ProWORX 32
Programming Software for PLCs
User Guide

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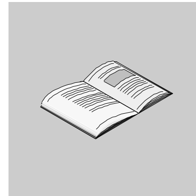


Safety Information

Important Information

NOTICE

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

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

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

DANGER

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

WARNING

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

CAUTION

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

PLEASE NOTE

Electrical equipment should be serviced only by qualified personnel. No responsibility is assumed by Schneider Electric for any consequences arising out of the use of this material. This document is not intended as an instruction manual for untrained persons.

About the Book

At a Glance

Document Scope

This manual describes how to install, configure and use ProWORX 32 and all of its components.
To find out about any changes to the manual after this version was published, consult our web site at public.modicon.com.

Terms and Abbreviations

Numbers are written according to international practice as well as according to approved SI (System International d'Unites) presentation; each thousand is separated by a space, along with use of the decimal point, e.g., 12 345.67

Validity Note

This document applies to the installation and use of ProWORX 32 in Windows 98, Windows Me, Windows XP, Windows NT 4.0, and Windows 2000 environments and ProWORX Server in Windows XP, Windows NT 4.0, and Windows 2000 environments.

Related Documents

Title of Documentation	Reference Number
Modicon Ladder Logic Block Library	840 USE 101 00
Modicon Modbus Plus PCI-85 Interface Adapter	890 USE 162 00
Modicon Quantum Hot Standby System Planning and Installation Guide	840 USE 106 00
Modicon TSX Quantum Automation Series Hardware Reference Guide	840 USE 100 00
TSX Momentum I/O Base User Guide	870 USE 002 00
Modicon A120 Series I/O Modules User Guide	890 USE 109 00
BM85 Bridge Multiplexer User's Guide	890 USE 103 00

Product Related Warnings

Schneider Electric assumes no responsibility for any errors that may appear in this document. If you have any suggestions for improvements or amendments or have found errors in this publication, please notify us.

User Comments

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

Getting Started

1

Welcome to ProWORX 32

About this Manual

This manual is a guide for operating ProWORX 32. It does not contain information about specific controllers, I/O cards, or ladder logic instructions. For further hardware and ladder logic information, go to the ProWORX 32 on-line help system.

Getting Started with ProWORX 32

This chapter guides you through starting out with ProWORX 32.

What's in this Chapter?

This chapter contains the following topics:

System Requirements

Hardware Requirements

Hardware:

Hardware	Requirement
Processor	P200
Memory	128 MB
Hard Disk Space (Available)	200 MB
Installation Media Type	CD
Display	256 color VGA or higher

Software Requirements

Software:

Software	Requirement
ProWORX 32 Client - Operating Systems	Windows 98, Windows NT (Version 4.0, SP5 or higher), Windows 2000, Window Me, and Windows XP.
ProWORX Server - Operating Systems	Windows NT (Version 4.0, SP5 or higher), Windows 2000, and Windows XP.
Microsoft Internet Explorer	Version 5.0 or higher.
Microsoft MDAC	Version 2.5 or higher.

Installing ProWORX 32

Installing ProWORX 32

ProWORX 32 requires the installation of MDac version 2.5 or greater and Internet Explorer 5.0 or greater. Install the MDac software from the ProWORX 32 installation CD, and ensure that you have a compatible version of Internet Explorer prior to installing ProWORX 32. Then, to install ProWORX 32:

Step	Action
1	Insert the ProWORX 32 CD into your CD-ROM drive. The ProWORX 32 installation screen should automatically load. If the ProWORX installation program does not automatically load, you can open the installation in Windows Explorer at **CD Rom Drive** → **Setup.exe.**
2	Select the Language you want to install ProWORX 32 in. (English, French, German, Spanish.)
3	Follow the on-screen instructions to complete the installation of ProWORX 32.

Modifying or Repairing the ProWORX 32 Installation

If you have already installed ProWORX 32:

Step	Action
1	Insert the ProWORX 32 CD into your CD-ROM drive.
2	Select **Modify** to add new components, or remove already installed components. Click **Next** and follow the on-screen instructions.
3	Select **Repair** to reinstall all components installed by the previous setup. Click **Next** and follow the on-screen instructions.

Uninstalling (Removing) ProWORX 32

If you have already installed ProWORX 32:

Step	Action
1	Insert the ProWORX 32 CD into your CD-ROM drive.
2	Select **Remove** to uninstall all installed components.
3	Click **Next** and follow the on-screen instructions.

Logging In

The ProWORX 32 Login Screen

When opening ProWORX 32 you are prompted with the ProWORX 32 Login screen. If you are using projects that reside on a server or you want to communicate through the server, enter the login information and click **Login**. If you are using only projects that reside on the client, click **Bypass**.

Logging In to the ProWORX 32 Server

To access the login screen from within ProWORX 32:

Step	Action
1	In the ProWORX 32 menu, select **File** → **Login**.
2	Enter the user name and password that your system administrator has given you in the **Name** and **Password** fields.
3	Select your method of communicating with the server from **TCP/IP** and **Modbus Plus**.
4	Enter the address of the server in the **Server Address** field.
5	Enter the timeout (seconds) in the **Timeout** field.
6	If you have selected TCP/IP, enter the port number in the **Port Number** field.
7	If you have selected Modbus Plus, enter the adapter number in the **Adapter Number** field.
8	Click **Login**.

Logging Out of the ProWORX 32 Server

Closing ProWORX 32 client logs you out of the server or to log out while remaining in ProWORX 32:

Step	Action
1	From the ProWORX 32 menu, select **File** → **Logout**.

Authorizing ProWORX 32

Opening the Authorization Program

From the Windows Start menu:

Step	Action
1	Select **Programs** → **ProWORX 32** → **Authorization**.

Using the Authorization Wizard

After opening the authorization wizard:

Step	Action
1	Select which task you would like to perform: ● **Authorize this PC**: Sets up the PC you are currently using to run ProWORX 32. ● **Transfer Authorization**: Transfers authorization from one PC to another. ● **Enter received code**: If already registered, you are taken directly to the Entering Authorization Code screen. When you have made a selection, click **Next**.
2	Select which method you would prefer to authorize ProWORX 32 by, and click **Next**: ● **Authorize by Phone**: A message box is displayed containing a customer support phone number and the customer support hours of operation. Click **OK** to return to the authorization application. ● **Authorize by Fax**: A fax page is printed containing the information you have entered and a number to send the fax to. ● **Authorize by Multi-User License Diskette**: This option is used strictly for uncopyprotected versions in which a diskette has been provided by Schneider Electric. The contents of the diskette will be transferred onto your machine. ● **Authorize by Email**: An email is sent to customer support containing the information you have entered. ● **Authorize by Web**: You will be directed to a web page at the Schneider Electric web site where the information that you have entered will be displayed and an authorization number will be generated for you.
3	Select which product you want to authorize and click **Next**: ● **Online Only Client**: Access to online only portions of ProWORX 32. ● **Lite Client**: Access to Momentum, Compact, and Micro controllers only. ● **Full Development Client**: Full access to all features of ProWORX 32. ● **Server**: Full access to the ProWORX Server.
4	Enter all of your personal information in the User Information screen and click **Next**. If you would like to view our privacy policy, click **Privacy Policy**.

Moving Authorization

After selecting Transfer Authorization in Step One:

Step	Action
1	Insert a diskette into your PC diskette drive.
2	Select which transaction you want to complete and click **Next**: ● Transfer authorization from computer to diskette. ● Transfer authorization from diskette to computer.

Entering the Authorization Number

After receiving an authorization number:

Step	Action
1	A **Code Entry Number** and a **Computer ID** are created automatically
2	Enter the Authorization Number provided to you by customer support and click **Next**.
3	To complete your ProWORX 32 authorization, click **Finish**.

The ProWORX 32 Environment

Overview

ProWORX 32 is organized in such a way that the information you need at any time is readily accessible through the ProWORX 32 main interface.

Setting ProWORX 32 Properties

From the My Computer right-click menu in the Navigation panel:

Step	Action
1	Select **Properties**.
2	Select the **Environment** tab.
3	Set the following ProWORX 32 Environment parameters:
4	**Auto Monitor/Logout**: When selected with Logout, the Online Network Editor closes after the specified amount of inactive time. When selected with Monitor, the Online Network Editor closes after the specified amount of inactive time and Monitor mode is activated.
5	**Prompt For Read When Exiting Online**: Displays a prompt to perform a read after switching out of online mode.
6	**Compare To Project On Attach**: Displays a prompt to perform a compare when switching to online mode.
7	**Enable Audit Trails**: Audit trails and the log book are viewable.
8	**Automatically Update Used Tables Online**: When going online, the used tables are automatically updated.
9	**Enable Scrolling Navigation Panel**: When this option is selected, the navigation panel shrinks showing only the panel’s border. To see the navigation panel, hover your mouse over the border and the navigation panel expands.
10	**Instruction Toolbar**: See *ProWORX 32 Toolbar, p. 23*.

ProWORX 32 Client Security

Overview

Security allows an administrator to disable features of ProWORX 32.

Setting Security for a Client

From the My Computer right-click menu in the Navigation panel:

Step	Action
1	Select **Security Settings** to open the Client Security dialog.
2	To set and confirm the administrative password, enter the password into the **Password** and **Confirm Password** boxes.
3	To set the rights that users have while running ProWORX 32 on this specific PC, select rights from the **Enabled Functionality** group of rights. See User Rights below for more information.
4	Click **OK** to confirm changes. Click **Close** to exit.

User Rights

User rights descriptions:

User Rights	Descriptions
Controller Configuration	The ability to change the controller configuration, or change controller type.
Traffic Cop	The ability to edit in the traffic cop.
Communications	The ability to change the communications setup including the controller’s address.
Logic	The ability to edit logic.
Forcing	The ability to force contacts and coils.
Insert	The ability to insert cells, rows, columns, and networks.
Delete	The ability to delete cells, rows, columns, and networks.
Sweep	The ability to enter sweep mode.
Data Editors	The ability to enter any of the data editors, If deselected, the user is unable to change register data.
Extended Memory	The ability to edit extended memory registers.
Protected Registers	The ability to set ranges of 4xxxx addresses that are uneditable. See Setting Protected Registers for more information.
Configuration Extensions	The ability to edit the configuration extensions.
ASCII Messages	The ability to edit the ASCII messages.
Search	The ability to use the search feature.
Read	The ability to read from the controller.
Write	The ability to write to the controller.
Start/Stop	The ability to start or stop the controller.
Clear Audit Trails	The ability to remove all audit trail and logbook entries.

Tracking Help

Overview

Tracking help is a brief description or overview of the editor, instructions, or I/O card that is currently selected in ProWORX 32.

Using Tracking Help

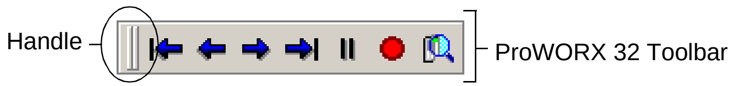
From the ProWORX 32 menu:

Step	Action
1	Select **View** → **Tracking Help** to open the tracking help window.
2	To see more information about the current tracking help topic, press **F1**.

ProWORX 32 Toolbar

Overview

The ProWORX 32 toolbar holds all of the icon buttons that can be used to access features, utilities, and tools needed to properly use ProWORX 32s development capabilities.



Using the Toolbar

From the ProWORX 32 toolbar right-click menu:

Step	Action
1	To add a toolbar, select a toolbar to add from the list. A toolbar that is displayed is denoted by a check .
2	To remove a toolbar, select a toolbar to remove from the list.
3	To move a selected toolbar within the ProWORX 32 toolbar area, select the toolbars handle, and drag and drop the toolbar to its desired location.
4	To customize the toolbars, click **Customize**. To view help concerning toolbar customizing please refer the Windows help file, **Windows Start Menu** → **Help**.

Customizing the Instruction Toolbar

In the project navigation panel:

Step	Action
1	From the project right-click menu, select **Properties**.
2	Select the **Environment** tab.
3	Scroll to the number of the button (1-14) you would like to change in the **Button Number** field. eg. 1 = the leftmost button, 14 = the rightmost button.
4	Enter the name of the instruction to be placed on the toolbar in the **Button Text** field.

Toolbar Listing

Default toolbars and items:

Toolbar	Item
Standard Toolbar	- Create a New Project
	- Save the Active Project
	- Print the Active Project
	- Open Print Preview
	- Open Report Setup
	- Undo the most recent action (CTRL+Z)
	- Repeats the most recent action
	- Cut the current selection and copy to the system clipboard (CTRL+X)
	- Copy the current selection to the system clipboard (CTRL+C)
	- Paste data from system clipboard to selected area (CTRL+V)
	- Open the Search window (CTRL+F)
	- Repeat the last Search operation (SHIFT+F4)
	- Find and Replace (CTRL+H)
	- Open Help (F1)
Control Toolbar. See *Working with a ProWORX 32 Project, p. 36*	- Take project offline
	- Take project to emulation
	- Take project online
	- Take project to combined mode

Toolbar	**Item**
Online Control Toolbar	- Start/Stop controller. See *Starting and Stopping Controllers, p. 98*.
	- Initialize logic. See *Initializing Logic in a Controller, p. 90*.
	- Read from controller. See *Reading From a Controller, p. 91*. ● Read ● Read extended memory
	- Write to controller. See *Writing to a Controller, p. 92*. ● Write logic ● Relocate logic and data ● Relocate logic only ● Write extended memory
DWW Log Toolbar	- First record
	- Previous record
	- Next Record
	- Last record
	- Pause/Resume
	- Record
	- Toggle between logging real-time data from a controller and logging stored
Instruction Toolbar	 - A user-defined set of instructions. Clicking an instruction adds it to the logic editor at the cursor.

Contacting Schneider Electric

Contact Information

Customer support is available to registered Schneider Electric users.

If you have a question about ProWORX 32 and can't find the answer in the ProWORX 32 Help system or the User's Guide, contact our Customer Service staff for assistance. You can reach Schneider's Customer Support department by Internet, phone, fax, or mail:

Schneider Electric
One High Street
North Andover, MA 01845

Internet: http://public.modicon.com/
E-mail: customercentral@schneiderautomation.com
Support Hotline: (888) 266-8705
Telephone: (978) 794-0800
Fax: (978) 975-9301

Support Guidelines

To help us assist you quickly, we suggest you have the following information ready:

- The version and serial number of your copy of ProWORX 32. To find this information, select About on the Help menu.
- What you were doing when the problem occurred, whether you can repeat it, and any error messages you received.
- Your version of Windows. To find this information in Windows ME, 98, 95, 2000 or NT 4.x: click Start, then Settings. Select Control Panel. When the Control Panel window opens, double-click System. When the System window opens, select the General tab. Your version of Windows is listed under the heading System.
- Information about your computer, including its processor type, memory, hard drive size, video card type, and I/O boards.

Working with Projects

2

At a Glance

Overview

ProWORX 32 holds information about each of your controllers in a project. The project stores:

- The controller's configuration
- Ladder logic
- Descriptors of the controller and ladder logic
- Project properties
- Data trends
- Compare results

What's in this Chapter?

This chapter contains the following topics:

Creating a New Project

Creating a New Project

From the ProWORX 32 tool bar:

Step	Action
1	Click **File** → **New**.
2	Enter a project name in the **New Project Name** box.
3	Click **OK**. The New Project Wizard appears.

Overview

The Project Configuration Wizard steps you through creating new default projects and modify existing projects in ProWORX 32. The configuration wizard guides you through a series of easy to understand steps to set up a project. Each step configures an important area of the project.

Each screen in the wizard has a caption stating which step you are currently completing. Also, each screen has a diagram and description detailing what the current step involves.

The standard wizard buttons are:

Button	Function
Help	Displays context-sensitive help pertaining to the current step.
Cancel	Exits the wizard and no new project is created or no changes are saved.
Back	Returns the wizard to the previous step.
Next	Advances the wizard to the next step.
Finish	Completes the wizard and creates a new project or saves the changes.

Step 1 - Select Creation Method

Select a path to create a new project:

Path	Description
Online to Controller	This option sets up a project enough to go online to a controller. The first step configures the parameters used to communicate with the desired controller. This step encapsulates communications setup; use of this step is identical to the Project communications setup dialog. Click **Next** to display the Finish step. Click **Finish** to go online to the desired controller.
Select Controller Type	This step allows you to set up the controller type. For more information, see *Selecting a Controller Type, p. 31*.
Base on Existing Project	This option creates a project based on an existing project. First, select an existing Project from the list of projects on the local computer. ProWORX 32 creates a copy of the project and uses it as the base for the new project. ProWORX 32 initializes the logic and clears the traffic cop of the new project. ProWORX 32 then displays a communications setup step to configure communications to the desired controller. On the finish step click **Finish** to complete the new project creation.
Read from Controller	This option creates a project based on a read of the program from an existing controller. ProWORX 32 displays a communications setup step to configure communications to the desired controller. On the Finish step click **Finish**. ProWORX 32 reads the contents of the controller into a new default project.
Use as a Macro	When selecting any offline options, you can click the Use as Macro checkbox to create a macro-enabled database. For more information, see *Macros, p. 214*.

Selecting a Controller Type

Selecting a Controller Type

This step includes two drop down lists to select a controller. To the right of the drop down lists is a detailed description of the currently selected controller. Displayed below the controller selection drop down list are pictures of the I/O type(s) supported by the current controller.

To select a controller:

Step	Action
1	Select a controller family from the **Pick a Controller Family** drop-down box: Compact, Micro, Momentum, 38x/48x, 484 Replacement, 68x/78x, 984ABX, Atrium, Other, Quantum, or VME.
2	Select the desired controller from the **Pick a Controller** drop-down box. The list of controllers depends on which controller family you selected in Step 1.
3	Click **Next** to continue.

Controller Details

The controller details available depends on the controller you have selected in the previous step. Set the available controller details:

Controller Detail	Description
Executive Cartridge	Cartridges which determine the controller's instruction set. Select the one installed in your controller. The Executive Cartridge is available for some 38x, 48x, 68x and Quantum controllers.
Memory Pack	The amount of both Extended and User Logic memory in the controller. Select the amount installed in your controller. Available on a variety of x80 and 984 A/B controllers.
Extended Memory	Additional memory providing 6xxxx registers. Select the amount installed in your controller. Available on a variety of x80 and 984 A/B controllers.
Built-in XMRD/XMWT	Select **Yes** or **No**. The built-in extended memory functions option is only available for the 984AS908.
User Logic	Memory available for ladder logic. Select the amount of memory you want to use for ladder logic from the total amount available in your controller. Available on a variety of x80 and 984 A/B controllers.
S908 Size	Select either 512 or 1024 (1k) input and output points per drop. Available for most 68x and 78x controllers.
Micro I/O Mode	Micro controllers only. Select: ● **Single**: The controller is independent, not in a parent/child relationship. ● **Parent**: The controller is the parent in a parent/child relationship. ● **Child**: The controller is the child in a parent/child relationship. Available for "Brick" controllers from the Micro 311/0 to the Micro 612/4.

Click **Next** when you have set the controller details.

Communications Setup

To select a communications mode:

Step	Action
1	Select a communications tab: **Modbus**, **Modbus Plus**, **Gateway**, or **TCP/IP**.
2	Set the communications-specific properties as desired. For more information see *Communications Overview, p. 66*.
3	If your project will communicate with a controller via the ProWORX server, click the **Use server to communicate** check box.
4	Click **Next** to continue.

Finish

The finish step displays a summary of the selected controller type. Click **Finish** to perform the operations set up in the previous steps. When the progress number reaches 100% the wizard closes. The newly created project appears in the project navigation tree.

Converting Ladder Logic Databases

Overview

Old ladder logic databases created in 484, 884, ProWORX, ProWORX Plus, ProWORX NxT, Modsoft, and Concept can be imported into the new format of ProWORX 32. By importing a database using the ProWORX 32 convert function, your logic, documentation, configuration, and other relevant areas of your project are converted directly into ProWORX 32.

Converting a Database

From the ProWORX 32 menu:

Step	Action
1	Select **File** → **Import Database**. The Select Database to Convert dialog appears.
2	Select a database to convert from the following database types: ● 484 databases - *.CF4 ● 884 databases - *.CF8 ● Old ProWORX databases - *.CF9, *.DCF ● Modsoft databases - *.CFG ● Concept databases - *.ASC ● ProWORX Plus/NxT databases - *.DCF
3	When you have selected a database, click **Open** to start the conversion process.
4	To cancel the conversion, click **Cancel** in the Conversion Status dialog.
5	Click **OK** in the Conversion complete dialog to return to ProWORX 32.

Using the ProWORX Server to Manage ProWORX 32 Projects

Overview

The ProWORX Server is an application used to store and manage ProWORX 32 projects. The following project transactions can occur between a ProWORX 32 client, and the ProWORX Server. For more information about the ProWORX Server, see *ProWORX 32 Server, p. 239*.

In the project navigation panel of the ProWORX 32 client, from the project right-click menu:

Transaction	Result
Select **Get from Server**.	The selected project is copied to your local PC. If you plan to make changes to a project it is recommended that you get the project from the server with a lock.
Select **Get from Server with Lock**.	The selected project is copied to your local PC. You have sole access and editing capabilities for a project when it is locked out to your PC.
Select **Put to Server**.	When you have finished making changes or you want to add a project to the server, use the Put to Server function. This function creates a copy of the project on the server.
Select **Unlock Project**.	The project is unlocked so that other clients can check it out of the server.

Working with a ProWORX 32 Project

Projects in Offline Mode

To work with a controller offline, you must create a project for it. This project stores the controller's traffic cop and configuration information, its ladder logic, and descriptors of the controller and ladder logic. As you work in offline mode, editors modify this data. Because the offline editors are not connected directly to the controller, changes made in it do not take effect immediately. Instead, when you have finished programming, you can write all your changes to the controller at once.

Taking a Project Offline

From the project right-click menu in the Navigation panel:

Step	Action
1	Select **Project State** → **Offline**.

Projects in Online Mode

To work with a controller online, select a project, and changes its mode to online. ProWORX 32 then attaches to that controller with the communications settings provided. The online editors read ladder logic, traffic cop information, register contents, and the controller's configuration directly from the controller and ProWORX 32 writes back to it. Changes made in the online mode take effect in the controller immediately, but don't appear in its project until you read from the controller.

Taking a Project Online

From the project right-click menu in the Navigation panel:

Step	Action
1	Select **Project State** → **Online**.

Projects in Emulation Mode

To work with a controller in emulation mode, you first make sure that the project is in offline mode. Bringing a project into emulation mode allows you to emulate the solving of logic without needing a controller. From emulation mode, you can view the solving of logic, and the changing of register data. Use the online controls to start and stop the emulator. For more information, see *Using Emulation Mode, p. 39*.

Taking a Project to Emulation

From the project right-click menu in the Navigation panel:

Step	Action
1	Select **Project State** → **Emulation**.

Projects in Combined Mode

Combined mode is a combination of offline and online modes. When a project is in combined mode, it attaches to the controller specified by the communication settings. All work done in the editors are made directly to the controller. Work done in the logic editor, traffic cop, and register editors are also saved back to the project file, so there is no immediate need to read from the controller to update the project file with all of the changes.

Taking a Project to Combined Mode

From the project right-click menu in the Navigation panel:

Step	Action
1	Select **Project State** → **Combined**.

Setting the Project Properties

From the project right-click menu in the Navigation panel:

Step	Action
1	Ensure that the project is selected in the navigation panel. The currently selected project is denoted by its name being part of the ProWORX screen's title bar.
2	Select **Properties**.
3	Select the **Project** tab.
4	Configure the project properties. See Project Properties Descriptions below.
5	Click **OK** to save changes.

Project Properties Description

Property descriptions:

Property	Description
Detailed Project Name	Enter the detailed description of the current project.
Project	Enter a name (brief description) for the current project.
Client	Enter the name of the project's client if applicable.
Author	Enter the name of the project author.
6 Digit Addressing	When On, sets all addressing to six digits, allowing ProWORX 32 to enter and display constants greater than 9999. Auto is the default, which sets addressing to five digits unless the controller has addresses configured that require six.
Maximum Decimal Value	Restricts registers to a decimal value of either 9999 (default) or 65535.
Enable Symbols	Enables or disables symbolic addressing.
Save to Flash on Exit of Online	If the controller supports flash memory, selecting this feature will save the controllers contents to memory on exit of online.
Online Update Rate	Adjust how fast ProWORX 32 polls the controller for information when online and running. The faster the update rate, the more accurate the data displayed. But, as the update rate is increased, the performance of the software is reduced.

Using Emulation Mode

Overview

The emulation function is used to test the integrity of the logic in a project without the need of a PLC. Emulation mode allows you to check discrete states and register contents, and test your logic in a "safe" environment.

Taking a Project to Emulation

In the project navigation panel:

Step	Action
1	From the project right-click menu, select **Project State** → **Emulation**.

Setting up Emulation

Before you test your logic, set the default states, or values into the emulator, so when you use the Load command, you can debug your database file using the states you have preset. Discretes may be set to OFF, ON, Enabled, Disabled OFF, or Disabled ON. Register values may be set to Decimal, Hexadecimal, Binary, ASCII, or Floating Point.

Setting Emulation Properties

From the project right-click menu in the Project Navigation Panel:

Step	Action
1	Select **Properties**. The properties window appears.
2	In the Properties window, select the **Emulation** tab.

Setting the Default Address Data Values

You can toggle discretes or transfer values to arrays of registers during emulation when setting states or register contents on a state or value.

Step	Action
1	In the Emulation Properties tab, enter an address or a range or addresses in the format (axxxx-axxxx) in the **Address Range** field.
2	If you have entered an analog address range, enter a value in the **Data Value** field. If you have entered a discrete address range, select a data value (Off, On, Enables, Disabled Off, Disabled On) from the **Data Value** drop-down list.
3	If you have entered an analog address range, select a radix for the address range from the **Radix** drop-down list. **Note**: Floating point only works with two registers. All others can be set to work on ranges of addresses.
4	Click **OK** to save the changes and return to ProWORX 32.
5	To load the default address values while in Emulation mode, select **Emulation** → **Load Default Address Values** from the logic editor right-click menu.

Setting Instructions with Loopback

You can toggle discretes or transfer values to arrays of registers during emulation when setting states or register contents based on a state or value. To edit the loopback table, in the Emulation Properties tab:

Step	Action
1	Enter the address where you want the loopback in the **Ctrl Address** field. **Control Address** - The instruction address in the logic that is checked for a condition while the logic is being emulated and Loopback is enabled.
2	Enter the state or value of the address in the **Condition** field. **Condition** - The state or value of the Control discrete or analog. If the condition of the Control's address is true, the Loopback stores a new value or triggers a new state in a Destination range of addresses.
3	Select the numeric system you want to enter your Condition in from the **Radix** drop-down list.
4	Enter the number of scans you want the Condition to be monitored by before being updated (0 to 65535) in the **Scan Delay** field. **Scan Delay** - You may not want the Loopback function to immediately update the Destination when a condition becomes true. By setting Scan Delay, you can set the number of scans for which the Condition must remain true before the Destination is updated.
5	Enter the address range by typing a the start and end addresses, separated by a dash, in the **Destination** field. If there is only one Destination for that control condition, enter only one address. **Destination** - The Destination is the range of addresses to be driven when the Loopback Control Condition is true.
6	For discrete destinations, select On or Off from the **Data Value** drop-down list. **Data Value** - The Data Value is the new state or value to be placed in a Destination address range when the Loopback Control Condition is true.
7	Select the numeric system you want to enter your Destination in from the **Radix** drop-down list.
8	Click **OK** to save the changes and return to ProWORX 32.
9	To load the loopback table while in Emulation mode, select **Emulation** → **Load Loopback Table** from the logic editor right-click menu.
10	To enable or disable loopback while in Emulation mode, select **Emulation** → **Loopback Enabled** from the logic editor right-click menu.

Adjusting Scan Time

In the Emulation Properties tab:

Step	Action
1	Enter a scan time rate between 1 and 999 in the **Scan Time** field. **Note**: This option does not speed up or slow down the emulator's solving time. It only affects how fast the timers increment.
2	Click **OK** to save the changes and return to ProWORX 32.

Starting Emulation

From the project navigation panel:

Step	Action
1	To start emulation, select **Online Commands** → **Start/Stop**.
2	Set the emulator's solve mode in the **Start/Stop** dialog. See Setting the Solve Mode for more information.
3	To start emulation in continuous solve mode, click **Start**.

Setting the Solve Mode

Several solve modes are available to assist in emulating logic. You can set Emulation to stop solving following any number of full sweeps, after a particular network is solved, when a breakpoint is reached or to stop when certain logical conditions are true or not true. You can change the solve mode by selecting **Online Commands** → **Start/Stop** and selecting a solve mode radio button at anytime when emulation is in a stopped state.

Setting the Solve Mode to Sweep

In the start/stop dialog:

Step	Action
1	Select the **Sweep** radio button.
2	Enter the number of times you want the logic to be solved before stopping in the **Number of Scans to Sweep** field.
3	To the **Spacebar** to run another sweep.

Solving by Network

In the start/stop dialog:

Step	Action
1	Select the **Network** radio button.
2	Logic is solved network-by-network in order of networks, starting at segment one, network one. Press the **Spacebar** to solve the next network.

Solving by Instruction

In the start/stop dialog:

Step	Action
1	Select the **Instruction** radio button.
2	Logic is solved instruction-by-instruction in order of instructions, starting at segment one, network one, cell (1,1). Press the **Spacebar** to solve the next instruction.

Solving to a Breakpoint

In the start/stop dialog:

Step	Action
1	Select the **Break** radio button. Select one of the following break types:
2	To set a break when a particular value is reached in a register, select **Register** radio button. Enter the address in the **Address** field and a data value in the **Value** field.
3	To set a break when a discrete value turns on or off, select the **Discrete** radio button. Enter the address in the **Address** field and select Off to On or On to Off in the **Value** field.
4	To set a break when the solve reaches a certain instruction type in logic, select the **Instruction** radio button. Select the instruction to break at from the **Instruction** drop-down list.
5	To set a break when a specific address is reached in logic, select the **Address** radio button. Enter the address to break at in the **Address** field.
6	To break at the breakpoints set in the breakpoint table, select the **Breakpoint** radio button. For more information on setting breakpoints, see Setting Emulator Breakpoints.
7	Logic is solved in order until it comes to the first breakpoint at which point it stops. To continue solving logic until the next breakpoint, press the **Spacebar**.

Setting Emulator Breakpoints

In the logic editor while in Emulation mode;

Step	Action
1	To set a breakpoiont at the cursor in the logic editor, select **Emulation** → **Breakpoint** from the right-click menu.
2	To delete a breakpoint, select **Emulation** → **Breakpoint Table** from the right-click menu. Select the row of the breakpoint that you want to delete and click **Delete**. Click **Close** to exit the Breakpoint Table.

Stopping Emulation

From the project navigation panel:

Step	Action
1	To stop emulation, select **Online Commands** → **Start/Stop**.
2	Click **Stop**.

Instructions Supported in Emulation Mode

Overview

Following is an alphabetical list of instructions support by ProWORX 32 1.0 emulation mode.

Instruction	Instruction	Instruction	Instruction
AD16	DV16	NBIT	SKP
ADD	EMTH (1-37)	NC	SRCH
AND	FIN	NCBT	SU16
BCD	FOUT	NO	SUB
BLKM	FTOI	NOBT	T.01
BLKT	IBKR	NTC	T->R
BROT	IBKW	OR	T->T
CMPR	ICMP	PTC	T0.1
CNR	ITOF	R->T	T1.0
COMP	JSR	RBIT	TBLK
CONV	LAB	RET	TEST
CR	MATH	RTTI	TTR
DCTR	MBIT	RTTO	UCTR
DIV	MSTR (reg read/write	SBIT	XOR
DMTH	MU16	SCIF	
DRUM	MULT	SENS	

Adding Emulation Instruction Solve Support

Overview

ProWORX 32 has the capability of allowing advanced users to add instruction solve support for the ProWORX emulator.

Creating an Emulation Solve File

Using a text editor:

Step	Action
1	Create a blank .ESF file in the ProWORX\32\EmulatorInst\ directory.
2	Name your .ESF file the same as the instruction that is to be solved. E.g.: The ADD instruction's emulation solve file would be named ADD.ESF. **Note**: Do not use spaces in your emulation solve file name.

Instruction Solve File Function Parameters

Parameter Descriptions

Variable	Description
Network	The network number where instruction is located.
Row	The row in logic where instruction is located.
Col	The column in logic where instruction is located.
TopTyp	The address type of the top node of the instruction (valid values: 0, 1, 3, 4, 8 for constants).
TopVal	The address offset of the top node of the instruction (valid values: 0 - 65535).
TopLen	The number of addresses the top node uses.
MidTyp	The address type of the middle node of the instruction (valid values: 0, 1, 3, 4, 8 for constants).
MidVal	The address offset of the middle node of the instruction (valid values: 0 - 65535).
MidLen	The number of addresses the middle node uses.
BotTyp	The address type of the bottom node of the instruction (valid values: 0, 1, 3, 4, 8 for constants).
BotVal	The address offset of the bottom node of the instruction (valid values: 0 - 65535).
BotLen	The number of addresses the bottom node uses.
UctrNum	Used only for UCTR instructions.
DctrNum	Used only for DCTR instructions.
Spare3	Spare parameter.

Note: All parameters must appear in the instruction subroutine declaration.

Emulation Solve File API Calls

API Call	Description
Power Flow Calls GetPowerFlow(Network, Row, Col, PowerState) SetPowerFlow(Network, Row, Col, 1)	Power flow calls are used to: ● Determine whether an instruction should be solved (using GetPowerFlow) ● To pass along powerflow to the next cell (using SetPowerFlow) ● To activate an error condition (using SetPowerFlow) Power flow calls can be used to either get or set a particular cell in logic. Depending on the instruction being solved, the row and col variables are used to access a particular cell within the 7 row x 11 column matrix.
Single Discrete State Calls GetSingleDiscreteState(RefTyp, RefVal, State) SetSingleDiscreteState(RefTyp, RefVal, 1)	Single discrete state calls are used to get or set the state of a 0xxxx or 1xxxx address. The State will return with 0 for Off or 1 for On. When calling the Set, use either 0 for Off or 1 for On.
Single Discrete History Calls GetSingleDiscreteHistory(RefTyp, RefVal, History) SetSingleDiscreteHistory(RefTyp, RefVal, State)	Single discrete history calls are used to get or set the history of a 0xxxx or 1xxxx address. The history will return with 0 for Off or 1 for On. When calling the Set, use either 0 for Off or 1 for On.
Single Discrete Disabled Calls GetSingleDiscreteDisabled(RefTyp, RefVal, Disabled) SetSingleDisabledState(RefTyp, RefVal, Disabled)	Single discrete disabled calls are used to get or set the disabled status of a 0xxxx or 1xxxx address. The disabled status will return with 0 for Enabled or 1 for Disabled. When calling the Set, use either 0 for Enabled or 1 for Disabled.
Single Register Data Calls GetSingleRegisterData(RefTyp, RefVal, Data) SetSingleRegisterData(RefTyp, RefVal, Data)	Single register data calls are used to get or set the data value of a 3xxxx or 4xxxx address. Valid range for data is 0 to 65535.
Group Discrete Calls GetGroupDiscreteState(RefTyp, RefVal, NumGroups, State(), Disabled()) SetGroupDiscreteState(RefTyp, RefVal, NumGroups, State()) SetGroupDisabledState(RefTyp, RefVal, NumGroups, Disabled())	Group discrete calls are similar to the single calls except 16 discretes per group are received or set at one time. The arrays must contain data for as many groups as are specified.

API Call	Description
Group Register Calls GetGroupRegisterData(RefTyp, RefVal, NumGroups, Data()) SetGroupRegisterData(RefTyp, RefVal, NumGroups, Data())	Group register calls are similar to the single calls except that a group of registers are received or set at one time. The Data array must contain data for as many groups as are specified.

Emulation Solve File Content Example

ADD.ESF File Content Example:

```
Sub ADDINST (Network, Row, Col, TopTyp, TopVal, TopLen,
MidTyp, MidVal, MidLen, BotTyp, BotVal, BotLen, Spare1,
Spare2, Spare3)

dim State,TData,MData,Bdata
'is top input powered?
call LLEmulator.GetPowerFlow(Network,Row,Col-1,State)
If State<>0 then
' get the value of top node
 If (TopTyp=3) or (TopTyp=4) then
 call LLEmulator.GetSingleRegisterData(TopTyp,TopVal,TData)
 Else
  TData=TopVal
 End if
'get the value of middle node
 If (MidTyp=3) or (MidTyp=4) then
 call LLEmulator.GetSingleRegisterData(MidTyp,MidVal,MData)
 Else
  MData=MidVal
 End if
 BData=TData+Mdata
'overflow
 If BData>9999 then
  BData=BData-10000
  call LLEmulator.SetPowerFlow(Network,Row,Col,1)
 End if
'set value into bottom node
 call LLEmulator.SetSingleRegisterData(BotTyp,BotVal,BData)
 End if
End Sub
```

Note: Only emulation solve files for instructions currently not supported by the Emulator are checked for by ProWORX 32. You cannot edit built-in instructions.

Documentation Editor

Overview

The documentation editor, the defaulted bottom-left editor, allows you to see and edit documentation for addresses and Traffic Cop items. It hot-tracks items that are selected in the many of the editors, including the data watch window and traffic cop. To open the documentation editor, select **View** → **Documentation** from the ProWORX 32 menu

There are three sections of the documentation editor: Edit, Summary, and Traffic Cop. To switch between sections, select the corresponding radio button at the top of the documentation editor.

Opening the Documentation Editor Properties Window

In the navigation tree:

Step	Action
1	Ensure the project folder is expanded and right-click the current project's folder.
2	Select **Properties** from the right-click menu.
3	Select the Documentation tab in the properties window.

Documentation Editor Properties

These properties are found in the Properties window under the Documentation tab:

Property	To set:	Function
Total Number of Descriptor Lines	In the **Total Number of Descriptor Lines** box enter a number between 3 and 9 or use the arrow keys to increase or decrease the number.	The descriptor field is a multi-line field that can be set from 3 lines to 9 lines of documentation. This preference forces the editor to edit only the set number of lines of the descriptor.
Number of Visible Descriptor Lines	In the **Number of Visible Descriptor Lines** box enter a number between 1 and the Total Number of Descriptor Lines value or use the arrow keys to increase or decrease the number.	The descriptor field is a multi-line field that can be set from 3 lines to 9 lines of documentation. This preference forces the editor to display only the number of lines of the descriptor that are set.
Supported Fields	In the **Supported Fields** frame, select the check boxes that you want displayed.	If a check box is unchecked, the corresponding field will never be displayed. If a check box is checked, the field will be displayed as long as dependant properties are set correctly. E.g. If Symbols are disabled for the project, the symbol field will not be displayed even though the check box is checked.

Using the Documentation Editor

Edit Mode Overview

The edit mode is a completely customizable and editable visual representation of the current project documentation. The edit mode hot-tracks items currently selected in ProWORX 32 including instructions, I/O cards, and addresses in the Data Watch Window.

Customizing the Edit Mode Fields

In the documentation editor:

To:	Function
Move a field	Click the field's handle and drag it to the area of the window that you would like the field moved to.
Resize a field	Click and drag the field's handle.
Minimize or maximize a field	Click the field's handle.

Using the Edit Mode

Enter an address into the **Reference** box to view the addresses documentation. To navigate through documented addresses click the previous documented address  and next documented address  buttons. To navigate sequentially through addresses click the previous address and next address  buttons.

Using the Single-line Mode

The single-line documentation editor displays the currently selected address' descriptors and is un-editable. To view the single-line documentation editor:

Step	Action
1	Select the **Display One Line Documentation Window** check box in the Properties dialog, Documentation tab. You can access the documentation properties by select **Properties** from the Documentation Editor right-click menu
2	When viewing single-line documentation, to edit the current address, click **Edit**.

Summary Mode Overview

Summary mode shows the most common information for documented addresses. Using the address type drop-down list box, select the type of address (Symbol, 0x, 1x, 3x, 4x, Xmem, or 'All addresses') you want to view. To edit the documentation of any address, double-click on the appropriate row and the documentation editor will switch to edit mode showing the selected address.

Using the Symbol Filter

When ‘Symbol’ has been selected in the address type drop-down list box, the Filter box will be visible. The symbol filter is a simple query that filters the symbol summary based on what criteria is entered into the filter. To view all symbols, leave the filter empty and press ENTER.

The contents of the filter is the LIKE statement of an SQL SELECT statement. Therefore, rules for entering text into the filter box are the same as composing an SQL query. Some filter examples:

Filter Text	Results
S*	All symbols that start with an ‘S’ are displayed.
*Switch	All symbols ending with ‘Switch’ are displayed.
[A-D]*	All symbols starting with ‘A’, ‘B’, ‘C’, or ‘D’ are displayed
Switch	All symbols with the letter sequence ‘Switch’ are displayed
Disk?	All symbols named ‘Disk(x)’ will be displayed. e.g. Disk1, Disk2, DiskA, etc.

Traffic Cop Mode

Using the traffic cop editor, you can edit short comments for head, drop, rack and slot addresses.

Importing and Exporting ProWORX 32 Documentation

Overview

ProWORX 32 imports and exports database documentation in several formats. The Documentation Import feature lets you bring documentation from existing files or databases into ProWORX 32 without having to re-enter information. Documentation Export lets you edit documentation in a separate word processing or spreadsheet program.

Note: This function **does not** import controller logic.

Importing Documentation

In the Project Navigation panel:

Step	Action
1	To append the documentation to the existing project documentation, select **Documentation Import** → **Append** from the project right-click menu.
2	To merge or overlay the documentation with existing project documentation, select **Documentation Import** → **Overlay** from the project right-click menu.
3	To delete all current documentation and import new documentation, select **Documentation Import** → **Create New** from the project right-click menu.
4	Once you have selected the import type, select a file (.csv, .mdb, .doc, .xls) to import from the Select Documentation File dialog and click **Open**.

Exporting Documentation

In the Project Navigation panel:

Step	Action
1	From the project right-click menu, select **Documentation Export**. The Select Destination File dialog appears.
2	Select a file type from the **Save as type** drop-down list box. (.csv, .mdb, .doc, .xls)
3	Enter the export file name in the **File name** field.
4	Navigate to the folder where you want to save the exported file. Click **Save**.

Import/Export Formats

Import/Export format descriptions:

Format	Description
MS Word (.doc)	Documentation is exported directly into an MS Word document. Each address type is displayed on a separate table.
MS Excel (.xls)	Documentation is exported directly into an MS Excel Workbook. Each address type is displayed on a separate MS Excel Worksheet. When importing documentation, ProWORX 32 expects these sheets to be in the same order with the same name.
MS Access (.mdb)	Documentation is exported directly into an MS Access database. Each address is in its own table. **Note**: It is important that you **do not** move or rename fields within the database if you are going to import your data.
.CSV File	The text file (.csv) is a comma-delimited file. This file can be edited using any standard text editor (Notepad, Wordpad, etc.). The comma-delimited line is different depending on the address type: ● **0xxxx/1xxxx** - Address, Desc1, Desc2,...,Desc9, Short Comment 1,...,Short Comment 4, Symbol, ISA Symbol, Page Title, Long Comment ID ● **3xxxx/4xxxx** - Address, Desc1, Desc2,...,Desc9, Short Comment 1,...,Short Comment 4, Symbol ● **6xxxx/Networks/Segments** - Address, Desc1, Desc2,...,Desc9, Short Comment 1,...,Short Comment 4, Page Title, Long Comment ID ● **Traffic Cop** - Address (HxxDxxRxxSxxx), Desc1, Desc2,...,Desc9, Short Comment 1,...,Short Comment 4
ProWORX ASCII (.fil)	Files for exchanging data easily. By default, ProWORX 32 creates this type of file for documentation.
ProWORX Symbol (.fis)	Files for exchanging symbols.
Spreadsheet Data Interchange Format (.dif)	ProWORX 32 creates standard .DIF files. Most spreadsheet programs can import this format without difficulty. However, you must take special care when transferring data to and from Microsoft Excel in .DIF files.
dBaseIV Database (.dbf)	ProWORX 32 creates standard .DBF files for use with Ashton-Tate’s data management program dBaseIV. Most other data management and spreadsheet programs (including Microsoft Excel) can read this format without difficulty.
Traffic Cop (.tef)	Importing a .TEF file overwrites the existing Traffic Cop data. Exporting creates a .TEF file of the current Traffic Cop data. ProWORX 32 requires both the .TEF and .DEF files to successfully import the documentation.
Concept (.txt)	When exporting, ProWORX 32 creates a .TXT file of the current descriptors and symbols for 0x, 1x, 3x, 4x and symbols for constants to be used in Concept.

Note: In order to import and export using .doc (MS Word) and .xls (MS Excel) files, you must have MS Word and/or MS Excel installed on your PC.

Note: Documentation files of type .fil, .fis, .dif, .dbf, .tef, and .txt are compatible across these ProWORX applications: ProWORX NxT, ProWORXPLUS, and ProWORX 32.

Protected Registers

Overview

Ranges of output registers added to the Protected Registers table are protected. Their data values are uneditable by users who do not have administative access to ProWORX 32. To use registers in the protected registers table, ensure that the **Protected Registers** check box is selected in the security settings. You can access the security settings from the **My Computer** right-click menu in the Project Navigation Panel.

Setting Protected Registers

Use the following steps to set protected registers:

Step	Action
1	From the project right-click menu in the project navigation panel, Select **Properties**. The properties dialog appears.
2	In the Properties dialog, select the **Protected Registers** tab.
3	Enter 4xxxx addresses in the **From** and **To** fields.
4	Click **Add** to add the range of addresses to the Protected Registers table.
5	To delete a range of addresses from the Protected Registers table, select the row to be deleted and then click **Delete**.
6	Click **OK** to save your changes and return to ProWORX 32.

Using Search

Overview

The search dialog is used find, replace or go to addresses or symbols in ProWORX 32.

Using Find

From the ProWORX 32 menu:

Step	Action
1	Select **Edit** → **Find** (CTRL+F) to open the Search dialog.
2	Enter the value you want to search for in the **Find What** field. **Note**: The value entered depends on the selection you make in the **Search By** drop-down field. By default the value type is Address.
3	To search a specific area of the project or by a different value type, click **Advanced**.
4	Select an area of ProWORX 32 from the **Search** drop-down box.
5	Select a value type to search by from the **Search By** drop-down box.
6	Click **Find Next** to complete a search. The search results are displayed in the **Search** panel.

Using the Search Panel

From the ProWORX 32 menu:

Step	Action
1	Select **View** → **Search** to open the search panel.
2	Select the tab of the area of ProWORX 32 that you want to go to.
3	Double-click the cell that contains the location of the address that you want to go to.
4	To close the search panel, click the x in the top, right-hand corner.

Address Used

Overview

The Address Used tables keep track of what addresses are used in logic, traffic cop, peer cop and the I/O scanner. Each address has it's own cell in the address used grid.

The Used tables are updated every time an address is changed in one of the above areas. The changes are reflected in the Used Table panel. The Used Tables are useful for determining what addresses are used, how they are used and how many times they are used. 0xxxx, 1xxxx, 3xxxx and 4xxxx address types are tracked. The tables reflect the content of the currently selected project; switching projects updates the used tables.

If the project is in online mode, there is a separate set of used tables for the online device. This is due to the fact that the online device may have different contents than the project database.

Using the Address Used Tables

From the ProWORX 32 menu:

Step	Action
1	Select **View** → **Address Used** to open the Address Used Tables.
2	To view an address type, select the corresponding tab. (**0xxxx**, **1xxxx**, **3xxxx**, **4xxxx**.)
3	To select an address for logic, select the address from the used table and drag-and-drop the address into the instruction that you want to use the address.
4	To show or hide the address used legend, click the **Legend** check box.

Address Used Display Descriptions

The Address Used table displays information as follows:

Display	Description
Top-left purple square	Address is used in logic.
Top-right blue square	Address is used in the traffic cop.
Bottom-left green square	Address is used in the Peer Cop.
Bottom-right yellow square	Address is used in the I/O Scanner.
An overlaid ‘C’	Coil is used in logic.
An overlaid ‘D’	Duplicate coil is used in logic.

Finding a Free Address

In the Address Used window:

Step	Action
1	Select the tab of the address type that you want to find.
2	Click **Find Free**.
3	Enter an address where the search begins from in **Start Address**.
4	Enter the number of free addresses in a row that you need in **Length**.
5	Click **Find** to search for the free address(es). Click **Close** to exit the Find Free section.

Rebuilding the Address Used Tables

In the Address Used window:

Step	Action
1	To rebuild the address used tables, click **Rebuild**. **Note**: If online, rebuilding requires a read from a PLC. The used tables are unavailable while being rebuilt.

The Knowledge Base

Overview

The Knowledge Base is a warehouse of accumulated process experience relating to a specific project. It is used to identify solutions to problems that have occurred in the past. It is also used to keep maintenance records of fixes.

Opening the Knowledge Base

In the project navigation panel:

Step	Action
1	Select **Knowledge Base** . **Note**: Each project has its own knowledge base, in other words, the knowledge base is specific to the project.

Searching for Keywords in the Knowledge Base

After opening the knowledge base:

Step	Action
1	Enter a word in the **Keyword** box.
2	Press **Search**. (All fields in the knowledge base are searched for the keyword.)
3	To find the next instance of the keyword, press the **Search** button again. **Note:** You may also search for partial word matches.

Adding a Record to the Knowledge Base

In the knowledge base utility:

Step	Action	Comment
1	Click **Add**.	The Knowledge Base Entry dialog will pop up.
2	Enter a name into the **Author** box.	Max 55 characters.
3	Enter the problem description into the **Problem** box.	Max 275 characters.
4	Enter the solution description into the **Solution** box.	Max 440 characters.
5	Enter the name of an image that may be associated with problem or solution in the **Image** field. The image name must be entered in full including the file extension. e.g. Image1.bmp is correct whereas Image1 is not.	Valid image types are .bmp and .jpg. The image must reside in ‘ProWORX\32\Projects\KBImages’. Max image name length: 255 characters.
6	Click **OK** to save the record.	The Date and Time is added automatically upon pressing OK.

Deleting a Record from the Knowledge Base

In the knowledge base utility:

Step	Action	Comment
1	Click **Delete**.	The record that the cursor is highlighting will be deleted.

Printing the Knowledge Base

In the knowledge base utility:

Step	Action
1	Click **Print**. The ProWORX 32 print setup appears. From here you can determine specifically what you want to print.

Communications Setup

3

Connecting to a Controller

Overview

ProWORX 32 can communicate with controllers in several ways. This chapter explains how to configure ProWORX for several common types of network connections. This chapter also describes how to select and attach to a controller, both directly, and by scanning your entire network for devices.

What's in this Chapter?

This chapter contains the following topics:

Communications Overview

Overview

Before your computer can connect to a controller (or, for some systems, the gateway which relays information to and from the controller), ProWORX 32 must be configured for your communication system.

Note: To connect with each other, your computer and controller must be configured for the same communication system with the same parameters.

Opening the Communications Setup Dialog

From the Project Navigator panel:

Step	Action
1	Double-click the **Communications** icon in a project to open the communications setup dialog.

Setting the Default Communications Type

In the Communications Setup dialog:

Step	Action
1	Select the tab of the communications you want to use.
2	Select the **Set CommunicationsType as default communications** check box.

Editing Communications Parameters

In the Communications Setup dialog:

Step	Action
1	To edit a communications parameter, double-click the parameter, or, while the parameter is selected, press **Change Setting**.
2	Make the desired changes in the Edit dialog and press **OK** to save changes.

Communicating Using the Server

In the Communications Setup dialog:

Step	Action
1	Ensure that you are logged on to the ProWORX Server.
2	To communicate with PLCs through the server’s communications portal, select the Use Server to Communicate check box.

Configuring Modbus Communications

Overview

Modicon's master/slave protocol, standard on 984 and many other controllers. Select this option if your computer is connected to a controller's Modbus port, either directly or through a modem.

Note: The controller must have the same Modbus settings as the computer. Set Modbus parameters for your PLC with the Ports tab of the Controller Configuration window or with its DIP switches.

Setting Modbus Parameters

Select the **Modbus** tab and set the following communications parameters:

Parameter	Description
Modbus Address	The Modbus address of the PLC.
Port	Identifies which serial port on your PC is connected to the controller or modem (if you are connecting to the controller through one). Default is COM1.
Baud Rate	Sets the data transfer speed of your PC's serial port in bits per second. The PC and controller must be set to the same baud. Default is 9600.
Parity	Adds a check bit to a packet to make the number of binary ones always either odd (Odd parity) or even (Even parity). If parity is set to None, the check bit is not added. The PC and controller must use the same parity. Default is Even.
Stop Bits	Sets the number of bits at the end of a packet prepares the receiving device for the next packet. The PC and controller must use the same number of stop bits. Default is 1.
Data Mode	Identifies which data protocol (Remote Terminal Unit or ASCII) to use. Both the PC and controller must use the same data protocol. Default is RTU.
Timeout	Specifies the length of time the PC will wait for successful communication with a controller before displaying an error message. Default is 3 seconds.
Modem Type	If your computer is connected directly to the controller, set the Modem Type to None. If your computer is directed to the controller through a modem it must be configured. See Modbus Communications by Modem.

When you have finished configuring the parameters, press **OK**.

Modbus Communications by Modem

Overview

Controllers in remote locations can be equipped with RS-232 modems. Your computer can then connect to the controller (by telephone, radio, or microwave systems) using its own modem. Once the connection is established, the computer and controller behave as if they were connected directly through a Modbus network.

You can easily configure ProWORX 32 to connect to controllers through dial-up and dedicated-line modems. Before you begin, confirm that:

- The controller is properly connected to its RS-232 modem.
- Your computer is properly connected to its modem.
- The modems' DIP switches, if they have them, are set like this:

DIP Switch Settings:

Modem DIP Switch Setting	Example: US Robotics Modem DIP Switches (seen from back)
Data Terminal Ready Always On	Switch 1 (on left): Down
Verbal Word Results	Switch 2: Up
Result Code Display Enabled	Switch 3: Down
Command mode local echo	Switch 4: Up
Auto Answer	Switch 5: Up
Carrier Detect Normal	Switch 6: Up
Load Non-Volatile RAM Defaults	Switch 7: Up
Use AT Command Set (Smart Mode)	Switch 8 (on right): Down

After configuring ProWORX 32 to use a modem, it checks to see whether there is an active connection each time you select a device on your network.

- If it cannot find one, ProWORX 32 asks you for a phone number to dial or, if your modem uses a dedicated line, opens a connection automatically.
- If it finds a connection (or after opening one), you can choose to select a Modbus device or close the connection and open a new one.

Use a modem connection to a controller just like a direct Modbus link. You can scan for and attach to Modbus devices (and Modbus Plus devices, if the controller supports Bridge Mode to allow you to connect to a Modbus Plus network) just as you normally would.

Setting the Modbus Modem Parameters

In the Communications Setup dialog:

Step	Action
1	Select the **Modbus** tab and set the communications parameters (see Configuring Modbus Communications for parameter descriptions).
2	The controller must have the same Modbus settings as the computer. Set Modbus parameters for your PLC with the Ports tab of the Controller Configuration window.
3	Set the **Port** parameter to show the computer port connected to the modem; otherwise, ProWORX 32 won't be able to locate it.
4	The Modbus configuration must send exactly 10 bits per data package to your modem. (See Modbus 10-bit Configurations below.) Modems generally expect 10 bits in a data package; however, the Modbus defaults (Even parity, RTU mode, and one stop bit) send 11 bits per package. Change the Modbus settings to provide 10 bits per data package or ProWORX 32 will not be able to communicate with the modem. Alternatively, if your modem supports large data packages, you can set its DIP switches to allow 11 bits per data package (see your modem's manual).
5	Select the type of modem from the **Modem Type** parameter drop-down. (See Modem Type Descriptions below.)
6	To edit the modem parameters, click **Modem Setup**. The Modem Configuration dialog appears. (For parameter descriptions, see below.)

Modbus 10-bit Configurations

These Modbus configurations provide 10 bits per data package:

Parameters	ASCII Mode	ASCII Mode	RTU Mode
Start Bit	1 bit	1 bit	1 bit
Data	7 bits	7 bits	8 bits
Stop Bits: 1	1 bit		1 bit
Stop Bits: 2		2 bits	
Parity: None		0 bits	0 bits
Parity: Odd or Even	1 bit		
Total	10 bits	10 bits	10 bits

Modem Type Descriptions

Modem Type specifies the kind of modem connected to your computer:

Modem Type	Description
None (Default)	For direct Modbus connections between the PC and controller without a modem. This setting disables the other modem options.
Dial-Up	For standard modems which do not require a password. If you are unsure, try this setting first. When you select a device, ProWORX 32 asks you for a number to dial.
Dial-Chat	For password-protected modems. After the connection is established, a terminal window opens so you can enter text. When you select a device, ProWORX 32 asks you for a number to dial.
Line/J478	For modems with a dedicated telephone line to the controller. You do not have to type a number to dial. This setting disables the other modem options.
LineRTS	For radio or microwave modems with a dedicated link to the controller. You don’t have to type a number to dial. This setting disables the other modem options.

Modbus Modem Parameter Descriptions

Set the following Modem parameters:

Parameter	Description
Phone Number	The phone number of the modem that the PLC is attached to.
Initialization	Some modems require special initialization commands such as ATZ before they can be used. Type a sequence of Hayes modem commands in this field for ProWORX 32 to send to your modem. Check your modem’s manual for the commands to turn off error correction, compression, and software flow control and turn on verbal word results.
Dial Command	Type ATDT for tone dialing (default) or ATD for pulse dialing. This prefix is sent to the modem along with the phone number you type in the Select Device dialog. To instruct the modem to pause for half a second, type a comma (,).
Command Suffix	Characters appended to every command you send to the modem, including the Initialization string and Hangup command. The default is a carriage return and a line feed.
Hangup Command	To hang up your modem, ProWORX 32 sends the standard Hayes modem command ATH. If your modem uses a different command, enter it here. This command is prefixed with ,,,+++,,,. Hanging up can take up to three seconds.

When you have finished configuring the parameters, press **OK**.

Configuring Modbus Plus Communications

Overview

Modicon's fast peer-to-peer protocol, standard on many 984 and other controllers. Select this option if your computer is connected to a Modbus Plus network through a network adapter card such as an SA85.

Setting Modbus Plus Parameters

Select the **Modbus Plus** tab and set the following communications parameters:

Parameter	Description
Modbus Plus Address	The Modbus Plus address of the PLC.
Adapter	Sets an identifying number for an SA85 Network Card. Up to two SA85 cards, numbered 0 or 1, can be installed. A card's identifying number in ProWORX 32 must be the same as in the Device command in the PC's CONFIG.SYS file. Default is 0.
Timeout	Specifies the length of time the PC will wait for successful communication with a controller before displaying an error message. Default is 3 seconds.

When you have finished configuring the parameters, press **OK**.

Configuring Ethernet Gateway Communications

Overview

A gateway connects two networks that would not normally be able to communicate with each other. ProWORX 32 supports Modicon's EMBP Gateway, which bridges your computer's TCP/IP Ethernet to the controller's Modbus Plus network.

Note: Your computer's Ethernet address is set in Windows by your network administrator (as is its sub-network mask address, if necessary).

Setting Ethernet Gateway Parameters

Select the **Gateway** tab and set the following communications parameters:

Parameter	Description
Gateway Type	Select a Gateway type (SGATE, NR&D MEB, GATEWAY?) to use TCP/IP to communicate with a computer which then communicates with the PLC.
Modbus Plus Address	The Modbus Plus address of the PLC.
IP Address	The TCP/IP address of the computer linking your PC's Ethernet to your controller's Modbus Plus network.
Timeout	Specifies the length of time the PC will wait for successful communication with a controller before displaying an error message. Default is 3 seconds.

When you have finished configuring the parameters, press **OK**.

Configuring TCP/IP Communications

Overview

Some controllers can be equipped with TCP/IP cards. Select this option if both your computer and controller use TCP/IP networking, regardless of whether they are on the same network or are connected by a gateway.

Note: Your PC's TCP/IP address is set in Windows by your network administrator (as are the gateway and sub-network mask addresses, if necessary).

Setting TCP/IP Parameters

Select the **TCP/IP** tab and set the following communications parameters:

Parameter	Description
IP Address	Enter a controller address in standard TCP/IP format: four numbers ranging from 0 to 255 separated by periods (for example, 10.0.254.68 is valid).
Timeout	Enter a value that specifies the length of time the PC will wait for successful communication with a controller before displaying an error message. Default is 3 seconds.

Note: You must install the TCP/IP Configuration Extension into your controllers to set TCP/IP addresses for their communication cards. For more information, see the *TCP/IP Extension, p. 125*.

When you have finished configuring the parameters, press **OK**.

Network Explorer

Overview

The Network Explorer finds controllers, bridges, bridge multiplexers, and other devices attached to networks. ProWORX 32 displays the devices it finds by their address number and also shows their type, mode, and status.

The results of a network scan are displayed in the panel tree on the left of the display. If any PLCs are found, they are displayed on the right panel. The right panel has two different views, the graphical, and the list view. The graphical view displays a picture of the series of controller found, along with all of its data. The list view displays the data in a spreadsheet format.

Using the Network Explorer

To access the network explorer:

Step	Action
1	From the utilities menu in the project navigation, select **Network Explorer**. The communications editor is launched. You can also access the Network Explorer from the communications editor by clicking **Network Explorer** at the bottom right of any of the communication type's tab.
2	Select the default communications type in the *Communications Overview, p. 66*. Click **OK** if you have opened the Explorer through the Utilities menu, or click **Network Explorer** if you are running the Network Explorer from the communications editor.
3	To return to the communications editor at any time, click **Communications Setup**.
4	To switch between views, select either the **Graphical View** radio button or the **List View** radio button.
5	The following information is provided for each controller found: ● Project Name - In certain controllers, you can save the project name inside of a loadable. The project name will be retrieved if the controller is running and the loadable is in logic. ● Controller Address ● Controller Type ● Current State of the Controller: Running, Optimized, Stopped (the Stopcode is displayed). For more information, see *Stopcode Error Analysis, p. 277*. ● Current State of the Battery on the Controller: Good or Bad. ● Current State of the Memory Protect Switch of the Controller: On or Off.

Configuring a Controller

4

Controller Configuration

Overview

The Configuration editor is used to edit and view the current controller configuration of the project. The configuration editor displays configuration options (properties) within several tabs. Each tab contains one or more property lists used to display and/ or edit items relating to controller configuration. Properties that are displayed depend on the controller that is being configured.

What's in this Chapter?

This chapter contains the following topics:

Controller Configuration

Overview

Before you begin, use the *Creating a New Project, p. 29* to select the right type of controller. The options that appear in the configuration editor depend on the controller type, so if the wrong one is selected, you can spend time configuring options your controller does not support.

Configuring a Controller

From the project navigation panel:

Step	Action
1	Click the **Configuration** icon
2	Click the tab for the options you want to configure: • **General** - Configures a controller's memory, including the number of coils and registers, I/O cards and drops, the amount of memory set aside for Configuration Extensions, and the number and size of the ASCII messages you want to use. • **Ports** - Configures the controller's serial and ASCII ports. • **Loadables** - Extensions to a controller's capabilities. When they appear as instructions (most of the time) they are represented as 3 node instructions.
3	Update parameters by clicking on the parameter row. Press ENTER to accept the changes or ESC to decline the changes.
4	The changes made will be saved to the project or controller when the configuration editor is closed. A prompt is displayed allowing you to confirm that you want to save changes.

'General' Tab

Overview

This tab in the Controller Configuration window allows you to configure a controller's memory. It contains many important options, including the number of coils, registers, segments of logic, and I/O cards the controller will use, the amount of memory it sets aside for configuration extensions, and the number and size of its ASCII messages.

General Tab Parameters

The following parameters are editable:

Parameter	Description
Registers	For each of the 0xxxx, 1xxxx, 3xxxx, and 4xxxx register fields, type the number of registers the controller will use. The controller polls all of these registers each scan, so to keep your controller scanning quickly, set up only as many registers as you need.
Segments	Type the number of logic segments the controller will use.
I/O Drops	Different controllers use different I/O drops: ● If you have a controller that uses Channels instead of I/O Drops, type the number of channels the controller I/O will use. Channels always come in pairs, so this must be an even number. ● If you have a Micro series controller in parent mode, type the number of children (0 to 4) associated with it. ● If you have a Micro series controller in child mode, type the Child ID (1 to 4).
I/O Words	Quantum, Atrium, 785E_LMS, Momentum, Compact (E258, E265, E275, E258) controllers only: type the maximum number of I/O words that will be available for programming in the Traffic Cop. Check your controller documentation for the appropriate values.
DCP Drop ID	680, 685, 685E, 780, 785, 785E or 785L controllers only: If another computer uses this controller for distributed control, type the controller's Distributed Control Processor ID number (0 to 32).
I/O Time Slice	Type the amount of time the controller will devote to peripheral port communication, from 1 to 100 milliseconds. The default is 10 ms for 984A, B, and X controllers and 20 ms for Quantum controllers.
Duplicate Coil Start	Set the starting address to a non-zero value to enable the duplicate coil range (i.e. allow coil addresses within this range to be assigned to more than 1 coil). Set the range to 0 disable the duplicate coil address range. The starting address of the duplicate coil range is part of the configuration and defines the entire range of coils that will be treated as duplicate coils. The range is from the starting address to the configured number of coils. Therefore to enable the entire range of coils, set the starting address to 1.

Parameter	Description
Remote Channels	984A-S901, 984B-S901, and 584 controllers only: Select from 2 to 32 remote I/O channels. Channels always come in pairs, so this setting must be an even number.
Total Messages	Controllers that support ASCII messaging only: Type the total number of ASCII messages the controller will use.
Message Words	Controllers that support ASCII messaging only: Type the length (in machine words) of your controller's ASCII messages. One machine word is equal to two ASCII characters.
ASCII Ports	Type the number of ASCII ports on the controller. This setting must be an even number.
B984 Controller	Select the type of B984 controller you have: B884 or B886.
Input Latched	Select this option if you want the controller to freeze the input state on power-down. Inputs remain frozen for one scan when the controller is powered back up.

Settling Time	Group Settling Time allows you to set parameters for input digital filtering.
	● Each input value is polled through a filter based on a time window. You can set the duration of the time window between 200 microseconds and 19.8 ms (in 200 microsecond increments).
	● The module samples each input every 200 microseconds and uses the time window associated with the input to determine the input state. If the scanned input state is OFF, the input state is set OFF. If the scanned input state is ON, the input state is set based on a history queue. If the input was ON one time window ago, the input is set ON; if the input was OFF, the input state is set OFF.
	● The inputs are divided into four groups. The Settling Time of each can be configured separately:
	  ● **Group 1**: Inputs 1-4
	  ● **Group 2**: Inputs 5-8
	  ● **Group 3**: Inputs 9-12
	  ● **Group 4**: Inputs 13-16

Battery Coil	Type the control address for the controller's battery.
Timer Register	Type the register offset used to store the controller's timer value.
Time of Day Clock	Type the register offset used to store the controller's clock value. For more information see *Hardware Clock, p. 152*.
Watch Dog Timer	Type the time-out delay for the Watch Dog Timer, in tens of milliseconds. The controller adds 250 ms to the value you enter. The default is 0000, which represents 250 ms.

Parameter	Description
Configuration Extension Used	Displays the amount of config extension space used. This field is not editable.

Configuration Extension Size	Type the amount of memory (in machine words) to be set aside for Configuration Extensions. Use the following information to calculate the minimum Configuration Extension size:
	● Configuration Overhead: 1 word
	● Extension Overhead:
	  ● TCP/IP: 100 words. For M1E Controllers: 20 Words.
	  ● Data Protect: 8 words
	  ● S980 Address: 8 words
	  ● Quantum Hot Standby: 17 words
	  ● VME Bus: 9 words
	  ● Profibus: Approximately 4096 words; check your Profibus manual for details
	  ● Peer Cop: 5 words
	
	Links: 3 words per link, plus:
	
	-) Global Output: 4 words per link
	
	-) Global Input: 2 words overhead plus, for each of up to 64 devices, 1 + twice the number of up to 8 sub-entries (max. 8). The maximum is 2 + (64*(1+2*8)) = 1090 words.
	
	-) Specific Output: 2 words overhead plus 2 words for each of up to 64 devices. The maximum is 2+(2*64) = 130 words.
	
	-) Specific Input: 2 words overhead plus 2 words for each of up to 64 devices. The maximum is 2+(2*64) = 130 words.
	  ● SY/MAX: 52 words
	  ● I/O Scanner: 4 M1E controllers; 10 words of overhead; 40 words of overhead for anything other than M1E's; 12 words/transaction.

Skips	Select this option to enable skips (segments can be skipped during solves).
Bridge Mode	Select True to enable Bridge Mode. Some controllers support Bridge Mode, which allows you to connect to a Modbus Plus network through their Modbus ports 1. **Note**: To use Bridge Mode, your controller's MEM/DIP switch must be in the MEM position.

‘Ports’ Tab

Overview

From this tab in the Controller Configuration window, you configure the controller’s Modbus and ASCII ports. These settings do not affect the communications setup of your PC in any way - only the controller’s.

Modbus Ports

The following parameters are editable:

Parameter	Description
Mode	Identifies which data protocol (Remote Terminal Unit or ASCII) to use. Both the PC and controller must use the same data protocol. Default is RTU. If you select ASCII protocol for a port, you can only configure its Parity, Stop/Data bits, and Baud settings.
Parity	Adds a check bit to a packet to make the number of binary ones always either odd (Odd Parity) or even (Even Parity). If parity is set to None, the check bit is not added. The PC and controller must use the same parity. Default is Even.
Stop/Data	Sets the number of bits at the end of a packet which prepare the receiving device for the next packet. The PC and controller must use the same number of stop bits. Default is 1.
Baud	Sets the data transfer speed of the controller’s Modbus port in bits per second. The PC and controller must be set to the same baud rate. Default is 9600.
Head	Quantum controllers only: sets the slot number on the local drop backplane where the CPU resides.
Dev Addr	Assigns the Modbus address for the port. Default is 1.
Delay	Sets the amount of time in tens of milliseconds the controller waits after receiving a message before sending an acknowledgment. Default is 1 (10); max. is 20 (200).
Modbus Port 2 Type	Momentum M1 controllers only: Sets the port type of Modbus Port 2, to either RS232 or RS485.

Simple ASCII Ports

Some Modicon controllers have RS-232 ports as part of Remote I/O drops. Advanced programmers can use these ports (called simple ASCII or ASCII/DAP ports), for serial communications between controllers and data terminal equipment. In ladder logic, use the Block Move (BLKM) instruction to send and receive Simple ASCII messages. Configure the number of ASCII ports for a controller by setting the ASCII Ports parameter in the General tab.

The 984A, 984B, and Micro 311, 411, 512, 612 controllers have simple ASCII ports having fewer properties than Modbus ports:

Parameters	Description
Parity	Adds a check bit to a packet to make the number of binary ones always either odd (Odd Parity) or even (Even Parity). If parity is set to None, the check bit is not added. The PC and controller must use the same parity setting. Default is even.
Stop/Data	Sets the number of bits at the end of a packet which prepare the receiving device for the next packet. The PC and controller must use the same number of stop bits. Default is 1.
Baud	Sets the data transfer speed of the controller’s Modbus port in bits per second. The PC and controller must be set to the same baud. Default is 9600.

ASCII Ports

This table allows the user to set each port to be compatible with the device to which it is being connected.

There are five properties that can be set:

Property	Description
Parity	Select EVEN, ODD, or NONE.
Baud Rate	The communication speed is set to one of the following baud rates: 50, 75, 110, 134.5, 150, 300, 600, 1200, 1800, 2000, 2400, 3600, 4800, 7200, 9600, and 19200.
Number of Stop Bits	Select the number of stop bits for each data byte (1 or 2). A system with NO PARITY generally uses 2 stop bits, while a system with PARITY uses 1 stop bit.
Number of Data Bits	Select the number of data bits issued from the ASCII port (a number from 5 to 8). The choice of 7 data bits is standard for most ASCII devices.
Keyboard/Non-Keyboard	Select the attached device is defined as a keyboard or non-keyboard device. The purpose of this function is to allow you to modify the response of the ASCII port to match the type of device to which it is connected. In the keyboard mode, the port echoes back the input character and requires delimiters to move to the next data field and to terminate the message. Editing of input data is possible from a terminal. In the non-keyboard mode, no data is echoed back and, as a data field is completed, the next available data field is entered or the message automatically terminates. No editing capabilities are supported.

Micro Ports

If you are using a Micro 311, 411, 512, or 612 controller, assign it's ports using the Micro port drop-down menu. The assignments in the list are combinations of the controller's COM1, COM2, and I/O Expansion Link port. The assignments available-depend on which Micro I/O Mode you set in the Controller Details section of the General tab in the Controller Configuration editor.

‘Loadables’ Tab

Overview

User loadables are instructions that do not come with a controller. Instead, they are supplied by Modicon or third-party vendors and must be copied into a controller or project to be used.

Loadables are extensions to a controller’s capabilities. When they appear as logic function blocks (most of the time) they are represented as three node instructions. The Loadables tab displays the loadables selected and available to be selected for the current project.

The display shows a table of loadables and related information. A check mark is shown beside loadables that are present in the project. Loadables with no check mark are present in the loadable library, but are not currently available in the project. To add or delete a loadable from a project, select or de-select the associated checkbox.

Note: You can only add loadables that are already part of a loadable library. Using a loadable is a two-step process: transferring it into a loadable library (see the *Loadable Library Wizard, p. 86*), then selecting it from the library into the controller or project by checking the loadables’ checkbox in the loadables tab and saving changes.

Loadable Parameter

Loadable’s parameter listing:

Parameter	Description
Name	User loadable name.
Opcode	A unique two-digit hexadecimal number used to identify an instruction in the programmable controller logic.
Version	The version number of the installed loadable.
Type	Either MSL or USL.

Updating Loadables Overview

Here are two possible scenarios that would require you to update a loadable:

- Periodically, new versions of loadables are made available. If you try to delete an old loadable from the configuration, the configurator alerts you to the fact that it is already used in logic and prevents the loadables' deletion. As adding or readding a loadable can be an extensive task, update loadable conveniently allows you to replace a loadable without first deleting it from logic.
- You may have read a controller's data into a project where the controller data contained an .MSL loadable (i.e. an .EXE file from Schneider Electric or a third party vendor). If the controller had been run prior to performing the read, the MSL loadable in the project is unusable if written back to the controller. Use update loadable to get the MSL loadable back to a state where it can be written to the controller. Update loadable asks you for the original .EXE loadable. It places it into the project and the project may then be rewritten successfully to the controller.

Updating Loadables

To update a loadable in a project:

Step	Action
1	Select **Update** from the right-click menu on the row of the loadable that you want to update.

Copying a Loadable to a Controller

To copy a loadable to a controller or project:

Step	Action
1	Select the loadable's checkbox. The **Select Opcode** dialog appears if no Opcode has been set for the loadable.
2	Select an available Opcode from the list and click **OK**.
3	If you are offline, selected (checked) loadables are included in the project. Any new loadables you check off will be added to the project when the configuration changes are saved. To use the loadables in a controller, write to the controller. See *Writing to a Controller, p. 92* for more information.
4	If you are in online mode, changes are not made to the current project. If you add loadables and close the configurator while online, the Configurator makes the changes directly to the controller. (**Note**: The controller must be stopped.)
5	If you are in online combined mode any changes that you save are saved to the current project and then written to the controller. (**Note**: The controller must be stopped.)

Deleting Loadables

To delete a loadable from a controller or project:

Step	Action
1	To delete a loadable from a project or controller, deselect the loadable's checkbox. **Note**: You cannot delete a loadable if it is used in logic.

Loadable Library Wizard

Overview

Before you can place a user loadable into a controller or project, it must be read into the loadable library. A loadable library holds a set of loadables for you so that you only have to translate them to ProWORX 32 format once.

In the Loadable Library, you can read a loadable from disk, translate it to ProWORX 32 format, and move it into a library. You can read loadables from an existing project, a Schneider Electric (.exe or .dat) or third party disk (.exe or .dat) or a ProWORX .TLD library file.

Note: Reading a user loadable into a loadable library does not copy it into your controller or project. Using a loadable is a two-step process: reading it into a loadable library, then from the library into the controller or project (see *'Loadables' Tab, p. 83* for more information).

Note: You are unable to open the loadable library wizard while the controller configuration editor is open.

Using the Loadable Library

From the Navigation Panel, Utilities tab:

Step	Action
1	Select **Loadable Library** to open the Loadable Library Wizard.
2	Select one of the following options: • **Edit Opcode** - See Editing Opcodes below. • **View Text** - Displays the manufacturer's notes for a loadable (if available). • **Rebuild Library** - On rare occasions, a library of loadables can become damaged (for example, when a computer crashes and files are corrupted). ProWORX 32 allows you to recreate a library from its .USL and .MSL files. • **Transfer Loadable into Loadable Library** - Transfer loadables from a project, an old ProWORX.tld file, Schneider Electric (.dat), or from within an .exe into the loadables library. Also use this option to update the version of existing loadables in the loadable library.
3	When you have completed using the loadable library wizard, click **Finish**.

Editing Opcodes

An opcode is a unique number identifying a loadable in the controller or project. Because each opcode must be different, they may need changing.

When a loadable is added to a project or controller, the configurator will compare the new loadable's opcode with the opcodes already used in the controller by built-in instructions and previously loaded loadables. If it sees that the new loadable opcode will conflict, the Select Opcode window appears.

However, if you happen to know an opcode that won't conflict with the loadables already in your controller you can use the Edit Opcode option in the wizard to make the change. Then when you add the loadable in configuration, you won't be prompted to provide a new opcode.

Working with Controllers

5

At a Glance

Overview

This chapter contains information on how to use ProWORX 32 to work with a controller.

What's in this Chapter?

This chapter contains the following topics:

Initializing Logic in a Controller

Overview

Initializing logic erases the networks, register contents and ASCII messages in a programmable controller. The controller must be stopped before you can initialize logic.

It is strongly recommended that you read the contents of the controller to a backup database before initializing logic.

	WARNING
⚠	**Ensure data integrity is maintained.** You are about to erase the contents of your controller. If you want to save any information stored in the controller, ensure that its contents have been read to a database. **Failure to follow this precaution can result in severe injury or equipment damage.**

Initializing Logic

From the project right click menu:

Step	Action
1	Select **Online Commands** → **Init Logic**.

Reading From a Controller

Overview

The Read from Controller function transfers memory contents from a programmable controller into a designated database. It is strongly recommended that you use this function to backup the contents of a controller before working with it online.

Reading From a Controller

From the project navigation panel:

Step	Action
1	Select the project you want to read to.
2	Ensure that you have selected the correct controller to read from and that the project you are reading into is backed up if necessary. Also, check the communications settings for the correct address.
3	From the project right click menu, select **Online Commands** → **Read** → **Read** to read the logic, traffic cop, configuration, loadables, ASCII, state and disabled tables.
4	Or, from the project right click menu, select **Online Commands** → **Read** → **Read Extended Memory** to read only the extended memory registers.
5	You are prompted to confirm that you want to read the selected controller. Click **OK** to perform the read.
6	When the read is complete, click **OK** to return to ProWORX 32.

Writing to a Controller

Overview

The Write to Controller function writes the contents of a database to a controller. The controller must be stopped before you can write to it.

Writing to a Controller

From the project navigation panel:

Step	Action
1	Select the project you want to write from.
2	Ensure that you have selected the correct controller to write to and that the controller you are writing to is backed up if necessary. Also, check the communications settings for the correct address.
3	From the project right click menu, select **Online Commands** → **Write** → **Write All** to write the logic, traffic cop, configuration, loadables, ASCII, state, and disabled tables. This command overwrites all existing PLC data.
4	Or, from the project right click menu, select **Online Commands** → **Write** → **Relocate Logic and Data** to write the contents of the controller as long as addresses and function blocks in logic are supported in the destination controller. You can choose to update either the Logic, Coils Used, ASCII, and State/ Disabled tables, or just the Logic and Coils Used.
5	Or, from the project right click menu, select **Online Commands** → **Write** → **Write Extended Memory** to write only the extended memory registers. Select all extended memory files or a specific extended memory file and click **OK**.
6	ProWORX 32 checks to ensure that the controller and database match and the results are stated in the Database/Controller Validation dialog. If the controller and database match click **Write** or **Relocate** to carry out the desired function. Potential reasons that the controller and database would not match include: ● The controller being written to may not have enough memory for the logic being written. ● The controller address ranges many not be large enough ● The controller instruction set many not match the database ● The database may use duplicate coils, which most controllers do not support
7	When the write is complete, click **OK** to return to ProWORX 32.

CAUTION

Process Cancellation Warning

Cancelling a write while in operation may leave your PLC in an indeterminate state.

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

Transferring Memory Contents to Controller EEPROM

Overview

This function works only with Compact controllers. This function cannot be performed while the controller is running. You must stop the controller first.

Note: Do not attempt the transfer operation if the controller's battery is LOW as the processor contents may be lost.

Tip: Memory Protect is a switch on your controller that stops you from altering the controller's contents. The Memory Protect switch should be ON or the card overwrites memory on power up.

Transferring Controller Memory to EEPROM

From the project right-click menu in the navigation panel:

Step	Action
1	Select **Online Commands** → **Write** → **Transferring to Flash/EEPROM/ PCMCIA**.
2	A-series Compact controllers have four enhanced EEPROM options which may be set prior to transferring: ● After power down, restore PLC to previous Run/Stop state. ● Start PLC after download from EEPROM. ● Save 4xxxx registers to EEPROM. ● Optimized Mode - When selected, the controller can't be edited while online.
3	Click **Transfer**. You are prompted to stop the controller if it is running.

Transferring the Flash RAM Executive

Using EXECLoader

To transfer the flash RAM executive, read a controller's flash RAM executive into a disk file, or write a device's flash RAM executive from a disk file, use the third-party EXECLoader application. The EXECLoader is a Windows based 32-bit program that allows you to update the executive firmware in a variety of Schneider Electric PLC modules.

Step	Action
1	To open EXECLoader, select **EXECLoader** from the Project Navigation panel, Utilities tab.

Transferring Memory Contents to Micro Flash RAM

Overview

This function works only with Micro controllers. This function copies the memory contents of a Micro controller to the controller's flash RAM.

When the Micro controller receives power, it first checks to see if a valid configuration is present in the data memory. If not, the contents of the flash RAM are re-loaded into the controller memory.

Flash RAM may be used as an alternative to the optional battery backup, or as an extra backup of the logic and configuration.

Transferring to Micro Controller Flash RAM

From the project right-click menu in the navigation panel:

Step	Action
1	Select **Online Commands** → **Write** → **Transferring to Flash/EEPROM/ PCMCIA**.
2	Click **Transfer**. You are asked whether or not you want ProWORX 32 to start the controller after loading to Flash RAM. Click **Yes** to have ProWORX 32 automatically start the controller after transferring memory contents to Flash RAM. Click **No** to keep the controller stopped after transferring memory contents to Flash RAM.
3	If the controller is currently running, you are prompted to stop it. You must do so to continue.

Transferring Internal Flash or PCMCIA to Controller Flash

Overview

This function copies the memory contents of a Compact TSX, Quantum 434, or Quantum 534 controller to the controller's flash RAM or PCMCIA memory card.

Note: Do not attempt the transfer operation if the controller's battery is LOW as the processor contents may be lost.

When the controller receives power, it first checks to see if a valid configuration is present in the data memory. If not, the contents of the flash RAM or PCMCIA memory card are re-loaded into the controller memory.

Flash RAM or PCMCIA memory card may be used as an alternative to the optional battery backup or an extra backup of the logic and configuration.

This function cannot be performed while the controller is running. You must stop the controller first.

Transferring the Controller's Memory Contents to Controller Flash or PCMCIA Memory Card

From the project right-click menu in the navigation panel:

Step	Action
1	Select **Online Commands** → **Write** → **Transferring to Flash/EEPROM/PCMCIA**.
2	Select **Internal Flash** to transfer the current logic to flash memory or **PCMCIA** to transfer the current logic to the PCMCIA memory card.
3	Compact controllers have enhanced options that may be set prior to transferring. Set the parameters for internal flash and PCMCIA settings: • **Start PLC after download from EEPROM**: Automatically starts the controller with the logic that was stored in flash memory or the PCMCIA card during a power failure. • **Save state RAM**: Saves the last state to flash memory or the PCMCIA card in the event of a power failure.
4	Type the number of registers to save in the **4xxxx registers** to save field. The specified number of registers are saved to flash memory or the PCMCIA card in the event of a power failure.
5	Click **Transfer** to transfer the logic to flash memory or the PCMCIA card. You are prompted to stop the controller if it is running. **Note**: Click **Clear Flash** to clear the logic stored in the flash memory or the PCMCIA card.
6	If the controller is currently running, click **Stop**.

Starting and Stopping Controllers

Starting and Stopping a Controller

From the ProWORX 32 Online Controls tool bar:

Step	Action
1	Click **Start/Stop** Controller. The Start/Stop dialog appears.
2	For controllers that support it, you can select **Optimization Mode**. In the optimized mode, the ability to edit or show power flow is disabled. You may have to stop the controller to make logic changes. The 685E and 785E controllers have a 2k buffer allowing editing during optimized mode. Once this buffer is full, no further changes can be made until the controller stops.
3	Click **Start** to start the controller.
4	The start/stop dialog box displays the following controller information: ● Project Name ● Processor Type ● Communications Type and Address ● Current State
5	Click **Stop** to stop the controller.

WARNING

Controller may be Process-Critical.

Stopping a controller stops a controller from solving logic, or performing I/O functions; the controller remains in the ready state. Stopping a controller may have a major impact on your process. Always consider fully the possible consequences of stopping a controller (i.e., is it performing a critical operation?) before proceeding.

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

PLC Status Viewer

Overview

The status viewer monitors PLC status words. The PLC to be monitored is specified by the project selected. Multiple projects can be monitored at once and results in the word data grid are saved to the project. See *Status Words for S901 and S908, p. 280* for more information about status words.

Note: The words available are dependant on the PLC being monitored.

Checking the Value of a Word

In the PLC status window:

Step	Action
1	Select the **Update current node** radio button
2	Select the word from the status word navigation panel that you want to see the value of. **Note**: Single bits are colored when set.

Logging Word Data

In the PLC status window:

Step	Action
1	Select the **Record selected nodes** radio button.
2	Select the word(s) from the status word navigation panel that you want to log by clicking the check boxes beside the status word icons.
3	Click the **Start Logging** button.
4	To end the logging session, click the **Stop Logging** button.

Working with Logged Word Data

After logging word data, right click on the logged data grid:

Step	Action
1	To clear the selected word data from the logged word data grid, click **Delete**.
2	To clear all word data from the logged word data grid, click **Delete All**.
3	To view the detailed word view and diagram of bits, click **View Bits**.
4	To print the logged word data, click **Print**.

Analyze Device

Overview

The Analyze feature is very useful in diagnosing problems with your PLC that wouldn't show up as part of typical online programming/commissioning. Analyze device performs a checklist of predetermined tasks to find specific problems relating to an I/O sub-systems health and general PLC status. The Analyze feature can pinpoint problems for maintenance staff to correct as well as keep an up-to-date knowledge base of maintenance records for future reference.

S901 Style Analyze

The S901 Analyze performs Stopcode Error, Controller Status, Battery Failed, Memory Protect, Single Sweep, Constant Sweep, S901/J200 Status, ASCII Error, Channel Communications Health, Module Health checks. All potential problems are placed into a report.

S908 Style Analyze

The S908 Analyze performs Stopcode Error, Controller Status, Battery Failed, Memory Protect, Single Sweep, Constant Sweep, Hot Standby, DCP Present, ASCII Error Set, Remote I/O, S908 Error Set, Cable A Errors, Cable B Errors, Global Comm Health, Cable A Comm Health, Cable B Comm Health, Local Drop Health, Remote Drop Health, Remote Drop Cable A, Remote Drop Cable B, Drop Communications, and Module Health checks. All potential problems are placed into a report.

Understanding the Analyze PLC Output

Output graphics descriptions:

Graphic	Description
	This area passed and no report entry has been made.
	An entry has been made into the report signifying the state of the area.
	A problem has been detected in the specific area. An entry in the report has been made.

Viewing the Analyze Device Report

From the Analyze Device window:

Step	Action
1	Select the **Report** tab. (The Report window shows the date and time the problem was found, and a brief description of the potential problem.)

Configuration Extensions

6

At a Glance

Overview

Configuration extensions are utilities that can be loaded into a controller. The Configuration Extensions area contains several different hardware configuration extensions. These extensions are controller-specific. Each different extension hasits own editor and some of the more complex extensions have a wizard as well.

What's in this Chapter?

This chapter contains the following topics:

Configuration Extensions

Overview

Configuration extensions can be edited while the project is either online or offline. Online changes can only be made to a stopped controller. The configuration extension information is stored within the project and can be loaded at any time.

Available configuration extensions listed in the **Active Extensions** panl:

Configuration Extension	Description
Data Protect	Prevents specific blocks of 0xxxx and 4xxxx references from being modified by general Modbus data write commands.
Peer Cop	Allows you to configure data blocks to be transferred between controllers on a Modbus Plus network.
S980 Addresses	Specifies the S980 station address.
Quantum Hot Standby	Allows additional configuration of the Quantum Hot Standby setup.
Profibus	Configures a Quantum controller for Profibus communications.
TCP/IP	Configures controllers to connect to a TCP/IP network through a communication card.
SY/MAX	Configures a Quantum controller for communication with SY/MAX drops.
I/O Scanner	Allows you to configure data blocks to be transferred between controllers on a TCP/IP network.
Compact Phase II	This extension is only available for Phase II Compact PLC's
VME Bus	Configures a VME controller for communications with a VME network.

Note: Before setting config extensions, you must set the Configuration Extension Size parameter in the controller configuration editor. For more information see, Configuring a Controller, *General Tab Parameters, p. 77*.

Using the Configuration Extensions Utility

In the project navigation tree:

Step	Action
1	Double-click the **Configurations Extensions** icon. The configuration extensions window will appear showing only the extensions that are available for the active project.
2	To add a configuration extension, select the check box beside the extension icon.
3	To remove a configuration extension, de-select the check box beside the extension icon.
4	To edit an extension, ensure that the extensions associated check box is checked. Then, select the extension that you want to edit from the extensions panel. The status bar at the bottom of the Configuration Editor window shows the number of words used, total number of words available and any error or status messages as they may appear.
5	To save the changes that have been made, close the Configuration Extensions window.

Compact Phase II

Overview

Compact Phase II extensions allow the programming of functions specific to the Compact Phase II controllers. This provides support for:

- PLC based password access
- Secure Data Area (SDA)
- Comm 1 CTS/RTS delay time settings.

Note: If the Compact Phase II extension does not appear in the Active Extensions panel, it is not a valid extension for the current controller type.

Editing the Compact Phase II Extension

In the Active Extensions panel select the Compact Phase II extension, then:

Step	Action
1	Enter a Secure Data Area value between 0 and 128 in the **SDA Size (K Words)** box. A zero value disables the feature.
2	Enter a value between 0 and 50 in the **CTS Delay (x10 ms)** box. A zero value indicates the feature is disabled. **Note**: This value is a factor of 10; if 5 is entered, 50 is assumed by the PLC.
3	Enter a value between 0 and 50 in the **RTS Delay (x10 ms)** box. A zero value indicates the feature is disabled. **Note**: This value is a factor of 10; if 5 is entered, 50 is assumed by the PLC.
4	Enter a password consisting of a maximum of 16 characters (A-Z, 0-9 and _) in the **PLC Password** boxes. The PLC password can only be changed while online. If the password is set to nothing, the PLC is not password protected.

Data Protect Extension

Overview

Data Protect is used to protect specific 0xxxx and 4xxxx references from being modified by Process Monitoring and Control software. Write access is allowed for all 0xxxx and 4xxxx references within the specified block.

References outside the ranges specified are protected from general Modbus data write commands. By default, all 0xxxx and 4xxxx references are unprotected.

Note: If the Data Protection extension does not appear in the Active Extensions panel, it is not a valid extension for the current controller type.

Editing the Data Protect Extension

In the Active Extensions panel select the Data Protect extension, then:

Step	Action
1	Enter an address in the **0xxxx Starting Address** field. Default - 0:0001.
2	Enter the number of references that are to be left unprotected in the **0xxxx Length** field. ProWORX 32 shows the protected reference ranges in the **0xxxx Protected Ranges** boxes. Suppose you type a Start value of 00017, and a Length of 1024. The first protected range will be from 00001 (the first possible value) to 00016 (the last value before the Start value you entered). There will then be an unprotected range from 00017 to 01040 (00017 + 1024). All references above 01041 are also protected. If you enter a length that is too high (goes beyond the addresses configured for the controller) ProWORX 32 automatically sets the value to include all addresses above the Starting Address fields.
3	Enter an address in the **4xxxx Starting Address** field. Default - 4:0001.
4	Enter the number of references that are to be left unprotected in the **4xxxx Length** field. ProWORX 32 shows the protected reference ranges in the **0xxxx Protected Ranges** boxes.

Quantum Hot Standby

Overview

The Quantum Hot Standby extension allows additional configuration of the Quantum Hot Standby setup. This lets you set the type of state RAM transfer between the CHS110-00 modules. It also lets you set the Initial Command Register and the Non-Transfer Area.This area is only available on version 2.x Quantum controllers that contain the CHS loadable in the configuration.

Note: If the Quantum Hot Standby extension does not appear in the Active Extensions panel, it is not a valid extension for the current controller type.

Editing the Quantum Hot Standby Extension

In the Active Extensions panel select the Quantum Hot Standby extension, then:

Step	Action
1	In the **General** tab, enter the 4xxxx address of the command register used to configure the hot standby system in the **Command Register** field. This register must be transferred every scan and cannot be in the non-transfer area. The initial command register contains the settings that are loaded into the controller when it is started. If any changes need to be made while the controller is running, the command register must be used, and not the initial command register. Settings such as port address swapping, allowing an executive upgrade, setting the standby's mode on a logic mismatch, setting the controller's modes and overriding the key switch can be changed from the command register.
2	Enter the starting address of the range of registers that are not to be transferred from the primary controller to the standby in the **Non-Transfer Area Start Address** field. This is commonly used to reduce scan time. ● The first two registers are used in reverse transfer operations. These registers allow information to be passed from the standby to the primary controller. ● The third register is the Status register, which stores the status of both controllers. This register provides information on how the hot standby system is operating, such as the power flow of the CHS instruction, position of the controller's A/B switch, and whether there is a logic mismatch between controllers. ● All registers following the third register are ignored (not transferred) during the scan.
3	Enter the length of the non-transfer register range in the **Non-Transfer Area Length** field. This value can be from 1 through the total number of registers configured in the controller.

Step	Action
4	Click the **Show Command/Status Registers** to view the command and status register contents in the Data Watch Window.

5	Select one of the following **State RAM Transferred** options:
	● **Default (12K)**: All 0xxxx and 1xxxx registers (up to 8192 each) are transferred.
	  ● If 10000 or fewer 3xxxx and 4xxxx (combined) registers are configured, then all are transferred.
	  ● If more than 10000 3xxxx and 4xxxx (combined) registers are configured, then (up to) 1000 3xxxx registers and all 4xxxx (up to a combined total of 10000) are transferred.
	● **Routine Only**: All addresses defined in the routine transfer table are transferred every scan. There must be a minimum of 16 4xxxx registers to support the non-transfer area. The Routine Transfer Table is a range of discretes and registers that must be configured as a multiple of 16.
	● **Routine and Extra**: All addresses defined in the Routine Transfer Table and in the extra tables are transferred. The range of each extra table must be a multiple of 16. The extra tables can be transferred over multiple scans.
	● **All State RAM**: All RAM configured in the controller is transferred every scan.

6	Select an address in the table and enter a reference length. ● For Routine Transfer Table address lengths, this must be a value between 16 and the maximum configured size for that address. ● For Extra Transfer Table address lengths, this must be a value between 16 and the maximum configured size for that address exclusive of the range set in the corresponding Routine table. ● Values must be a multiple of 16. The ranges defined are updated and displayed to the right on the tables as the values change.
7	Enter the number of scans (1-255) needed for the primary controller to transfer the extra transfer tables to the standby in the **Scans to Transfer** field,
8	Select the **Initial Command Register** tab.
9	Set the **Swap Port (x) Addresses** parameters to either Yes or No.
10	Set the **Controller (x) Mode** parameters to either Offline or Online.
11	Set the **Standby Mode (on logic mismatch)** to either Yes or No.
12	Set the **Executive Upgrade Switch** to either Enabled or Disabled.
13	Set the **Keyswitch Override** to either Enabled or Disabled.

IO Scanner

Overview

The I/O Scanner extension provides data transfer between two or more controllers on a TCP/IP network. The I/O Scanner lets you to simultaneously configure up to 128 communication transactions, depending on your controller. Because the TCP/IP connection is established only once and remains connected during an entire session, it makes this type of communication very efficient.

Note: If the IO Scanner extension does not appear in the Active Extensions panel, it is not a valid extension for the current controller type.

IO Scanner Wizard

ProWORX 32 includes a configuration wizard to step you through data transaction setup between a local device and a number of remote devices on a TCP/IP network.

Editing the IO Scanner Extension

In the Active Extensions panel select the IO Scanner extension, then:

Step	Action
1	Select a card to edit from the **Card Number** drop-down list box. There may be one, two or six cards available to edit depending on the PLC type. Each card has an independent set of data values.
2	Enter an IP address in the **IP Address** field in the format (1-255).(1-255).(1-255).(1-255) This address should match the TCP/IP extension for the selected card.
3	Enter a 1xxxx or 3xxxx address that will receive health information in the **Health Block (1x/3x)** field.
4	Enter the number (1-16) of the slot in the backplane the selected card inhabits in the **Head Number** field. This value should match the value in the TCP/IP extension for the selected card.
5	The transaction list displays up to 128 (64 for M1E PLC's) transactions. A transaction that isn't configured is denoted by a red X, a partially configured transaction is denoted by a yellow exclamation mark, and a configured transaction is denoted by a green check mark. To configure a transaction, right-click anywhere in the transaction list and select **Add Transaction**. Transactions are configured in order so if you have three transactions and select Add Transaction, the fourth transaction can be configured.
6	To clear the configuration of the last transaction in the list, right-click anywhere in the transaction list and select **Delete Transaction** or press the DELETE key.
7	Enter the IP address of the remote device that you are communicating with in the **IP Address** field.

Step	Action
8	Enter the value of the destination Unit ID in the **Unit ID** field. This is an identifier for a pair of transactions (specifically Link Client/Server transactions). The transaction pair must have matching Unit ID's. An example situation would include a single Server Write that sends data to the matching Client Reads in a remote device. All Client Read transactions accept the data sent from the single Server Write transaction as long as the Unit ID's match.
9	Enter a millisecond value representing the length of time to wait for a reply for each transaction in the **Health Timeout (0-50k)** field.
10	Enter a millisecond value representing the length of time to wait before repeating the transaction in the **Repetition Rate (0-50k)** field. A value of 0 indicates the quickest possible rate.
11	Select one of the following functions from the **Function** drop-down list: • Read - A unilateral read in which a local device reads data from a remote device. • Write - A unilateral write in which a local device writes data to a remote device. • Read/Write - A unilateral read/write in which a local device reads data from and writes data to a remote device. • Link Client Read - A paired function type in which a local device responds to a write transaction from a remote device which must have a matching server write. • Link Client Write - A paired function type in which a local device writes to a remote device which must have a matching server read. • Link Client Read/Write - A paired function type in which a local device reads and writes data to and from a remote device which must have a matching server read and write. • Link Server Read - A paired function type in which a local device initiates a read from a remote device. The remote device must have a matching client write. • Link Server Write - A paired function type in which a local device writes to a remote device. The remote device must have a matching client read. • Link Server Read/Write - A paired function type in which a local device reads and writes data to and from a remote device which must have a matching client read/write. **Note**: For unilateral function types, no intervention is required for the remote devices. They respond to any Read or Write without the need to set up an I/O Scanner transaction. Linked function types require two complementary transactions, on in each device.

Step	Action
12	Select a fallback value from the **Fallback Value** drop-down list box: ● Zero - Resets the data values for the selected transaction to zero in the event of a power failure. ● Hold Last - Retains the last data values for the selected transaction and make them available at restart in the event of a power failure.
13	Type the local data address receiving data from the remote controller in the Read from Remote, **To** field.
14	Enter the remote address where the read data is coming from in the Read from Remote, **From** field.
15	Enter the number of sequential registers to read in the Read from Remote, **Number To Read** field. Up to 125 registers are allowed.
16	Enter the local data address that sends data to the remote controller in the Write to Remote, **From** field.
17	Enter the remote address where the write data is going to in the Write to Remote, **To** field.
18	Enter the number of sequential addresses to write in the Write to Remote, **Number To Write** field. Up to 100 registers are allowed.

IO Scanner Wizard

Overview

To launch the IO Scanner wizard, click the **IO Scanner Wizard** button situated directly below the Active Extensions panel.

The wizard operates independently of the Offline/Online mode. All changes are made to Offline projects with an option to modify Online devices as well. TCP/IP communications are required only when modifying online devices.

Using the IO Scanner Wizard

Read the introduction instructions on the first screen and click **Next**:

Step	Action
1	Set the transaction type by selecting either the **Direct** radio button or **Link Client/Server** radio button. Click **Next**. • **Direct** - Creates a single transaction in the local device. Data is transferred regardless of the programming of the remote device. This option is simpler than Link Client/Server but could pose more risk as the target device needs no additional program to verify its operation. • **Link Client/Server** - Creates a pair of matching transactions, one in each device. The server makes a request from a client which then responds to that request. This is a safer option than Direct transactions but is more complex to set up and maintain.
2	Set the local device address by entering an IP address in the **Local Device IP Address** box in the standard IP format (1-255).(1-255).(1-255).(1-255) If you are using a Quantum PLC, select the slot that the NOE (or similar ethernet adapter) card resides in from the **Head Number** drop-down list. Click **Next**.
3	To properly use the IO Scanner extension, you must define target PLC's to communicate with. These target PLC's are called Remote Devices. To add a remote device, click **Add**. To remove a remote device, click **Remove**. At least one remote device must be defined before proceeding. • Select a project to add its associated remote device to the list by clicking the Browse button and selecting a project to the **Remote Device/Database** box. Enter the IP address of the PLC for the remote device's project in the **Select an IP Address** box. If you are using a Quantum PLC, select the slot that the NOE (or similar ethernet adapter) card resides in from the **What slot in the remote rack is this device mounted in?** drop-down list. Click **Next** to return to the remote device summary screen. • Repeat the above step until all desired remote devices have been added. When you have finished adding remote devices to the IO Scanner extension, click **Next**.

Step	Action
4	To transfer data from one device to another a transaction is required. Existing transactions cannot be modified using the IO Scanner wizard and are greyed out. Up to 128 transactions may be created, except if you are using the M1E PLC's, then only support 64 transactions can be supported. To add a new transaction, click **Add**. To edit a transaction created by the IO Scanner wizard, click **Edit**. To remove a transaction created by the IO Scanner wizard, click **Remove**. ● After clicking Add to add a new transaction, you are prompted to select a remote device. To do this, click on a remote device from the list, and press **Next**. ● Now you can configure the new transaction. First, select a function from the drop down list. Second, enter 4xxxx addresses into the From and To fields and numeric values in the Number of Registers field in the Read from Remote Device and Write to Remote Device areas. ● When you have finished editing the transaction, click **Next** (To see descriptions of the functions and fields, see Editing the IO scanner extension.)
5	The transaction summary screen displays a summary of all new transactions to be written to the local device as well as the variously selected remote devices. Ensure the transactions are correct and click **Next** **Caution**: Clicking Next will proceed with the modifications and cannot be undone once completed. **Note**: Only offline databases are modified in this step.
6	Click the Update Online Devices button to update the physical devices defined as remote devices by the wizard. This does not update the local device. That must be done once the configuration extension editor is closed and all changes are saved. **Caution**: Online devices may be running! They must be stopped before their contents can be modified. Before stopping any device, ensure that it is safe to do so. Devices are restarted once the operation is complete. Also, when these changes are complete, they cannot be undone. Click **Next**.
7	Click the **View Log File** button to view a log of all changes made to the local and remote devices. This file (ScannerWizard.log) may be saved and printed as needed. Click **Finish** to close the wizard and return to the Configuration Extension Editor.

Peer Cop

Overview

The Peer Cop extension provides data transfer between two or more controllers on a peer-to-peer network, as well as linking multiple networks using the S985 communication card. Peer Cop configures data blocks to be continuously transferred (once per scan) between nodes on a Modbus Plus network. Data can be broadcast to all nodes on a single link (Global I/O) or between specific Modbus Plus nodes on a link (Specific I/O).

A maximum of 32 data registers or 512 (for example, 32*16) I/O points can be transferred to or read from a controller at a time. Peer Cop is supported by the A145 and all E-Series and Quantum controllers. Up to three Links of the Peer Cop can be configured and edited.

> **Note:** If the Peer Cop extension does not appear in the Active Extensions panel, it is not a valid extension for the current controller type.

Peer Cop Wizard

ProWORX 32 includes a configuration wizard to help you set your Peer Cop extensions. To access the Peer Cop wizard, see *Peer Cop Wizard, p. 118*.

Editing the Peer Cop Extension

In the Active Extensions panel select the Peer Cop extension, then:

Step	Action
1	The Peer Cop extension can be configured for up to three links. When you add a link you will have access to the 64 possible devices on another peer-to-peer network. ● Link 1 is the internal link; all devices on the local Modbus Plus network can be accessed from Link 1. ● Links 2 and 3 are remote links through S985 cards. To add a link, click **Add Link**. To clear the configuration of a link, click **Clear Link**. To delete a link, click **Delete Link**.
2	To configure a link, set its Head Number, Time-out value, and Last Value parameters. For link 2 or 3, select a head number (1 through 16) from the **Link x Head Number** drop-down list box. Head Number specifies the head number on a Quantum rack. If you are using a Quantum Controller, you have the option of editing the head number for the second or third link. The first link is internal, therefore it cannot be edited.
3	Select a value from the **Timeout (ms)** drop-down list box. Time-out specifies the health time-out interval. The default value is 500ms. This value specifies the minimum time period a Peer Cop configured communication must fail before the associated health bit is cleared. Valid time-out values range from 20ms to 2 seconds. If you type a value too big, the value truncates to a multiple of 20. For example, 230 truncates to 220 (it is not rounded up to 240).
4	Select ‘Clear’ or ‘Hold’ from the **Last Value** drop-down list box. Last Value specifies whether or not to hold the last value. When set to ‘Hold’, the input data area associated with an unhealthy transfer is left in its previous state (i.e. the last value with a health of OK).

Global Input/ Output

Global I/O is one of two communication methods used by the Peer Cop extension (the other is Specific I/O). Global I/O is a broadcast communication method, where a message is broadcast (made available) to all controllers on the Modbus Plus network. Global I/O data transfers do not require an acknowledgment from the receiving controller, so there is no immediate overhead placed on the receiving controller.

Note: You can view the register data of any global input/output or specific input/ output by clicking View Data. The data watch window will open displaying the relevant data.

Editing Global Inputs

Global Input is used to receive global data from any device on a Modbus Plus network. One entry (line) is available for each device (1 through 64). Each device's global data can also be received in pieces determined by Subfields.

Step	Action
1	Select the **Global Input** icon in the Links panel.
2	Select a global input from the **Global Input** list by double-clicking on an input. The global input properties grid appears.
3	Enter the starting point (1 through 32) of the broadcast data to read in the **Index** field.
4	In the **Start** field, enter the destination for the received data (i.e., where the received data is to be stored).
5	Enter the number of words (1 to 32) to read forwards from the Index value in the **Length** field. For example, suppose the source controller is broadcasting 10 words of data using the Global Output function, but the receiving controller only uses words 3 to 7. You would type an Index value of 3 and a Length of 5. **Note**: The length value plus the index value must be less than or equal to 33.
6	Select either BIN (default) or BCD from the **Type** drop-down field.

Editing Global Input Subfields

Each device's global data can also be received in sections determined by Subfields. You can define a subfield for each block of the broadcast data that you want the controller, to receive while ignoring the remainder.

Step	Action
1	To view the subfields of a global input, click **View Subfields**.
2	Select a subfield from the **Global Inputs Subfields** list.
3	Subfields have the same parameters as inputs. When you are finished editing the subfields parameters, click **Return** to go back to the list of global inputs.

Editing the Global Output

Global Output broadcasts the specified range of discretes or registers to the devices on the Modbus Plus network. Each device used to access the data must also be configured to accept Global Input from the broadcasting device (1-32).

Step	Action
1	Select the **Global Output** icon in the Links panel.
2	n the **Start** field, enter the destination for the received data (i.e., where the received data is to be stored).
3	Enter the length (1-32) of the address range (i.e., the number of registers to broadcast). in the **Length** field.
4	Select either BIN (default) or BCD from the **Type** drop-down field.

Specific Input/ Output

Specific I/O is one of two communication methods used by the Peer Cop extension (the other is Global I/O). Specific I/O uses a one-to-one communication method and requires an acknowledgment from the receiving device, which creates a certain amount of overhead. When using Specific I/O, the destination controller must accept the entire block of data from the source controller. This means that the Index value used in Global I/O is not necessary.

Specific I/O allows you to configure multiple defined data blocks for transmission to specific devices on the Modbus Plus network. The device receiving the data must be configured for Specific Input from the broadcast device. The length (in words) of the specific input (configured in the destination controller) must be identical in length to the specific output (configured in the source controller). The input data, however, can be stored in any type of reference desired. That is, five words of 4xxxx data can be stored into five words of 0xxxx memory area.

Note: You can view the register data of any global input/output or specific input/ output by clicking View Data. The data watch window will open displaying the relevant data.

Editing Specific Inputs

Select the Specific Input icon in the Links panel, then:

Step	Action
1	Select a specific input from the **Specific Input** list by double-clicking on an input. The specific input properties grid appears.
2	In the **Start** field, enter the starting address of the block of data to be placed from the source controller.
3	Enter the number of words (1 to 32) to be received from the source controller in the **Length** field.
4	Select either BIN (default) or BCD from the **Type** drop-down field.

Editing Specific Outputs

Select the Specific Output icon in the Links panel, then:

Step	Action
1	Select a specific output from the **Specific Output** list by double-clicking on an output. The specific output properties grid appears.
2	In the **Start** field, enter the starting address for the block of data to be sent to the destination controller.
3	Enter the number of words (1 to 32) to be sent to the destination controller in the **Length** field.
4	Select either BIN (default) or BCD from the **Type** drop-down field.

Peer Cop Wizard

Overview

To launch the peer cop wizard, click the **Peer Cop Wizard** button situated directly below the Active Extensions panel.

ProWORX 32 includes a peer cop wizard to step you through transaction setup between a local device and a number of remote devices on a Modbus Plus network. The wizard operates independently of the Offline/Online mode. All changes are made to Offline projects with an option to modify Online devices as well. Modbus Plus communications are required only when modifying online devices.

Using the Peer Cop Wizard

Read the introduction instructions on the first screen and click **Next**:

Step	Action
1	Enter an IP address (01-64).(00-64).(00-64).(00-64) in the **Local Device MB+ Address** box. Click **Next**.
2	Define target PLC's for the PLC to communicate with by adding remote devices to the Remote Device Summary list. Click **Add** to add a remote device and its corresponding project. Click **Remove** to delete a remote device from the list. ● To configure the remote device being added to the extension, click **Browse** to select a project, and enter an IP address in the **Select MB+ Address for this Device** field. ● When you have configured the remote device, click **Next**. **Note**: The Modbus Plus routing paths for the local device and all remote devices must match. Only the last, non-zero, address value may be different. All proceeding values must be the same because Peer Cop transactions cannot pass across Modbus Plus bridges or multiplexers.

Step	Action
3	To transfer data from one device to another a transaction is required. Existing transactions cannot be modified using the peer cop wizard and are greyed out. Up to 64 read and 64 write transactions may exist. To add a new transaction, click **Add**. To edit a transaction created by the peer cop wizard, click **Edit**. To remove a transaction created by the peer cop wizard, click **Remove**. When finished adding or editing transactions, click **Next**. ● After clicking Add to add a new transaction, the Specific Transaction screen appears, allowing you to configure the transaction. Select 'Read' or 'Write' from the **Function** drop down list. Read requests data from the remote device and Write sends data to the remote device. ● Enter the 4xxxx address where the data comes from in the **From** field. The address is from the remote device for a read function and from the local device for a write function. ● Enter a 4xxxx address where the data is sent to in the **To** field. The address is from the local device for a read function and from a remote device for a write function. ● Enter the number of consecutive registers to transfer (1 through 32) in the **Word Length** field. ● When you have finished configuring the transaction, click **Next**
4	The Global Transactions List lists all of the global device-to-device transactions. Existing transactions cannot be modified using the peer cop wizard and are greyed out. To add a new global transaction, click **Add**. To edit a global transaction created by the peer cop wizard, click **Edit**. To remove a global transaction created by the peer cop wizard, click **Remove**. When finished adding or editing global transactions, click **Next**. **Note**: Up to 64 read transactions may exist although only one global output transaction can exist. Of course, numerous global output transactions can be defined for different remote devices. However, once the first global output transaction is defined, the 'From' address cannot be changed. ● After clicking Add to add a new global transaction, the global transaction screen appears, allowing you to configure the transaction. Select 'Read' or 'Write' from the **Function** drop down list. Read requests data from the remote device and Write sends data to the remote device. ● Enter the 4xxxx address where the data comes from in the **From** field. The address is from the remote device for a read function and from the local device for a write function. ● Enter a 4xxxx address where the data is sent to in the **To** field. The address is from the local device for a read function and from a remote device for a write function. ● Enter the number of consecutive registers to transfer (1 through 32) in the **Word Length** field. ● When you have finished configuring the global transaction, click **Next**

Step	Action
5	The summary of transactions screen displays all of the new transactions created by the wizard. These transactions are written to the local device as well as the various remote devices when **Next** is clicked. To overwrite any transactions in the remote device that would interfere with the new one, check the **Overwrite Existing Remote Transactions** check box. **Caution**: Pressing 'Next' proceeds with all modifications, and cannot be undone. **Note**: Only offline databases are modified in this step.
6	Click **Update Online Devices** to update the physical devices defined as remote devices by the wizard. This does not update the local device. The local device must be updated after the configuration extension editor is closed and all changes are saved. **Caution**: Online devices may be running! They must be stopped before their contents can be modified. Before stopping any device, ensure that it is safe to do so. Devices are restarted once the operation is complete. Also, when these changes are complete, they cannot be undone. Click **Next**.
7	Click **View Log File** to view all of the changes made to the local and remote devices. This file (PeerWizard.log) may be saved or printed as needed. Click **Finish** to exit the Peer Cop wizard.

Profibus Extension

Overview

The Profibus configuration extension allows you to communicate with a Profibus network. In order to successfully install and configure the Profibus configuration extension, you will have to use a total of three separate utilities:

- The ProWORX 32 Profibus wizard
- Softing's PROFI-KON software, included with the Profibus hardware
- Modicon's SPU931 utility, also included with the Profibus hardware

Note: PROFI-KON and SPU931 are not ProWORX 32 products. While every effort has been made to ensure the accuracy of these instructions, users of PROFIKON and SPU931 do so at their own risk.

Note: If the Profibus extension does not appear in the Active Extensions panel, it is not a valid extension for the current controller type.

Editing the Profibus Extension

The Profibus extension displayed in the configuration extensions utility is for display purposes only. To edit and configure the Profibus extension, you must use the Profibus wizard.

Profibus Wizard

Overview

To launch the profibus wizard, click the **Profibus Import Wizard** button situated directly below the Active Extensions panel.

Using the Profibus Wizard

Follow the on-screen instructions as you make your way through the wizard:

Step	Action
1	Read the Introduction screen and click **Next**.
2	Select either the Create a new Profibus Station radio button or the Move configuration extension from existing radio button. Click **Next**.
3	In order to configure a Profibus configuration extension, you have to have the following directory layout: **Drive** → **Plant Directory** → **Station Directory.** In the Select Plant Path screen, select a drive from the drive drop-down list box. Next, select a plant directory from the directory list or click **New Folder** to enter a new folder name into the list. When you have selected a drive and a plant directory, click **Next**.
4	In the Select Station Path screen, select a station directory from the directory list or click **New Folder** to enter a new folder name into the list. The selected folder will hold the .cfg file and the .cfg file will have the same name as this folder. When you have selected a drive and a plant directory, click **Next**.
5	If you have selected Create a New Profibus Station in the Options screen, then pressing Next in the previous step will generate a .cfg file. If you have selected Move configuration from existing, no .cfg file will be created and you will be taken to the next step.
6	To configure the .cfg file you must use two external pieces of software: ● SyCon (System Configuration) - Use this software to configure the Profibus Network. ● SPU-931 - Use this software to configure the Profibus-DB for the CRP811 Profibus card. Once you have completed configuring the .cfg file, click **Next**.
7	Click **Finish** to move the Profibus configuration extension into your ProWORX 32 Project.

S980 Extension

Overview

The S980 Configuration Extension stores the S980 station address. This address is then used as part of the S980's mismatch detection mechanism; when the controller is powered up, the S980 checks to see if it has been moved to a different 984.

Note: If the S980 extension does not appear in the Active Extensions panel, it is not a valid extension for the current controller type.

Editing the S980 Extension

In the Active Extensions panel select the S980 extension, then:

Step	Action
1	Enter up to a 12-digit hex number representing the S980 address in the **Address** field.

SY/MAX Extension

Overview

The SY/MAX configuration extension allows you to properly access and configure up to six SY/MAX RIO cards. This extension is only available when using Quantum controllers revision 2 or later.

Note: If the SY/MAX extension does not appear in the Active Extensions panel, it is not a valid extension for the current controller type.

Editing the SY/MAX Extension

In the Active Extensions panel select the SY/MAX extension, then:

Step	Action
1	Select a card (1-6) from the **Card** drop-down list.
2	Enter a I/O drop number (-1 through 99) in the **Module Drop Number** field. Set to -1 if the drop is not defined.
3	Enter the number of the slot (0 through 16) that the RIO card inhabits in the **Backplane Slot** field. Set to 0 to remove a module.
4	Enter a retry number (1 through 255) in the **Retry Count** field.
5	Enter a timeout value (1ms through 65535ms) in the **Timeout** field.

TCP/IP Extension

Overview

Before your controller can connect to a TCP/IP network, you must install and set up the TCP/IP configuration extension. This extension lets the controller recognize its TCP/IP communication card. For more information about configuring TCP/IP communications, see *Configuring TCP/IP Communications, p. 73*.

Note: If the TCP/IP extension does not appear in the Active Extensions panel, it is not a valid extension for the current controller type.

Editing the TCP/IP Extension

In the Active Extensions panel select the TCP/IP extension, then:

Step	Action
1	Select a card (1-6) from the **Card** drop-down list box. **Note**: Different controllers support different numbers of communications cards: • Quantum 113 Rev. 2 and 213 Rev. 2 controllers support two cards. • Quantum 424 Rev. 2 supports up to six cards. • M1E Momentum controllers only support one card and the Head Number is fixed at one.
2	Select a head number (1 through 16) from the **Head Number** drop-down list box.
3	Enter an IP address (1-255).(1-255).(1-255).(1-255) in the **IP Address**, **Subnet Mask**, and **Gateway IP** fields. 0.0.0.0 indicates an undefined address.
4	Select either Ethernet II or IEEE 802.3 from the **Framing Type** drop-down list box.
5	Select either Extension or BOOTP Server from the **IP Address Selection** drop-down list box. • **Extension** - Upon Power Up, the PLC will read its TCP/IP addressing information from this extension. • **BOOTP** - Upon Power Up, the PLC will require a BOOTP server to supply TCP/IP addressing information.

Quantum VME Bus Extension

Overview

The VME Bus extension lets a VME-424/X controller control data transfers between devices on a master/slave Quantum network. In a master/slave protocol, one device (the "master") has control over other devices ("slaves"). As the network runs, each element can lose and gain master status, based on negotiations with other members of the network.

Note: If the VME Bus extension does not appear in the Active Extensions panel, it is not a valid extension for the current controller type.

Editing the VME Bus Extension

In the Active Extensions panel select the VME Bus extension, then:

Step	Action
1	Enter the appropriate value in the **Slave Interrupt Level** field. Boards on a VME Bus can send and respond to messages on seven interrupt levels, numbered from 1 to 7. This field determines which interrupt level the board uses when it's acting as a slave.
2	Enter a value between 1 and 255 in the **Status ID** field. When the VME controller receives an interrupt while acting as a slave, this is the value it sends.
3	Select an appropriate value for master arbitration type from the **Master Arbitration Type** drop-down list. This field determines how the controller will operate. Valid settings are Not System Controller, Primary Mode (PRI) or Round Robin Mode (RRS).
4	Select an appropriate value for master release mode from the **Master Release Mode** drop-down list. This field determines when a board acting as a master relinquishes its master status. Valid settings are Release on Request (ROR), Release When Done (RWD), Release On Clear (ROC), or Bus Capture and Hold (BCAP). The proper setting depends on how your Quantum network is configured.
5	Select the appropriate value for master VME Bus request level from the **Master Bus Request Level** drop-down list. This field determines what priority the board has when trying to acquire master status. It can range from BR0 (the lowest) to BR3 (the highest).
6	For each interrupt level from **Interrupt 1** to **Interrupt 7**, select whether it should be Enabled or Disabled. These fields will only have an effect when the VME acts as a master. If an interrupt level is: • **Enabled** - The controller responds to any messages sent on that interrupt. • **Disabled** - The controller ignores them.

Using the Logic Editor

7

At a Glance

Logic Editor Overview

The Logic Editor is used to view and/or edit ladder logic in Offline, Online or Emulation mode. In Offline mode, network logic is loaded into the Logic Editor from the database when it is opened. In Online mode, network logic is read from the PLC one network at a time. In Emulation mode the power flow is simulated using the network logic loaded from the project.

What's in this Chapter?

This chapter contains the following topics:

Logic Editor Overview

Overview

The Logic Editor is used to enter logic elements, display input/output data, and add descriptors and force discretes.

The Logic Editor shows project ladder logic in either Offline, Online, Combined or Emulation mode. In Offline mode, network logic is loaded into the Logic Editor from the project when the editor is opened. In Online and Combined mode, network logic is read from the PLC one network at a time. During idle states of Online mode, networks around the currently displayed network may be cached for faster access to the networks.

The logic editor is made up of four panels:

Panel	Description
Network Navigator panel	The Network Navigator Panel (tree) is used to navigate through networks and segments. To display or hide the Network Navigator Panel, select **View** → **Navigation Tree** from the logic editor right-click menu.
Logic Editor panel	The Logic Panel contains the view of the logic contained in the currently viewed network. The title of the Logic Panel contains the current network, maximum network and the page title for the network. In Online and Emulation mode, powerflow will be drawn per cell based on the properties of the Logic Editor. The cursor tracks several features: instruction help placed in Tracking Help window, tracking documentation for the current address in Documentation editor and data for the current network.
Instructions panel	The Instructions Panel contains a list of all available instructions for the current project. New instructions are entered by dragging from the Instructions Panel and dropping into the Logic Panel. The list of instructions is alphabetically sorted. To display or hide the Instructions Panel, select **View** → **Instruction List** from the logic editor right-click menu.
Properties Panel	The Properties Panel contains information about the current cell the cursor is on. Depending on the type of cell, the Properties Panel will contain a 1, 2 or 3 high instruction. For a blank cell, the Properties Panel will contain only the name property. To display or hide the Properties Panel, select **View** → **Properties** from the logic editor right-click menu.

Note: The instructions, properties and networks panels can be opened or closed using the right-click menu in the logic panel. Select **View** → **Instruction List or Properties or Navigation Tree.**.

Logic Editor Properties

Customizing the Logic Editor Display

The Logic properties dialog box tells ProWORX 32 how to display each cell in a network. In the project navigation tree:

Step	Action
1	Right click the **Logic** icon.
2	Select **Properties** from the right-click menu.
3	Configure the logic editor properties as desired. See ‘Logic Editor Display Properties’.
4	Click **OK** to save and apply changes.

Logic Editor Display Properties

In the logic editor properties window:

Property	Description
Color Configuration	The color of the descriptor, symbol, data, back reference, cursor background, cursor foreground, logic background, logic foreground, and power flow is user defined. Click the color box beside the text and select a color from the Color dialog box. To set the colors to their defaults, click the **Default** button. This will also set the power flow line width to three.
Power Flow Line Width	In Emulation or Online mode, the power line shows the flow of power. You can adjust the width of this line from 1 to 6.
Display Settings	Up to seven lines are available for each element: Five lines above the instruction and two below it. For each line, select one of the following: ● Clear - This line is not displayed. ● Address - The address associated with the cell is displayed. ● Descriptor (1 - 9) - Descriptors specified in the documentation editor are displayed. ● Symbol (1,2) - Symbols specified in the documentation editor are displayed. ● Data - The addresses data is displayed. ● Back Ref - Back referencing information is displayed. ● Blank - This line is blank.
Column Width	Select the column width for the seven lines of cell description. Increasing the width allows less instructions to fit on the screen, but more descriptor, data and symbol information to be displayed.
Always Fit 7 Rows x 11 Cols	Check the check box to always see the full grid of instructions in the window. If the check box is unchecked, the cells will be displayed at full size and you will have to scroll to see the entire network.

Property	Description
Show Coils in Solve Column	Check the check box to see the coils where they are solved by the controller. If the check box is unchecked, the coils will always be displayed in the 11th column attached to the solve column by dots.
Multi Function Naming	When checked, function identifier constants are replaced with four-letter descriptions of the function operation.
Confirm Overwrites	You are prompted to confirm each time you overwrite an existing ladder logic instruction with a new one. This security feature is useful when working online.
Multi Instruction Insert	When checked, you can add as many instruction as you want without specifying an associated address.
Confirm Deletes	You are prompted to confirm each time you try to delete an instruction from ladder logic. Use this function to protect your ladder logic, especially while working online.
Use Insert/ Delete Key Menus	When checked, you can access the Insert menu by pressing the INSERT key and the Delete menu by pressing the DELETE key. When cleared, these keys operate normally and the menus are only accessible from the Edit menu.
Show Cross Reference Tips	When checked, a tooltip will be visible showing the cross reference information for the address that your cursor is hovered over. The tooltip is in the format network.row.instruction.
ISA Symbols	When checked, enables the use of ISA symbols in the logic view.

Hotkey Template

Overview

The hotkey template is used to select the type of hotkey support that you wish to use. The possible options are ProWORX 32, ProWORXPLUS, or Modsoft. The following table lists the supported hotkeys for Modsoft and ProWORXPLUS.

Changing the Hotkey Template

From the My Computer (in the Navigation panel), right-click menu:

Step	Action
1	Select **Properties**. The Properties dialog appears.
2	Select the **Logic** tab.
3	From the Hotkey Template drop-down, select the template you want to use. (ProWORX 32 (default), ProWORXPlus, or Modsoft.
4	Click **OK** to save the changes and exit the Properties dialog.

Modsoft Hotkey Listing

Modsoft Hotkey Listing:

Hotkey	Operation	ProWORX 32 Equivalent
ALT+F2	Invoke RDE	Data Watch Window
ALT+F3	Copy	Block Copy
ALT+F4	Delete	
ALT+F5	Paste	Block Paste
ALT+F6	Offset	Replace
ALT+F7	Search	
ALT+A	Append Network	Insert Previous Network
ALT+B	Retrace	
ALT+D	Delete Network	
ALT+I	Insert Network Before	Insert Previous Network
ALT+L	Latched Coil	
ALT+M	Retentive Coil	
ALT+N	Negative Transitional	
ALT+P	Positive Transitional	
ALT+T	Trace	Locate Coil
ALT+V	Vertical Short	
ALT+Z	DX-Zoom	Register Editor
CTRL+PgUp	Previous Segment	
CTRL+PgDn	Next Segment	
CTRL+Home	Goto 1st Network of Segment	
CTRL+End	Goto Last Network of Segment	
CTRL+F8	Configuration	

ProWORXPLUS Hotkey Listing

ProWORXPLUS Hotkey Listing:

Hotkey	Operation	ProWORX 32 Equivalent
ALT+A	Address Used	
ALT+C	Coil Rebuild (Offline), Coil Column (Online)	
ALT+G	Global Addressiing	Replace
ALT+H	Help	
ALT+J	Jump to Mark	
ALT+L	Log Book	
ALT+O	Locate Coil	
ALT+R	Register Editor	
ALT+S	Search	
ALT+T	Trace (Online)	
ALT+U	Undo	
ALT+X	Mark Location and Exit	
ALT+Z	Retrace	
CTRL+D	Network Display Setup	Logic Properties
CTRL+T	Terminal Block Search	
CTRL+U	Unlink All Macros	

Using the Logic Editor

Editing Overview

The level to which you can edit in the logic editor is set in the client security settings. For more information see *ProWORX 32 Client Security, p. 20*, User Rights.

Offline Edit Mode Overview

Offline Edit Mode lets you make changes (e.g., entering instructions with undefined addresses or duplicate coils) to network logic in the online logic editor without updating the controller in real-time.

Switching to Offline Edit Mode

From the logic editor right-click menu:

Step	Action
1	Select **Edit** → **Offline Edit Mode**. While you are in Offline Edit Mode, the network appears in bright blue, with no power flow or state flow shown. The status bar will display "Offline Edit Mode" in bright blue. As long as you are in the Offline Edit Mode, changes made to the network won't be sent to the controller. Instead, they will be kept in a temporary buffer until you exit the Offline Edit Mode or change networks.

Editing Logic in Offline Edit Mode

In the logic editor:

Step	Action
1	Use the same editing conventions and procedures as the ProWORX 32 Offline editor does. Remember, however, that you cannot edit more than one network without either cancelling the edit or writing the edit to the controller.

Exiting Offline Edit Mode

From the logic editor right-click menu:

Step	Action
1	Select **Edit** → **Offline Edit Mode**. -or- Select **Edit** → **Save Network**. (Only visible when in offline network mode.) -or- Exit the logic editor.
2	You are then prompted about writing your changes to the controller: ● **Yes**: ProWORX 32 checks the new network for undefined addresses and duplicate coils. If none are found, ProWORX 32 deletes the original network in the controller, and sends the new network (created in Offline Mode) to the controller. ● **No**: Returns to regular logic editor. ● **Cancel**: Returns to Offline Edit Mode.

Undoing and Redoing Edits

Use the undo/redo feature to reverse or reapply up to 10 actions.

Note: If you receive the messages "Undo information not recognized, clearing undo/ redo information", a possible cause could be the register ranges that are set for the PRWX loadable are being overwritten by theTraffic Cop, Peer Cop, MSTR, or other instruction addresses that are already used. Search for address conflicts with the Used Address feature, see *Address Used, p. 60*.

To Undo/Redo an Edit

From the logic editor, right-click menu:

Step	Action
1	Select **Edit** → **Undo** or **Edit** → **Redo**. The Undo/Redo Stack dialog appears.
2	Click in the list where you want the starting point of the actions redone/undone. The rows (actions) above the selected action are also selected.
3	Click OK to undo or redo the selected actions.

Undoing/ Redoing Online

While working online, the undo/redo feature only works when:

- The property Online Multiple Undo/Redo Enabled is selected. See *Logic Editor Properties, p. 130* for more information.
- The PRWX MSL loadable is added to your controller and is in the logic.
- You use a running controller that supports this feature.

Online undo/redo is supported by the following controllers:

984-685E	984-AT4	Compact A120 Series
984-785E	All Quantums	Compact TSX
984-785L	984-VM4	Atrium

Adding the PRWX MSL Loadable

After the Online Multiple Undo/Redo Enabled property is enabled:

Step	Action
1	Attach to a valid controller. The Add PRWX Loadable dialog box appears.
2	In the **Command** field, type an unused register to be used by ProWORX 32 to control the loadable.
3	In the **Table** field, type an unused register of a starting range (4yyyy to 4yyyy+150) to used by ProWORX 32 to transfer data into the loadable.
4	In the Network field, type a value between one and the maximum number of networks in the device. This number represents the network location to be created and where the PRWX instruction will be placed. Up to 5000 networks can be defined.

Working with Networks

Overview

A ladder logic network contains a 7x11 celled grid. Network logic is solved from left-to-right, top-to-bottom.

Inserting Networks

In the logic editor:

Step	Action
1	To insert a network into a blank segment, select **Insert Network** from the Network Navigator panel right-click menu.
2	To insert a network after the current network, select **Insert** → **Next Network** from the Network Editor right-click menu.
3	To insert a network previous to the current network, select **Insert** → **Previous Network** from the Network Editor right-click menu.

Moving Networks

You can move or copy networks within or between segments and within or between projects by using the standard **Cut**, **Copy**, and **Paste** functions. Theses functions can be selected from the Network Navigator right-click menu, or from the ProWORX 32 toolbar.

Deleting Networks

From the logic editor right-click menu:

Step	Action
1	Select **Delete** → **Network**. The current network is deleted and the any remaining networks are shifted up one network.

Working with Network Rows and Columns

In the logic editor:

Step	Action
1	To insert a row or column, select **Insert** → **Row (or) Column** from the logic editor right-click menu. You can only insert a row or column if it does not make the network invalid. Inserting a column shifts existing columns to the right. Inserting a row shifts existing rows down.
2	To delete a row or column, select **Delete** → **Row (or) Column** from the logic editor right-click menu. You can only delete a row or column if it does not make the network invalid. Deleting a column shifts existing columns to the left. Deleting a row shifts existing rows up.

Initializing Logic

In the logic editor:

Step	Action
1	To initialize logic (delete all existing logic and networks from the current project), select **Initialize Logic** from the loigc editor right-click menu.

Instructions

Overview

The Instruction Panel contains all available logic instructions. You can use the instruction list to drag and drop instructions into logic.

Displaying the Instruction List

From the logic editor right-click menu:

Step	Action
1	Select **View** → **Instruction List**.

Adding an Instruction to a Network

From the instruction panel:

Step	Action
1	You can drag-and-drop instructions from the instruction to any point in logic.
2	You can also add an instruction to the cell that the cursor is currently on, by selecting an instruction from the Instructions Toolbar.

Moving Instructions

You can move or copy instructions within or between networks and within or between projects by using the standard **Cut**, **Copy**, and **Paste** functions. Theses functions can be selected from the Logic Editor right-click menu, **Edit**, or from the ProWORX 32 toolbar.

Finding Instructions

To find all like instructions in ladder logic:

Step	Action
1	Set the logic editor cursor to the bottom node of the instruction that you want to search for.
2	Select **Search** → **Instruction Search** from the logic editor right-click menu. E.g. To find all ADD instructions in logic, set your cursor to the bottom node of an ADD instruction anywhere in logic and select Instruction Search.
3	All instructions found are listed in the Search Results window in the format InstructionName.Network.Row.Column.
4	To go to an instruction in the Logic Editor, double-click the desired instruction in the Search Results window.

Deleting an Instruction from a Network

From the logic editor:

Step	Action
1	Select the instruction that you want to delete and press DELETE.

Configuring an Instruction

In the properties panel:

Step	Action
1	Select the property you want to configure.
2	Enter an appropriate value.
3	Press ENTER to update the instruction's properties.

Instruction Properties

Property descriptions:

Property	Description
Top Type	Top node address type.
Top Offset	Top node address.
Mid Type	Middle node address type.
Mid Offset	Middle node address.
Bottom Type	Bottom node address type.
Bottom Offset	Bottom node address.
Name	Instruction name.

Working with Addresses

Editing Addresses in Ladder Logic

In the logic editor:

Step	Action
1	To edit a single address, double-click the cell that contains the address you want to edit. Type the new address in the cell and press ENTER to save the changes.
2	You can also change the address by using the Properties panel and changing the **Type** and **Offset** values for any given cell.
3	To edit a batch of addresses across networks, select **Search** → **Replace**.
4	Enter the address to replace in the **Find What** field and the address that is to replace it in the **Replace With** field, and select **Replace**. The logic Replace dialog appears.
5	Click **Find Next** to find an instance of the source address. If you want to replace the address, click **Replace**. If not, click **Find Next** again, and so on. If you simply want to replace all addresses, click **Replace All**.

Finding Addresses in Ladder Logic

In the logic editor:

Step	Action
1	To find a specific address, select **Search** → **Find** (CTRL+F).
2	Enter the address you want to search for in the **Find What** field.
3	Click **Find Next** to find the address in logic.
4	To find all like addresses in ladder logic, set the logic editor cursor to a cell that contains the address that you want to search for.
5	Select **Search** → **Address Search** from the logic editor right-click menu. E.g. To find all 10001 addresses in logic, set your cursor to a cell containing the address 10001 and select Address Search.
6	All Addresses found are listed in the Search Results window in the format InstructionName.Network.Row.Column.
7	To go to an address in the Logic Editor, double-click the desired address in the Search Results window.

Tracking Ladder Logic Addresses in the Data Watch Window

From the logic editor right-click menu:

Step	Action
1	To track the address at the cursor, select **Data** → **Add Watch** (CTRL+W) or select **Data** → **Track** → **Address**.
2	To track all addresses in an instruction, select **Data** → **Track** → **Instruction**.
3	To track all addresses in a network, select **Data** → **Track** → **Network**.
4	To track all discrete addresses in a network, select **Data** → **Track** → **Discrete**.

Disabling and Forcing Discretes

You can force a discrete to the ON or OFF state. This removes control of the discrete from logic: it remains in the fixed state until the force is removed. Enabling a discrete removes the Disabled On or Disabled Off, placing control of the discrete back in logic.

Step	Action
1	To force discretes in a network ON, select **Data** → **Disable On** (CTRL+S) from the logic editor right-click menu.
2	To force discretes in a network OFF, select **Data** → **Disable Off** (CTRL+D) from the logic editor right-click menu.
3	To return control of a discrete's state back to logic, select **Data** → **Enable** (CTRL+E) from the logic editor right-click menu.

Using Addresses from the Documentation Editor

In the Documentation Editor, summary view:

Step	Action
1	Select an address and drag-and-drop it into any instruction in logic or any address property in the properties panel.

Configurable Mnemonics

Overview

In ProWORX 32, all instruction mnemonics are configurable, so you can use mnemonics you are already familiar with.

Editing a Mnemonic

From the project right-click menu in the Navigation panel:

Step	Action
1	Select **Properties**.
2	Select the mnemonic to edit and click **Edit** or double-click the mnemonic to edit.
3	Type in the new mnemonic.
4	Click outside of the field or press ENTER. **Note**: If you try to type an existing mnemonic, ProWORX 32 reverts to the old mnemonic.
5	Click **OK**.

Mnemonics Listing

Mnemonic descriptions:

Mnemonic	Description	
NO	-] [-	Normally Open
NC	-]\[-	Normally Closed
PTC	-]P[-	Off to On
NTC	-]N[-	On to Off
VTO	| OPEN	Vertical Open
VTS	| SHRT	Vertical Shunt
HSH	-SHRT	Horizontal Shunt
CNR	-()-	Normal Coil
CR	-(L)-	Latched Coil
SKP	SKP	Skip Function
UCT	UCTR	Up Counter
DCT	DCTR	Down Counter
T1	T1.0	Timer (seconds)
T0	T0.1	Timer (tenths)
T.	T.01	Timer (hundredths)
ADD	ADD	Addition
SUB	SUB	Subtraction
MUL	MULT	Multiplication

Mnemonic	**Description**	
DIV	DIV	Division
RT	R->T	Register to Table
TR	T->R	Table to Register
TT	T->T	Table to Table
BLK	BLKM	Block Move
FIN	FIN	First-In
FOU	FOUT	First-Out
SRC	SRCH	Table Search
STA	STAT	System Status
AND	AND	Logical And
OR	OR	Inclusive Or
CMP	CMPR	Logical Compare
SEN	SENS	Logical Bit Sense
MBI	MBIT	Logical Bit Modify
COM	COMP	Logical Complement
XOR	XOR	Exclusive Or
BRO	BROT	Logical Bit Rotate

ISA Symbols

Overview

If the ISA Symbol Name field in the project is set up to support discrete addresses, the network editor draws the ISA symbol instead of the ladder logic instruction.

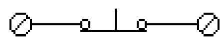
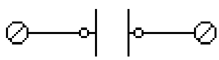
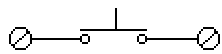
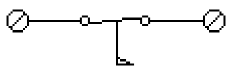
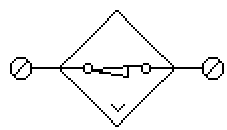
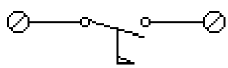
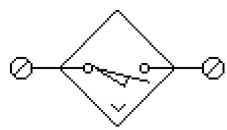
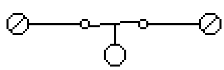
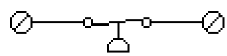
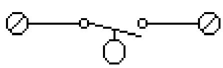
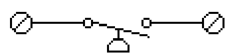
Attaching an ISA Symbol to a Discrete Device

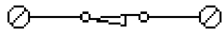
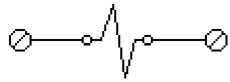
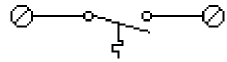
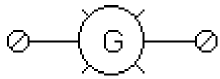
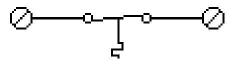
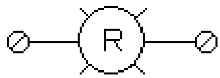
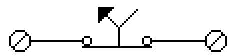
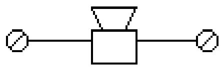
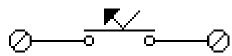
From the logic editor:

Step	Action
1	Select a discrete device.
2	Enter an ISA symbol name in the **ISA Symbol** field in the Documentation Editor.

ISA Symbol Reference

ISA Symbols:

Symbol	Diagram	Symbol	Diagram
CRNC		PBNC	
CRNO		PBNO	
FLSNC		PRSNC	
FLSNO		PRSNO	
FSNC		PSNC	
FSNO		PSNO	

Symbol	Diagram	Symbol	Diagram
LSNC		SOL	
LSNO		TASN	
LTG		TASNC	
LTR		TGSN	
HORN		TGSNO	

Diagnostic Trace

Overview

The Diagnostic Trace feature is a very powerful search mechanism. It is used to find dependencies of a particular output (0xxxx). A search is performed to find the destination point. Then each network is searched to find dependencies of the output address. Each network is then searched to find dependencies of these dependencies.

Why Use Diagnostic Trace?

Use Diagnostic Trace to isolate problems relating to a specific output. For instance, if an output is off when it should be on, the Diagnostic Trace will search through logic to determine which addresses affect its state.

Using Diagnostic Trace

From the right-click menu in the logic panel:

Step	Action
1	Make sure that the address you want to trace is selected and click **Search** → **Diagnostic Trace**.
2	To move to an addresses cross reference, select the cross reference from the address drop-down box. The logic editor moves to the selected network, row, and column.

Analyzing Diagnostic Trace Results

The Diagnostic Trace window shows the output address on the right side of the window. The column to the left is all the dependencies of the output address. The next column is all the dependencies of the dependencies.
Address color scheme:

Color	Description
Red	This address is likely to be the source of the problem.
Yellow	This address could be related to the problem.
Green	This address is not likely to be the source of the problem.

Note: To update the ladder logic cross references, select **Update Cross References** from the logic editor right-click menu.

Sweep (Online Only)

Overview

The Sweep function is a powerful diagnostic tool that lets you solve logic for a set number of scans or solve logic continuously with a constant time between scans.

Constant Sweep Mode

The Constant Sweep mode sets the controller to scan and solve logic and update I/O continuously, but with a constant time interval between scans.
If the actual scan time is less than the imposed scan time, the controller waits for the imposed scan time to elapse before performing the next scan. If the actual scan time is more than the imposed scan time, the controller finishes the scan, then continues on with the next scan. This lets you slow the scan time to when debugging logic, so that the controller doesn't solve logic too quickly for you to catch errors.

Performing a Constant Sweep

From the networks panel (tree), right click menu:

Step	Action
1	Select **Sweep**.
2	In the **Sweep Mode** area, select the **Constant Sweep** radio button.
3	Enter the target time (in 10's of milliseconds) for each scan in the **Time** box.
4	Enter a 4xxxx register to hold the target time value in the Register (4xxxx) box. The actual time taken for each scan is placed in the next register, so a total of two registers are used.
5	Click **OK**.

Single Sweep

Single Sweep mode sets the controller to scan and solve logic, and update I/O for a set number of scans only. When the sweep is finished, the controller stops solving logic and updating I/O, waits until you manually trigger the sweep.

WARNING

Ensure hardware not part of critical process.

The Single Sweep function should **not** be used to debug controls on machine tools, processes, or material handling systems when they are active. Once the set number of scans is solved, all outputs are frozen in their last state. Since no logic solving is occurring, all input information is ignored. This can result in unsafe, hazardous, and destructive operation of the machine or process connected to the controller.

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

Performing a Single Sweep

From the networks panel (tree), right click menu:

Step	Action
1	Select **Sweep**.
2	In the **Sweep Mode** area, select the **Single Sweep** radio button.
3	Enter the target time (in 10's of milliseconds) for each scan in the **Time** box. **Note**: If the actual scan takes less time than the target scan time, the controller waits for the target scan time to elapse before performing the next scan. If the actual scan takes more time than the target scan time, the controller finishes the scan, then continues on with the next scan. This lets you force the scan time to a higher rate when debugging logic that the controller may solve too quickly to otherwise catch.
4	Enter the number of scans (1-15) to be performed during the sweep the **Scans** box.
5	Click **OK**.
6	When you are ready to perform the sweep, select **Sweep** from the networks panel (tree) right click menu.
7	Select one of the following radio buttons: ● **Invoke**: Select to start the sweep. ● **Trigger**: Select to set a trigger for the sweep. ● **Turn Off**: Select to shut off the sweep.
8	Click **OK**. The controller performs the scans (unless you selected Turn Off), then stops solving logic with all outputs frozen in their last state. You can then browse register contents and perform other diagnostics using this "snapshot" of the solving process.

Setting Bookmarks in Logic

Overview

You can set bookmarks in your network logic so you can quickly return to a cell or series of cells. The Mark and Goto Marks functions allow quick viewing of non-consecutive areas of logic. By marking multiple cell locations on different networks, you can use the mark table to quickly jump between the marked locations.

Setting a Mark in Logic

In the logic editor:

Step	Action
1	Set the cursor to the cell that you want to mark.
2	Select **Search** → **Mark** from the right-click menu. The cell is added to the Bookmark Table.

Going to a Marked Cell

In the logic editor:

Step	Action
1	From the right-click menu, select **Search** → **Goto Mark**. The Goto Mark dialog appears.
2	Select the mark you want to go to from the list and click **Goto**.

Deleting a Bookmark

In the logic editor:

Step	Action
1	From the right-click menu, select **Search** → **Goto Mark**. The Goto Mark dialog appears.
2	Select the mark you want to delete from the list and click **Delete**.

Hardware Clock

Overview

Many controllers have a built-in Time of Day clock. You can set these clocks if the controllers starting register is configured in Configuration (see *General Tab Parameters, p. 77*), you have the necessary rights, and the controller is running.

Configuring the Hardware Clock

From the network tree right-click menu:

Step	Action
1	Select **Hardware Clock**. The Hardware Clock dialog appears.
2	In the **First Day of Week** drop-down list box, select the day the controller will use as the first day of the week.
3	Do one of the following: ● To synchronize the controllers date and time with your computer, click **Auto Set**. ● Type the date in mm-dd-yy format in the **Controller Date** box. Type the time in hh-mm-ss format in the **Controller Time** box.
4	Click **OK**

Hardware Clock Registers

The time of day clock requires eight 4xxxx registers in your controller:

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

Segment Scheduler

Overview

The Segment Scheduler governs when each segment of logic is solved and controls which I/O drops are updated after each segment is solved.

The number of segments in the project is set in the Configuration editor. By default, the segments are solved in numerical order (segment one first, segment two next, and so on).

Using the Segment Scheduler

In the Networks panel right-click menu:

Step	Action
1	Select **Segment Scheduler**.
2	Edit the fields in the Segment Scheduler dialog.

3	Select the control input:
	• Continuous: Sets the segment in this row to be solved every scan.
	• Set Control: Sets the segment to be solved only when a discrete address is in a specific state. If you select Set Control, you must also:
	  • Type the discrete address in the Address field, which controls whether the segment in this row is to be solved.
	  • Select whether the segment in this row is to be solved when the control discrete is **On** or **Off**.
	• Watchdog Timer Reset: Inserts a Watchdog Timer.

4	Select the segment from the drop down list.
5	Select the input drop associated with the segment in this row during the solve from the drop down box.
6	Select the output drop associated with the segment in this row during the solve from the drop down box. For S901 projects/controllers the Drop In is replaced with Chan In and Drop Out is replaced with Chan Out.
7	Click **OK**.

Equation Networks

Overview

An Equation Network provides an easy way to program complex math functions, with values stored in register locations. Equations in an Equation Network are presented in a regular, left-to-right format, technically known as "infix" notation. You program Equation Networks and set its enable contact and output coil(s) in the Equation Network Editor.

Equation Networks were introduced in Quantum Rev. 2 controllers; not all controllers support Equation Networks. The easiest way to see if your controller supports Equation Networks is by trying to create a new one—if your controller doesn't support it, the Equation Network option on the right-click Insert menu won't be available.

Creating an Equation Network

In the Network Navigation panel:

Step	Action
1	Select the network where you want to insert the equation network.
2	From the right click menu in the logic editor select **Insert** → **Equation Network**. An equation network occupies a whole network, regardless of the contents of the equation network.

Using the Equation Network

In the Properties panel:

Step	Action
1	Select an input type from the **Input Type** drop-down list.
2	Enter the input offset in the **Input Offset** property
3	Set the register address for the output coils. You can enter either the direct address (in X:Y numeric format) or a symbolic address. You can also insert addresses from the Symbols list panel, Used Register Address table and the Descriptor Summary.See below for coil descriptions.
4	Enter an equation into the network by selecting the ellipsis box in the **Equation** property or double-clicking anywhere in the Equation Editor Network. The Equation Editor dialog appears.

Coil Descriptions

Coil descriptions:

Coil	Description
Solved OK	Solved OK is set when the equation is being solved without errors.
< Coil	Result<0 is set when the equation result is less than zero.
= Coil	Result=0 is set when the equation result is equal to zero.
> Coil	Result>0 is set when the equation result is greater than zero.
Error Coil	Error is set when errors have occurred while solving the equation. While online, if the Error coil receives power, an error message will appear under the coil describing the error.

Note: If you don't want to use a particular output coil, leave the address for that coil blank (or erase one already typed in). That coil will not be included in the Equation Network.

Setting up an Enable Contact

An Equation Network's enable contact, when set, activates the Equation Network. If an enable contact passes current, the Equation Network will be solved. You change settings for the enable contact in the Enable Editor display.

To select a type for the enable contact, select the symbol of the enable contact that corresponds with your chosen type. An enable contact can be a normally-open contact, normally-closed contact, horizontal short, or a horizontal open.

To select a register address for the enable contact, in the Enable Contact address field, type the direct address (in X:Y numeric format) or symbolic address for the enable contact coil. This field is only available if the enable contact type is a normally-open or normally closed contact.

Mathematical Equations in Equation Networks

Equation Format

ProWORX 32 expects equation elements to appear in a specific format. Operations and functions each have their own format. Also, for each value, you must specify what kind of value it is (register address, constant or symbol) and its data type (signed integer, unsigned integer, etc.).

Equation Values and Data Types

Each value can refer to a constant, register address or symbol. The Equation Network Editor determines which data type the value is, based on the following format.

Format	Meaning	Example
Default (no # sign or single quotes	Register address	40001
Prefixed by #	Constant	#123
Enclosed in single quotes	Symbol	‘HEIGHT’

The actual data type of a value is determined by its suffix, as shown in the following table:

Suffix	Meaning	Example
None	16-bit Integer	#38
U	16-bit unsigned Integer	40001U
L	Long (32-bit) signed Integer	#-123L
UL	Long (32-bit) unsigned Integer	‘HEIGHT’UL
F	32-bit floating point (real)	#+1.45E-4F

Typically, you’d first indicate the register address where the calculated result is to be stored, followed by an equal sign (the "assignment operator"), followed by the calculation itself. For example:

```
40001 = 40002U + COS(40003UL) * #+1.35E-4F / ’HEIGHT’L
```

- 40002U is an address of a 16-bit unsigned integer.
- COS(40003UL) calculates the cosine of a long (32-bit) unsigned integer value stored at address 40003.
- #+1.35E-4F is the floating point value of 0.000145, given in exponential notation.
- ’HEIGHT’L is a symbol of the name HEIGHT, representing the address of a long (32-bit) signed integer.
- 40001 = indicates that the result of the calculation is to be stored in register address 40001 as a 16-bit signed integer.

Everything to the right of the assignment operator also constitutes an expression. An expression is any part of an equation that can be evaluated to a single value. This can be a single constant or register address, or a complete mathematical operation. For example, #35 is an expression, as are LOG(#10) and 40002U + COS(40003UL). Complex expressions can contain other expressions within them, as in #3 * (40002U + COS(40003UL)). For the most part, any operator or function can be performed on any expression, no matter how complex.

Note: It is good programming practice to enclose all expressions in parentheses, even when they're not actually needed. This makes the equation easier to read and ensures that operations in an equation are solved in the correct order.

Exponential Notation

Floating point numbers are normally specified in exponential notation, as in:

`+1.34E-4`

This represents 1.35 times 10 to the -4th power, or 1.35 times 0.0001. Thus, we would shift the decimal place four places to the left to get 0.000135. The "-4" part is called the exponent (note the preceding "E") and can be a positive or negative number.

In the Equation Network Editor, you must also indicate:

- That these numbers are constants; and
- Their data types. For example, integers or floating point numbers.

The default data type is unsigned 16-bit integer. So, since the above value is a fraction (and therefore must be a floating point number), it would have to appear as `#+1.35E-4F`.

With no data type suffix, numbers in exponential notation are assumed to be integers. For example, #+1.35E+2 represents the unsigned 16-bit integer value 135. Exponential notation is particularly useful for very large integers.

Mathematical Operations in Equation Networks

Mathematical Operations

The following table lists the mathematical operations you can include in your equation:

Type	Operator	Result
Assignment operator The assignment operator = is used to assign a storage place for the results of the equation. All equations will use the assignment operator. The format is: `ADDRESS = EXPRESSION` Where ADDRESS is a valid register address and EXPRESSION is a valid value or expression assigned to the address.	=	Assignment
Unary Operators "Unary" means "single", so unary operators are used on only one value. The unary operator is placed just before the value or expression to which it is applied. For example, -(30002) returns -1 times the number stored at address 30002.	-	Negation. The result is -1 times the value.
	~	Ones complement. This works on the binary representation of a value: all 1s are changed to 0s and vice versa.
Exponentiation operator Takes values to a specified power. 40001**3 returns the (integer) value stored at 40001, taken to the third power.	**	Exponentiation
Arithmetic operators These require two values, one before and one after the operator. These values can be any valid expression. For example, #4 * 40003 results in four multiplied by the value stored at address 40003.	*	Multiplication
	/	Division
	+	Addition
	-	Subtraction

Type	Operator	Result
Bitwise operators Bitwise operators work on binary (base 2) representations of values. • In the case of AND, OR and XOR, the computer applies the operator to each digit in the two values: 010 XOR 011 (2 XOR 3 in decimal numbers) results in 001 (1 in decimal). • In the case of shifting operators, the computer shifts all digits in the binary representation of the number the given number of places to the left or right. Digits on one side of the number are lost, and zeros fill in the blanks on the other side. For example, for 8-bit numbers, 77 << 2 means 01001101 shifted left two digits. The binary result is 00110100, or 52 decimal.	&	AND. The single bit result of an AND operation is only true (1) if both bits are set to 1.
	|	OR. The single bit result of an OR operation is true (1) if either bit is set to 1. The result is false (0) only if both bits are set to 0.
	^	XOR. Short for "Exclusive OR". The single bit result of an XOR operation is false (0) if both bits are the same, true (1) otherwise.
	<<	Left Shift. The result of 40001<<#2 is the binary representation of the number stored at 40001 shifted left two (#2) places. Zeros are added on the right to fill in the gap.
	>>	Right Shift. The result of 40001>>#2 is the binary representation of the number stored at 40001 shifted right two (#2) places. Zeros are added on the left to fill in the gap.
Relational operators These operators describe a comparison between two values or expressions. The result is always true (1) or false (0). For example, #35 <= #42 evaluates to 1 (true). Relational operators are used in Conditional expressions.	<	Less than.
	<=	Less than or equal to.
	=	Equal to.
	<>	Not equal.
	=>	Greater than or equal to.
	>	Greater than.
Conditional operators See below for details.	?:	Used in conditional expression.
Parentheses Used to set precedence in solving equations. To make sure certain operations are solved before others, enclose those operations in parentheses.	()	

Conditional Expressions

In Equation Networks, conditional expressions take the following form:

```
EXPR1 RELOP (EXPR2) ? (EXPR3) : EXPR4
```

EXPR1 through EXPR4 can be any address, value or expression. If EXPR2 or EXPR3 are not single values or addresses, they must be enclosed in brackets. RELOP can be any relational operator, such as > (greater than) or <> (not equal to).

When solving a conditional expression, the computer first compares EXPR1 and EXPR2, based on the relational operator. If the comparison is true, the value of the conditional expression is the result of EXPR3. If the comparison is false, the value of the conditional expression is EXPR4.

Note: It is especially good programming practice to enclose all expressions within a conditional expression in parentheses, even when they're not actually needed. This makes the equation easier to read and ensures that operations are solved in the correct order.

Mathematical Functions in Equation Networks

Mathematical Functions

The following table lists the pre-defined math functions you can include in your equation. Each of these functions takes one argument enclosed in brackets following the function name. The argument can be any valid value or expression. For example, COS(#35+40001) returns the cosine of 35 plus the number stored at address 40001. In this table, X refers to a function's argument (as in "COS(X)").

Function	Description
ABS(S)	Absolute value of X (i.e. negative numbers become positive).
ARCCOS(X)	Arc cosine of X radians.
ARCSIN(X)	Arc sine of X radians.
ARCTAN(X)	Arc tangent of X radians.
COS(X)	Cosine of X radians.
COSD(X)	Cosine of X degrees.
EXP(X)	Calculates e (approximately 2.7182818) to the Xth power.
FIX(X)	Converts floating point number X to an integer.
FLOAT(X)	Converts integer X to a floating point number.
LN(X)	Natural (base e) logarithm of X.
LOG(X)	Common (base 10) logarithm of X.
SIN(X)	Sine of X radians.
SIND(X)	Sine of X degrees.
SQRT(X)	Square root of X.
TAN(X)	Tangent of X radians.
TAND(X)	Tangent of X degrees.

Using the Traffic Cop

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At a Glance

Traffic Cop Overview

The Traffic Cop is used to visualize and configure I/O series, drops, cards, and slots. Each I/O series (Quantum, Momentum, Symax, Compact A120, Compact TSX 800, 800, 200-500, DCP, S901, 900, Micro, Micro 984) has the same look and feel, although some series have different I/O structures.

What's in this Chapter?

This chapter contains the following topics:

Traffic Cop Overview

Overview

The Traffic Cop is used to visualize and configure I/O series, drops, cards, and slots. Each I/O series (Quantum, Momentum, Symax, Compact A120, Compact TSX 800, 800, 200-500, DCP, S901, 900, Micro, Micro 984) has the same look and feel, although some series have different I/O structures.

Navigation Panel (Tree)

The navigation panel shows a text-based representation of the traffic cop. The panel is enabled regardless of which I/O series is selected. The tree provides a hierarchical view of configured drops, racks and slots. Navigate through the tree to select a drop or rack to view or to edit its configuration in the Drop or Slot Properties Panel. Using the tree view you can insert, delete, and move any part of the tree (drops, racks, or slots).

Visual Representation

The Visual Representation of the I/O system consists of three views:

- **Drop View** - Visual representation of all racks and slots within the selected I/O drop. Click on any slot to jump to the rack view that contains the selected slot.
- **Rack View** - Visual representation of all slots within the selected rack. Click on any slot to access that slots properties in the Slot Properties Panel.
- **Momentum View** - Visual representation of the momentum traffic cop. This shows only the current branch of I/O. If a new card can be programmed, the last shown card is labelled "AVAILABLE".

Initializing the Traffic Cop

In the traffic cop navigation panel:

Step	Action
1	Right-click the I/O series you want to initialize.
2	Select **Initialize** from the pop-up menu.

	WARNING
	Ensure data integrity. Initializing the traffic cop deletes all drops, racks, and slots, and clears all properties. **Failure to follow this precaution can result in severe injury or equipment damage.**

Working with Drops and Racks

Drop Properties Panel

Lists user-editable and calculated properties pertaining to the selected drop. Available drop properties are:

Property	To Edit:
Drop Series	Select a drop from the available Drop Series drop-down list box.
Hold-up Time	Enter a hold-up time value (3 - 65,535).
Rack (1-x)	Select a rack from the rack drop-down list box. (X represents the number of racks available.)
ASCII Port	Enter an ASCII port value.
Input Bits	Read only - number of input bits used within the selected drop.
Output Bits	Read only - number of output bits used within the selected drop.
Status Word	Enter a 3xxxx address (holds the status information for the drop).
Read Only	Select TRUE or FALSE from the available drop mode drop-down list box.

Note: Not all properties are available for all drops - i.e. a Quantum drop will not have an ASCII port property.

Working with Drops

In the traffic cop navigation panel, select the drop you want to work with. From the right-click menu:

Function	Action	Comment
To insert a drop:	Select **Insert**.	Inserting a drop inserts a drop above the selected drop and moves existing drops down.
To edit a drop:	Select **Edit**.	You can edit the currently selected drop at any time by editing properties in the Drop Properties Panel.
To clear a drop:	Select **Clear**.	Clearing a drop clears all racks from the selected drop.
To delete a drop:	Select **Delete**.	Deleting a drop deletes the currently selected drop and moves the remaining drops up.

Working with Racks

In the traffic cop navigation panel, select the rack you want to work with. From the right-click menu:

Function	Action	Comment
To insert a rack:	Select **Insert**.	Inserting a rack inserts a rack above the selected rack and moves existing racks down.
To edit a rack:	Select **Edit**.	You can edit the currently selected rack at any time by editing the rack property in the Drop Properties Panel.
To clear a rack:	Select **Clear**.	Clearing a rack clears all slots from the selected rack.
To delete a rack:	Select **Delete**.	Deleting a rack deletes the currently selected rack and moves remaining racks up.

Using Cut/Copy/Paste

In the ProWORX 32 traffic cop:

Step	Action
1	All items in the traffic cop (heads, drops, racks, and slots) can be cut, copied and pasted. Also, items can be cut, copied, or pasted between different projects traffic cops.
2	From the item right-click menu, select: ● **Cut** - Removes the currently selected item (including documentation) from the traffic cop into a buffer. ● **Copy** - Copies the currently selected item (including documentation) from the traffic cop into a buffer. ● **Paste** - Inserts the buffered item (including documentation) into the currently selected Slot/Rack/Drop/Head. **Note**: A Slot copy can only be pasted into a slot, if the user attempts to paste the slot onto a drop the paste will be ignored. This holds true for any item that is pasted. The I/O series of the paste must match or it is ignored. ● **Paste Special** - The same as paste, but new available addresses are automatically assigned to any slot that is pasted.

Working with Slots

Slot Properties Panel

Lists user-editable and calculated properties pertaining to the selected slot.

Available slot properties are:

Property	**To Edit:**
Card Name	Select a card from the available cards drop-down list box.
Description	Read only - description of the selected card.
Input Reference	Enter an address type. Only valid entries are accepted.
Input Data Mode	Select a data mode (BIN or BCD) from the data mode drop-down list box.
Output Reference	Enter an address type. Only valid entries are accepted.
Output Data Mode	Select a data mode (BIN or BCD) from the data mode drop-down list box.
Data Length	Enter the data length.
Power Rating	Read only - power rating of the selected card.
Bus Module Count	Read only - number of modules a Bus Module contains.
Bypass Local Bus	Select TRUE or FALSE from the bypass local bus drop-down list box.
Bypass remote	Select TRUE or FALSE from the bypass remote drop-down list box.
Card Config	Displays hex parameter data. To edit, double-click the Card Config property and a Card Config dialog box will open.

Note: Not all properties are available for all slots - i.e. a discrete card will not have the Data Mode property.

Working with Slots

In the traffic cop navigation panel, select the slot you want to work with. From the right-click menu:

Function	Action	Comment
To insert a slot:	Select **Insert**.	Inserting a slot inserts a slot above the selected slot and moves existing slots down. Leaving the Slot Properties Panel without selecting a module while in a Momentum traffic cop will result in the insert being cancelled.
To edit a slot:	Select **Edit**.	You can edit the currently selected slot at any time by editing properties in the Slot Properties Panel.
To clear a slot:	Select **Clear**.	Clearing a slot clears the card from the selected slot.
To delete a slot:	Select **Delete**.	Deleting a slot deletes the currently selected slot and moves remaining slots up.

Online Module Status

PLC Status/ Traffic Cop Functionality Matrix

Functionality Matrix:

		PLC Status		
		Online Running	**Online Stopped**	**Offline**
Traffic Cop Functionality	Read-Only	Yes	No	No
	PLC Status Update Method	Automatically every 3 seconds	Automatically every 5 seconds	N/A
	Online Health	Yes	No	N/A
	Online Module Recognition	No	Yes	N/A
	Data Committed Method	N/A	Controller is updated after user verification	Project is automatically updated

Module Status Icon Reference

Online Stopped - Module Recognition:

Icon	Description
	Indicates that an associated slot is incorrect or missing.
	Indicates a slot that is missing or not configured.
	Indicates that an incorrect slot has been added to the traffic cop.

Online Running - Module Health:

Icon	Description
	Indicates an unhealthy slot.

Adding a Missing Slot

From the traffic cop navigation panel:

Step	Action
1	Double-click the slot  that you want to add. (The correct slot will be selected in the Module property combo-box in the Slot Properties Panel.)
2	Press ENTER to accept the selected slot.
3	Configure the remaining properties of the selected slot.

Fixing an Incorrect Slot

From the traffic cop navigation panel:

Step	Action
1	Double-click the slot  that you want to fix.
2	Select the correct card from the Module property combo-box in the Slot Properties Panel.
3	Press ENTER to accept the selected slot.
4	Configure the remaining properties of the selected slot.

I/O Drawing Generator

Overview

The I/O Drawing Generator creates CAD (Computer-Assisted Design) drawings of 800, Micro, Quantum and A120 Traffic Cop series cards. The drawings are saved in .DXF format, which is supported by most CAD programs.

Setting up the I/O Drawing Generator

From the project right-click menu in the navigation panel:

Step	Action
1	Select **Properties**.
2	Select the **I/O Drawing** tab.
3	Enter, or select by clicking **Browse**, the directory path to store the **Symbol**, **Master**, **Intermediate**, and **Final** I/O drawings in. The I/O drawings created reside in the selected path in a subdirectory which has the same name as the project the drawings are created from.
4	Select **Overwrite Existing Drawings** to discard the existing drawings and save the new ones in their place.
5	Select **Ignore**, **Break**, or **Warn** from the Missing Master Drawings options. This property sets how ProWORX 32 reacts when a master drawing is missing while the I/O drawings are being created.

Using the I/O Drawing Generator

In the project navigation panel:

Step	Action
1	I/O drawings are generated in a two-step process: • **Intermediate**: These drawings are used as a "working" step. Generating a series of Intermediate drawings as you go can save time when it comes to generating the Final drawings. • **Final**: These drawings are generated based on the corresponding Intermediate drawings.
2	To generate an intermediate drawing, select **I/O Drawing** → **Intermediate Drawings** from the Traffic Cop right-click menu.
3	To generate a final drawing, select **I/O Drawing** → **Final Drawings** from the Traffic Cop right-click menu.
4	To generate both an intermediate and final drawing, select **I/O Drawing** → **Both Drawings** from the Traffic Cop right-click menu.

Materials List

Overview

When you have finished configuring the I/O area of your system, you may want to know what materials are required to create the hardware system as configured. The material list function creates a list of all required materials (as configured) and their associated part numbers.

When the materials list is first launched it will generate a list of materials required by the selected project. The materials list will be created from the project if offline or from the controller if online. On a second launch of the materials list the data will be read from the project rather than generated. You can add prices and comments to existing materials as well as add new materials to the list. The materials list can then be printed or saved to HTML, MS Excel or MS Word.

Note: The Material List utility makes some assumptions about cabling that should be checked and modified before printing.

Using the Materials List

In the project navigation panel (tree):

Step	Action
1	From the traffic cop icon right click menu, select **Materials List**.
2	Enter up to six lines of text in the **Header** text box. This text will be displayed at the top of the printed materials list.
3	Add or edit materials in the grid. All fields are editable except Total which is calculated.
4	To regenerate a material list from the controller or project, select **Generate** from the materials grid right click menu.
5	To inset a row at the current cursor position, select **Insert** from the materials grid right click menu.
6	To clear the currently selected row, select **Clear** from the materials grid right click menu.
7	To delete the currently selected row and shuffle the remaining rows up, select **Delete** from the materials grid right click menu.
8	To save the materials list to another format, select **Save As** from the materials grid right click menu.
9	To print out the materials list, select **Print** from the materials grid right click menu.
10	Close the materials list to save the changes.

Cabling Assumptions

Cabling Assumptions:

1	’97-5951-000 RG-11/U Coax Cable 1000 ft. reel’ This is the recommended cable for use as Trunk cable. It can also be used for Drop cabling although it is recommended to use the less expensive: ’97-5750-000 RG-6/U Coax Cable 1000 ft. reel’ for Drop cabling. RG-6/U can also be used for Trunk cabling if the cable run is less than 5000 ft. but is not recommended. If it is used then ’52-0488-000 RG-6/U BNC Connectors’ are used in place of ’52-0401-000 RG-11/U F Connectors’ For cable runs over 8000 ft. up to 15000 ft., CATV cable should be used but is not supplied by Modicon.
2	’AS-W801-012 I/O Signal Cable 12 ft.’ This also comes in 6 ft.’-006’and 1.5 ft.’ -002’lengths.
3	’AS-W804-012 I/O Power Cable to rack with power 12ft.’ This also comes in 5 ft.’-005’and 1.5 ft. ’-002’ lengths.
4	’AS-W802-012 I/O Power Cable to rack no power 12 ft.’ This is interchangeable with: ’AS-W808-002/-005/-008 Light-weight cable’ in 1.5,5 or 8 ft. lengths.

Using the Data Watch Window

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At a Glance

Data Watch Window Overview

The Data Watch Window is used to view and edit register data values for the selected project. The project can be Online, Offline or in Emulation. Live, real time data may be viewed or edited within the Data Watch Window. The data values may be displayed in a number of ways depending on what Data Watch view is active. Several views are available including a Generic Register Editor, a Data Watch/Edit window, a Spreadsheet view, a Trend view, an Instruction view for specific instructions, a Terminal Block view for specific I/O cards and a mini-HMI view. If the preferences are selected, data for Traffic Cop and Network Logic elements are tracked automatically. Data values may also be logged. These values are saved into an external file for future use. Preferences and properties of the Data Watch Window are saved in the project.

What's in this Chapter?

This chapter contains the following topics:

Data Watch Window Overview

Overview

The watch window is the primary Data Watch Window. You can select any valid address for the current device and view the data for that address. Up to 100 addresses of any type may be entered and tracked. The data may be edited at any time. Register values may be changed and discrete values may be enabled or forced on or off. Addresses are automatically saved on exit and reloaded on entry.

Any register data may be viewed or edited with any selected radix type. Available radices are Decimal, Hex, Binary, ASCII, Signed integer, BCD, 32-bit Floating point or 32-bit integer. The bottom status bar will display various information including Status messages, Offline/Online/Emulation state, Running/Stopped state, Trigger info and Clamping info.

Adding Addresses to Track in the Data Watch Window

In the data watch window:

Step	Action	Result
1	Double-click or press ENTER in the first available **Address** cell.	
2	Insert a valid address into the **Address** cell.	
3	Press ENTER to insert the address, ESC to cancel the entry.	The **Data** and **Radix** fields are automatically populated if the address exists in the project. You can edit the data or radix of an address by double-clicking on the cell you want to change.

Clearing Addresses

From the right-click menu:

Step	Action	Result
1	Select **Clear**.	All addresses are cleared from the Window.

Loading Addresses and Data from a Log File

From the right-click menu:

Step	Action	Result
1	Select **Load**.	The DataWatch Address Load dialog appears.
2	Select a log file and click **OK**.	All addresses from the file are added to the Data Watch Window.

Filling the Data Watch Window with Addresses

From the right-click menu:

Step	Action	Result
1	Select **Fill Addresses**.	The Add Addresses dialog appears within the Data Watch Window.
2	Enter an address in the **Starting Address** box.	This is the first in a range of addresses to be added to the Data Watch Window.
3	Enter a numeric value (1 through 100) in the **Number of Addresses** box.	This is the length of the range of addresses to be added to the Data Watch window.
4	Click **OK**.	Addresses specified are added at the current grid location. Existing addresses may be overwritten.

Setting the Radix for Multiple Addresses

In the data watch window:

Step	Action	Result
1	Select the radices you want to change.	
2	From the right-click menu, select **Set Radix**.	The Set Radices dialog appears within the Data Watch Window.
3	Select a radix from the **Radix** drop-down list box.	
4	Click **OK**.	All selected radices are updated to the specified radix.

Deleting Addresses

In the data watch window:

Step	Action	Result
1	Select the addresses you want to delete.	
2	From the right-click menu, select **Delete Addresses**.	Selected addresses are deleted.
3	Or, Select an address and press DELETE.	Selected address is deleted.

Jumping to a Specific Address

From the right-click menu:

Step	Action	Result
1	Select **Goto Address**.	The Goto Address dialog appears within the Data Watch Window.
2	Enter an address in the **Select an Address to find** box.	
3	Click **OK**.	The specified address is selected in the Data Watch Window.

Copying Data Values from One Range of Addresses to Another

From the right-click menu:

Step	Action	Result
1	Select **Data Utilities** → **Copy Data**.	The Data Utilities dialog appears within the Data Watch Window.
2	Enter an address into the **Start Address** box.	The value of this address is the first in the range to be copied.
3	Enter an address into the **End Address** box.	The value of this address is the last in the range to be copied.
4	Enter an address into the **Destination Address** box.	The value of this address is the first to be copied to in the sequential range of addresses specified.
5	Click **OK**.	Values are copied.

Moving Data Values from One Range of Address to Another

From the right-click menu:

Step	Action	Result
1	Select **Data Utilities** → **Move Data**.	The Data Utilities dialog appears within the Data Watch Window.
2	Enter an address into the **Start Address** box.	The value of this address is the first in the range to be copied.
3	Enter an address into the **End Address** box.	The value of this address is the last in the range to be copied.
4	Enter an address into the **Destination Address** box.	The value of this address is the first to be moved to in the sequential range of addresses specified.
5	Click **OK**.	Values are moved.

Filling a Range of Addresses with a Data Value

From the right-click menu:

Step	Action	Result
1	Select **Data Utilities** → **Fill Data**.	The Data Utilities dialog appears within the Data Watch Window.
2	Enter an address into the **Start Address** box.	The value of this address is the first in the range to be filled.
3	Enter an address into the **End Address** box.	The value of this address is the last in the range to be filled.
4	Enter a numeric value into the **Data Value** box.	This value is copied into all specified addresses.
5	Click **OK**.	Address values are set to the specified value.

Searching for a Data Value

From the right-click menu:

Step	Action	Result
1	Select **Data Utilities** → **Search Data**.	The Search Data dialog appears within the Data Watch Window.
2	Enter a numeric value into the **Data Value** box.	This is the value to be searched for.
3	Click **OK**.	The address with the specified data value are selected in the Data Watch Window.

Properties

Using the Data Watch Window Properties Dialog

In the navigation window:

Step	Action
1	Right-click the **Data Watch Window** icon.
2	Select **Properties** from the drop-down list.
3	When you have made your property changes: To save the proerty changes and close the properties window, click **OK**. To save the property changes and remain in the properties window, click **Apply**.

Multi Radix View

When the **Multi Radix View** check box is selected, the Watch Window and the Register Editor are in Multi Radix view. A column is assigned for each selected radix (Hexadecimal, ASCII, Long, Binary, and/or Float) as well as one for Decimal. Each column displays the data value for the given address in the selected format. Radices cannot be edited.

When the **Multi Radix View** check box is not selected, the Watch Window and the Register Editor will be in Single Radix view. Only one radix will be viewable per address. Any radix can be changed.

Changing the View (Single Radix vs. Multi Radix)

In the Data Watch Window Properties dialog:

Step	Action
1	Click the **Multi Radix View** check box.
2	Select which radices (Hexadecimal (**Hex**), Binary (**Bin**), ASCII (**Asc**), **Float**, and **Long**) you would like to view.
3	Click **OK** to save the changes and return to the Data Watch Window.

Trigger

When the **Trigger** check box is selected, the value of a specific address is tracked. When the data for this address reaches the specified value, the Data Watch Window begins tracking and/or logging values. The data is not tracked or logged until the condition is met.

When the **Trigger** check box is not selected, the Data Watch Window automatically tracks and/or logs values.

Setting a Trigger Condition

In the Data Watch Window Properties dialog:

Step	Action
1	Click the **Trigger** check box.
2	Enter the address that you would like to track in the **Address** box.
3	Select the > or < option button.
4	Enter a numeric value in the **State** box.
5	Click **OK** to save the changes and return to the Data Watch Window.

Clamps

When the **Clamps** check box is selected, all data values tracked are forced inside or outside of the range specified. This affects the display only and does not affect the actual data values in the device. This also affects the data sent to the log file.

When the **Clamps** check box is not selected, all data values are displayed as their actual data value.

Setting a Clamp

In the Data Watch Window Properties dialog:

Step	Action
1	Click the **Clamp** check box.
2	Enter a numeric value in the **Lo Clamp** box.
3	Enter a numeric value in the **Hi Clamp** box.
4	Select the **Capture Inside** or **Capture Outside** option button.
5	Click **OK** to save the changes and return to the Data Watch Window.

Log File Size Limit

This value places a size limit on the Log file. Once the limit is reached, no further logging will be done. The limit is in Megabytes.

Setting the Log File Size Limit

In the Data Watch Window Properties dialog:

Step	Action
1	Enter a numeric value (in Megabytes) in the **Max Log File Size** box.
2	Click **OK** to save the changes and return to the Data Watch Window.

Sample Rate

Specifies how often to poll the device for data. The faster the polling is, the more accurate the data is, but the client computers responses will become more sluggish. This rate also affects the rate that data points are logged. The minimum sample rate is one read every sixty minutes, and the maximum sample rate is one read every 25 milliseconds.

Note: This is a target sample rate. The actual sample rate may be slower than you specify due to a large amount of data being polled and the capabilities of your machine.

Setting the Sample Rate

In the Data Watch Window Properties dialog:

Step	Action
1	Move the **Sample Rate** slider to the right for a slower sample rate or to the left for a faster sample rate.
2	Click **OK** to save the changes and return to the Data Watch Window.

HMI

HMI Overview

This view displays a simple Human-Machine graphical grid-based workspace. It allows data to be displayed, data values to be entered, discrete controls to be enacted and basic animation to be visualized.

Each cell in the grid may have a series of pictures assigned to it. These pictures are selected based on the data value of an address assigned to the cell. Therefore, as the data changes, the pictures will change as well. Animated switches, gauges, meters and similar graphics are available.

Setting the Background Color

In the Data Watch Window Properties dialog:

Step	Action
1	Click the Background Color - **Select** button.
2	Choose a color from the Color dialog.
3	Click **OK** to close the Color dialog.
4	Click **OK** to save the changes and return to the Data Watch Window.

Setting the Number of Rows and Columns

In the Data Watch Window Properties dialog:

Step	Action
1	Enter a numeric value into the **Number of Rows** box. (Max: 10, Min: 1)
2	Enter a numeric value into the **Columns** box. (Max: 10, Min: 1)
3	Click **OK** to close the Color dialog.
4	Click **OK** to save the changes and return to the Data Watch Window.

Creating Bitmap Files to Associate with Address Values

Use Windows Explorer to:

Step	Action
1	Ensure all files you want to associate with a cell are in the same directory.
2	Ensure the files you want to associate with a cell are named sequentially **Correct**: Timer_1.bmp, Timer_2.bmp, Timer_3.bmp,... Timer_10.bmp **Incorrect**: Timer.bmp, TTwo.bmp, TimerThree.bmp,... Time10.bmp **Tip**: The easiest way to name bitmaps for use in the HMI is to use the ’BitmapName_#.bmp’ format.

Editing Cell Data

From the right-click menu:

Step	Action
1	Select **Edit Data**.
2	Enter a value in the **Picture** box. (This will update the value of the address associated with the picture.)
3	Enter a value in the **Monitor** box. (This will update the value of the address being monitored.)
4	Press **OK** to save changes.

Associating a Picture with an Address Value

From the right-click menu:

Step	Action
1	Select **Edit Cell**.
2	Select the **Picture Enabled** check box.
3	Enter an address into the **Address** box.
4	Select from the **Stretch Picture** drop-down list box how you would like the pictures to be displayed. (Selecting **None** will trim the bottom and the right-side of the picture to fit, selecting **Fit Cell** will make the entire picture fit the cell, selecting **Fit Width** will trim the bottom of the picture, and selecting **Fit Height** will trim the right-side of the picture.)

Associating a Picture with an Address Value (continued)

After entering an address to associate a picture with:

If...	Step	Action
you have entered a discrete address (0xxxx or 1xxxx)	1	Click **Off Picture** → **Browse** and select a bitmap (.bmp file) to view when the value of the selected address is 0 (zero).
	2	Click **On Picture** → **Browse** and select a bitmap (.bmp file) to view when the value of the selected address is not 0 (zero).
	3	Press **OK** to save changes.
you have entered an analog address (3xxxx or 4xxxx):	1	Click **Picture** → **Browse** and select the first bitmap (.bmp) in a numbered sequence of bitmaps.
	2	Enter a number in the **Actual Range** boxes. (These are the low and high data values you expect or know the address will hold.)
	3	Enter a number in the **# of Pictures** box. (This number will be used to associate different sequentially named pictures with values from the selected address.) E.g. If you enter as an actual range the values 0 and 999, then enter 10 into the # of pictures box, Picture1.bmp (the picture you selected in step 1) will be associated with values 1 through 99, Picture2.bmp will be associated with values 100 through 199, and so on.
	4	Press **OK** to save changes.
Note: A maximum of 100 pictures may be associated with a cell.		

Adding a Caption to a Cell

From the right-click menu:

Step	Action
1	Select **Edit Cell**.
2	Select the **Caption Enabled** check box.
3	Enter the text you want displayed in the cell in the **Caption** box (Maximum 20 characters).
4	Click the **Foreground** button to select the text color.
5	Select the positioning (Top, Middle, or Bottom) of the caption from the **Alignment** drop-down list box.
6	Press **OK** to save changes.

Adding a Value to Monitor

From the right-click menu:

Step	Action
1	Select **Edit Cell**.
2	Select the **Data Monitor Enabled** check box.
3	Enter an address into the **Address** box. (This address may be the same as or different than the address associated with the picture.)
4	Click the **Foreground** button to select the text color.
5	Enter numeric values into the **Actual Range** boxes. (These are the low and high values you expect or know the address will hold.)
6	Enter numeric values into the **Scale Range** boxes. (You can use the scale range to display a ratio value or an offset value for data analysis purposes. You can also set the Scale range to the same values as the Actual range to display raw data.)
7	Select the positioning (Top, Middle, or Bottom) of the caption from the **Alignment** drop-down list box.
8	Press **OK** to save changes.

Trend

Trend Overview

This view does not allow editing of any on-screen information. It is for viewing data only. When active, this view will display a graphical line chart of data values. The time that the data was taken is displayed on the X axis. The data value is displayed on the Y axis as well as on the right hand legend. This is useful for tracking changes in data over time. There are several Zoom and pan functions available.

Setting the Y-Axis Values

In the Data Watch Window properties dialog:

Step	Action
1	Click the **Auto Y Axis Scale** check box to have the Y Axis automatically set and adjust to include all data points. - or - Enter a numeric value into the **Y Axis Min** and **Y Axis Max** boxes to manually set the Y Axis range.
2	Click **OK** to save the changes and return to the Data Watch Window

Setting the Alarm Values

The alarm values are a range of 'safe' values. Any value that is outside of this range triggers an alarm state.In the Data Watch Window properties dialog:

Step	Action
1	Enter a numeric value into the **Lo Alarm** and/or **Hi Alarm** boxes.
2	Click **OK** to save the changes and return to the Data Watch Window.

Setting the Setpoint Value

The setpoint value is a baseline value that can be used as a reference. In the Data Watch Window properties dialog:

Step	Action
1	Enter a numeric value into the **Setpoint** box.
2	Click **OK** to save the changes and return to the Data Watch Window.

Setting the Resolution Value

The resolution value is in Milliseconds and defines the width of the X Axis. This is the time window of the visible data.In the Data Watch Window properties dialog:

Step	Action
1	Enter a numeric value into the **Resolution** box.
2	Click **OK** to save the changes and return to the Data Watch Window.

Using the Graph Functionality

In the trend window:

Step	Action
1	Select the **Mode** you want to use (Scroll-X, Zoom-X, Scroll-Y, Zoom-Y, Scroll-XY, Zoom-XY, Cursor, or Zoom-Box).
2	Left-click the data point you want to work from.
3	Hold-and-drag to manipulate the on-screen view of the data.

Trend - Mode Functionality Table

Data Watch Window - Trend

Mode Functionality Table:

Mode	Description of Functionality
Plot	Default view. This is the setting used when viewing a live trend or logged data. If viewing live data, the trend automatically updates and scrolls. Selecting Plot also resets the view to the default by cancelling any scroll or zoom operations.
Scroll-X	Drag the trend chart left or right to view trend data by time. Not available while viewing live data.
Zoom-X	Compresses or expands the X (Time) axis. This allows for viewing more detail or more data points. Not available while viewing live data.
Scroll-Y	Drag the trend chart up or down to view trend data that may be beyond the bounds of the current Y axis. Not available while viewing live data.
Zoom-Y	Compresses or expands the Y (Value) axis. This allows for viewing more detail or more data points. Not available while viewing live data.
Scroll-XY	This allows for scrolling of the X and Y axis simultaneously. Not available while viewing live data.
Zoom-XY	This allows for zooming of the X and Y axis simultaneously. Not available while viewing live data.
Cursor	Shows a cursor, the value of the data point and the time it was taken for a given trend line. Specific trend lines may be selected from the legend on the right. The cursor my be moved via the mouse, keys or navigation buttons. Not available while viewing live data.
Zoom-Box	Use a selection box to zoom into a specific part of the trend. Not available while viewing live data.
View Selected Only Checkbox	When Checked, the trend only displays the plot of the address selected in the legend on the right. When cleared, all address plots are displayed. Only available in cursor mode with logged data.

Track Logic Editor

Track Logic Editor

When the **Track Logic** check box is selected, the specified addresses in logic are automatically added to the Data Watch window and their values tracked. When the cursor position in logic is changed, the previously tracked addresses are removed and a new set of addresses are tracked. There are four logic-related options that can be tracked:

- **Network** - All addresses and their values from the most recently selected network in the Logic Editor are displayed in the Watch Window.
- **Instructions** - All addresses and their values that are associated with the most recently selected instruction are displayed in the Instruction Window.
- **Discrete** - All addresses with discrete values associated with the most recently selected network in the logic editor are displayed in the Watch Window.
- **Address** - The most recently selected address and its value is displayed in the Watch Window.

When the **Track Logic** and **Track Traffic Cop** check boxes are not selected, addresses must be entered manually into the Watch Window in order to be tracked.

Tracking Logic Editor Addresses in the Data Watch Window

In the Data Watch Window Properties dialog:

Step	Action
1	Select the **Track Logic** check box.
2	Select the option button (**Network**, **Instruction**, **Discretes**, or **Address**) that you want to track.
3	Click **OK** to save the changes and return to the Data Watch Window.
4	Ensure that the Logic Editor and Data Watch Window are open.

Track Traffic Cop

Track Traffic Cop

When the **Track Traffic Cop** check box is selected, the specified addresses in the Traffic Cop are automatically added to the Data Watch window and their values tracked. As the cursor position is changed in the Traffic Cop, the tracked addresses are also changed. The traffic cop-related option that can be tracked is:

- **Slot** - The associated addresses of the card in the most recently selected slot are displayed in the Terminal Block Window.

When the **Track Logic** and **Track Traffic Cop** check boxes are not selected, addresses must be entered manually into the Watch Window in order to be tracked.

Tracking Traffic Cop Addresses in the Data Watch Window

In the Data Watch Window Properties dialog:

Step	Action
1	Select the **Track Slot** check box.
2	Click **OK** to save the changes and return to the Data Watch Window.
3	Ensure that the Traffic Cop and Data Watch Window are open.

Instruction Editor / Terminal Block Editor

Instruction Editor Overview

You can view the addresses and data of specific Logic instructions using the Instruction Editor.

Additionally, the DRUM Summary and the PID Summary can activate the Instruction Editor for the DRUM or PID function selected in the summaries. Only the addresses referenced by the current instruction will be included.

The display is built using a user-defined VB script. These scripts are editable and may be used to modify the on screen display in any way.

Viewing an Instruction in the Instruction Editor

The Instruction Window works hand-in-hand with the Logic Editor. To view a certain instruction simply select the desired instruction in the Logic Editor and the instruction will be displayed in the Instruction Window

Terminal Block Editor Overview

You can view the addresses and data of specific I/O cards using the Terminal Block editor. Depending on property settings, you can view addresses and edit address values found in the currently selected item (rack or slot) in the Traffic Cop.

The display is built using a user-defined VB script. These scripts are editable and may be used to modify the on screen display in any way.

Viewing an I/O Card in the Terminal Block Editor

The Terminal Block Window works hand-in-hand with the Traffic Cop. To view a certain card simply select the desired card in the Traffic Cop and the card will be displayed in the Terminal Block Window.

Instruction / Terminal Block Editor Display Scripts

Display Scripts Overview

The Instruction and Terminal Block views may be customized using specialized VB Script files (.ucs). A large variety of .ucs files are provided for common instructions and for some advanced I/O cards. All .ucs files use a standard set of functions that link into the PRWX32 Data editor to provide the on screen elements needed. As well, all regular VB Script functions (such as FOR loops and IF statements) are available.

Note: The script must follow standard VBS coding methods and rules.

Creating a Display Script File

From your Windows Start menu:

Step	Action
1	Open a blank script in a script editor (Notepad or Wordpad).
2	Enter the outline of the new script function as follows: `Sub FunctionName(TopAddr, MidAddr, BotAddr, TopLen, MidLen, BotLen, Page, Unused1, Unused2)  End Sub`
3	Add functions to the script as needed. **Note**: All functions must be prefixed by 'Call Editor.' E.g., Call Editor.scAddGrid.
4	Save the script in the ProWORX\32\Scripts directory using the naming conventions laid out in 'Naming a display script file'.

Naming a Display Script File

Rules and guidelines:

Step	Action
1	Script files must be saved with a .ucs extension. E.g., VMER.ucs
2	Instruction scripts must be saved using their machine name. E.g., Correct: MSTR.ucs, Incorrect: Master.ucs
3	Script file names cannot have spaces or punctuation in them. E.g. Correct: DAO84010.ucs, Incorrect: DAO 840 10.ucs, DAO-840_10.ucs

Display Script Variables

Variable Description Table

Variables used within the display script:

Variable	Type	Description
FunctionName	NA	The function name must be the same as the name of the instruction or I/O card it supports. E.g. For the ADD instruction, the function name would be "ADD", and the script file name would be Add.ucs.
TopAddr	String	Instruction Editor: The address in the top node of the instruction. Terminal Block Editor: For cards with input addresses only, the first input address. For cards with output addresses only, the first output address. For cards with both input and output addresses, the first input address.
MidAddr	String	Instruction Editor: The address in the second node of the instruction if second node exists. Terminal Block Editor: First output address for cards containing both input and output addresses.
BotAddr	String	Instruction Editor: The address in the third node of the instruction if third node exists. Terminal Block Editor: Empty.
TopLen	Integer	Instruction Editor: The number of implied addresses associated with the address in the top node. Terminal Block Editor: Empty.
MidLen	Integer	Instruction Editor: The number of implied addresses associated with the address in the middle node. Terminal Block Editor: Empty.
BotLen	Integer	Instruction Editor: The number of implied addresses associated with the address in the bottom node. Terminal Block Editor: Empty.
Page	Integer	If a page control is specified in this script using 'scAddPages', this will give the page number to display.
Unused1, Unused2	Empty	Reserved Values.

Note: All of these parameters will pass data into the script

Display Script Functions

Functions Used Within the Display Script

Note: All functions must be prefixed by 'Call Editor.' E.g., Call Editor.scAddGrid

Note: All strings must be surrounded by quotes. E.g., Call Editor.scSetRowInfo(1, 1, "This is a string description", "Decimal")

scAddGrid (Address, NumRows, VisibleRows)

This is the main function used to display data values. It is responsible for adding a grid of addresses along with their data values and radices. All radices will default to decimal. Grids are numbered starting at 1 in the order that they are added. This number is used as an ID for other functions such as 'scSetRowInfo'.

Variable	Type	Variable Description
Address	Integer	The first address in a sequential list of addresses.
NumRows	Integer	The number of rows (and addresses) to display in this grid.
VisibleRows	Integer	This will limit the grid to showing only the number of rows specified. Additional rows will be accessible via scrolling.

scSetRowInfo (GridIndex, GridRow, TextString, Radix)

This function modifies the contents of a specific row in a specific grid. The Description and a specific Radix may be added with this function.

Variable	Type	Variable Description
GridIndex	Integer	This is the Grid's ID Number. See 'scAddGrid'.
GridRow	Integer	The row in this grid to modify. Valid rows start at 1 and go to the maximum number of rows this grid contains.
TextString	String	The Description text to add.
Radix	String	What radix to display the data in. Valid entries are: "Hexadecimal", "Binary", "ASCII", "Float", "Long", "Signed", "BCD", and "Decimal".

scGetText (TextIndex)

This retrieves internal PRWX32 text strings. Usually you should use a literal text string ("Hello") instead of this function.

Variable	Type	Variable Description
TextIndex	Integer	The number of the internal text string you wish to retrieve.

scAddBitDisplay (BitDisplayName, GridNumber, GridRow, LineState, Editable)

This will add an ellipsis button to the specified Grid on the specified Row. This button activates a Bit Display dialog that gives detailed bit-by-bit descriptions and editing capabilities.

Variable	Type	Variable Description
BitDisplayName	String	This is a name to be used to identify this particular display. A script may create numerous different Bit Displays.
GridNumber	Integer	This is the Grid’s ID Number. See ’scAddGrid’.
GridRow	Integer	The row in this grid to modify. Valid rows start at 1 and go to the maximum number of rows this grid contains.
LineState	String	A string of 16 numeric characters. The first character is the MSB. Each character may be one of: ● "0" - No Line ● "1" - Horizontal Stub ● "2" - Full Line ● "3" - End Stub
Editable	Boolean	Set to "True" to enable bit editing. Set to "False" to make the display read only.

scAddBitInfo (BitDisplayName, BitNumber, BitDescription)

This adds a bit description to the contents of a specified Bit Display created with ’scAddBitDisplay’.

Variable	Type	Variable Description
BitDisplayName	String	This is a name to be used to identify this particular display. See ’scAddBitDisplay’.
BitNumber	Integer	The number from 1 to 16 of the bit to add the description to. 1 = LSB.
BitDescription	String	The description text to add.

scAddBitEditValue (BitDisplayName, BitNumber, FirstBit, LastBit, Description, Value)

This creates a drop-down list box for a specified bit in the specified Bit Display. This box may be used to set a block of bits to a specific pattern associated with a descriptive state. Only one list entry is added per call. Entries are added in sequential order.

Variable	Type	Variable Description
BitDisplayName	String	This is a name to be used to identify this particular display. See 'scAddBitDisplay'.
BitNumber	Integer	The number from 1 to 16 of the bit to add the description to. 1 = LSB.
FirstBit	Integer	The first bit number in a sequence to be modified (MSB).
LastBit	Integer	The last bit number in a sequence to be modified (LSB).
BitDescription	String	The description of the list entry.
Value	String	The binary pattern to set the bits to. (E.g.: "110110")

scAddEquation (EquationStr, Var1, Var2, Var3, Var4, Var5)

This will create a functional equation in a box. Up to 5 variables may be included.

Variable	Type	Variable Description
EquationStr	String	A string containing the equation to display. Use "A", "B" through "E"" to denote a variable. Variables will be mapped to the data in a Grid row. (E.g.: "A + B = C")
Var1 through Var5	String	A string in the format "a,b,r" where a=Grid ID Number, b=Grid Row, r=Radix: "ILDF". The radix value specifies the radix to display the equation data in. Integer, Long, Double, or Float. Double is not a normal radix. It builds a concatenation of 2 16 bit data values. These will be the data values that appear in the equation. Use "" for variables that are not used.

scAddErrorField (GridNumber As Variant, GridRow As Variant)

This will create an error box that displays an error message. This box will only be visible if an error condition is met. Conditions are specified using the 'scAddError-FieldText' function. Error conditions are a particular value contained in a particular register. A row in a grid defines this. Only one Error Field is allowed.

Variable	Type	Variable Description
GridNumber	Integer	This is the Grid's ID Number. See 'scAddGrid'.
GridRow	Integer	The row in this grid to modify. Valid rows start at 1 and go to the maximum number of rows this grid contains.

scAddError-FieldText (DataValue As Variant, ErrorText As Variant)

This adds an error condition to an error field. Any number of conditions may be added. A condition is true is a data value equals the specified value.

Variable	Type	Variable Description
DataValue	Integer	A value that corresponds to an error.
ErrorText	String	The error message to display.

scAddPages (NumPages)

This adds a Page selection control. Only one may be specified at a time. Pages are numbered sequentially starting at one. This is useful if an instruction has a large amount of information to display.

Variable	Type	Variable Description
NumPages	Integer	The total number of pages to display.

scAddPicklist (ListName, GridNumber, GridRow)

This will add a drop-down list box to a specified Grid at a specified Row. This list will allow the easy selection of specific data values for the associated address. Each pick list must be identified by giving it a name.

Variable	Type	Variable Description
ListName	String	This is a name to be used to identify this particular pick list. A script may create numerous different pick lists.
GridNumber	Integer	This is the Grid's ID Number. See 'scAddGrid'.
GridRow	Integer	The row in this grid to modify. Valid rows start at 1 and go to the maximum number of rows this grid contains.

scAddToList (ListID, ListText, ListValue)

This will add a data value to a pick list created with 'scAddPickList'.

Variable	Type	Variable Description
ListID	String	This is a name to be used to identify this particular pick list. See 'scAddPickList'.
ListText	String	Text that will be appear in the List. Usually it describes the purpose of a data value.
ListValue	Integer	A data value that will be set if this list entry is selected.

scAddStaticText (TextSting)

This will add a static block of text. This is useful for titles, instructions, or additional information not provided by any other means.

Variable	Type	Variable Description
TextString	TextString	The text to display.

Register Editor

Register Editor Overview

The Register Editor allows you to view and edit data for all available addresses. This includes all discretes as well as all input, holding and extended registers.
Note: Addresses cannot be edited since they are specified by a project's configuration.

Changing the Displayed Address Type

In the Register Editor Window task bar:

Step	Action
1	Select an address type (0x, 1x, 3x, 4x, 6x) option button. **Note**: Extended memory addresses are defined by memory file.

Displaying Extended Memory Addresses

In the Register Editor Window task bar:

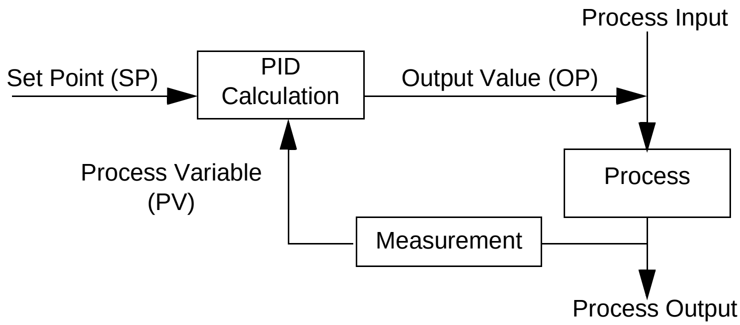
Step	Action
1	Select the 6x option button from the status bar.
2	Choose an extended memory file from the **File** drop-down list.

PID Tuner

PID and PID2 Blocks Overview

PID and PID2 blocks are software programming blocks that allow a process tobe controlled with no changes or additions to hardware. "PID" stands for "Proportional Integral Derivative". While the PID2 is a more advanced version of the PID, both operate in the same manner.

PID/PID2 Process



The PID calculation compares a process variable (PV) with a desired control point called the set point (SP). The calculation uses the difference between the set point and the process variable to adjust the PID output value (OV), sometimes called the control variable. This output value is used to manipulate an input to the process so that, eventually, the measured process variable equals the desired set point.

PID Tuner Overview

The PID summary displays a list of all the PID and PID2 instructions in the logic of the current project. Each row in the grid gives the instruction name, its location in logic, and the addresses of key data values related to that PID block.

The currently selected row has an associated PID Faceplate. This faceplate allows simple tuning of the selected PID block. You may invoke manual mode or adjust the setpoint value.

Note: There may be a delay while a search is performed for PID instructions in logic.

Adjusting the Setpoint Value

In the PID Summary Window:

Step	Action
1	Click the **Adjust** button.
2	Click and drag the slider up to increase the setpoint and down to decrease the setpoint.

Jumping to the Currently Selected PID Block in the Logic Editor

In the PID Summary Window:

Step	Action
1	Select the row of the PID or PID2 instruction that you want to jump to.
2	Click the **Goto** button. (The Logic Editor is activated and the cursor is positioned on the selected PID block.)

Editing PID Data

In the PID Summary Window:

Step	Action
1	Select the row of the PID or PID2 you want to edit
2	Click the **Tune** button. The Instruction Editor is activated containing the selected PID or PID2 instruction. Here you may edit all data values related to the instruction.
3	Click **PID Summary** tab to exit the Instruction window.

Trending PID Data

In the PID Summary Window:

Step	Action
1	Select the row of the PID or PID2 you want to trend.
2	Click the **Trend** button. The Trend Window is activated showing the trend data of the selected PID or PID2.
3	Click **PID Summary** tab to exit the Instruction window.

Setting the PID Contact

In the PID Summary Window:

Step	Action
1	Click the **Force Input Contact** check box. **Note**: This overrides the contact setting by disabling the contact. Ensure that this does not result in any safety issues.
2	The default contact setting is Auto. To toggle the contact click the **Auto/Manual** button. The label on the button specifies the current state of the contact. Auto = ON, Manual = OFF. Adjusting this disables the contact immediately in front of the top node of this PID instruction and forces it ON or OFF.

DRUM Summary

DRUM Instruction Overview

The DRUM instruction operates on a table of 4x registers containing data representing each step in a sequence. The number of registers associated with this step data table depends on the number of steps required in the sequence. You can pre-allocate registers to store data for each step in the sequence, thereby allowing you to add future sequencer steps without having to modify application logic.

DRUM incorporates an output mask that allows you to selectively mask bits in the register data before writing it to coils. This is particularly useful when all physical sequencer outputs are not contiguous on the output module. Masked bits are not altered by the DRUM instruction, and may be used by logic unrelated to the sequencer.

Drum Summary Overview

The DRUM summary displays a list of all the DRUM, ICMP and SCIF instructions in the logic of the current project. They are sorted by their top address. This address' data is known as its 'Step' value. All instructions with the same Step value appear together on the right. All the Step values that are available appear on the list to the left.

Each row shows the instruction name, its location in logic, and key data values related to that block. 'Steps Used', 'Machine ID'. and 'Profile ID' are all editable values.

Note: There may be a delay while a search is performed for DRUM instructions in logic.

Selecting a Step

In the DRUM Summary window:

Step	Action
1	Select an address from the left panel and all applicable instructions referencing that address will be displayed.

Editing DRUM Summary Data

In the DRUM Summary window:

Step	Action
1	Double-click the **Steps Used**, **Machine ID**, or **Profile ID** cell that you want to edit.
2	Enter a value into the cell.
3	Press ENTER to save the changes, or ESC to cancel the changes.

Editing Instruction Address Data Value

In the DRUM Summary window:

Step	Action
1	Select the instruction you want to edit.
2	Click the **Sequencer** button.
3	In the Instruction Window, double-click the **Data** cell that you want to edit.
4	Enter a value into the cell.
5	Press ENTER to save the changes, or ESC to cancel the changes.
6	Click the **DRUM Summary** tab to exit the Instruction Window.

Importing and Exporting Data Watch Window Data

Overview

Data watch window data can be imported or exported to or from a text file. This file may be modified with any text editor or spreadsheet program such as Notepad or Microsoft Excel.

Importing data watch window data is only available from the data watch window and register editor when in offline mode. Exporting data watch window data is available when in either online or offline mode.

Importing Data

From the data watch window right-click menu:

Step	Action
1	Select **Data Utilities** → **Import Data**.
2	Select a file (.txt or .csv) to import.
3	Click **Open**.
4	Data from every address found in the Import file is imported regardless of which addresses are on the screen prior to the import. Any address in the Import file that is in the configured range of the Project being imported to will have its data imported. A progress bars displays the progress of the import.

Exporting Data

From the data watch window right-click menu:

Step	Action
1	Select **Data Utilities** → **Export Data**.
2	Enter a new file name or select an existing file (.txt or .csv).
3	Click **Open**.
4	The data is exported as follows: • Data Watch Window (Offline) - All addresses and data values currently shown in the data watch window are exported. If there are no addresses, nothing is exported. • Data Watch Window (Online) - All addresses and data values currently shown in the data watch window are exported. If there are no addresses, nothing is exported. Note that the exported data is a snapshot of the data values in the PLC. • Register Editor (Offline) - All addresses and data values for the selected address type are exported. For example, if the 4x type is selected, all configured 4x addresses and data will be exported.

Data Formats

Data watch window data import and export file formats:

File	Format
.TXT - Tab Separated Variable text file.	Address <tab> Data
.CSV - Comma Separated Variable text file.	Address,Data

Working with the ASCII Editor

10

ASCII Editor

Using the ASCII Editor

ASCII messages let your controller report information to you in plain language. Use them, for example, if you want to see a written alert on your screen every time a motor switches on or a printout every hour of how many items have passed by a counter.

Use the ASCII Message Editor to enter and edit the messages you want your controller or project to send.

Note: Use the ASCII Read Block (READ) and ASCII Write Block (WRIT) in your ladder logic to send a message from a controller to your output device (such as a screen, printer, or disk drive).

Configuring ASCII Messages

Start by configuring your controller or project to use ASCII messages:

Step	Action
1	Confirm that your controller supports ASCII messages.
2	In the **Controller Configuration Window** → **General Tab**, configure the controller's ASCII parameters. (Total Messages, Message Words, and ASCII Ports.) For more information see, **Controller Configuration - General Tab**.
3	Ensure your ASCII ports are configured correctly in the Ports tab of the Controller Configuration Window. For more information, see **Controller Configuration - Ports Tab**.

Message List

The message list panel contains all messages in the current project. Click a message to edit or preview it in the Editor / Preview window.

Note: A yellow message denotes a message that has too many words.

From the right-click menu:

To...	Function	Result
Cut/Copy/Paste messages:	Select cut, copy, or paste	The message is added to the windows clipboard and can be pasted into any other message.
Insert a message:	Select **Insert** (INSERT)	Shuffles the messages up from the selected message.
Clear a message:	Select **Clear** (DELETE)	Deletes all words from the selected message.
Delete a message:	Select **Delete** (SHIFT+DELETE)	Deletes the selected message and moves messages up.
Initialize all messages:	Select **Initialize**	Clears all messages.

Editor/Preview Window

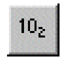
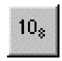
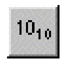
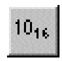
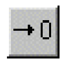
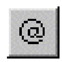
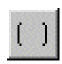
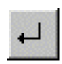
The editor window is a WYSIWYG message editor. Enter instructions into the editor by using either the toolbox buttons or the keyboard hot keys. The preview window is a view-only preview display of the currently selected ASCII message. To toggle between the editor and preview windows, right-click the desired message and select **Preview** or **Editor**.

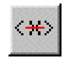
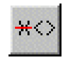
Note: Instructions placed after a carriage return will be ignored.

Note: Do not confuse blank cells with spaces. Blank cells will be removed when the message is saved.

ASCII Editor Toolbox

To insert an item either click the corresponding button or press the hot-key. Items are inserted at the cursor.

Tool	Description	Button	Hot-Key
Text Box	Up to 128 characters of text is displayed.		T
Binary	A placeholder for a binary field. Defined in ladder logic using a WRIT instruction.		B
Octal	A placeholder for an octal field. Defined in ladder logic using a WRIT instruction.		O
Integer	A placeholder for an integer field. Defined in ladder logic using a WRIT instruction.		I
Hexadecimal	A placeholder for a hexadecimal field. Defined in ladder logic using a WRIT instruction.		H
Leading 0 Integer	A placeholder for a leading 0 integer field. Defined in ladder logic using a WRIT instruction.		L
ASCII	A placeholder for an ASCII field. Defined in ladder logic using a WRIT instruction.		A
Space	Consecutive blank spaces are displayed.		SPACE
Carriage Return	Moves cursor to the next line.		ENTER
Repeat	A repeat is denoted by a repeat start ({) and a repeat end (}). A repeat must have both a start and an end.		{ - Start } - End
Control	A control character is displayed.		CTRL
Flush	The message buffer contains a 256 byte data field. These bytes contain data values ranging from 00 to FF. The flush command clears all characters form the message buffer.		BACKSPACE
Flush Num Bytes	Removes from 1 through 255 bytes from the beginning of the message buffer.		N/A

Tool	Description	Button	Hot-Key
Flush Inclusive	Clears specific groups of data from 1 to 255 times, or until a match is found. The terminator value determines how many times the buffer is flushed. The controller stops the buffer flushing when it finds a match for the terminating characters.		N/A
Flush Exclusive	Clears the buffer until a match is found for the terminating character pair. It does not flush the match characters. This uses two registers. The first register contains the type identifier and the second contains the hex values of the terminating pair. The hex values range from 0000 to FFFF. The controller searches for this range in the buffer. If the second character of the match pair is not a null (00), then the next character in the buffer must be equal or the search continues. If the last character test is equal or null, the flush is performed up to but not including the matched terminators.		N/A

Tool Properties

Each tool has specific properties that are editable using the properties panel. Changing a tools properties will automatically update the message editor and preview windows.

Working with Macros

11

At a Glance

Overview

When writing logic networks, you may find yourself reusing pieces of code again and again, changing addresses only for a few of the variables. In these cases, subroutines might not be suitable-such as when large numbers of variables are involved or when you want to reuse the same piece of code in different projects. What you're looking for is a macro.

What's in this Chapter?

This chapter contains the following topics:

Macros

Overview

Macros are generic pieces of logic networks you create with parameters instead of actual addresses. Macros are programmed offline in the Logic Editor. When you insert a macro in your main project, you map the parameters to real addresses. You can insert the same macro in several places with different sets of mapped addresses each time. The addresses change but the logic stays the same.

The main project retains its link to the inserted macros. This means ProWORX 32 notices if you make changes to a macro and informs you when you view it in the Logic Editor.

Creating a Macro Project

To create a macro project:

Step	Action
1	Create a new ProWORX 32 offline project by selecting **File** → **New Project** from the ProWORX menu. For more information about creating projects, see *Creating a New Project, p. 29*.
2	Select the **Use as a Macro** checkbox and complete the remaining new project wizard steps.
3	Once a macro project has been created it is denoted by the macro project icon, 

Editing a Macro

In general, you edit a macro with the same tools as a regular project. However, several ProWORX 32 functions are disabled when editing a macro project. Among them are:

- Traffic Cop
- Config Extensions
- ASCII Functions
- Extended Memory
- PLC Status
- I/O Drawing Generator
- Analyze Device
- Reading and Writing

Using Macro Parameters

While editing macro projects, you can assign macro parameters in place of register addresses or symbols. These are the addresses that will change for each insertion into the main project.

Macro parameters use this format: @txx

- The "t" represents the type of address: 0 for 0xxxx, 1 for 1xxxx, 3 for 3xxxx and 4 for 4xxxx.
- The "xx" represents the parameter number, which can be from 1 to 50.

For example, a macro parameter of @304 would represent the fourth programmable address of the form 3xxxx. Note that @304 and @404 refer to different parameters and are mapped to totally different addresses.

You can have a total of 200 parameters in your macro project - 50 for each address type.

Using Macros in Logic

Adding Macro Projects to Logic

Insert macros into logic while working offline in the Logic Editor. To insert a macro into a ProWORX 32 project:

Step	Action
1	Select **Insert** → **Macro** from the logic editor right-click menu. The Available Macros list appears.
2	Select a macro from the list and click **OK**. The Macro Parameters dialog appears.
3	For each parameter, enter a Modicon address in the **Address** column.
4	When all the parameters have been mapped to Modicon addresses, click **Insert**. ProWORX 32 checks each address to ensure it's valid for the macro parameter's address type and range. If invalid addresses are found, you are returned to the Macro Parameters dialog box. Otherwise, the macro's logic is inserted into your ProWORX 32 project and you are taken to the **Macro Overview** screen.

Removing Macro Projects from Logic

Deleting a macro from a project doesn't erase the macro file from your hard drive - it just removes an inserted macro's logic from your main logic. To remove a macro completely from your hard drive, first remove it from the project as described below, then from the macro project right-click menu in the Navigation panel, select **Delete**. To remove a macro from a ProWORX 32 project:

Step	Action
1	Select the macro you want to delete and select **Delete Macro** from the network navigation panel right-click menu. A confirmation dialog appears.
2	Click **Yes** and the macro is removed from the project.

Logic Editor Macro Display Overview

The Macro Overview display appears in the Logic Editor when you move the cursor onto an inserted macro. It also appears just after inserting a macro into a project. This display gives the macro's file name, description (the "Detailed Project Name" as entered from the project properties), status, and a list of its parameters and the Modicon addresses or symbols to which they are mapped.

The macro status can be one of two things:

- **Macro has changed**: The macro has been changed since it was inserted into the main logic network. You may want to update the inserted macro to reflect the changes made to the macro project it is linked to.
- **Macro not found**: The macro project file either no longer exists or has been moved to a different directory.

Making Changes in Macros

If you make changes to a macro project after it has been inserted into a main logic network, you'll have to update each copy of it within that logic network.

There may also be times when you want to make changes in logic to a single macro insertion without changing the original macro project. In this case, you'll have to unlink that macro insertion. Unlinking a macro removes its connection to the original macro project; the logic in that macro insertion becomes part of the regular main project logic.

Once a macro insertion has been unlinked it cannot be re-linked. Changes made to the macro project will no longer be detected by the Logic Editor.

Updating a Macro in a Project

In the logic editor:

Step	Action
1	Move the cursor onto a macro that needs to be updated. The Macro Overview screen appears, with a status that reads "Macro Has Changed." (If the macro status reads "Rec: xxx", where "xxx" is a series of numbers, then you don't need to update it.)
2	From the network navigation panel right-click menu, select **Update Macro**. The macro's logic is reinserted into the logic network.

Unlinking a Macro from a Project

Note: Once you've unlinked a macro, you can't re-link it.

Step	Action
1	While in the Logic Editor, move the cursor onto the macro you want to unlink. The Macro Overview screen appears.
2	From the network navigation panel right-click menu, select **Unlink Macro**. A confirmation dialog appears.
3	To unlink all macros, select **Unlink All Macros** from the network navigation right-click menu.
4	Click **Yes** to confirm the unlink. The macro is unlinked and the Macro Overview display disappears and you are returned to the Logic Editor.

ProWORX 32 Utilities

12

At a Glance

Overview

This chapter gives an in-depth look at the following ProWORX 32 Utilities:

What's in this Chapter?

This chapter contains the following topics:

BM85 Setup

Overview

A BM85 Bridge Multiplexer allows you to connect up to four Modbus devices or networks of Modbus devices to a Modbus Plus network.

The BM85 Setup utility is used to configure a BM85 device. BM85 Setup can be run as either a stand-alone application (BM85_Setup.exe in the ProWORX\32 directory) or as a utility in the utility menu.

Working with the BM85 Configuration Dialog

In the BM85 Configuration Dialog;

To:	Action
Read current settings from the BM85,	Click **Read from MUX**.
Write configuration settings to the BM85,	Click **Write to MUX**.
Print configuration settings,	Click **Print**.
Save configuration settings to .mux file,	Click **Save to File**.

Setting up the BM85

In the BM85 Configuration Dialog:

Step	Action
1	Select a Communications Port from the **Communications Port** drop-down box.
2	Enter a path and file name into the **File Name** box or click **Browse** to find a .mux file.
3	To create a new .mux file, click **Browse**, navigate to the folder you want the file to reside in and Enter a file name (*.mux) into the **File Name** box. When asked if you want to create this file, click **Yes**. You can now edit the generic settings.
4	To retrieve and display the current settings of the BM85, click Read from MUX.

Configuring the Modbus Ports of a BM85

Configure each of the BM85's four ports by editing the parameters below:

Parameter	Description
Port Type	Selects the Modbus device that attaches to the port: ● Master - Select for a master device, such as a PC ● Slave - Select for a slave device, such as a PLC ● Network - Select for a network of slave devices connected through a modem ● X-Master - Select for a device in Silent Master mode
Address'	Sets the address of a slave device from 1 to 247. Only available when Port Type is Slave.
Baud Rate	Sets the speed of data transmission in bits per second. The default is 9600.
Stop Bits	Sets the number of bits at the end of a packet which prepare the receiving device for the next packet. Either 1 or 2.
Parity	Adds a check bit to a packet to make the number of binary ones always either odd (Odd Parity) or even (Even Parity). If Parity is set to None, the check bit is not added. The PC and controller must use the same parity. Default is None.
Data Mode	Selects a communications mode for the port: RTU or ASCII. Default is RTU.
Priority	Determines the order in which the BM85 checks the ports, with 1 being the highest priority and 4 the lowest. All ports must have different priorities.
Link Time-out	Sets the maximum time in multiples of 100 milliseconds that the BM85 waits for slave devices to respond to commands before it sends an error message.
Modem Booster	Determines whether the BM85 maintains a dedicated connection to a slave device until it completes a command or transparently processes other network traffic while it waits. This option is not available unless the port type is set to Network. Note that this option should be set to No for ports attached to 584 controllers operating in SAFE84 Mode.

Working with Routing Paths

In the BM85 Configuration Dialog:

To:	Action:
Add a routing path	Select a table from the **Table** drop-down box, and an address from the **Address** drop-down box. Enter a routing path in the **Installed Routing Path** box. Click **Add**.
Remove a routing path	Select a routing path from the **Address** list box and press DELETE or click **Remove**.

Communicating with the BM85

If you are having trouble communicating with the BM85:

Step	Action
1	Make sure the COM port selected is plugged into the BM85.
2	Make sure the port on the BM85 you are plugged into is in configure mode. Set MODBUS Port Configuration switches on the BM85 to CONFIGURE, PORT 1, 9600 BAUD, NO PARITY, 1 STOP BIT (All off).

BootP Server

Overview

ProWORX 32 supports the configuration of the IP Address of a Quantum NOE Ethernet adapter, an ENT module or a Momentum controller via an Ethernet network. The BootP server lets you record and configure a device's IP Address and, optionally, the Gateway IP Address and Sub network mask.

Using the BootP Server

In the navigation panel, utilities tab:

Step	Action
1	Select **Boot P** to open the BootP Server utility.
2	To enable active pinging of devices in the list, select the **Enable Active Device Ping** check box.
3	To check if there is a device at the specified IP address, click **Ping**. If successful, the status field displays 'Device found at specified IP Address'.
4	To exit the BootP Server utility, click **Close**.

BootP Listening

When a BOOTP client such as a PLC requires an IP address, it broadcasts a request for an address across its Ethernet connection and through the TCP/IP network. It continues broadcasting these requests periodically until a reply is received or a set amount of time has passed. In the case where a PLC has a TCP/IP configuration extension active, the information in the extension may be used to configure an IP address if a BootP response is not received. The BOOTP Server listens for these IP address requests and responds accordingly. The response includes an IP address for the client. When the response is received, the client uses this new IP as its own and may then be accessed normally through the TCP/IP network.

Using BootP Listening

In the BootP Server utility:

Step	Action
1	Click **Start Listening** to make the BOOTP Server listen for incoming IP requests. The BOOTP Server now responds to any BOOTP IP address requests coming from Modicon devices.
2	Click **Stop Listening** and the BOOTP server ignores any incoming requests.

Automatically Checking IP Addresses

In the BootP Server utility:

Step	Action
1	Click **Enable Active Device Ping**. This periodically pings each IP address in the list. The status of the device located at the address is reported back in the Status field. **Tip**: Use Enable Active Device Ping when performing automatic BootP operations. Once a BootP operation is complete, the success of the operation is updated in the Status column in the list.

Using the Device List

In the BootP Server utility:

Step	Action
1	To add a device to the BootP list, click **New Device**.
2	To remove a device from the BootP lists, select a device from the list and click **Delete Device**.
3	To configure a device in the BootP list, select a device from the list and enter the parameters into the available Device Info and Optional Parameters fields. For parameter descriptions, see ‘Device Parameters’.
4	To have the ability to write the Gateway address and the Subnet mask to the device, select the **Write Optional Parameters** check box, otherwise these parameters are unavailable.

Device Parameters

BootP device parameter descriptions:

Parameter	Description
Device	Displays the description of the associated row selected in the BootP Parameters table.
MAC Address	A 12 digit hexadecimal number uniquely identifying an Ethernet device. A device's MAC address cannot be changed. The MAC Address is on a label (currently marked as the "IEEE GLOBAL ADDRESS") on each Schneider Ethernet device.
IP Address	A logical 32-bit address used to identify a TCP/IP device. Each IP address has two parts: the network ID and the host ID. The network IP identifies all hosts (devices) that are on the same physical network. The host ID identifies a specific host on a network. Each computer that runs TCP/IP requires a unique IP address. The IP Address may be available from or assigned by your network administrator.
Status	The existing condition of the ping: ● Device Found: ProWORX 32 has found a Schneider device with this MAC address and IP address ● Device not found: ProWORX 32 could not find a Schneider device with this MAC address and this IP address.
Subnet Mask	Used to mask a portion of the IP address so that TCP/IP can distinguish the network ID from the host ID. TCP/IP hosts communicate by using the subnet mask to determine whether the destination host is located on a local or remote network. The Subnet Mask may be available from or assigned by your network administrator.
Gateway	For communication with a host on another network, an IP host must be configured with a route to the destination network. If a configured route is not found, the host uses the gateway to transmit the traffic to the destination host. The default gateway is where the IP sends packets that are destined for remote networks. If a default gateway is not specified, communications are limited to the local network. The Gateway may be available from or assigned by your network administrator.

Compare Utility

Overview

ProWORX 32's Compare function finds differences in logic and configuration between a project and a controller or between two projects or between two controllers. This powerful tool lets you be sure that your controllers are using the right logic and are configured properly, and that a local project is the same as your operation's master project.

The compare function examines any or all of these elements:

Networks	Coils used - Up to four ranges, each range 1 - 1600
Controller configuration	Coil state - Up to four ranges, each range 1 - 1600
DX instructions	Input state - Up to four ranges, each range 1 - 256
Traffic cop	3xxxx registers - Up to four ranges, each range 1 - 99
Segment Scheduler	4xxxx registers - Up to four ranges, each range 1 - 1800
ASCII port parameters	Coil disable - Up to four ranges, each range 1 - 1600
ASCII messages	Input disable - Up to four ranges, each range 1 - 256

Using Compare

In the utilities menu, select **Compare**:

Step	Action
1	To view all of the elements, click **Advanced**.
2	To compare an element, select its checkbox. To compare all elements, click **Toggle**.
3	To view the master databases existing compare report, select **View Report**.
4	To compare two projects, click Compare **Browse** and select a project from the Master Project list. Click To **Browse** and select a project from the Compare Project list. Deselect both **Online** checkboxes and click **OK**.
5	To compare a project and controller, follow step 4 but select the **To**, **Online** check box.
6	To compare two controllers, follow step 4 but select the **Compare**, **Online** and **To**, **Online** check boxes.
7	To run the compare, click **OK**.

Using the Compare Report

After selecting OK in the compare utility:

Step	Action
1	After clicking **OK** to run the compare from the compare setup menu, the compare report is displayed in your default browser.
2	 - Elements match.  - Element mismatch. - Element compare not applicable. - Element not compared.
3	For elements that are mismatched, click the text link to see mismatch element details.
4	To print the compare report select **File** → **Print** from the compare index page. To include the whole report select the **Print all linked documents** under the Options tab in the Print dialog. Click **Print**.

I/O Drawing Viewer

Overview

The drawings are in a .DXF format that is supported by most CAD programs. The I/O Drawing Generator uses the master .DXF drawings to create I/O drawings based on the I/O Configuration and Documentation information. Once the final .DXF drawings are created, they can be imported using your CAD program.

This dialog box displays the I/O drawing for the current card. It also allows you to print the displayed portion of the current .DXF drawing using the default Windows printer settings. Several options are available to allow you to view your drawings.

Pan allows you to scroll the view of the drawings displayed in much the same way as Autocad. Zoom allows you to zoom in on a selected section of the drawing. Zoom Out takes you back to display the complete .DXF drawing.

Using the I/O Drawing Viewer

From the Navigation panel, Utilities menu:

Step	Action
1	Select **I/O Drawing Viewer** to open the I/O drawing viewer.
2	To pan across the drawing, click **Pan**. Click the location you want to begin your pan view. Drag the cursor to another location in the drawing and release the mouse button. The view pans from the start location to your end location.
3	To zoom into the display, click **Zoom**. Click at the start location where you want to begin your zoom. Drag your cursor to mark the area. A rectangle appears to define the section of drawing you want to zoom in on. Release the mouse button.
4	To zoom out of the display, click **Zoom Out**.
5	To select a different .DXF drawing, from the I/O Drawing Display window, click **Open**. The File Open dialog box appears. Select the .DXF to display, then click **OK**.
6	To print a drawing, from the I/O Draw Display window, click **Print**. The drawing is printed to your default printer.
7	To save the I/O drawing in another format, click **Save As**.

The Ping Utility

Overview

Ping is a TCP/IP utility for testing a given IP address. The address is checked to see if a device exists for it. If the address exists, the Ping is successful and a round trip time (ms) is returned. If the ping fails, an error response will be given. This will help diagnose problems with the TCP/IP communications as well as determining a devices existence. Ping options are saved to the ProWORX .INI file.

Using the Ping Utility

From the navigation tree utilities tab:

Step	Action
1	Select Ping.
2	Enter the IP address to ping in the **IP Address to Ping** box.
3	Click **Ping** to perform a ping. The status of the ping attempt is displayed in the Return Status field and if successful, the ping time is displayed in the Round Trip Time field.
4	Click **Close** to exit the ping utility.

MBP Stat

Overview

To access device status and diagnostic tools, select one of the following items from the device right-click menu:

Status and Diagnostic Tools	**Tool Tabs**	**Description**
Bus Status (CTRL+B)		Used to obtain network status of nodes on the network.
	Active station table	Active nodes on the network are highlighted. **Note**: The node that the cursor is on is not highlighted.
	Token station table	Nodes on the network that are receiving and passing the token are highlighted. The Token Rotation Time and Token Pass Counter are also displayed. **Note**: The node that the cursor is on is not highlighted.
	Global data station table	Nodes that are sending global data to the selected node are flashing if the selected node is configured to receive global data from the nodes.
Network Statistics (CTRL+N)		Obtain statistics for the node on which the cursor is located.
	Personality	Node information, such as type, address, version and communication state, is displayed.
	Error counter	Communication information and errors for the selected node are displayed.
	Receive buffers	When the node selected is receiving specific input from other nodes on the network, the number of receive buffers in use is flashing.
	Transactions	The number of data transactions for the 8 data paths of the selected node: ● **DM** - Data master ● **DS** - Data slave ● **PM** - Programming master ● **PS** - Programming slave
	Work-to-do	The type of programming and/or data activity for the 8 data paths of the selected node is displayed. A flashing square indicates data activity.
Read Global Data (CTRL+G)		The global data being transmitted for the selected node is displayed. The data can be viewed in HEX, DEC signed or DEC unsigned format.

Status and Diagnostic Tools	Tool Tabs	Description
CPU status (CTRL+U)		CPU firmware, hardware revisions, and crash codes are displayed. From here you can access the CPU Status words.
Adapter statistics (CTRL+A)		CPU firmware, hardware revisions, and crash codes are displayed. From here you can access the CPU Status words.

Note: The Refresh slider allows you to set the rate at which the data is updated.

To stop communications with the selected device, click **Stop**. To begin communications with the selected device, click **Start**.

ProWORX 32 Reporting

13

Reporting

Overview

The ProWORX 32 reporting feature allows you to print many aspects of your project to a file or printer. Reporting is a very powerful tool, which can be used to extract information from your project into a printed document.

Using the Printing Menu

From the ProWORX 32 menu:

Step	Action
1	Select **File** → **Print** to send the currently selected documentation to the printer.
2	Select **File** → **Print Preview** to view the current report as it will be printed.
3	Select **File** → **Print Setup** to edit the content and documentation that will make up the report.

Quick Picks

Quick picks are pre-defined sets of reporting options. Select an option in the quick pick list box to get a pre-selected list of options for reporting. Choose an option in the list box and the respective report options will be automatically selected.

The options are as follows:

Quick Pick	Description
Turn off all options	All report options are deselected.
Turn on all options	All report options are selected.
All networks	All settings within the Networks report option are selected.
Everything but networks	All settings within all report options are selected except the Networks report option.
All documentation tables	All settings within the Descriptor Ranges option and Documentation Tables options are selected.
All controller tables	All settings within the Configuration Tables, Traffic Cop, Register Content Ranges, and Used Tables report options are selected.
All used tables	All settings within the Used Tables report option are selected.
All mismatch tables	All settings within the Mismatch Tables report option are selected.

Using the Reporting Setup

After opening the reporting setup dialog (Step 3 in ‘Using the printing menu’):

Step	Action
1	Select the report options that you want to include in the report, from Networks, Descriptor ranges, Documentation tables, Configuration tables, Traffic cop, Register content ranges, Used tables, and Mismatch tables, by clicking the corresponding check box.
2	Set the parameters within each report option that you have selected. (To see further details pertaining to each report option, see below.)
3	To select all parameters, or deselect all parameters within a report option, click **Toggle All**.
4	To save the current report options, click **Save Settings**.
5	To preview the report as it will be printed, click **Print Preview**.
6	When you are finished setting the report options, click **Close**.

Networks

After selecting **Networks** from the report options list:

Step	Action
1	Select which networks that are to be printed by typing the numeric range of networks in the **Print Networks** box. To select all networks enter "All". To select no networks enter 'None'.
2	Select whether you want **One Network per Page** or **Two Networks per Page**.
3	If you select One Network per Page, you can then select **Cross References** to print all of the cross references that are associated with the particular network, **Network Long Comment** to print long comments for the particular network.

Descriptor Ranges

After selecting **Descriptor Ranges** from the report options list:

Step	Action
1	Enter the range of descriptors to be printed for each address type. Valid entries include: "1-100", "None", and "All".
2	Select **Items Used in Logic** to print addresses used in logic.
3	Select **Items with Descriptions** to print addresses that have descriptions.
4	Select **All Items** to print all coils. This includes all items used in logic and items with descriptions.

Documentation Tables

After selecting **Documentation Tables** from the report options list:

Step	Action
1	Select any combination of the following documentation check boxes: ● **Log Book / Audit Trail** ● **Symbol Table** ● **Page Titles** ● **Short Comments** ● **Long Comments** ● **Cross References**

Configuration Tables

After selecting **Configuration Tables** from the report options list:

Step	Action
1	Select any combination of the following configuration tables check boxes: ● **Configuration** ● **Segment Scheduler** ● **ASCII Messages** ● **Config Extensions**

Traffic Cop

After selecting **Traffic Cop** from the report options list:

Step	Action
1	Select any combination of the following traffic cop check boxes: ● **Drop Summary** ● **Rack Overview** ● **Slot Summary** ● **Descriptors** ● **Symbols** ● **Cross References** ● **Short Comments**

Register Content Ranges

After selecting **Register Content Ranges** from the report options list:

Step	Action
1	Enter a range of register contents to print in the address (3xxxx, 4xxxx, and 6xxxx (file 1 - 10)) boxes. Valid entries include: "1 - 100", "None", and "All".

Address Used Tables

After selecting **Used Tables** from the report options list:

Step	Action
1	Select whether you want a **Brief** or **Full** printout of the addresses used in logic.
2	Select the check boxes of the addresses you want to include in the report from: **0xxxx**, **1xxxx**, **3xxxx**, and **4xxxx**.
3	Click the **Disable References** check box to include the addresses that have been disabled in logic.

Mismatch Tables

After selecting **Mismatch Tables** from the report options list:

Step	Action
1	Select which addresses that have descriptors, but are not used in logic that you want to include in the report by clicking the 0xxxx, 1xxxx, 3xxxx, and 4xxxx check boxes under the **Described But Not Used In Logic** heading.
2	Select which addresses that are used in logic, but do not have descriptors that you want to include in the report by clicking the 0xxxx, 1xxxx, 3xxxx, and 4xxxx check boxes under the **Used In Logic But Not Described** heading.

ProWORX 32 Server

14

At a Glance

Overview

The ProWORX 32 server (see *Overview, p. 35*) is the repository for projects, the center for security, and a hub for communications.

What's in this Chapter?

This chapter contains the following topics:

Using the ProWORX 32 Server

Logging on to the ProWORX 32 Server

From the Windows start menu:

Step	Action
1	Select **Programs** → **ProWORX 32** → **ProWORX Server**
2	Enter the user name given to you by the system administrator in the **Name** field.
3	Enter your password in the **Password** field.
4	To logout of the ProWORX server, select **File** → **Logout**. To re-login, select **File** → **Login**.
5	Click **Close** to exit ProWORX 32 Server.

Setting the Server Communications

In the ProWORX Server menu:

Step	Action
1	Select **File** → **Set Server Communications**.
2	Select communications type from **TCP/IP**, **MBP Adapter 0**, and **MBP Adapter 1** that the server uses to communicate with the clients.
3	If you have selected TCP/IP, enter the appropriate TCP/IP port number in the **TCP/IP Port Number** field.
4	Click **OK**. To make the communications changes you must restart the ProWORX 32 Server.

Working with Projects

Select the **Projects** tab:

Step	Action
1	Select a project from the project tree. In the Project Info pane you will find: • Project Name • Project Status - Checked out by username or Not checked out
2	Click View Project Details to see further project information: • Project Name (Long) - A more descriptive project name • Project Description - A detailed description of the project • Client - The end-user of the project • Author - The author of the project • Controller Type • Controller Address - Communications type and address
3	Click **View Audit Trail** to view the transaction history of the project.

Creating ProWORX 32 Users

Select the **Users** tab:

Step	Action
1	Click **Add User**. The Add User dialog appears.
2	Enter the new users name in the **User Name** field.
3	Enter a distinct password in the **Password** field.
4	Click **OK** to confirm the new user.
5	To edit a user name or user password, click **Edit User**. To delete a user, click **Remove User**.

Creating ProWORX 32 User Groups

Select the **Users** tab:

Step	Action
1	Click **Add Group**. The Group Rights dialog appears.
2	Enter the name of the new group in the **Group Name** field.
3	Select **Administration Rights** for the group.
4	Select **Project Rights** for the group.
5	Click **OK** to save the new group.
6	To edit a group name or group rights, click **Edit Group Rights**. To delete a group, click **Remove Group**.

Working with ProWORX 32 Users and User Groups

Select the **Users** tab:

Step	Action
1	To add a user to a user group, select a user from the Users list, select a group from the User Groups list and click **Add User to Group**.
2	To remove a user from a user group, select a user from the User Groups list and click **Remove User From Group**.

User Rights

User rights descriptions:

User Rights	Descriptions
Controller Configuration	The ability to change the controller configuration, or change controller type.
Traffic Cop Editor	The ability to edit in the traffic cop.
Communications Setup	The ability to change the communications setup including the controller's address.
Logic Editor	The ability to edit logic.
Forcing	The ability to force contacts and coils.
Insert	The ability to insert cells, rows, columns, and networks.
Delete	The ability to delete cells, rows, columns, and networks.
Sweep	The ability to enter sweep mode.
Data Editors	The ability to enter any of the data editors, If deselected, the user is unable to change register data.
Extended Memory	The ability to edit extended memory registers.
Configuration Extensions	The ability to edit the configuration extensions.
ASCII Messages	The ability to edit the ASCII messages.
Documentation Editor	The ability to change any of the documentation.
Read	The ability to read from the controller.
Write	The ability to write to the controller.
Start/Stop	The ability to start or stop the controller.
Clear Audit Trails	The ability to remove all audit trail and logbook entries.
Get Projects	The ability to get projects from the server.
Put Projects	The ability to put projects to the server.

The Status Tab

The **Status** tab displays the following project information:

- User - The client currently logged in to the ProWORX Server
- Transfer Type - The type of transfer being performed (Data or File)
- Description:
  - File - The file name and lock status
  - Data - The data type
- Progress:
  - File - A progress number or ‘Done’
  - Data - The number of packets transferred

Audit Trail

Overview

The audit trail keeps a record of project transactions between the ProWORX 32 client and ProWORX 32 server. Each transaction is stored as an entry in the audit trail. Audit trail comments can be added to each record when putting a project to the server.

Using the Audit Trail

In the project navigation tree:

Step	Action
1	From the project right-click menu, select **Audit Trail**.
2	To view a specific transactions information, select a transaction from the list in the navigation panel. Transactions list: ● User - Who made the changes to the current transactions. ● Date and Time - When the transaction was completed. ● Changes Made - ProWORX 32 areas that were changed from the previous to current transaction. ● User Comments - Any notes or comments that the user has entered when putting the project to the server. You can also navigate through the transactions by clicking the standard navigation buttons at the top of the window.
3	To hide or view the navigation panel, click the view tree button .
4	To clear all audit trail from transactions from the audit trail, click **Clear Audit Trail**.
5	To print the current audit trail, click **Print**.
6	When you are finished, click **Close** to return to ProWORX 32.

Schneider Alliances

15

At a Glance

Overview

Schneider Alliances is a third-party utility used by Schneider Alliances partners to add or modify I/O cards.

What's in this Chapter?

This chapter contains the following topics:

Using the Schneider Alliances Tool

Adding an I/O Card

After opening Schneider Alliances:

Step	Action
1	Select an I/O system from the **I/O System** drop-down list box.
2	Click **Add**. (Certain default values are entered into the parameter list.)
3	Edit the parameters to match the card you are adding.
4	Click **Update** to save the new data, or click **Cancel** to remove the new data and start over.

Editing an I/O Card

From the Schneider Alliances default screen:

Step	Action
1	Select an I/O system from the **I/O System** drop-down list box.
2	Select an existing card from the **Card** drop-down list box. (The current card data is entered into the parameters list.)
3	Click **Edit**.
4	Edit the parameters you wish to update. (See Editing an I/O Card Parameter.)
5	Click **Update** to save the new data, or Cancel to undo the changes you have made.

Editing an I/O Card Parameter

While adding or editing an I/O card:

Step	Action
1	Press ENTER or click the Value column of the desired parameter. (The selected parameter will now be editable.)
2	Type a valid value or select a value from the drop-down list. (Some parameters require you to click the ellipsis box for further configuration.)
3	Press ENTER to accept the new parameter, or ESC to cancel the change.

Using the MCS Simple 2 Editor

After clicking the ellipsis box in the MCS Simple 2 parameter:

Step	Action
1	Double-click the ’1’ or ’0’ to toggle a bit.
2	Click the **Save** button to save changes back to the main grid, or click **Cancel** to return the main grid without updating any changes.

Using the Default Parameter Data Editor

After clicking the ellipsis box in the Default Parameter Data parameter, the Data Values dialog opens, showing the current number of rows in the Number of Parameters Used parameter, and the current value in the Default Parameter Data parameter. To edit the contents of a row, simply double-click the cell you want to edit, and enter a Hex value. Use the following functions to further edit the parameter:

Function	Action	Comment
1	Click **Add**.	A blank cell is added to the end of the grid.
2	Click **Remove**.	The currently selected row is deleted, and the cells below are shuffled up.
3	Click **Move Up**.	The contents of the currently selected cell are moved up one cell.
4	Click **Move Down**.	The contents of the currently selected cell are moved down one cell.

I/O Card Parameters

Parameters list:

Parameter	Description
Card ID	Hex Value. The Unique Modicon ID for each card of an I/O series.
INTERBUS ID	Hex Value. The INTERBUS S ID of a card.
Drop Allowed	Momentum Only. Defines whether or not a Momentum CPU supports a non-local, INTERBUS S drop.
Card Description	Description of the currently selected I/O card. This is used throughout ProWORX 32 to pick, edit, and add I/O cards. Maximum ten characters.
Medium Description	Text description displayed in the Traffic Cop when editing slot properties of a card.
Long Description	A more detailed description of the card.
Power	The amount of power used by the card in the rack.
Power (+5)	Number of mA used by card at this power rating.
Power (+4.3)	Number of mA used by card at this power rating.
Power (-5)	Number of mA used by card at this power rating.

Parameter	Description
Number of Parameters Used	The number of Card config parameters that are used by default.
Default Number of Parameters	The available number of parameter words by default.
In Bytes	The number of input bytes used by the card.
Out Bytes	The number of output bytes used by the card.
In Bytes (IBus)	Momentum Only. Defines the number of input bytes for an INTERBUS card.
Out Bytes (IBus)	Momentum Only. Defines the number of output bytes for an INTERBUS card.
Module Type	Defines the type of card. Discrete, Analog, or Analog with no discretes allowed.
Doc Only	Certain cards are not programmed into the controller memory, but are still displayed in the traffic cop. These cards are documentation only cards.
MCS Simple 1	Type of hardware module.
MCS Simple 2	Defines behavior of card. See: Using the MCS Simple 2 editor.
Default Parameter Data	The value of the card config words by default.
Rack View Bitmap	The bitmap displayed in the Traffic Cop rack View.
Drop View Bitmap	The bitmap displayed in the Traffic Cop in Drop view.
Extra Bus Info	Momentum Only. One word that defines extra information for an INTERBUS Drop.
Script Data	The WYSIWYG card config editor.

Using the Script Editor

Overview

Schneider Alliances Script Editor is a WYSIWYG property based editor used to create card configuration scripts. The VB Script file used by ProWORX 32 to display card configuration is automatically created by the card configuration editor. These scripts are used by ProWORX 32 to configure optional card parameters in the Traffic Cop.

Adding a Control to the Grid

From the script editor dialog:

Step	Action
1	Click a control in the ToolBox panel to add it to the grid.
2	Set the properties for the control. **Tip**: To most effectively set your control, select the controls container in the **Container** property first. This will move the control onto the desired frame.
3	Place the control by clicking the controls center selection handle, and holding and dragging the control to the desired location.
4	Resize the control by clicking and dragging the controls perimeter selection handles to the desired size.

Common Properties

Common control properties:

Property	Description
Left	The left-most part of the control in twips. **Note**: For reference, there are 1440 twips per inch.
Top	The topmost part of the control in twips.
Width	The width of the control in twips.
Height	The height of the control in twips.
Caption	The text display related to the control.
Container	The container is the object that the control is anchored to. **Note**: You can anchor a control to either the form (pbEditor) or to any frame. When a control is anchored to a frame, the controls positional variables (Left and Top) are relative to the anchor, not to the form.
StartBit	The first bit in a range of bits to edit.
EndBit	The last bit in a range of bits to edit.
Word	The word number you want to edit. **Note**: To add a control that whose data value has no consequence to a word, set the **Word** property to 0. The word list is 1-base.
Event	This is a portion of script that will execute when the value of the control is changed.

Using the Event Editor Dialog

The event of a control is executed when the data value of the control changes. The event script allows you to enter VB script code to manipulate controls. The event script editor will do minor error checking for syntax mistakes. The gird has a unique Initialize function which is executed when the form is opened. Using events you can hide controls using the .visible property, enable and disable controls using .enabled and many other standard VB functions.

After clicking the ellipsis box in the Event property of a control:

Step	Action
1	Enter VB script code into the event window.
2	When finished, click **OK** to return to the script editor. Certain errors will be caught by the event script editor and there will be an error message if any errors exist. Certain errors will not be detected by the editor though and the I/O card's script will not be functional in the traffic cop. To cancel your changes and return to the script editor, click **Cancel**.

Editing Parameter Data - Card Config Words Using Controls

In the properties panel:

Step	Action	Comment
1	Select the control that will be used to edit a word.	Valid controls are: Radio Buttons, Check Boxes, Data Edit Boxes, and Combo Boxes.
2	Select a word from the drop-down list in the Word property.	The word numbers correspond with the Default Parameter Data words. 1 is the first word, 2 is the second word, and so on.
3	Enter a bit number into the StartBit property.	This is the first bit in a range of bits to be edited. Valid bit numbers are 1 through 16.
4	Enter a bit number into the StartBit property.	This is the last bit in a range of bits to be edited. Valid bit numbers are 1 through 16.

Editing Card Config Word Data Example

Word ones current value is 10101010 - 10101010 (43690 decimal). A controls properties are set as follows:

- Word = 1
- StartBit = 9
- Word = 16
- Data value of the control = 15

When the card config dialog is saved, word ones new value is 10101010 - 00001111 (43535 decimal). Notice, bits 9 through 15 (00001111) are equal to 15 which is what the properties had specified.

Using Script Editor Controls

Frame

Frames are used to enclose and group related controls. Scripts allow multiple layers of frames to be added on top of each other. After a frame has been added to a grid or previous frame, any of the available controls can be contained by (anchored to) that frame.

Radio Button

Radio buttons are used on the grid or on a frame to display a limited set of options. Only one radio button in a container can be selected at a time.
Control-specific properties:

Property	Description
Data	The value that the bits are set to if the radio button is selected.

Check Box

Check boxes are used on the grid or on a frame to display either/or options.
Control-specific properties:

Property	Description
DataChecked	The value that the bits are set to if the check box is checked.
DataUnchecked	The value that the bits are set to if the check box is unchecked.

Label

Most often used as a label for a combo box or a data edit box control, labels can be used for on-screen instructions, as well as further detail or descriptions.

Combo Box

The combo-box is used when there are a set number of selections you want the user to be able to choose from. Each item in the list has a corresponding data value.
Control-specific properties:

Property	Description
List	The list property provides an ellipsis box which when clicked opens up a Combo Box Configuration dialog. The combo box configuration dialog allows you to enter the contents and related values of the items in the list box.

Creating a List for the Combo Box

In the combo box configuration dialog:

Function	Action
1	To add an item to the list, Click **Add**.
2	Edit the Combo List Item and Item Data fields by double-clicking on the cell.
3	To move the item within the list, click **Move Up** and **Move Down**.
4	To remove an item, click **Remove**.
5	To save the items and data and return to the script editor, click **OK**. To cancel changes and return to the script editor, click **Cancel**.

Data Edit Box

Data edit boxes are used on the grid or on a frame to allow the user to enter any valid value. Valid values are determined by which radix is set for the data edit box. For example, if ‘Binary’ is selected in the radix property, only ones and zeros are valid data, and the value can only have a length of 16 characters.
Control-specific properties:

Property	Description
Radix	The mode of the edit box. Available options are Decimal, Binary, Hexadecimal, ASCII, and Long. **Notes**: ● All radices are have a 16-bit limit except Long, which has a 32-bit limit. ● A ‘Long’ data type will overwrite the word that is selected in the Word property of the data edit box as well as the next word in the order that they are set in the Default Parameter Data property of the I/O card. ● It is not recommended that you put a long data value in the last word. If the last word is selected in the Word property, the ‘Long’ data value will be truncated and put into the last word. This may alter the results you expected significantly.

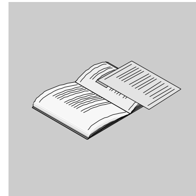
Command

The command button is a seldom used control but can be very useful for batch processes. For example, you can have a button that will check or uncheck a group of check boxes, or a button that would clear all fields in a group.

Time State Properties

The time state property control is different from other controls in that it is a toggle edit combo box. It is used to edit parameters of cards that are actually not passed as data words. Namely, when editing the time-out state of a card, you would use a timestate drop-down to set the parameter to "User Defined" or to "Last Value".

Appendices



At a Glance

Overview

These appendices provide information on the I/O cards supported by ProWORX 32 and troubleshooting tools and resources.

What's in this Appendix?

The appendix contains the following chapters:

I/O Cards

A

At a Glance

Overview

This appendix lists the I/O cards supported by ProWORX 32 for the following I/O series:

What's in this Chapter?

This chapter contains the following topics:

800

800 Series Cards

I/O cards supported (in alphabetical order):

Card	Description	Card	Description
B802-008	115 VAC 8 Point Output Module	B872-002	4-20 mA,1-5V 4 Channel Analog Output
B803-008	115 VAC 8 Point Input Module	B872-011	Selectable 4 Channel Voltage Output
B804	16 Point Output Module	B872-100	4-20mA 4 Channel Current Output Module
B804-016	115 VAC 16 Point Output Module	B872-200	Selectable 4 Channel Voltage Output
B804-116	115 VAC 16 Point Output Module	B873-001	4-20mA,1-5V 4 Channel Analog Input
B805-016	115 VAC 16 Point Input Module	B873-002	4-20mA,1-5V 4 Channel Analog Input
B806	32 Point Output Module	B873-011	-10 V to 10 V 4 Channel Analog Input
B806-032	115 VAC 32 Point Output Module	B873-012	-10 V to 10 V 4 Channel Analog Input
B806-124	24 VAC 32 Point Output Module	B873-200	V/A, Thermo, RTD, Strain Gauge Input
B807	32 Point Input Module	B875-001	4-20mA, 1-5V 8 Channel Analog Input
B807-032	115 VAC 32 Point Input Module	B875-002	4-20mA, 1-5V 8 Channel Analog Input
B807-132	115 VAC 32 Point Input Module	B875-011	-10 V to 10 V 8 Channel Analog Input
B808-016	230 VAC 16 Point Output Module	B875-012	-10 V to 10 V 8 Channel Analog Input
B809-016	230 VAC 16 Point Input Module	B875-101	Fast selectable 8 Channel Analog Input
B810-008	115 VAC 8 Isolated Output Module	B875-102	Fast selectable 8 Channel Analog Input
B814	8 Point Output Module	B875-111	Select. 8 channel Differential Input
B814-001	NO Power Relay 8 Point Output Module	B875-200	V/A, Thermo, RTD, Strain Gauge Input

Card	Description	Card	Description
B814-002	NC Power Relay 8 Point Output Module	B877-111	Select. 16 channel Single Ended Input
B814-108	NO/NC Power Relay 8 Point Output Module	B881	Input/Output Module
B817	16 Point Isolated Input Module	B881-001	24 VDC 16 Point Latched Input (TrueHigh)
B817-116	115 VAC 16 Point Isolated Input Module	B881-108	115 VAC 8 Point Protected Output Module
B817-216	230 VAC 16 Point Isolated Input Module	B881-508	125 VDC 8 Point True High Output Module
B818-032	24 VDC 32 Point Output (True High)	B882-032	24 VDC Diagnostic Output Module
B819-032	230 VAC 32 Point Input Module	B882-239	0-30 kHz 2 High Speed Up-Counter Module
B820-008	10-60 VDC 8 Point Output (True High)	B883	Input/Output Module
B821	8 Point Input Module	B883-001	0-50 kHz 2 High Speed UP/ Down Counter
B821-008	10-60 VDC 8 Point Input (True High)	B883-101	4 kHz CAM ABS Encoder Input,8 Disc Out
B821-108	10-60 VDC 8 Point Input (True High)	B883-111	1 kHz CAM with Velocity compensation
B824-016	24 VDC 16 Point Output (True High)	B883-200	10 Thermocouple Input Module
B825-016	24 VDC 16 Point Input (True High)	B883-201	8 RTD Input Module
B826-032	24 VDC 32 Point Output (True High)	B884-002	2 Loop, PID Control Module
B827-032	24 VDC 32 Point Input (True High)	B885	Main Module
B828-016	5V TTL 16 Point Output	B885-002	ASCII/BASIC Module
B829-116	5V TTL 16 Input (Fast Response)	B885-100	Motion Module
B832-016	24 VDC 16 Point Output (True Low)	B885-110	Motion Module
B833-016	24 VDC 16 Point Input (True Low)	B886-000	High Speed Logic Solver

Card	Description	Card	Description
B836-016	12-250 VDC 16 Point Output Module	B887-000	12 Register Bidirectional
B837-016	24 VAC/DC 16 Point Input (True High)	B888-100	Datalogic CM1000 AutoID interface
B838-032	24 VDC 32 Point Output (True High)	D908-110	Distributed Control Single
B840-108	NO/NC Reed Relay 8 Point Output Module	D908-120	Distributed Control Dual
B842-008	NO/NC Reed Relay 8 Point Output Module	J890-001	RIO Single
B846	Analog MUX Module	J890-002	RIO Redundant
B846-001	Analog MUX (16 voltage to one output)	J892-001	RIO ASCII Single
B846-002	Analog MUX (16 current to one output)	J892-002	RIO ASCII Redundant
B849-016	48 VAC/DC 16 Point Input Module	P800-003	Power Supply
B853-016	115 VAC/125 VDC 16 Input (True High)	P802-001	Power Supply
B855-016	12 VDC 16 Point Input (Intr. Safe)	P810-000	Power Supply
B862-001	4 Channel Register Output (TTL Level)	P830-000	Power Supply
B863	4 Channel Register Input	P840-000	Power Supply
B863-001	4 Channel Register Input (TTL Level)	P884-001	Power Supply
B863-032	4 Channel Register Input (TTL Level)	P890-000	Power Supply
B864-001	8 Channel Register Output (TTL Level)	P892-000	Power Supply
B865-001	8 Channel Register Input (TTL Level)	S908-110	RIO Processor Single
B868-001	8 Channel Register Output (TTL Level)	S908-120	RIO Processor Dual
B869-001	8 Channel Register Input (TTL Level)	S911-800	Hot Standby Module
B872	4 Channel Analog Output		

A120

A120 Series Cards

I/O cards supported (in alphabetical order):

Card	Description	Card	Description
ADU 204	4 Channel Register Input (+/- 0.5V)	DEP 208	230 VAC 8 Point Input Module
ADU 205	4 Channel Register Input (+/- 10V)	DEP 209	120 VAC 8 Point Input Module
ADU 206	4 Channel Register Input	DEP 210	115 VAC 8 Point Input Module
ADU 211	8 Channel Analog Input Module	DEP 211	115 VAC 8 Point Input Module
ADU 212	8 Channel Analog Input Module	DEP 214	12-60 VDC 16 Point Input Module
ADU 214	4 Channel Multi Range A/D Input	DEP 215	5 VDC TTL 16 Point Input Module
ADU 216	8 Channel Thermocouple	DEP 216	24 VDC 16 Point Input Module
CM900	Auto Interface	DEP 217	24 VDC 16 Point Input Module
DAO 216	24 VDC 16 Point Output Module	DEP 218	115 VAC 16 Point Input Module
DAP 204	24 VDC 4 Point Relay (NO) Module	DEP 220	Fast 24 VDC 16 Point Input Module
DAP 208	24 VDC 8 Point Relay (NO) Module	DEP 257	110 VDC 16 Point Input Module
DAP 209	120 VAC 8 Point Output Module	DEP 296	60 VDC 16 Point Isolated Input Module
DAP 210	24-230 VAC 8 Point Output Module	DEP 297	48 VDC 16 Point Isolated Input Module
DAP 212	24 VDC 8 Point Input/4 Point Output	M7251	Programmable Limit Switch
DAP 216	24 VDC 16 Point Output Module	M7350	Resolver Decoder Function Module
DAP 217	5-24 VDC 16 Point Output Module	MOT 201	1 Slot 1 Axis Motion Control Module Encoder
DAP 218	24-240 VAC 16 Point Output Module	MOT 202	2 Slot 1 Axis Motion Control Module Resolver & Encoder
DAP 220	24 VDC 8 Point Input/Output Module	P120 000	Power Supply

Card	Description	Card	Description
DAP 252	LowTemp 24 VDC 8 Point Input/4 Point Output	P120 125	Power Supply
DAP 253	LowTemp 110VDC 8 Point Input/4 Point Output	VIC 200	4 High Speed Pulse or 4 VRC Inputs
DAP 292	60 VDC 8 Point Input/4 Point Output	VIC 205	4 High Speed Pulse or 4 5V TTL Inputs
DAU 202	2 Channel Register Output (+/ -10V)	VIC 212	4 High Speed Pulse or 12 VDC Inputs
DAU 204	4 Channel Analog Output, Opto-Isolation	VIC 224	4 High Speed Pulse or 24 VDC Inputs
DAU 208	8 Channel Register Output (+/ -10V)	ZAE 201	High speed Counter/Positioner (2 Relay)
DEO 216	24 VDC 16 Point Input Module	ZAE 204	4 Channel High speed Counter/Positioner

Compact TSX

Compact TSX Series Cards

I/O cards supported (in alphabetical order):

Card	Description	Card	Description
ADU 204	4 Channel Register Input (+/-0.5V)	DAP 292	60 VDC 8 Point Input/4 Point Output
ADU 205	4 Channel Register Input (+/-10V)	DAU 202	2 Channel Register Output (+/-10V)
ADU 206	4 Channel Register Input	DAU 204	4 Channel Analog Output, Opto-Isolation
ADU 210	4 Channel Analog Input Module	DAU 208	8 Channel Register Output (+/-10V)
ADU 211	8 Channel Analog Input Module	DEO 216	24 VDC 16 Point Input Module
ADU 212	8 Channel Analog Input Module	DEP 208	230 VAC 8 Point Input Module
ADU 214	4 Channel Multi Range A/D Input	DEP 209	120 VAC 8 Point Input Module
ADU 216	8 Channel Thermocouple	DEP 210	115 VAC 8 Point Input Module
ADU 257	8 Channel Thermocouple	DEP 211	115 VAC 8 Point Input Module
BKF 202	Interbus S Slave	DEP 214	12-60 VDC 16 Point Input Module
BKF201-16	16 Word Interbus S Master	DEP 215	5 VDC TTL 16 Point Input Module
BKF201-64	64 Word Interbus S Master	DEP 216	24 VDC 16 Point Input Module
DAO 216	24 VDC 16 Point Output Module	DEP 217	24 VDC 16 Point Input Module
DAP 204	24 VDC 4 Point Relay (NO) Module	DEP 218	115 VAC 16 Point Input Module
DAP 208	24 VDC 8 Point Relay (NO) Module	DEP 220	Fast 24 VDC 16 Point Input Module
DAP 209	120 VAC 8 Point Output Module	DEP 257	110 VDC 16 Point Input Module
DAP 210	24-230 VAC 8 Point Output Module	DEP 296	60 VDC 16 Point Isolated Input Module
DAP 211	120 VAC 4 Point Output Module	DEP 297	48 VDC 16 Point Isolated Input Module

Card	Description	Card	Description
DAP 212	24 VDC 8 Point Input/4 Point Output	FRQ 204	Frequency and Speed Measurement
DAP 216	24 VDC 16 Point Output Module	KOS260-24	Universal Communications Module
DAP 217	5-24 VDC 16 Point Output Module	KOS260-64	Universal Communications Module
DAP 218	24-240 VAC 16 Point Output Module	MOT 201	1 Slot 1 Axis Motion Control Module Encoder
DAP 220	24 VDC 8 Point Input/Output Module	MOT 202	2 Slot 1 Axis Motion Control Module Resolver & Encoder
DAP 250	24 VDC 8 Point Input/Output Module	P120 000	Power Supply
DAP 252	LowTemp 24 VDC 8 Point Input/4 Point Output	P120 125	Power Supply
DAP 253	LowTemp 110VDC 8 Point Input/4 Point Output	ZAE 201	High speed Counter/Positioner (2 Relay)

Micro

Micro Series Cards

I/O cards supported (in alphabetical order):

Card	Description	Card	Description
MIC128	16 IN, 12 Relay OUT 24V DC	MIC140	8 Bit Counter/Interrupt Input
MIC129	16 IN, 8 Relay OUT 24V DC	MIC141	4 IN, 2 OUT 12 Bit 0-10V
MIC130	16 IN, 4 Relay OUT 24V DC	MIC142	4 IN, 2 OUT 12 Bit 1-5V
MIC131	16 IN, 8 Triac 4 Relay OUT 115V	MIC143	4 IN, 2 OUT 12 Bit ñ10V
MIC132	16 IN, 8 Triac OUT 115V	MIC144	4 IN, 2 OUT 15 Bit 0-10V
MIC133	16 IN, 4 Relay OUT 115V	MIC145	4 IN, 2 OUT 14 Bit 1-5V
MIC134	16 IN, 8 Triac 4 Relay OUT 230V	MIC146	4 IN, 2 OUT 10V
MIC135	16 IN, 8 Triac OUT 230V	MIC147	16 Bit Timer/Count Value
MIC136	16 IN, 4 Relay OUT 230V	MIC148	1 Word IN, 1 Word OUT
MIC137	16 IN, 12 FET OUT 24V DC	MIC149	2 Words IN, 2 Words OUT
MIC138	16 IN, 8 FET OUT 24V DC	MIC150	4 Words IN, 4 Words OUT
MIC139	16 IN, 4 FET OUT 24V DC	MIC151	8 Words IN, 8 Words OUT

Momentum M1 and INTERBUS

Momentum Series Cards

I/O cards supported (in alphabetical order):

Card	Description	Card	Description
AAI030-00	8 Channel Differential Input	AEC920-00	High Speed Counter 50khz
AAI140-00	16 Channel single ended Input	AMM090-00	24 VDC 4 In / 2 Out Bidirectional
AAI520-40	4 Channel RTD/Thermocouple	ANM050-10	Seriplex Interface
AAO120-00	4 Analog Output 0-20mA	ANR120-90	Bi-directional Analog (6 in/4 out) with 24 VDC (8 in/8 out) discrete
AAO921-00	4 Analog Output 4-10mA	ARM370-30	24 VDC 10 In / 8 Out Relay
ADI340-00	24 VDC 16 Point I/P Module	ATV058-00	Single Phase Drive
ADI350-00	24 VDC 32 Point I/P Module	BAI036-00	8 Channel Analog I/P Module
ADI540-50	120 VAC 16 Point I/P Module	BAM096-00	4 I/P / 2 O/P Analog Module
ADI740-50	230 VAC 16 Point I/P Module	BAO126-00	4 Channel Analog O/P Module
ADM350-1X	24 VDC 16 In / 16 Out	BDI346-00	24 VDC 16 Point I/P Module
ADM370-10	24 VDC 16 In / 8 Out	BDI356-00	24 VDC 32 Point I/P Module
ADM390-10	24 VDC 16 In / 16 Out	BDI546-50	120 VAC 16 Point I/P Module
ADM390-30	24 VDC 10 In / 8 Out Relay	BDI746-50	230 VAC 16 Point I/P Module
ADM540-80	120 VAC 6 In / 3 Out Bi-Dir	BDM346-00	24 VDC 16 In / 16 Out
ADM690-50	115 VAC 10 In / 8 Out	BDM346-30	8 In / 8 Out Relay
ADO340-00	24 VDC 16 Point O/P Module	BDO346-00	24 VDC 16 Point O/P Module
ADO350-00	24 VDC 32 Point O/P Module	BDO356-00	24 VDC 32 Point O/P Module
ADO530-50	115 VAC 8 Point O/P Module	BDO946-50	115 to 230 VAC 16 Point O/P
ADO540-50	115 VAC 16 Point O/P Module	BNO671-00	BUS Module
ADO730-50	24 VAC 8 Point O/P Module	IBUS-XXXX	Generic INTERBUS S Modules
ADO740-50	230 VAC 16 Point O/P Module	ISP001-0X	ISP Weighing Module

Quantum

Quantum Series Cards

I/O cards supported (in alphabetical order):

Card	Description	Card	Description
ACI030-00	Analog 8 Channel Unipolar Input	DDI841-00	10-60 VDC 16 Input Module
ACI040-00	16 Channel Analog Current Module	DDI853-00	10-60 VDC 32 Input Module
ACI050-00	32 Channel Analog Current In	DDM390-00	16/8 Bidirectional 24 VDC
ACI051-00	32 Channel Analog Voltage/ Current	DDM690-00	125 VDC 4 Input/4 Output HPO Module
ACI052-00	32 Channel Analog Voltage/ Current	DDO153-10	5 VDC 4x8 Output Module
ACO020-00	4-20 mA Analog Output Module	DDO353-00	24 VDC 32 Output Module
ACO130-00	8 Channel Output Module	DDO353-01	24 VDC 32 Point Output Module
AII330-00	I. S. 8 Channel Analog Input	DDO353-10	24 VDC True Low 32 Output Module
AII330-10	I. S. 8 Channel Analog Input Current	DDO364-00	24 VDC True High 96 Output Module
AIO330-00	I. S. Analog Output	DDO843-00	10-60 VDC 16 Output
AMM090-00	Analog In/Out 4Ch/2Ch	DDO885-00	125 VDC 12 Point O/P Module
ARI030-10	8 Channel RTD	DEVNET-08	64 Register Devicenet Scanner
ATI030-00	8 Channel Thermocouple	DEVNET-32	16 Register Devicenet Scanner
AUI040-00	16 Channel Universal Input Module	DII330-00	I. S. Digital Input
AVI030-00	8 Channel Bipolar, Analog Input	DIO330-00	I. S. Digital Output
AVI050-00	32 Channel Analog Voltage In	DRA840-00	16 Output Relay
AVO020-00	Analog Voltage Output Module	DRC830-00	8 Output ISO Relay
CHS110-00	Hot Standby	DSI353-00	24 VDC 32 Point Input Module
CPS-111	115/230V AC Power Supply 3A	DVO853-00	10-30 VDC Verified Output Module
CPS114	115/230V AC Power Supply 8A	EHC105-00	High Speed Counter 5 Channel

Card	Description	Card	Description
CPS124	115/230V AC Power Supply RED 8A	EHC202-00	High Speed Counter
CPS-211	24 V DC Power Supply 3A	EHC204-00	High Speed Counter 4 Channel
CPS-214	24 V DC Power Supply 8A	EHC208-00	High Speed Counter 8 Channel
CPS-224	24 V DC Power Supply RED 8A	EIA921-00	1 Channel AS-1 Module Interface
CPS-414	48 V DC Power Supply SUM 8A	ERT854-10	32 Point Smart Digital Input
CPS-424	48 V DC Power Supply RED 8A	ESI062-10	2 Channel ASCII Interface
CPS-511	125V DC Power Supply 3A	GPS100-00	IRIG-B Time Sync Interface
CPS-524	125V DC Power Supply 8A	HLI340-00	Hi-Speed/Latch/Interrupt
CRA211-10	DIO Drop MB+	HRT100-00	HART Serial Communications Card
CRA211-20	DIO Drop MB+	I2T010-00	I2T 10 Input / 10 Output
CRA212-10	DIO Drop MB+	I2T016-00	I2T 16 Input / 16 Output
CRA212-20	DIO Drop MB+	MCI186X	Resolver Interface Module
CRA931-00	RIO Drop S908	MCI18X1X2	Single Turn Interface
CRA932-00	RIO Drop S908	MCI18X3X4	MultiTurn Resolver Interface
CRP811-00	Profibus DP Interface Module	MMB102-00	Two axis motion with incremental
CRP931-00	RIO Head S908	MMB104-00	Four axis motion with incremental
CRP932-00	RIO Head S908	MMC120-0X	2-Axis Motion Control
DAI340-00	24 VAC ISO 16 Input Module	MMD102-00	Two axis absolute motion
DAI353-00	24/48 VAC 32 Input Module	MMD104-00	Four axis absolute motion
DAI440-00	48 VAC 2x8 Input Module	MSB101-00	Motion Inc Enc
DAI453-00	48 VAC 32 Input Module	MSC101-00	Motion Enc/Res
DAI540-00	115 VAC 16 Input Module Isolated	NOA611-00	Interbus-S Master Module
DAI543-00	2x8 115 VAC Input Module	NOA611-10	Interbus-S Master with PCP
DAI553-00	115 VAC 32 Input Module	NOE211-00	Ethernet TCP/IP Twisted Pair
DAI740-00	230 VAC 16 Input Module	NOE251-00	Ethernet TCP/IP Fiber Optic
CPS-424	48 V DC Power Supply RED 8A	NOE311-00	Ethernet SY/MAX Twisted Pair

Card	Description	Card	Description
DAM390-00	16/8 Bidirectional 24 VAC	NOE351-00	Ethernet SY/MAX Fiber Optic
DAM490-00	16/8 Bidirectional 48 VAC	NOE511-00	Ethernet MMS Twisted Pair
DAM590-00	16/8 Bidirectional 120 VAC	NOE551-00	Ethernet MMS Fiber Optic
DAO840-00	24-230 VAC 16 Output	NOE771-00	Ethernet TCP/IP 10/100 Megabit
DAO840-10	24-115 VAC 16 Output	NOE771-10	Ethernet TCP/IP 10/100 Megabit
DAO842-10	100-230 AC 16 Output Module	NOL911-XX	LonWorks Interface
DAO842-20	24-48 VAC 16 Output	NOM212-10	MB+ Drop Interface Card
DAO853-00	24-230 VAC 4x8 Output	NOM2XX-00	MB+ Drop Interface Card
DCF077-00	24 VDC Input Module	NOP911-00	Profibus FMS Interface Module
DDI153-10	5 VDC 4x8 Input Module	QSPXM	Seriplex Master
DDI353-00	24 VDC 32 Input Module	QUCM-SE	Programmable communications module
DDI353-10	24 VDC True Low 32 Input Module	SERX53-00	Sequence Of Events Recorder
DDI364-00	24 VDC 6x12 Fast Input Module	XCP900-00	Battery Backup
DDI673-00	125 VDC 24 Point I/P Module		

Sy/Max

Sy/Max Series Cards

I/O cards supported (in alphabetical order):

Card	Description	Card	Description
CRM931-D1	Digital 2 Slot RIO Adapter	RIM131	High Speed Counter Module
CRM931-D2	Digital 4 Slot RIO Adapter	RIM144	Multiplexed BCD Input Module
CRM931-D4	Digital 8 Slot RIO Adapter	RIM301	85-140 VAC 16 Input Module
DRM931-D8	Digital 16 Slot RIO Adapter	RIM331	32-Function 24V DC Input
CRM931-RG	Register RIO Adapter Module	RIM361	16-Function 240V AC/DC Input
RDI116	16 Channel Input	RIM731	64-Function 24V AC/DC Input
RDI132	32 Channel Input	ROM121	4-Function Analog Output
RDI1XX	Input Module	ROM122	4-Function Isolated Output
RDO616	16 Channel Relay Output	ROM131	Stepper Motor Controller Module
RDO732	32 Channel Relay Output	ROM141	Multiplexed BCD Output Module
RDOXXX	Relay Output	ROM221	16-Function 120V AC Output
RIM101	16-Function 120V AC/DC Input	ROM271	16-Function 120V AC RelayOutput
RIM121	4-Function Analog Input	ROM421	35-140 VAC 16 Output Module
RIM123	8 Channel High Speed Analog Input	ROM431	16-Function 240V AC Output
RIM125	16-Function Analog Input	ROM441	32-Function 24V DC Output
RIM126	8 Channel Analog/Thermo Input	ROM871	64-Function Relay Output
RIM127	12 Channel RTD Input Module	SIM116	16 In Simulator

Troubleshooting

B

Troubleshooting

Troubleshooting Overview

This chapter includes various tools and resources for troubleshooting networks, ladder logic, I/O cards, etc. Contact support (see *Contacting Schneider Electric, p. 26*) if you require further information about I/O cards.

What's in this Chapter?

This chapter contains the following sections:

B.1 General Troubleshooting

Section Overview

Overview

The Troubleshooting tools help to reduce down time and improve your maintenance personnel's understanding of the controller installation.

What's in this Section?

This section contains the following topics:

Isolating Faults

Isolating Faults

Faults can fit into one of four categories:

Fault	Possible Causes/Fixes
Input/Output Faults	This is the most common type of fault. It occurs when an open, short, or an electrical or mechanical malfunction happens. Common locations for these faults are in the field devices and the wiring between the I/O module that interfaces to the field device.
Controller Faults	These faults include a faulty controller or improper ladder logic. The Controller Manual Check helps isolate a faulty Controller.
Communication Faults	Communication Faults: Modicon controllers communicate with the I/O sub system through remote I/O processor communication networks or within local drops on the Modbus subsystem. Faults occur when two pieces of hardware unexpectedly stop communicating or communications becomes unintelligible.
Invalid Command	When the warning 'Command Not Valid Unless Logged In' appears, check the following: • Ensure the cable is properly attached to the controller. • Ensure that the controller you're connected to isn't logged onto by another user. • Ensure you're using the correct cable. • Ensure the cable is connected to the correct controller port. If the problem persists, contact Schneider Electric's Customer Support.

Manual Procedure List

Procedure One

Controller failed to power up with good AC supply and fuse OK:

Step	Action
1	Ensure that the power supply jumper is correct on the slot mount controllers.
2	Check the input power select switch position is correct for supply voltage.
3	Check for loose crimps or screws at the power supply terminal strip.
4	Check fuses where relevant.

Procedure Two

To replace a 38x/48x fuse:

Step	Action
1	Remove memory and executing cartridges.
2	Remove 9 screws that hold the side (1/4 inch nut driver).
3	Remove line cord cover screws and the plastic line cord cover.
4	Remove 2 line cord standoffs (3/16 inch nut driver).
5	Remove screws near battery compartment.
6	The front part of the controller can now separate from the circuit board. The fuse is located near the AC power connector.
7	Replace fuse with the same size and type.

Procedure Two

To replace a 68x/78x fuse:

Step	Action
1	Remove 2 thumbscrews and 2 machine screws with start washers as shown on front view.
2	Remove small cover.
3	Remove 4 machine screws from rear cover and slide rear cover back 3 inches. (Exec pack cover may have to be removed from the right side).
4	Carefully slide the left side section toward the back expose the two fuses.
5	Replace blown fuses with the same type and size.

Procedure Two

To replace a P930/P933 fuse:

Step	Action
1	Turn off the P930/P933 power supply.
2	Turn off the supply power to the power supply.
3	Remove the supply power line from the P930/P933 power terminal.
4	Loosen mounting screws on top and bottom of the front face of the P930/P933 and slide the P930/P933 out of the chassis.
5	Replace fuse with on of the same type and size.

Procedure Three

Failure to attach to a running controller:

Step	Action
1	Ensure that the proper cables and software are being used.
2	Are the communication parameters on the computer the same as those on the controller?
3	Check the cable attachment and pinout.
4	If Modbus Plus is being used then ensure the Modbus Plus driver is installed and the Modbus Plus active LED on the SA85 or PC85 card and the controller are flashing at six times a second. (The Modbus Plus Indicator normal operating state.)
5	If this is the first time this cable has been used then test the cable.

Procedure Four

If Modbus Plus is the chosen mode of communication, please ensure that the Modbus Plus driver software is installed. You may use the Modbus Plus diagnostic tools included with the driver suite. Check if the Modbus Plus active LED is flashing both at the interface card (PCI85 or SA85) and at the PLC. Normal indication is six times per second.

Modbus Plus

Modbus Plus Communications for Concept Exec Loader

When using Modbus Plus communications and the interrupt is NOT "5C", you must add the following line to the "modicon.ini" file located in the Windows folder:
Under the heading: `[Ports]`
`MBP0 (or MBP1) = interrupt 5D`

Modbus Plus Indicator

On most Modbus Plus devices, a green LED flashes a repetitive pattern indicating the communication status of the node. The patterns are:

- Six flashes per second: Normal operating state. The node is successfully receiving and passing the token. All nodes in operation on the network should be flashing this pattern.
- One flash per second: Node is offline after just being powered up or there is another node on the network with the same address (duplicate addresses are not allowed). The node remains in this state for five seconds, then attempts to go to its normal operating state.
- Two flashes, then OFF for two seconds: Node is hearing the token being passed among other nodes, but is never receiving the token. Check the network link for an open or short circuit, or defective termination.
- Three flashes, then OFF for 1.7 seconds: Node is not hearing any other node. It is periodically claiming the token, but finding no other node to which to pass it to. Check the network link for an open or short circuit, or defective termination.
- Four flashes, then OFF for 1.4 seconds: Node has heard a valid message from another node that is using the same address as this node. The node remains offline in this state as long as it continues to hear the duplicate address. If the duplicate address is not heard for five seconds, the node then changes to the pattern of one flash every second.

Stopcode Error Analysis

Stopcode Error Analysis

Bit/Error reference:

Bit	Error	Description
0 (0001 Hex)	Illegal Configuration	Someone or something has probably been modifying controller memory and the configuration is not valid for this controller. The error may also be caused by a bad memory board or Executive pack or by inserting the wrong memory or executive into a controller.
1 (0002 Hex)	984 A/B/X and 584 - Backup Checksum Error	Information saved in a coil and register has been corrupted. In order to recover the corrupted information, the program must be reloaded. A bad memory board may also cause this error.
1 (0002 Hex)	984 -80 Series (984 A/B/X - some PROMS) Discrete Disabled Error	Usually caused by trying to start the controller in the optimized mode with discrete points that are disabled.
2 (0004 Hex)	Logic Checksum Error	The calculated user logic checksum does not agree with the stored checksum. It can be caused by an illegal change of memory or by a bad memory board. Try reloading the program. This error also occurs if the ASCII area has been loaded incorrectly. If reloading fails then try initializing the ASCII area. As a last resort try replacing the memory board.
3 (0008 Hex)	Invalid Node Type	This error usually occurs when loading the controller. It may be caused by loading or relocating a program from a machine supporting a DX instruction not supported or configured for in the target machine, i.e. relocating a program with an HSBY function block to a 984 not configured for an HSBY. It may also be caused by loading a program made on a 24 bit machine to a 16 bit machine i.e., specifying a constant greater than 999.

Bit	Error	Description
4 (0010 Hex)	S908 RIO Head Failure or Remote I/O option failed	Causes: ● A failed S908 RIO board (replace the board) ● Illegal board configuration in the 984 (e.g., the wrong PROM pack) ● Configuring for more than one drop and not attaching anything to the S908 ● Cards contained in the Traffic Cop that are not present in the field or cards in the field that mismatch with the Traffic Cop. ● Powering up an intelligent I/O card (B984) at the same time as the 984 ● Attempting to start an HSBY system without the S908 cards interconnected. ● Cycling power on the controller may be necessary to clear this error.
5 (0020 Hex)	984 A/B/X and 584 CPU Diagnostic Failure	The CPU board is bad and should be replaced.
5 (0020 Hex)	984 -80 Series Bad Coil Used Table	The coils existing in the logic do not match those found in the used table.
6 (0040 Hex)	Real Time Clock Failure	The CPU board is bad and should be replaced.
7 (0080 Hex)	Watchdog Time Expired	This bit is usually set in conjunction with another. It often signals a Data transfer program that is too large. The logic is not being solved fast enough.
(0090 Hex)	Real I/O Option Failed	Check that the S908 card is properly installed and that its ready light is on steady.
8 (0100 Hex)	No EOL Detected or Bad Number of Segments	This error usually occurs when a startup is attempted after the incomplete loading of a program. Reload or try another program. **Note:** You may receive this system error when you first configure the system, before you have programmed any logic. This is not a fatal error. The system cannot find the end of logic because there is no logic programmed from the primary to the standby state.
9 (0200 Hex)	984 A/B/X and 584 State RAM Test Failure	The continuously running diagnostics have failed. Replace the RIO processor.

Bit	Error	Description
9 (0200 Hex)	984 -80 Series Bad Power Down Checksum	Cycle the power on the controller to clear the error or Start Controller.
10 (0400 Hex)	SON Did Not Start Segment	Improper programming from a programming device or software package is usually the cause of start-of-node failure.
11 (0800 Hex)	Bad Segment Scheduler Table	The Segment Scheduler has been programmed improperly.
12 (1000 Hex)	Illegal Peripheral Intervention	This error is caused by an attempt to clear the System Stop State word. A programming device has altered memory in a non-authorized manner.
13 (2000 Hex)	Dim Awareness	The 984 has not been configured successfully. This bit can be set in conjunction with other flags.
14 (4000 Hex)	984B and 584 Extended Memory Parity Error	This error indication pertains to the 984B or extended memory 584 only. Try reloading memory. If that fails to solve the problem, replace the memory board.
14 (4000 Hex)	984 -80 Series Traffic Cop Failure	Usually caused by configuring for more than one drop and not having an S908 remote I/O processor in the controller rack. This error can also be caused by too many points contained in the Traffic Cop (512 inputs and 512 outputs allowed per drop), or by more cards in Traffic Cop than physically present (Micro 984).
15 (8000 Hex)	Peripheral Port STOP	This simply indicates the PLC has stopped.

B.2 Status Words for S901 and S908

At a Glance

Overview

With both the S901 and S908 controllers, the first 11 Status Words are always found at absolute memory address 65-6F hex. Pointers determine the absolute memory locations of the remaining words. A pointer for the start of the status information is always located at address 6F hex.

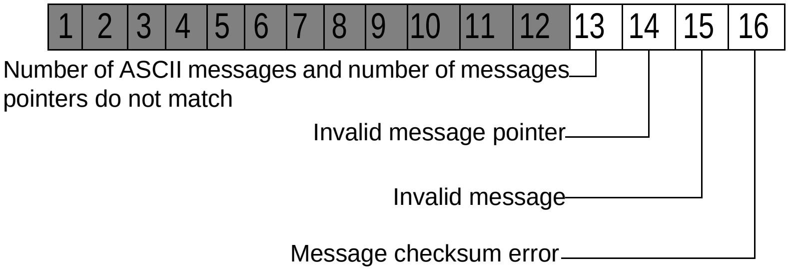
What's in this Section?

This section contains the following topics:

ASCII Message Status

Word 6D Hex (109 Decimal)

This word reflects the status of the ASCII message database. Bits set in this word indicate that errors occurred while creating or editing ASCII messages.

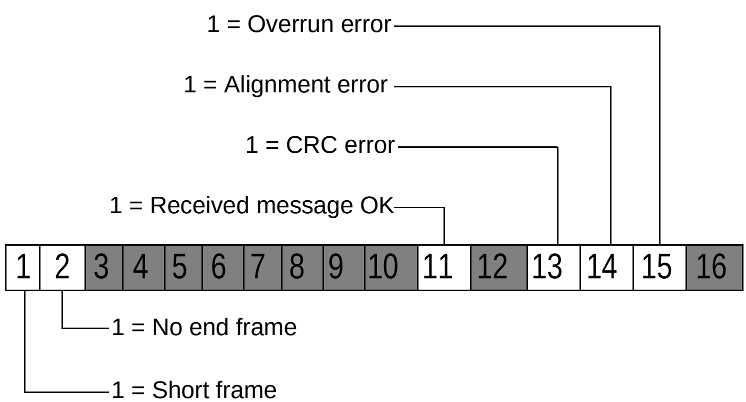


Cable A Errors

Cable A Errors

Cable A is the main cable connecting the remote I/O Processor to the Remote I/O Interface.

Status Word	Description
173	The count of frame size errors and DMA overrun errors. The high order byte represents a count of Cable A frame size errors. This indicates that the length of the data message was incorrect. The low order byte represents a count of DMA receiver overrun counts. This indicates that the hardware had more data to send than was required.
174	The Cable A LAN receiver error counter and the Bad Drop reception on cable A counter. This indicates a cable or noise problem to a drop. The "Drop Communication Errors (173)" should be examined to determine which drop is having problems.
175	The last received LAN error code for cable A. The LAN hardware detected an error in receiving a message.

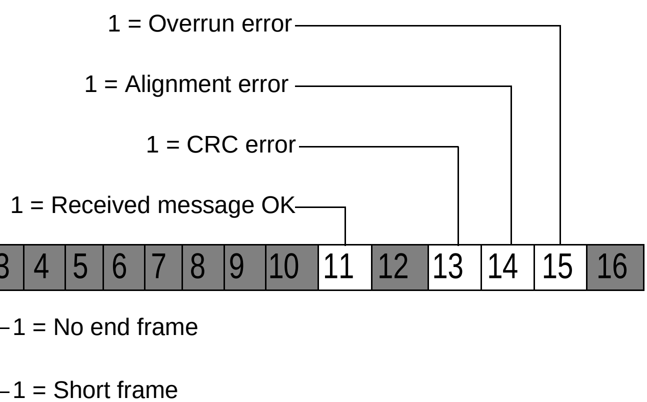


Cable B Errors

Cable B Errors

Cable B is the secondary or redundant cable connecting the Remote I/O Processor to the Remote I/O Interface (optional redundant cables).

Status Word	Description
176	The count of frame size errors and DMA overrun errors. The high order byte represents a count of Cable B frame size errors. This indicates that the length of the data message was incorrect. The low order byte represents a count of DMA receiver overrun counts. This indicates that the hardware had more data to send than was required.
177	The Cable B LAN receiver error counter and the Bad Drop reception on cable B counter. This indicates a cable or noise problem to a drop. The "Drop Communication Errors (173)" should be examined to determine which drop is having problems.
178	The last received LAN error code for cable B. The LAN hardware detected an error in receiving a message.

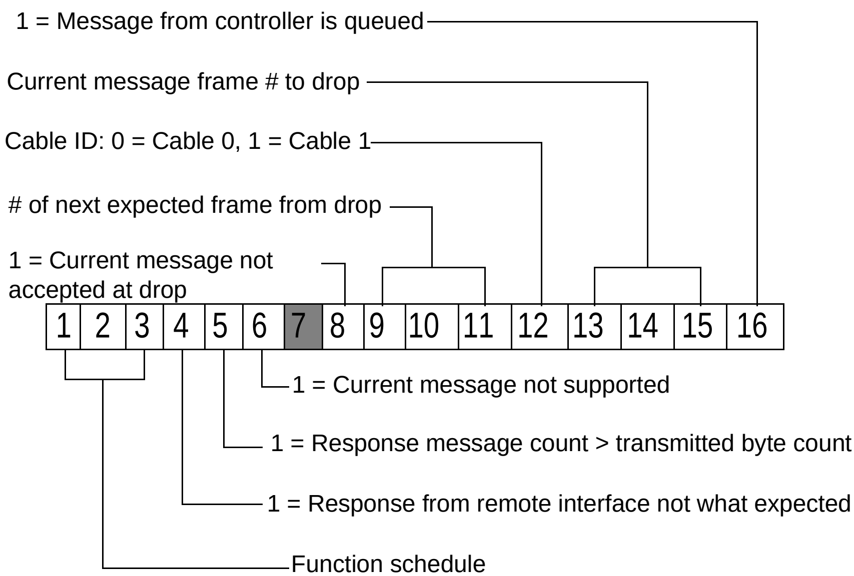


Communication Status

Communication Status 1/2 (S901)

The Remote I/O communication Status Word 1 shows errors and normal operating indication of the indicated channel pair. Under normal operating conditions the lower byte should be counting and the upper portion of the byte should match the lower portion of the byte.

Any bits set in the upper byte indicates an error condition for the channel pair. Note that a disconnected channel pair or a channel pair that does not exist will set the function scheduled to 001 (Restart - communication reset).

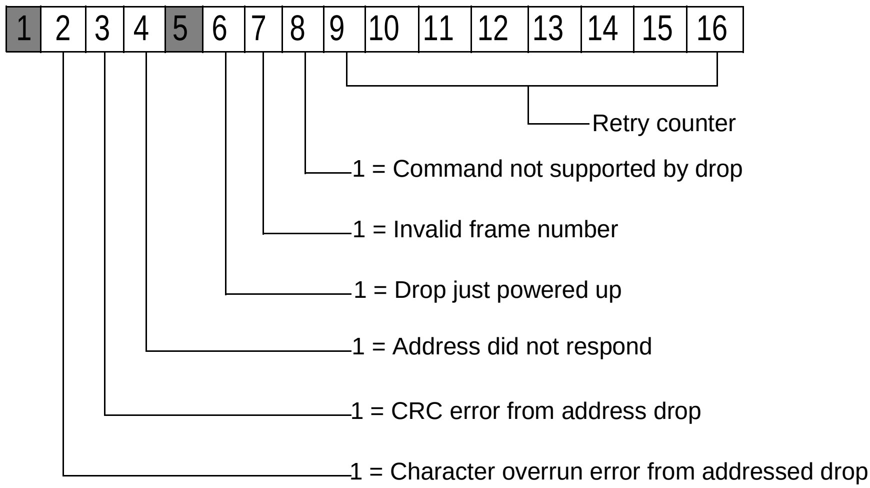


Function Schedule:

Binary Number	Description
000	Normal I/O
001	Restart (comm reset)
010	Restart (application reset)
100	Inhibit

Communication Status 2/2 (S901)

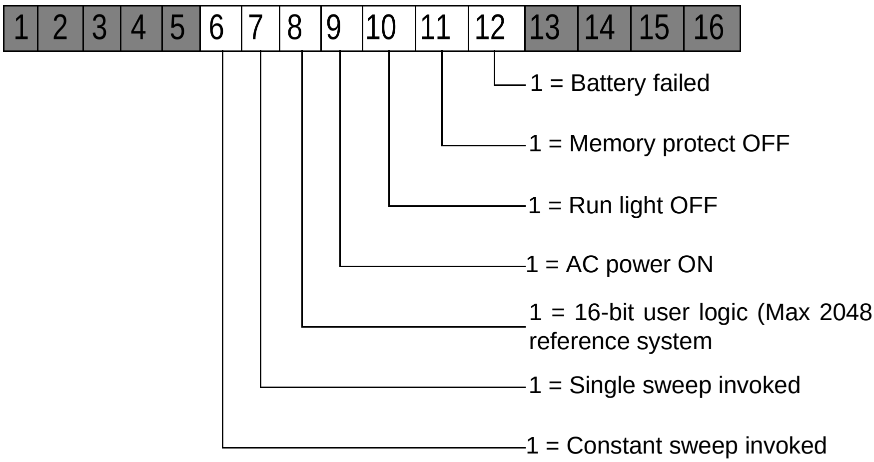
The Remote I/O communication Status Word 2 shows errors and the retry count on lost communications. If communications is lost with the channel pair then the corresponding error bit will be set and the retry counter will increment. If the retry counter counts to maximum then other indicators will be affected.
Module health will show as ’0’. If communication is re-established, this error count and error word is not cleared. The only way to clear this word is to cycle power on the controller or issue a start and stop command.



Controller State

S908 Controller - Word 65 Hex (101 Decimal)

The Controller state word shows information pertaining to the state and size of the controller. A state is any condition, which is either set for the life of the controller (16-bit vs. 24-bit) or set by external events (memory protect). The upper bits have no meaning for an 984/S908 or –80 -85 controllers. The AC power bit will always be on or monitoring would not be possible. The down size flag indicates controllers with < 4K logic memory. Some Micro 984 controllers show a 0 for battery failed. The 16 bit user logic bit indicates controllers that support 2048 references. (The 984B and the 780/785 are 24-bit controllers.)



S901 Controller - Word 65 Hex (101 Decimal)

The Controller state word shows information pertaining to the state and size of the controller. A state is any condition that is either set for the life of the controller (16-bit vs. 24-bit) or set by external events (memory protect). The AC power bit will always be on or monitoring would not be possible. The down size flag indicates controllers with < 4K logic memory. The 16-bit user logic bit indicates controllers that support 2048 references. (The 984B and 584 Level 4 are 24-bit controllers.)

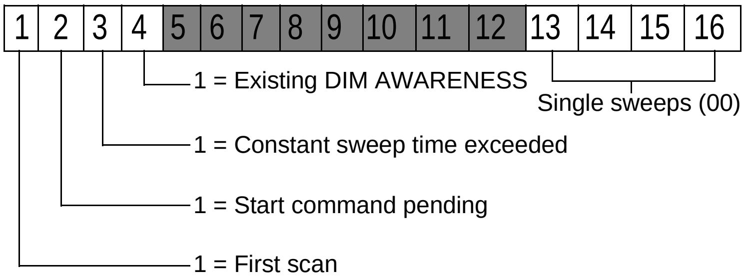
D0	Reserved
D1	Set offline mode
D2	Set data exchange active
D3	Operating mode

Controller Status

S908 and S901 Controllers - Word 67 (103 Decimal)

The controller status words indicate certain statuses of the machine. A status is any condition which changes during the running of the controller, usually from an internal event.

Word 3 (4xxxx + 2) - General controller status:



EOL (End of Logic) Pointer

Word 6B Hex (107 Decimal)

This location contains the end of logic pointer. The EOL pointer provides the hexadecimal address of the end of user logic.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

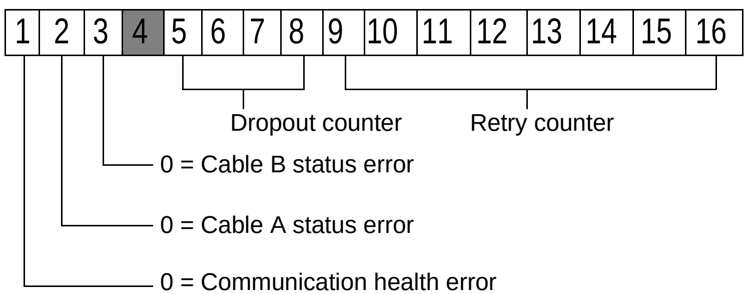
EOL pointer address

Global Errors

Global Errors

Status Word	Description
179	The Global Communication Status. This word stores communications status for both cable A and cable B. Cable A is the main cable connecting the remote I/O Processor to the Remote I/O Interface. Cable B is the optional secondary or redundant cable. The specific information stored is shown in the figure below.
180	Global Cumulative error counter for cable A. High byte - Framing error count / Low byte - No response count. Errors counted here cause the error counters in *Cable A Errors, p. 282* to increment.
181	Global Cumulative error counter for cable B. High byte - Framing error count / Low byte - No response count. Errors counted here cause the error counters in Cable B Errors (169) to increment.

Figure 1



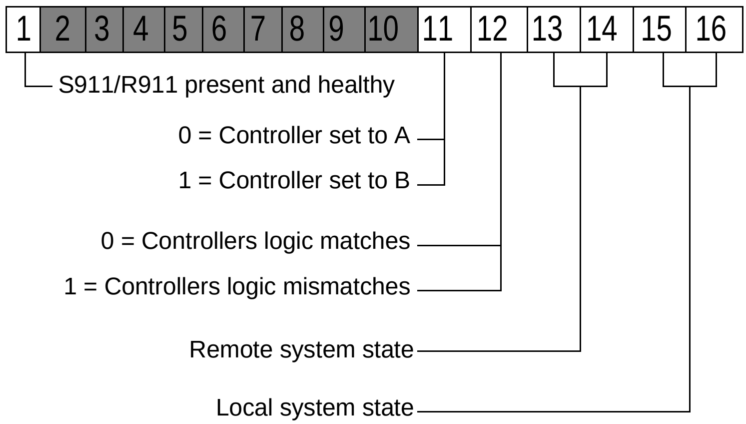
Note: It is possible for bits 2 and 3 to be ‘1’ and bit 1 to be ‘0’ "Cables (171)"

S911 Hot Standby Status (S908)

Word 66 Hex (102 Decimal)

The hot standby status is valid if a redundancy system is present. It shows if the unit is reporting present and healthy and the word also indicates if the unit is the primary or secondary controller.

Word 4 (4xxxx + 3) - S911/R911 Hot Standby Status



System State:

Binary Number	Description
01	Offline
10	Primary
11	Secondary

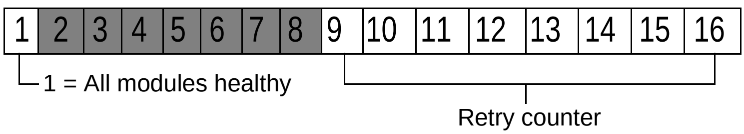
Local Drop Communications Errors (S908)

Status Words 182-184

Status Words 182 to 184 show the status of the local drop communication errors (when a local drop is present). The first drop may or may not be a local drop depending upon the controller type being used.

Status Word	Description
182	The overall health and retry counter for the local drop. If the MSB is not 1 then there are Module Health (166) errors on the local drop.
183	The ourbus error count for the local drop. If the count is incrementing then there are errors on the local drop. This may be caused by invalid information in the traffic cop, an unhealthy module in the local drop, or a mismatch between the traffic cop and the module that exists in a slot located in the local drop.
184	The ourbus retry count for the local drop. Under normal operating conditions, only the all modules healthy bit should be set.

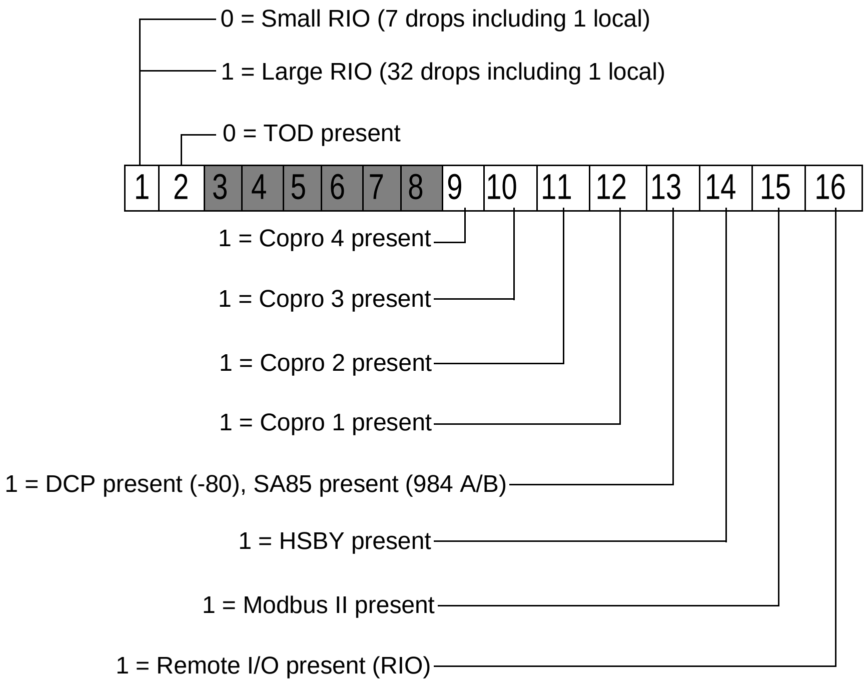
Figure 1



Machine Configuration

Word 61 Hex (97Decimal)

This screen shows the options that are present for the attached controller. These options include remote I/O (S908 processor), Modbus II, Hot Standby, Distributed Control Processor (D908) and Coprocessors. It also indicates whether or not the time of day option is available for this controller and the remote I/O adapter size.
Note: Some versions of the S908 remote I/O processor only support 6 remote drops.
A '1' indicates that an option is present.
Figure 1



Module Health

S908 Controller

Module Health Status information consists of up to 160 words. A single bit is used to represent the Health Status of a single module. A binary '1' means that the module is healthy. Each drop in the I/O sub system has five words allocated to contain I/O module status. Each of these five words contains the I/O module status of a single rack within the drop. The most significant bit (MSB) represents the status of the module in slot 1. Slot 2 module status is represented by the bit to the immediate right of the MSB.

A healthy I/O module must meet the following conditions:
- The specified slot must be configured in the Traffic Cop.
- The slot must contain the module specified in the Traffic Cop.
- Valid communication must exist between the module and the interface.
- Valid communication must exist between the interface module and the controller.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Odd channel bits 1 through 8 Even channel bits 9 trough 16

Note: If a module is configured in the Traffic Cop and active, then the bit will be 1.

WARNING

Upgrade Recommended

On systems using J890/J892s with PROM rev 1000, slot 1 will be the LSB. J890/J892s with PROM revs greater than 1000 will appear as previously described. The earlier J890/J892s should be upgraded as they will be incompatible with any user programming that assumes slot 1 status to be the MSB.

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

S901 Controller

The I/O Module Health Status information consists of words that represent the module health for channel pairs. Each word represents 2 channels. The words are also divided into input modules and output modules. A single bit is used to represent the Health Status of a single module.

If the slot is inhibited in the Traffic Cop then the bit will be a ’0’. If the slot contains an input module then the bit will be a ’1’. This will not be the case if the Communication Status Word 2/2 (183) indicates an error.

If the slot contains an output module and if the active light is on then this bit will be a ’1’. If the active light is off then this bit will be a ’0’. It is common to set the status indicator for an output slot to toggle between ’0’ and ’1’ when active and healthy.

The Upper byte contains the status of the lower channel number of the channel pair (for example, channel 1 for channel pair 1/2). The lower byte contains the status of the higher channel number of the channel pair. Each byte represents the status of slots 1 to 8 of the channel. The Most Significant Bit of the channel represents slot 1 and the Least Significant Bit shows the status of slot 8.

Status Word #012: Drop # 01/01 Rack # 1/5

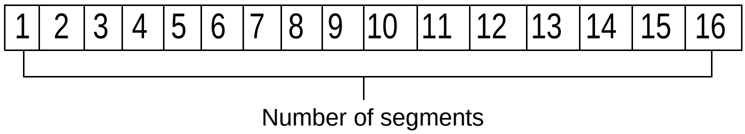
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

Slot #1 through Slot #11 **E-Series** Plus these five w/**Quantum**

Number of Segments

Word 6A Hex (106 Decimal)

This word is confirmed during power up to be the number of I/O exchange nodes plus 1 (for end of logic). If this is not true then a stop code of 0100 would result.



Status Word Pointer Table

Description

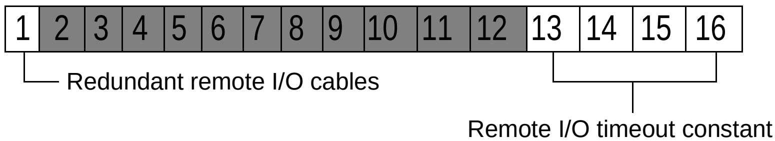
The address in 6F points to a table of pointers 76 words long. It is important to remember that this 76 word long table is a table of address pointers for the 75 word long system status area.

RIO Time-out

Word 6C Hex (108 Decimal)

This word contains the Remote I/O time-out constant and a bit that indicates if redundant cables are present.

Note: Cable A and Cable B are used for remote I/O communications.



Run/Load/Debug Status

Word 6E Hex (110 Decimal)

This word is a mode indicator for 984 controllers. The load mode is used for loading a program to the controller. The run mode indicates that the controller was started in the optimized mode (no editing allowed while running). The debug mode is the normal mode of operation for a controller. In this mode network editing is allowed while the controller is running.

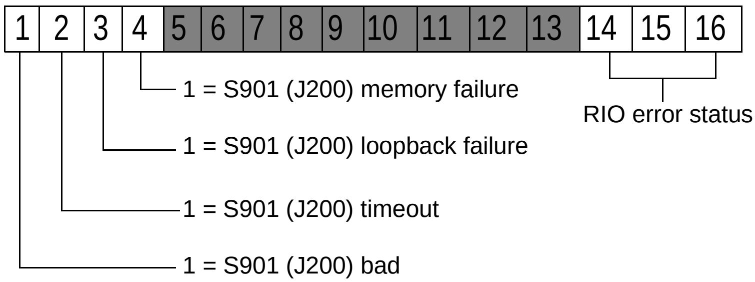
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16

15	16	
0	0	= Debug
0	1	= Run
1	0	= Load

S901/J200 Status

Word 68 Hex (104 Decimal)

This word shows the status of the remote I/O processor. The upper 4 bits should be zero under normal operating conditions. An error indicates a failure in the remote I/O processor.



RIO error status:

Binary Number	Description
000	RIO did not respond
001	No response on loopback
010	Failed loopback data check
011	Timeout while awaiting response
100	RIO did not accept all of message

S908 Errors

S908 Errors

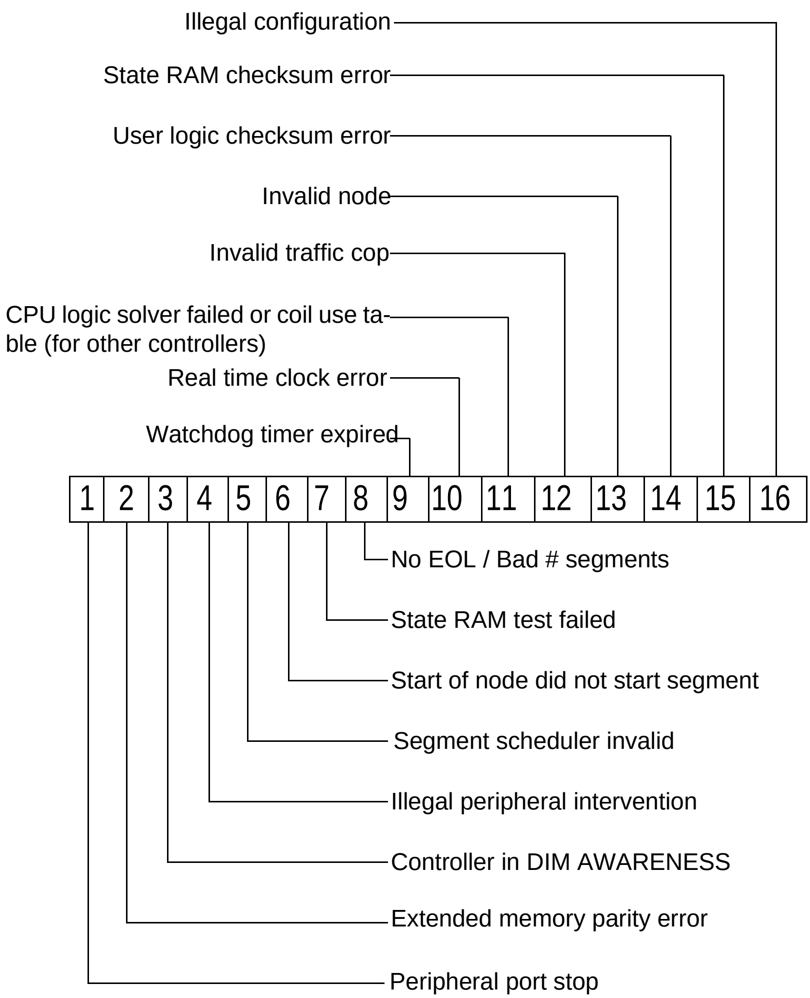
This word is the S908 start error code. This word will always be 0000 in a running system. If an error does occur, the controller will not start and will generate a Stopcode system error of 4000.

Number	Description	Number	Description
1	Bad Traffic Cop Length	23	Bad Number of Input Bytes
2	Bad Remote I/O Link Number	25	Bad First Reference Number
3	Bad Number of Drops	26	Bad Second Reference Number
4	Bad Traffic Cop Checksum	27	No Input or Output Bytes
10	Bad Drop Descriptor Length	28	Discrete Not on 16 Bit Boundary
11	Bad I/O Drop Number	30	Unpaired Odd Output Module
12	Bad Drop Holdup Time	31	Unpaired Odd Input Module
13	Bad ASCII Port Number	32	Unmatched Odd Module Reference
14	Bad Number of Modules in Drop	33	1xxxx Reference After 3xxxx Register
15	Drop Already Configured	34	Dummy Module Reference Already Used
16	Port Already Configured	35	3xxxx Module Not a Dummy
17	More than 1024 Outputs	36	4xxxx Module Not a Dummy
18	More than 1024 Inputs	40	Dummy Then Real 1xxxx Module
20	Bad Module Slot Address	41	Real Then Dummy 1xxxx Module
21	Bad Module Rack Address	42	Dummy Then Real 3xxxx Module
22	Bad Number of Output Bytes	43	Real Then Dummy 3xxxx Module

Stopcode

S908 Controller - Word 69 Hex (105 Decimal)

This word contains a Stopcode that describes what kind of stop state (if any) that the machine has. A ’1’ in the most significant bit indicates that the controller is not running. Any other ’1’ bit indicates an error. It is possible to have multiple errors. For a detailed explanation of Stopcodes, see *Stopcode Error Analysis, p. 277*.



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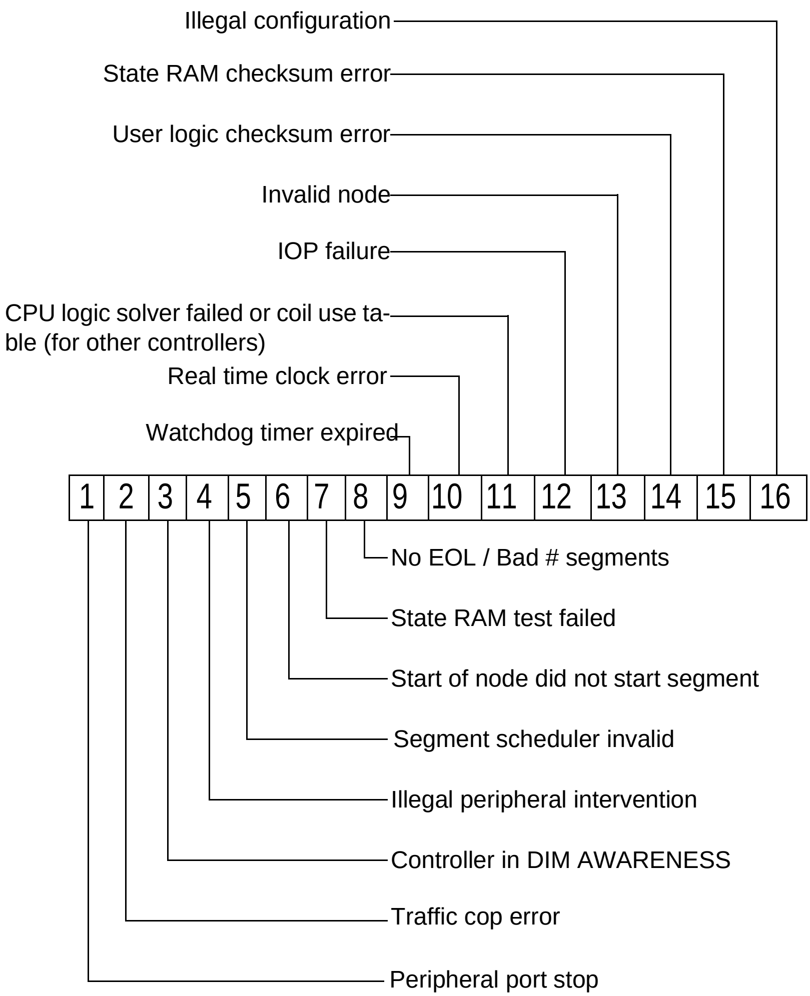


Editing .DIF Files with Microsoft Excel

C

Editing .DIF files with Microsoft Excel

Overview

When Excel imports a .DIF file, it converts the controller addresses in the first column of the database into numerical values which ProWORX 32 cannot read. Excel also exchanges the rows and columns of the database in the .DIF file's header. Unless you correct these problems, an error appears when you try to import a .DIF file back into ProWORX 32 after you have changed it in Microsoft Excel.

To use Excel to edit documentation, follow these seven steps:

Step One

Set the size of your descriptor fields for Microsoft Excel.

Step	Action
1	Select the ProWORX 32 project whose documentation you want to edit.
2	From the project right-click menu in the navigation tree, select **Properties**.
3	In the properties dialog, select the **Documentation** tab.
4	Set **Number of Descriptor Lines** to 9.
5	Click **OK** to save changes and return to ProWORX 32.

Step Two

Export your ProWORX 32 project as a .dif file.

Step	Action
1	From the project right-click menu in the navigation tree, select **Export Documentation**.
2	Select a path and enter a file name in the **Select Destination File** dialog.
3	Click **OK** to export documentation.

Step Three

Open and edit the documentation in Microsoft Excel.

Step	Action
1	Open the .DIF file in Microsoft Excel. The number in **Column A** tells you what controller address the row describes. The letter in **Column B** tells you what information the next cells in the row contain: ● D - Descriptors 1 through 9 in columns C through K. ● S - Short Comments 1 through 4 in columns C through F. ● L - Long Comment lookup number in column C. ● T - The Page Title in column C
2	Make your changes to the documentation.

Step Four

Convert the controller addresses from numbers to text.

Step	Action
1	Find an unused column in the spreadsheet. This temporary column holds information during the conversion process.
2	In the first cell of the unused column, type: =TEXT(A1,"00000"). This formula converts the numerical value in cell A1 into a text value which ProWORX 32 can read. When you press ENTER, the text value appears in the cell where you entered the formula.
3	Select the cell.
4	From the Excel menu, select **Edit** → **Copy**.
5	Select the temporary column by clicking its header. For example, if you entered the TEXT formula into the first cell of Column M, now select all of Column M.
6	From the Excel menu, select **Edit** → **Paste**. This operation pastes the TEXT formula copied from the first cell of the temporary column into all the other cells in the column. Click **Yes** if a warning message appears telling you that the selection is too large for Undo. The temporary column now contains the same values as Column A, but formatted as text instead of numbers.
7	Select the entire temporary column again.
8	From the Excel menu, select **Edit** → **Copy**.
9	Select Column A.
10	From the Excel menu, select **Edit** → **Paste Special**, then click **Values**. The text values from your temporary column replace the numerical values in column A. Click **Yes** if a warning message appears telling you that the selection is too large for Undo.
11	Select the entire temporary column.
12	From the Excel menu, select **Edit** → **Clear** then click **All**. The values in your temporary column disappear. Click **Yes** if a warning message appears telling you that the selection is too large for Undo.

Step Five

Export the Microsoft Excel spreadsheet as a .dif file.

Step	Action
1	Save the edited database as a .DIF file.

Step Six

Correct the rows and columns in the .dif header.

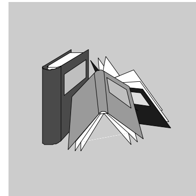
Step	Action
1	Open the .DIF file with a text editor. (Notepad or Wordpad)
2	Switch the "VECTORS" and "TUPLES" values in the header of the .DIF file.
3	Save the edited database as an ASCII .DIF file.

Step Seven

Import the documentation back into ProWORX 32.

Step	Action
1	From the project right-click menu in the navigation tree, select **Import Documentation** (Append, Overlay or Create New).
2	Select the .dif file containing the changed documentation from the **Select Documentation File** dialog.
3	Click **Open**. The documentation of the current project is updated.

Glossary



A

Address 1) On a communications network, the identifying number for a station such as a PLC.

2) In a computer's or PLC's memory, a location where data, usually a specific input or output value is stored.

Address Used Table A list of all I/O addresses in a controller, indicating which addresses are being used in ladder logic instructions and which are not.

Analog Inputs (such as temperature) or outputs (such as motor speed) which can have a range of values. Compare to **Discrete**.

ASCII American Standard Code for Information Interchange.

1) A way of encoding the standard text (the letters, numbers, etc. on your keyboard) your computer generates.

2) A data transmission mode for Modbus communications which sends and receives standard text. ASCII mode used 7 data bits while RTU mode uses 8.

ASCII Message A text message transmitted or received by a programmable controller. These messages are sent to or from a terminal through an ASCII port.

Assembly Register A register that accepts keyboard input for command and value entry in the Network Editor.

Attaching to	Also called selecting. Connecting your PC to a programmable controller so ProWORX 32 can read its ladder logic, traffic cop information, and configuration, and write changes back to it.

B

Baud Rate	For serial communications, the speed (in bits per second) at which data is transmitted.
BCD	Binary Coded Decimal.
Binary	The base-two numbering system. It has two symbols: 1 (representing ‘On’) and 0 (‘Off’)
Bit	The smallest amount of information in binary: either a 1 or a 0.
Bits per Second (BPS)	The number of bits passed from one device to another in one second. Used to measure data transmission speed.
Block	A section of ladder logic which is defined while using the logic editor. This block can be copied, deleted, saved, moved, and loaded.
BM85	See **Bridge Multiplexer**.
BP85	See **Bridge Plus**.
Bridge Multiplexer	Allows you to connect up to four Modbus devices or networks of Modbus devices to a Modbus Plus network. Nodes on the Modbus Plus network can access slave devices connected to the BM85 Modbus ports.
Bridge Plus	Links together two Modbus Plus networks.
Byte	A group of eight bits. A byte stores a value from 0 to 255.

C

Cell	A single location in ladder logic.

Channel In an S901 I/O subsystem, a group of 128 inputs and 128 outputs assigned to a segment. The ladder logic in the segment usually controls all I/O operations of the corresponding channel.

Characters per Inch (CPI) The number of characters a printer prints in one inch. (Also called horizontal pitch.)

Checksum A calculation that sums a range of data and compares it to a pre-calculated value. This determines if the data is in error or has changed.

Coaxial Cable A round cable containing two conductors, one inside the other (separated by a insulator). The inner conductor transmits a signal while the outer conductor is a shield.

Commentary The descriptors, short comments, long comments, and page titles within a project.

Controller An industrial control computer, also called a programmable logic controller or PLC.

CPS Characters per Second.

Cross-Reference A list of the networks in which a particular address can be found.

Current Element The cell or ladder logic element being edited. The logic editor's cursor is always on the current element.

Current Network The network being edited. The network displayed in the logic editor is always the current network.

Cursor A bar or block which indicates a position on the screen. Generally, the cursor is located where something can be inserted or selected.

D

Data Bits The bits in a data package which carry a message, distinct from start bits, stop bits, and parity bits. Remote Terminal Unit mode (the Modbus default communication mode) sends eight data bits per package. ASCII mode sends seven data bits per package.

Data Contents A printout showing the data values in a ladder logic program.

Data Register A 4xxxx holding/output register.

DCP Drop ID# A distributed control processor drop address. It is equivalent to the drop number used by the DCP.

DCP-908 A distributed control processor providing intelligent bidirectional communication between a supervisory 984 controller and distributed 984 controllers.

Decimal The base-ten number system. It consists of the symbols 0 through 9.

Default A value automatically assigned by the computer in a software program. Usually, this value can be changed.

Descriptor Field One of up to nine text strings which are a short description of an address within a ladder logic program.

Descriptor Record All descriptors, short comments, the long comment number, and the page title for one address point.

Descriptor Table The table of addresses displayed on the screen in the descriptor module.

Descriptor Tables Listing A group of printouts which consist of tables of descriptors, a table of short comments, long comments, and mismatch tables.

Descriptors A short description of an address within a ladder logic program. A number of descriptor fields.

Device Any programmable unit (such as a PLC, numeric controller, or robot) or I/O card.

Dim Awareness The state of a PLC that contains no logic, configuration, or traffic cop information.

Directory A group of files and/or subdirectories. A directory called the root directory is placed on each disk when it is formatted. Subdirectories can be created within the root directory and within other subdirectories. Files can be stored in a subdirectory or the root directory. In Windows, directories are often called "folders".

Disable To stop the programmable controller's logic-solving mechanism from updating the state of a coil or updating the state of a discrete input. Also see **Force**.

Discrete Inputs (such as switches) or outputs (such as coils) that can only be on or off. Discrete inputs are usually held in 1xxxx registers. Compare to **Analog**.

Display A visual output device such as a monitor.

Distributed I/O (DIO)	One of four major architectures for input/output systems (also see **Local I/O**, **Remote I/O**, and **Peer-to-peer Communications**). I/O that is installed away from the PLC over a wide area and communicates with it through a Modbus Plus network. One Quantum controller can support up to three distributed I/O networks, each with up to 64 drops. The local rack houses a DIO processor for each network, which sets the network's head number.
Documentation	A description of a controller's memory, logic, and configuration. The descriptors, short comments, long comments, and page titles within a database.
Documentation Editor	The editor in which descriptors, short comments, long comments, and page titles can be entered and modified.
Double Precision	A 32-bit format which uses two registers to store numerical values.
Drop	A group of I/O cards physically connected together as an I/O network. A controller reads information from the drop, solves logic, then writes results to the drop in one segment of ladder logic. The Segment Scheduler controls the order in which drops are serviced.
Duplicate Coil	An output coil address which has been assigned to more than one coil.

E

EEPROM	Electrically Eraseable Programmable Read-Only Memory.
Element	A ladder logic instruction such as a coil, timer, or short.
Enable	To allow a PLC, based on the logic programmed into it, to update the state of a coil or input.
Equation Network	A special section of logic that lets the programmer solve regular mathematical equations within the network. Not supported by every controller.
Exponential Notation	A format for numbers based on powers of 10. For example, +1.35E-4 indicates 1.35 multiplied by 10 to the power of -4 (i.e. with an exponent of -4), which works out to 0.000135.
Extended Memory	Extra register memory available for some models of 984/584 controllers. It is accessed through the XMRD and XMWT functions.

Extension The three letters after the period in a DOS file name, often used to indicate the file's purpose.

F

File A collection of information stored on a disk. It can contain either a program or data.

File Name The name of a file. ProWORX 32 uses DOS naming conventions: a file name can have up to eight characters, followed by a period and a three character extension.

Force To change the state of a coil or a discrete input, overriding any actions in ladder logic. For example, if a coil is forced off, but the ladder logic is trying to turn it on, it will remain off.

Function A ProWORX 32 command or operation.

G

Global Address Change An operation in the Logic Editor which substitutes one address or a range of addresses for another or several others.

H

Head A collection of I/O drops tied to one CPU, DIO, or RIO processor. This term is specific to Modicon's Quantum hardware.

Hexadecimal A base 16 representation of an integer. It uses the symbols 0 through 9 and letters A through F.

I

I/O Input/Output.

I/O Configurator A PLC internal operation that maps logic element addresses to physical I/O cards. Also known as the Traffic Cop.

Instruction One of the programmable controller's instruction set.

L

Ladder Logic A relay-based programming language typically used in programmable logic controllers. So called because it looks vaguely like a ladder.

Ladder Logic Documentation Text information, notes, and other descriptions of the ladder logic.

Ladder Logic Listing A printout of a group of networks which make up a ladder logic program.

Latch A coil, the state of which is backed up in memory.

Lines Per Page The number of lines printed on a page when printing ladder logic listings.

Load To retrieve data from a disk or other source.

Loader A module that reads and writes ladder logic from a personal computer to a programmable controller or an industrial programming terminal. It also starts and stops a programmable controller from a personal computer.

Local I/O One of four major architectures for input/output systems (also see **Distributed I/O**, **Remote I/O**, and **Peer-to-peer Communications**). The PLC and I/O modules communicate directly through wiring from the field. For Quantum controllers, local I/O allows a CPU, power supply, and from one through 14 I/O modules in a single backplane (up to 448 I/O points). Local I/O is limited to a single rack and is always head number 0. RIO and DIO processors are added in the local rack to extend the controller's I/O system.

Logic Editor The editor in which you edit ladder logic.

Long Comment A block of text which comment on an address within a ladder logic program. These are printed between the networks in the ladder listing.

LPI Lines per inch.

M

Machine Word	16 bits of data (two bytes). Also called a **word**.
Macro	Generic pieces of logic networks that can be inserted into main logic databases. See also **Macro Parameter**.
Macro Parameter	A "placeholder" variable used in a macro. When inserted into a regular logic database, each macro parameter is mapped to a real register address.
Master	A networked device which controls the devices it connects to. Compare to **Slave**.
Memory	The part of a computer or programmable controller which stores information for manipulation.
Mismatch Tables	Two printouts which show the differences between two sets of data; for example, between descriptor records that have been entered for PLC addresses and addresses that have actually been used in a program.
Mnemonic (ne-mon-ik)	1) A memory aid. 2) A computer instruction with an abbreviated name that indicates its function. For example, BLKM is used for the Block Move instruction.
Mnemonic Assignments	A table in the configuration menu that lists the configuration of function key levels, prompts, and instruction mnemonics.
Modbus	Modicon’s RS-232C master-slave serial communications protocol.
Modbus Plus	Modicon’s high-speed, peer-to-peer, token-ring communications protocol.
Modem	Modulator/Demodulator. A communications device that allows a computer to transmit information, usually over a standard telephone line.
Module	An input/output card.
Motion Control I/O Drop	Usually, an I/O drop tied to an ICC410, 3220, or 3240 motion control system.

N

Network 1) A unit of ladder logic in a matrix of elements that is 11 columns wide and seven rows long. It is used to group a function's ladder logic.

2) A chain of interconnected computers and/or programmable controllers which share data.

Network Comment A descriptor record assigned to a network. Contains short comments, a long comment, a page title and descriptors.

Network Listing A printout of a group of networks of ladder logic which make up a program.

Network Logic A programmable controller control program or the representation of a programmable controller control program. It includes logic elements, networks, and register contents.

Node A device that is connected to a network and is capable of communicating with other network devices, usually to send or receive I/O data.

Not Described Mismatch Table A printout of those programmable controller addresses in a ladder logic program which do not have descriptor records.

O

Offline When the computer is not connected to the programmable controller and works instead from a database.

Online When the computer is connected to a programmable controller, working with it directly and in real time.

Operator In mathematics (and in Equation Networks), a symbol or character that indicates a specific operation to be performed on one or more elements, called operands. In "3 + Y", the plus sign (+) is an operator that indicates addition between the two operands, "3" and "Y".

Order of Solve 1) The order in which segments are solved, as ordered by the Segment Scheduler.

2) The order in which elements are solved in a network.

P

Page Title A line of text which describes a page or group of pages in a ladder logic listing. Printed at the top of the page.

Path The part of a file specification that indicates the drive and subdirectory the file is in.

PC Personal Computer

Peer-to-Peer One of four major architectures for input/output systems (also see **Distributed I/O**, **Local I/O**, and **Remote I/O**). A protocol for networked devices in which any device can initiate data transfer.

Power Flow In logic, an instruction is highlighted if it solves true and passes power. All instructions "upstream" of it (to its left in the Traffic Cop display) must also be passing power.

Preset The maximum value a timer or counter can have.

Processor A **Programmable Logic Controller**.

Program For PLC's, a set of ladder logic instructions contained in a set of ProWORX 32 files (a **Project**).

Programmable Logic Controller (PLC) An industrial control computer, also known simply as a controller.

Project A group of files sharing a common name (but different file extensions) where the ladder logic program and descriptor data for a controller is stored.

ProWORX 32 Function A ProWORX 32 command or operation.

Q

Quick Print	A function that allows you to print a network to a printer, with or without documentation.

R

Rack	A collection of up to 16 I/O modules mounted in one back plane.
Radix	The base system of a value. The radix of decimal numbers is 10, the radix of binary numbers is 2 and the radix of hexadecimal numbers is 16. In ProWORX 32, the term "radix" sometimes refers to a value's data type: binary, integer, floating point and so on.
Random Access Memory (RAM)	Random Access Memory. Memory that holds programs while they are being executed.
Read Only Memory (ROM)	Memory that is not erased by a power failure and that is programmed at the factory to hold vital information. This memory cannot be changed.
Remote I/O (RIO)	One of four major architectures for input/output systems (also see **Distributed I/O**, **Local I/O**, and **Peer-to-peer Communications**). I/O that is installed away from the PLC and communicates with it though a high-performance, S908 coaxial cable network. For Quantum controllers, an interface device at each remote I/O drop communicates with an RIO processor in the PLC. The interface device sets the address of the drop. Each RIO processor supports up to 31 remote drops, each of which allows 64 input words and 64 output words.
Remote Terminal Unit (RTU)	A data transmission mode used for Modbus communications. RTU uses 8 data bits.
Reports Listing	A group of printouts which consist of hardware allocation, data usage, and data contents for a ladder logic program.
Routing Path	The sequence of devices through which a message passes to reach its final destination.
RS-232	A popular standard for a serial data link connection.

Run Light	A light on the front panel of a controller that is on while the controller is running.

S

Save	To store information on a disk.
Search	To locate a specified network element (or elements) in the ladder logic.
Segment	A group of I/O networks solved as a unit by the programmable controller. The Segment Scheduler controls the frequency of segment execution and order of I/O operations. Each segment controls two I/O channels in a 584 or 984/S901 configuration, or one drop in a 984/S908 configuration.
Serial Port	A 9- or 25- pin port used for serial communications (for example, **Modbus**).
Short Comment	Up to four lines of text which comprise a comment about an address within a PLC ladder logic program. Typically printed beside output instructions in the ladder listing.
Short Comment Field	One of up to four lines of text which comprise a comment about an address within a PLC network logic program. Typically printed beside output instructions, or below the network in the network listing.
Slave	A networked device controlled by another device. Slave devices to not initiate data transactions. Compare to **Master**.
Slot	The position of an I/O module in a rack.
State Flow	In logic, an instruction is highlighted if it solves true instead of only when it passes power (compare to **Power Flow**).
Stop Bits	Bits used to indicate the end of transmission of a data item or frame.
Subdirectory	A directory within a directory.
Sweep	For a PLC, one cycle of scanning inputs, solving logic, and writing outputs.

T

TCP/IP A communication protocol for computers connected through an Ethernet or Token Ring network.

Text A collection of ASCII characters.

Timeout If communications fail, the program waits the specified number of seconds before trying to communicate again.

Trace An operation in the Network Editor that locates a specified output coil in the network logic.

Traffic Cop A programmable controller's internal configuration that maps logic element addresses to physical I/O cards.

U

Used Table A list of all I/O addresses in a controller, indicating which addresses are being used in instructions and which have not.

Utility A computer program included in a software package, but run separately from the package's main program.

W

Word 16 bits of data (two bytes). Also called a **machine word**.

Index

Symbols

A

B

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