td>4</td>
</tr>
<tr>
<td>4000 words</td>
<td>4</td>
</tr>
</tbody>
</table>
### CPU31110 Unity Processor

<table>
<thead>
<tr>
<th>Number of Words</th>
<th>Number of Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>100 words</td>
<td>1</td>
</tr>
<tr>
<td>1000 words</td>
<td>1</td>
</tr>
<tr>
<td>2000 words</td>
<td>1</td>
</tr>
<tr>
<td>4000 words</td>
<td>1</td>
</tr>
</tbody>
</table>

### CPU534-14A Unity Processor

<table>
<thead>
<tr>
<th>Number of Words</th>
<th>Number of Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
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<tr>
<td>100 words</td>
<td>1</td>
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<tr>
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<tr>
<td>2000 words</td>
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<tr>
<td>4000 words</td>
<td>1</td>
</tr>
</tbody>
</table>

### Results for Quantum Processors

### CPU534-14A Quantum Processor

<table>
<thead>
<tr>
<th>Number of Words</th>
<th>Number of Modules</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0</td>
</tr>
<tr>
<td>100 words</td>
<td>0.6</td>
</tr>
<tr>
<td>1000 words</td>
<td>0.6</td>
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<tr>
<td>2000 words</td>
<td>0.6</td>
</tr>
<tr>
<td>4000 words</td>
<td>0.6</td>
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</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Point Number</th>
<th>Database Address</th>
<th>Group Assignment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>
### 8.7.2 Form for data types M_ME_NA_1 and M_ME_NB_1

<table>
<thead>
<tr>
<th>Point Number</th>
<th>Database Address</th>
<th>Group Assignment</th>
<th>Default Deadband</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>
### 8.7.3 Forms for all command data types except C_RC_NA_1

<table>
<thead>
<tr>
<th>Point Number</th>
<th>Database Address</th>
<th>Monitor Point #</th>
<th>Monitor Database Address</th>
<th>Require Select</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tr>
</tbody>
</table>
### 8.7.4 Form for C_RC_NA_1 data type

<table>
<thead>
<tr>
<th>Point Number</th>
<th>Database Address</th>
<th>Monitor Point #</th>
<th>Monitor Database Address</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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</tbody>
</table>
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 >1200 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           | □ 1200 bit/s
- 600 bit/s             | ☒ 19200 bit/s          | ☒ 38400 bit/s          | □ 1200 bit/s
Transmission speed (monitor direction)

<table>
<thead>
<tr>
<th></th>
<th>Unbalanced interchange</th>
<th>Unbalanced interchange</th>
<th>Balanced interchange</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard</td>
<td>Recommended if &gt; 1 200 bit/s</td>
<td></td>
<td></td>
</tr>
<tr>
<td>100 bit/s</td>
<td>□</td>
<td>×</td>
<td>□</td>
</tr>
<tr>
<td>200 bit/s</td>
<td>□</td>
<td>×</td>
<td>□</td>
</tr>
<tr>
<td>300 bit/s</td>
<td>□</td>
<td>×</td>
<td>□</td>
</tr>
<tr>
<td>600 bit/s</td>
<td>□</td>
<td>×</td>
<td>□</td>
</tr>
<tr>
<td>1200 bit/s</td>
<td>□</td>
<td>×</td>
<td>□</td>
</tr>
<tr>
<td>2400 bit/s</td>
<td>□</td>
<td>×</td>
<td>□</td>
</tr>
<tr>
<td>4800 bit/s</td>
<td>□</td>
<td>×</td>
<td>□</td>
</tr>
<tr>
<td>9600 bit/s</td>
<td>□</td>
<td>×</td>
<td>□</td>
</tr>
<tr>
<td>19200 bit/s</td>
<td>□</td>
<td>×</td>
<td>□</td>
</tr>
<tr>
<td>38400 bit/s</td>
<td>□</td>
<td>×</td>
<td>□</td>
</tr>
</tbody>
</table>

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

- Balanced transmission
- Unbalanced transmission

Address field of link

- Not present (balanced transmission only)
- 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_1
- <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
<20> := Single-point information with time tag CP56Time2a M_SP_TB_1
<30> := Double-point information with time tag CP56Time2A M_DP_TB_1
<31> := Step position information with time tag CP56Time2A M_ST_TB_1
<30> := Single-point information with time tag CP56Time2a M_SP_TB_1
<32> := Double-point information with time tag CP56Time2A M_DP_TB_1
<33> := Step position information with time tag CP56Time2A M_ST_TB_1
<33> := 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

System information in control direction
(Station-specific parameter)

<100> := Interrogation command
<101> := Counter interrogation command
<102> := Read command
<103> := Clock synchronization command
<104> := Test command
<105> := Reset process command
<106> := Delay acquisition command

Parameter in control direction
(Station-specific parameter)

<110> := Parameter of measured value, normalized value
<111> := Parameter of measured value, scaled value
<112> := Parameter of measured value, short floating point value
<113> := Parameter activation

File transfer
(Station-specific parameter)

<120> := File ready
<121> := Section ready
<122> := Call directory, select file, call file, call section
<123> := Last section, last segment
<124> := Ack file, ack section
<125> := Segment
<126> := Directory
Basic Application Functions

Station initialization
(Station-specific parameter)
☒ Remote initialization

General Interrogation
(System- or station-specific parameter)
☒ global
☒ group 1 ☒ group 7 ☒ group 13
☒ group 2 ☒ group 8 ☒ group 14
☒ group 3 ☒ group 9 ☒ group 15
☒ group 4 ☒ group 10 ☒ group 16
☒ group 5 ☒ group 11
☒ group 6 ☒ group 12
Addresses per group have to be defined

Clock synchronization
(System-specific parameter)
☒ Clock synchronization

Command transmission
(Station-specific parameter)
☒ Direct command transmission ☒ Select and execute command
☒ Direct set point command transmission ☒ Select and execute set point command
☒ C_SE_ACTTERM used \(^{\text{Note 2}}\)
☒ No additional definition
☒ Short pulse duration (duration determined by a system parameter in the outstation) \(^{\text{Note 4}}\)
☒ Long pulse duration (duration determined by a system parameter in the outstation) \(^{\text{Note 4}}\)
☒ 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

- How to Contact Us: Technical Support................................................ 171
- Return Material Authorization (RMA) Policies and Conditions............. 172
- LIMITED WARRANTY......................................................................... 173

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

<table>
<thead>
<tr>
<th>Internet</th>
<th>Web Site: <a href="http://www.prosoft-technology.com/support">www.prosoft-technology.com/support</a></th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia Pacific</td>
<td>E-mail address: <a href="mailto:support@prosoft-technology.com">support@prosoft-technology.com</a></td>
</tr>
<tr>
<td>+603.7724.2080,</td>
<td></td>
</tr>
<tr>
<td><a href="mailto:support.asia@prosoft-technology.com">support.asia@prosoft-technology.com</a></td>
<td></td>
</tr>
<tr>
<td>Languages spoken include: Chinese, English</td>
<td></td>
</tr>
<tr>
<td>Europe (location in Toulouse, France)</td>
<td></td>
</tr>
<tr>
<td>+33 (0) 5.34.36.87.20, <a href="mailto:support.EMEA@prosoft-technology.com">support.EMEA@prosoft-technology.com</a></td>
<td></td>
</tr>
<tr>
<td>Languages spoken include: French, English</td>
<td></td>
</tr>
<tr>
<td>North America/Latin America (excluding Brasil) (location in California)</td>
<td></td>
</tr>
<tr>
<td>+1.661.716.5100, <a href="mailto:support@prosoft-technology.com">support@prosoft-technology.com</a></td>
<td></td>
</tr>
<tr>
<td>Languages spoken include: English, Spanish</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td></td>
</tr>
<tr>
<td>Brasil (location in Sao Paulo)</td>
<td></td>
</tr>
<tr>
<td>+55-11-5084-5178, <a href="mailto:eduardo@prosoft-technology.com">eduardo@prosoft-technology.com</a></td>
<td></td>
</tr>
<tr>
<td>Languages spoken include: Portuguese, English</td>
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</tbody>
</table>

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.
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 warranted 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. 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 include, 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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