ProWORX 32
Programming Software
for PLCs
User Guide

Version 2.1

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Telemecanique

www.telemecanique.com

Table of Contents

Safety Information

NOTICE

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

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

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

DANGER

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

WARNING

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

CAUTION

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

PLEASE NOTE

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

About the Book

At a Glance

Document Scope

This manual describes 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 www.telemecanique.com.

Terms and Abbreviations

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

Validity Note

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

This document applies to the installation and use of **ProWORX 32** client in the following environments.

- Windows 98SE
- Windows NT (V4.0, SP6a or higher)
- Windows 2000 (SP3 or higher)
- Windows XP Professional (not Home), SP1 & 2

This document applies to the installation and use of **ProWORX 32 Server** in the following environments.

- Windows NT (V4.0, SP6a or higher)
- Windows 2000 (SP3 or higher)
- Windows XP Professional (not Home), SP1 & 2

Related Documents

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

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.

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

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

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

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

User Comments

We welcome your comments about this document. You can reach us by e-mail at techpub@schneider-electric.com

Getting Started

1

Welcome to ProWORX 32

Overview

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 online help system.

What's in this Chapter?

This chapter contains the following topics:

System Requirements

Hardware Requirements

Hardware	Client Requirement	Server Requirement	Client/Server Requirement
Processor	650 MHz (Pentium III)	1 GHz (Pentium III)	1.8 GHz (Pentium 4)
Memory	256 MB	512 MB	512 MB
Hard Disk Space (Available)*	200 MB		
Installation Media Type	CD		
Display	256 color VGA or higher		

Note: To **Print Preview** a project with 5000 networks, 1GB of available hard disk space is required.

Software Requirements

Software	Requirement
ProWORX 32 Client - Operating Systems	• Windows 98 • Windows NT (V4.0, SP6a or higher) • Windows 2000 (SP3 or higher) • Windows XP Professional (not Home), SP1 & 2
ProWORX 32 Server - Operating Systems	• Windows NT (V4.0, SP6a or higher) • Windows 2000 (SP3 or higher) • Windows XP Professional (not Home), SP1 & 2
Microsoft Internet Explorer	Version 5.0 or higher
Microsoft MDac	Version 2.5 or higher

Language Availabilty

The ProWORX 32 Software only supports English, French, German, and Spanish.

Installing ProWORX 32

Installing ProWORX 32

ProWORX 32 requires the installation of MDAC version 2.5 or later and Internet Explorer 5.0 or later. 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.
2	In Windows Explorer, open the installation from the CD-ROM drive at **ProWORX_32** → **disk1** → **setup.exe**.
3	Select the language of ProWORX 32 you want to install (English, French, German, Spanish).
4	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	Click **Modify** to add new components or remove already installed components.
3	Click **Next**, and follow the on-screen instructions.
4	Click **Repair** to reinstall all components installed by the previous setup.
5	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	Click **Remove** to uninstall all installed components.
3	Click **Next**, and follow the on-screen instructions.

Logging in to ProWORX 32

The ProWORX 32 Login Screen

When you open ProWORX 32, the login dialog box appears. 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 projects that reside on the client, click **Bypass**.

Note: If you consistently use projects that reside on the client, you can clear the **Display dialog on startup** check box in the login dialog box, so that it does not appear every time you open ProWORX 32.

Note: ProWORX 32 servers, version 1.*x* and 2.*x*, are not compatible. Both the client and server must be at the same major revision for the client to log in to the server.

Note: The Bypass button is changed to the Close button when the Enforce Client Login checkbox is checked in the Environment Properties display.

Logging in to Windows as a Non-Administrator

If you try to log in to Windows locally with a non-administrative account, using Windows NT, Windows 2000, or Windows XP, a **Runtime Error 70 Permission Denied** appears on the screen.

To log in to Windows as a non-administrator, follow the steps below.

Step	Action
1	Log in to Windows as an administrator. **Note**: Make sure you have a user or group defined with power user privileges.
2	Open Windows Explorer.
3	Right-click the **ProWORX** → **32** folder.
4	Click **Properties**.
5	Click the **Security** tab. **Note**: In Windows XP, if you do not see the **Security** tab, follow the instructions below to enable Security features. ● Click **Start** → **Settings** → **Control Panel**. ● Double-click **Folder Options**. ● Click the **View** tab. ● Clear the **Use simple file sharing (Recommended)** checkbox.

Step	Action
6	In the **Group or user names** field, click the group or user to whom you want to grant power user permission.

Note: If you want to create a new group or user, click **Add**. Type the name of the group or user and click **OK**. Then, continue with Step 6 above.

Step	Action
7	Select all permission check boxes in the **Allow** column (except **Full Control**).
8	Click **Advanced**. ● For Windows 2000, select the **Reset permissions...** check box. ● For Windows XP, select the **Replace permissions...** check box.
9	Click **OK**. Click **Yes** in the warning dialog box.
10	Click **OK**.
11	Log off Windows as an administrator. You can now log in to Windows as a non-administrator.

Logging in to the Server with TCP/IP

Note: If your computer is configured for a ProWORX Server connection, you must set the server communications type (see *p. 284*) for TCP/IP before you log in.

To log in to the server with TCP/IP:

Step	Action
1	From the ProWORX 32 menu, click **Server** → **Login**, or click the **Login** toolbar icon.
2	Enter the user name and password that your system administrator has given you in the **Name** and **Password** fields.
3	Click the **TCP/IP** button.
4	Click either the **Server Address** button or the **Server Name** button.
5	If you click the **Server Address** button, select or type the appropriate Ethernet address from the address field list, which shows the 10 most recently used Ethernet addresses.
6	If you click the **Server Name** button, select a server name from the list of the 10 most recently used server names, or enter the host name of the computer on which ProWORX Server is installed.

Step	Action
7	Click **Browse** to search for a specific computer host name. A dialog box opens, which displays a list of domains currently accessible from the user's computer. Double click on a domain name to view the computers within that domain.
8	Click **Rescan** to reexamine the network for domains. Click a computer name and click **Select**, or double click the computer name to enter the name into the **Server Name** text field. **Note**: If you click **Cancel Scan**, the scan stops, and it may take several minutes.
9	Enter the server communications timeout (seconds) in the **Timeout** field.
10	Enter the port number in the **Port Number** field. The port number entered must match the port number on which the ProWORX 32 Server is listening.
11	Click **Login**.

Logging in to the Server with Modbus Plus

Note: If your computer is configured for a ProWORX Server connection, you must set the server communications type (see *p. 284*) for Modbus Plus before you log in.

To log in to the server with Modbus Plus:

Step	Action
1	From the ProWORX 32 menu, click **Server** → **Login**, or click the **Login** toolbar icon.
2	Enter the user name and password that your system administrator has given you in the **Name** and **Password** fields.
3	Click the **Modbus Plus** button.
4	Click the **Server Address** button. Select a server address from the list of 10 most recently used server addresses. Or, type the Modbus Plus address of the server.
5	Enter the server communications timeout (seconds) in the **Timeout** field.
6	Enter the Modbus Plus adapter number in the **Adapter Number** field.
7	Click **Login**.

Note: If the client and server are installed on the same computer, a second Modbus Plus adapter card is required for the client to connect to the server.

Logging out of the ProWORX 32 Server

Closing the ProWORX 32 client automatically logs you out of the server. To log out of the server, while remaining in ProWORX 32:

Step	Action
1	From the ProWORX 32 menu, click **Server** → **Logout**, or click the **Logout** toolbar icon.

Authorizing ProWORX 32

Opening the Authorization Program

Click **Start** → **Programs** → **ProWORX 32** → **Authorization**.

Using the Authorization Wizard

Step	Action
1	The authorization wizard welcome screen appears. Click **Next**.
2	Click the **Client** or **Server** button to authorize.
3	Click one of the following buttons, and click **Next**. ● **Authorize this PC**: Sets up the PC you are currently using to run ProWORX 32. ● **Transfer Authorization**: Transfers authorization (see *p. 21*) from one PC to another. ● **Enter received code**: If already registered, you are taken directly to the Enter Received Code (see *p. 21*) screen.
4	If you selected **Authorize this PC**, click one of the following methods to authorize ProWORX 32, and click **Next**. ● **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. ● **By Fax**: A fax page is printed containing the information you have entered and a phone number to which to send the fax. ● **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. ● **By Email**: An email is sent to customer support containing the information you have entered. ● **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.
5	Click one of the following buttons 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.
6	Enter your personal information in the User Information screen, and click **Next**. If you would like to view our privacy policy, click **Privacy Policy**.

Transferring Authorization

If you selected **Transfer Authorization** in Step 3 in the table above, follow the steps below.

Step	Action
1	Insert a diskette into your PC diskette drive, or select any medium (network drive, USB, etc.) to which you want to move authorization from another PC.
2	Click one of the following buttons, and click **Next**. ● Transfer authorization from computer to diskette/medium. ● Transfer authorization from diskette/medium to computer.

Entering the Authorization Code

Follow the steps below to enter your 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 in the **Received Authorization Code** field, and click **Next**.
3	To complete your ProWORX 32 authorization, click **Finish**.

ProWORX 32 Client Security

Overview

Security allows an administrator to disable features of ProWORX 32.

Setting Security for a Client

Step	Action
1	• Right-click **Workspace** in the project navigation panel, and click **Security Settings**. - or - • Click **File** → **Security Settings**.
2	To set and confirm the administrative password, enter the password into the **Password** and **Confirm Password** fields.
3	To set the rights that users have (see *p. 23*) while running ProWORX 32 on this specific PC, select rights from the **Enabled Functionality** group of rights.
4	Click **OK** to confirm changes. Click **Close** to exit.

User Rights

User rights descriptions:

User Right		Description
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 on or off. This feature is allowed without online editing enabled.
	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 6x extended memory registers.
	Protected Registers	The ability to set ranges of 4xxxx addresses that are uneditable. See *p. 68* 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.

Contacting Schneider Electric

Customer Support

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 guide, contact customer support.

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

Customer Support Guidelines

To help us assist you quickly, please have the following information ready.

- The version and serial number of your copy of ProWORX 32. To find this information, click **Help** → **About**.
- 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 98, Windows NT 4.x, Windows 2000 Professional (not Home), or Windows XP Professional (not Home), click **Start** → **Settings**. Select **Control Panel** and double-click **System**. Select the **General** tab. Your version of Windows is listed under the **System** heading.
- Information about your computer, including its processor type, memory, hard drive size, video card type, and I/O boards.

Working with ProWORX 32

2

At a Glance

Overview

This chapter explains the ProWORX 32 environment, including setting the ProWORX 32 environment and using the toolbar. This chapter also discusses the features of the **My Projects**, **My Computer**, **Utilities**, **Plant**, and **Documents** tabs.

What's in this Chapter?

This chapter contains the following topics:

ProWORX 32 Environment

Setting ProWORX 32 Environment Properties

The following table describes the different options that you can set in the Environment properties.

Step	Action
1	• Click **View** → **Properties**. - or - • Right-click **Workspace** or a project name in the project navigation panel, and click **Properties**.
2	Click the **Environment** tab. Set the following ProWORX 32 Environment parameters.
3	**Auto Monitor/Logout**: When you select the **Auto Monitor/Logout** check box, the Online Network Editor closes after the specified amount of inactivity, and the user mode changes from program to monitor. You will see the message **Auto Device Logout has taken all projects offline** in the Message Central window.
4	**Instruction Toolbar**: See *p. 30*) for detailed information on modifying the toolbar.
5	Under **Online**, select one or more of the following check boxes. **Prompt for Read when Exiting Online**: Displays a prompt to perform a read after switching out of online mode. **Compare to Project on Attach**: Displays a prompt to perform a compare when switching to online mode. **Automatically Update Used Tables Online**: When going online, the used address tables are automatically updated. This feature requires additional time to go online. **Verify Device**: When you switch between online and offline/combined, this option prompts you to toggle the memory protect switch to verify that you are connected to the intended device.
6	Under **Environment**, select one or more of the following check boxes. **Enable Audit Trails**: See *p. 293*) and the log book are viewable. **Enable Scrolling Navigation Panel**: The navigation panel shrinks, enabling the horizontal scroll bar. **Save Project Mode on Exit**: Saves the project mode, offline or online, when you exit. The next time the project is opened, it will attempt to enter the mode that was saved. If the project was online when you exited, it will attempt to connect to the PLC the next time the project is opened. **Enable Client-Server Integration on Same Machine**: The next time ProWORX 32 starts, the server installed on this machine also starts. This process allows other clients continued access to the server after the ProWORX 32 client closes. **Start in Monitor Mode**: Starts ProWORX 32 in monitor mode. You must switch to program mode to make changes to a project.

Note: The difference between monitor mode and program mode:
- In monitor mode, the controller program is read only. The **Monitor** display box in the status bar at the bottom of the screen is yellow.
- In program mode, the control program allows you read/write privileges. The **Program** display box in the status bar at the bottom of the screen is gray.
- To switch between modes, choose one of the following:
  - Toggle the display box in the status bar at the bottom of the screen.
  - Click **Edit** → **Program Mode**. When checked, program mode is active. When unchecked, monitor mode is active.
  - Press **Alt+P**.

Step	Action
7	Under **Server Security**, select one or more of the following check boxes. **Auto Deletion of Project after Put to Server**: This feature when checked ensures that the ProWORX 32 Client software deletes a project, not only from the workspace, but also from the projects directory. The default setting is unchecked which causes the project if open in the workspace to be closed and removed from the workspace but maintained in the projects directory **Enforce Client Login**: When this checkbox is checked, the Bypase button changes to the Close button in the Environment properties display. The Server Security properties are only enabled when the user is logged into the Server via the Administrator server login.

Note: The 'Warning: The selected option closes and deletes the project after it has been Put to the server.' dialog is displayed to warn the user that projects ‘Put’ onto the Server will be deleted. This message is displayed only once after the ‘Auto Deletion of Project after Put to Server’ checkbox is initially checked in the Environment Properties window.
Also, a warning message dialog box: 'If project changes are not saved, changes will be lost and cannot be recovered, Continue with Put without saving? OK/Cancel is displayed when putting a project to the Server and the project has changed and hasn't been saved in the Client, ProWORX 32 asks the user to save the changes before the Put. If the user replies ‘Yes’ the ‘Put’ is done and the project is deleted from the Workspace and the Client projects directory, if ‘No’ is selected the following warning is provided: Pressing ‘OK’ puts the project, without changes, on the Server and then deletes the project from both the Workspace and the Client projects directory. Pressing ‘Cancel’ cancels the ‘Put’ operation.

Step	Action
8	Under **Message Central**, select one or more of the following check boxes. **Auto Display Message Central**: Automatically displays Message Central when a message is generated by ProWORX 32. **Auto Switch to Tabs in Message Central**: If the Tracking tab is active, ProWORX 32 will switch tabs to Message Central when a new message appears. **Alert User of Critical Messages**: Displays critical messages in Message Central and a message dialog box. **Alert User of Non-Critical Messages**: Displays non-critical messages in Message Central and a message dialog box.

Note: The Message Central and Tracking Help windows default to remaining open. If you want the windows to be closed continuously:
Clear these 2 check boxes:

- **Auto Display Message Central**
- **Auto Switch to Tabs in Message Central**

Select these 2 check boxes:

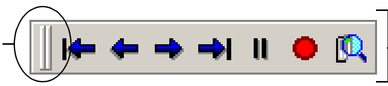
- **Alert User of Critical Messages**
- **Alert User of Non-Critical Messages**

Step	Action
9	Under **Traffic Cop**, select one or more of the following check boxes. **Prompt when Inserting Drops**: Displays a prompt when the user inserts a drop. **Prompt when Deleting Drops**: Displays a prompt when the user deletes a drop. **Prompt when Inserting Racks**: Displays a prompt when the user inserts a rack. **Prompt when Deleting Racks**: Displays a prompt when the user deletes a rack. **Prompt when Inserting Slots**: Displays a prompt when the user inserts a slot. **Prompt when Deleting Slots**: Displays a prompt when the user deletes a slot. **Paste Duplicate Traffic Cop Warning**: Displays a prompt when the user pastes a duplicate traffic cop.

ProWORX 32 Toolbar

Overview

The ProWORX 32 toolbar contains all the icons that can be used to access features, utilities, and tools.



Using the Toolbar

Step	Action
1	Click **View** → **Toolbars**, or right-click any toolbar.
2	To add a toolbar, select a toolbar from the list. A toolbar that is displayed is denoted by a check ✓.
3	To remove a toolbar, select the checked toolbar from the list.
4	To move a selected toolbar within the ProWORX 32 toolbar area, select the toolbar handle, and drag and drop the toolbar to its desired location.

Customizing the Toolbar

Step	Action
1	Right-click any toolbar. Click **Customize**.
2	Click the **Toolbars** tab to add and/or remove toolbars. ● To add a toolbar, select any of the toolbar check boxes. ● To remove a toolbar, clear any of the toolbar check boxes. ● To create a toolbar, click **New**. Type the new name of the toolbar, and click **OK**.
3	Click the **Commands** tab to add and/or remove icons to/from a toolbar. ● Click a menu item in the **Categories** field. ● To add an icon, click the icon in the **Commands** field, and drag and drop the icon to its desired location on the toolbar. ● To remove an icon, click the icon on the toolbar, and drag and drop it anywhere inside the **Customize** dialog box.

Step	Action

4	Click the **Options** tab to personalize your menus and toolbars. Select or clear any of the following check boxes, depending on your preferences.
	● Menu show recently used tools first (defaults to checked)
	  ● Show full menus after a short delay
	● Large Icons
	● Show ScreenTips on Toolbars (defaults to checked)
	  ● Show shortcut Keys in ScreenTips
	● Menu animation
	Choose one of the following animation styles:
	  ● (None)
	  ● Random
	  ● Unfold
	  ● Slide

5	Click **Keyboard** to assign keyboard shortcut keys to respective toolbar icons.
6	Click **Close** to confirm all changes.

Note: There is no warning if the key that you wish to assign as a shortcut key is already in use. The old shortcut key will be replaced. For more information on customizing toolbars, click **Start** → **Help** to view the Windows help file.

Customizing the Instruction Toolbar

Step	Action
1	● Right-click a project or **Workspace**, and click **Properties**. - or - ● Click **View** → **Properties**.
2	Click the **Environment** tab.
3	Scroll to the number of the button (1-14) you would like to change in the **Button Number** field (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.
5	Click **OK**.

Toolbar Listing

Default toolbars and icon.

Toolbar	Icon
Standard Toolbar	- Create a new project
	- Open a project
	- Close the active project
	- Save the active project
	- Save all projects
	- Change the report layout
	- Print preview
	- Print the active project
	- Reverse the last action
	- Repeat the last action
	- Cut the current selection and copy to the system clipboard
	- Copy the current selection to the system clipboard
	- Paste data from system clipboard to selected area
	- Change the view of the current Network
	- Activate 7 x 11 full screen mode
	- Zoom in
	- Zoom out
	- Global replace
	- Search
	- Find and replace
	- Help

Toolbar	Icon
Control Toolbar	- Take a project offline
	- Take a project to emulation
	- Take a project online
	- Take a project to combined mode
DWW Toolbar	- First record
	- Previous record
	- Next record
	- Last record
	- Pause/resume
	- Record
	- Toggle between logging real-time data from a controller and logging stored
Online Controls Toolbar	- Start/stop controller (see *p. 117*)
	- Initialize logic (see *p. 106*)
	- Read from controller (see *p. 107*) ● read ● read extended memory
	- Write to controller (see *p. 109*) ● write logic ● relocate logic and data ● relocate logic only ● write extended memory
Instruction Toolbar	-] [- -]\[- -]P[- -]N[- -( )- -SHRT |SHRT ADD SUB MULT A user-defined set of instructions. Click an instruction to add it to the logic editor at the cursor.

Toolbar	Icon
Project Toolbar	- Project menu
	- Configuration
	- Traffic Cop
	- Communications
	- Logic
	- Data Watch Window
	- Configuration extensions
	- ASCII messages
	- PLC status
	- Analyze device
	- Knowledge base
	- Change controller type
Server Toolbar	- Login to server
	- Logout of server
	- Unlock a project
	- Update lock status
	- Get from server
	- Get from server with lock
	- Put to server

Navigating in ProWORX 32

Overview

The navigation panel in ProWORX 32 includes the following tabs:

- My Projects
- My Computer
- Utilities
- Plant
- Documents

My Projects

The following features are available under the My Projects tab.

Feature	Description
Configuration	Use Configuration to edit controller configuration and properties, ports, and loadables.
Traffic Cop	Use the Traffic Cop to visualize and configure I/O series, drops, cards, and slots.
Communications	Use Communications to configure ProWORX for common types of network connections.
Logic	Use the Logic editor to edit ladder logic in online, offline, or emulation mode.
Data Editors	Data Editors includes the following windows, which are used to view and edit register data values for a selected project. ● Data Watch Window ● Register Editor ● PID Summary ● Drum/ICMP Summary ● HMI View
Configuration Extensions	Configuration Extensions provides you with utilities that can be loaded into a controller.
ASCII Messages	Use ASCII Messages to enter or edit messages that you want your controller or project to send.
PLC Status	PLC Status allows you to monitor PLC status words. You can monitor multiple projects at the same time.
Analyze Device	Analyze Device performs a checklist of predetermined tasks to find specific problems relating to an I/O sub-system's health and general PLC status.
Knowledge Base	Knowledge Base is a user-defined library of accumulated process experience relating to a specific project that allows you to identify solutions to problems that have occurred in the past.

My Computer

The My Computer tab displays the same features as the My Projects tab. Difference between these 2 tabs:

- My Projects displays a list of projects that were opened or created in the installation projects directory. The display contains the project’s controller type communications setting and address. Projects in this list can be opened and get from or put to the server.
- My Computer displays a list of projects that were opened or created outside of the projects directory. The display contains the project name and path. The status bar at the bottom of the list contains the current projects and their respective paths. You can use projects located anywhere on your computer.

Utilities

The following features are available under the Utilities tab.

Feature	Description
MBP Stat	Use MBP Stat to access device status and diagnostic tools.
BootP	Use the BOOTP server to listen for IP address requests. The response includes an IP address for the client.
Ping	Use Ping to test for a given IP address. Ping helps diagnose problems with the TCP/IP communications as well as determine a device’s existence.
Network Explorer	Use Network Explorer to find controllers, bridges, bridge multiplexers, and other devices attached to networks.
BM85 Configuration	Use BM85 Configuration to configure a BM85 device.
Compare	Use Compare to discover differences in logic and configuration between a project and a controller or between two projects or between two controllers.
I/O Drawing Viewer	Use pan and zoom features of I/O Drawing Viewer to view drawings. These drawings are in a .DXF format that is supported by most CAD programs.
Loadable Library	Use Loadable Library to hold sets of loadables so you only have to translate them to ProWORX 32 format once.
Exec Loader	Use Exec Loader 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.
WebLoader	Use WebLoader to transfer Web content between a PC and a M1E Processor's FLASH memory over the Modbus TCP/IP communication network.

Plant

The Plant Layout is a powerful means of organizing ProWORX 32 projects and documents into a logical arrangement. The Plant Layout is a tree that looks like a folder list in Windows Explorer. The files in the tree are projects and documents. Each folder in the tree may contain several items. This allows you to group your projects and documents together in any order that you like.

Example

You have a plant with 3 production lines. Each line has two machines and a schematic wiring diagram. Each machine has a ProWORX 32 project used for programming it. Now, you can create a Plant Layout that mimics this physical reality. Your Plant Layout will have 3 folders in the tree, 1 for each line. Inside each folder will be 2 projects and 1 document. In this way, you can easily tell what project belongs to what physical machine and how they are related to each other. The Plant Layout also includes any documents that may be related to the projects, lines, or the plant itself.

Note: If you are logged into a server, files that are locked out by a user are denoted with a red check mark. The Plant Layout itself may be locked out and modified.

The following features are available from the right-click menu in Plant Layout.

Command	Function
Add New Plant Item	Returns an input prompt that asks for a new Plant Item. If an item is entered, it will appear as a Group root node in the Plant Layout list.
Delete Plant Item	Asks the user if he wants to delete the Plant Item. If the user selects **Yes**, the Item, all associated Projects, and Related Docs are removed from the Plant Layout tree. If the user selects **No**, no changes are made.
Add Project	Adds an existing project to the current Plant Item group. The **Select Project** dialog appears for this operation.
Remove Project	Removes the project from the Plant Layout tree. The project will remain in the Projects tree. Only available if a Project is selected.
Add File	Opens a dialog for file selection. If a file is selected, it is added to the Documents list. Files are placed into a **...\RelatedDocs** folder in the applications path.
Remove File	Deletes a file from both the tree and from the **...\RelatedDocs** folder. Available only if a file is selected.
Get Plant Layout from Server	Retrieves the PlantLayout.INI file from the server and updates the Plant Layout tree. Only available if logged into a server.

Command	Function
Get Plant Layout with Lock	Retrieves the PlantLayout.INI file from the server and updates the Plant Layout tree. The Root Node of the Plant Layout tree displays a locked status and the PlantLayout.INI file is checked out to the current user.
Put Plant Layout to Server	Sends the PlantLayout.INI file to the server. The file now exists on the Server, and is available for checkout or to other clients. Only available if logged into a Server.
Unlock Plant Layout	Unlocks the PlantLayout.INI file on the server without making any changes to the server's copy of the file. Other clients may access it normally. Only available if logged into a server.
Get Project from Server	Retrieves the selected project from those listed under the **Server** node and places it in the **...\Projects** folder. Project also appears in the tree. Only available if logged into a server.
Get Project with Lock	Retrieves the selected project from those listed under the **Server** node and places it in the **...\Projects** folder. Project also appears in the tree. Projects displays a locked status, and is checked out to the current user.
Put Project to Server	Sends the selected project to the server and adds it to those listed under the **Server** node. Project is not on the Server, and is available for checkout to other clients. If the project already exists on the Server, the user will not be allowed to put it to the server unless he checks out the project.
Unlock Project	Unlocks the selected project on the server without making any changes to the server's copy of the project. Other clients may access it normally.
Get File from Server	Retrieves the selected file from those listed under the **Server** node and places it in the **...\RelatedDocs** folder and in the tree.
Get File with Lock	Retrieves the selected file from those listed under the **Server** node and places it in the **...\RelatedDocs** folder and in the tree. File displays a locked status, and will be checked out to the current user.
Put File to Server	Sends the selected file from the **...\RelatedDocs** folder and adds it to those listed under the **Server** node. The file now exists on the Server, and is available for checkout or to the other clients. If the file already exists on the Server, the user will not be allowed to put it to the server unless she checks out the file.
Unlock File	Unlocks the selected file on the server without making any changes to the server's copy of the file. Other clients may access it normally.

Documents

The Documents tab displays an alphabetical list of all documents that have been added.

> **Note:** If you are logged into a server, an additional **Server** root node will appear with a list of all documents stored on the server. Files that are locked out by the user are denoted with a red check mark.

Double clicking any file launches the file in its associated editor.

The following features are available from the right-click menu in the Documents tab.

Command	Function
Add File	Opens a command dialog for the selection. If a file is selected, it is added to the Documents list.
Remove File	Deletes a file from the document's tree and from the **...\RelatedDocs** folder.
Get File from Server	Retrieves selected file from list under **Server** node, places it in the **...\RelatedDocs** folder, and displays it in the document tree. Only available if logged into a server.
Get File with Lock	Retrieves the selected file from those listed under **Server** node, places it in the **...\RelatedDocs** folder, and displays it in the tree. File will display a locked status and will be checked out to current user. Only available if logged into a server.
Put File to Server	Sends the selected file to the **...\RelatedDocs** folder, and lists it under **Server** node. File can now be checked out or is available to other clients. Only available if logged into a server.
Unlock File	Unlocks the selected file on the server without making any changes to the server's copy of the file. Other clients may access it normally. Only available if logged into a server.

Tracking Help

Overview

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

Using Tracking Help

To open the Tracking Help window:

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

Note: The Message Central and Tracking Help windows default to remaining open. If you want the windows to be closed continuously, click **View** → **Properties** or right-click **Workspace** or a project name and click **Properties**. Click the **Environment** tab. Under **Message Central**:
Clear these 2 check boxes:
- **Auto Display Message Central**
- **Auto Switch to Tabs in Message Central**

Select these 2 check boxes:
- **Alert User of Critical Messages**
- **Alert User of Non-Critical Messages**

Message Central

Overview

Message Central displays messages from ProWORX 32 related to the project in which you are working.

Message Central has the following fields.

Field	Description
Time	Time of message
Project	Name of project related to message
Area	Area of project related to message
Message	Text of message

Setting Properties

To set properties for Message Central, click **View** → **Properties** or right-click **Workspace** or a project name. Click **Properties**, and then click the **Environment** tab. Properties related to Message Central include:

- Auto Display Message Central
- Auto Switch to Tabs in Message Central
- Alert User of Critical Messages
- Alert User of Non-Critical Messages

See *p. 26* for detailed information on setting properties related to Message Central.

Note: The Message Central and Tracking Help windows default to remaining open. If you want the windows to be closed continuously, click **View** → **Properties** or right-click **Workspace** or a project name and click **Properties**. Click the **Environment** tab. Under **Message Central**:
Clear these 2 check boxes:

- **Auto Display Message Central**
- **Auto Switch to Tabs in Message Central**

Select these 2 check boxes:

- **Alert User of Critical Messages**
- **Alert User of Non-Critical Messages**

Working with Projects

3

At a Glance

Overview

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

- controller's configuration
- ladder logic
- descriptors of the controller and ladder logic
- project properties
- data trends
- results comparison

What's in this Chapter?

This chapter contains the following topics:

Creating a New Project

Overview

The Project Configuration Wizard takes you through creating new default projects and modify existing projects in ProWORX 32. The configuration wizard guides you through a series of simple steps to set up a project.

Each dialog box in the wizard has a caption stating which step you are currently completing. Also, each dialog box 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.

Creating a New Project

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

4	Select a method to create the new project.
	● Online to Controller
	● Offline to Controller
	    ● Select Controller Type
	    ● Base on Existing Project
	    ● Read from Controller
	Note: If you choose **Select Controller Type**, you can also select the **Use as a Macro** check box.

Creation Method Details

The creation methods include:

Path		Description
Online to Controller		This option connects directly to a controller in the online mode. The next step configures the parameters used to communicate (see *p. 44*) with the desired controller.
Offline to Controller		
	Select Controller Type	This step allows you to set up the controller type (see *p. 43*).
	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. See *p. 44* to configure communications to the desired controller.
	Read from Controller	This option creates a project based on a read of the program from an existing controller. See *p. 44* to configure communications to the desired controller.
	Use as a Macro	With the **Select the Controller Type** option, you can select the **Use as Macro (see *p. 250*)** checkbox to create a macro-enabled database.

Selecting a Controller Type

This step includes 2 lists to select a controller. Below the lists are detailed descriptions of the currently selected controller. Displayed below the controller selection list are pictures of the I/O types supported by the current controller.

To select a controller:

Step	Action
1	Select a controller family from the **Pick a Controller Family** list: 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** list. The list of controllers depends on which controller family you selected in step 1 above.
3	Click **Next** to continue.

Controller Details

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

Controller Detail	Description
Executive Cartridge	Cartridges that determine the controller's instruction set. Select the one installed in your controller. The Executive Cartridge is available for the 38x, 48x, 68x, and legacy 984 slot-mount 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 *p. 80*.
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.

Completing a New Project

Click **Finish** to complete the creation of your new project. 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, 584, 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

Step	Action
1	Click **File** → **Import** → **Database**. The **Select Database to Convert** dialog box appears.
2	Select a database to convert from the following database types: ● ProWORX 484 (*.cf4) ● ProWORX 884 (*.cf8) ● ProWORX NxT Macro (*.wns) ● ProWORX 984 (*.cf9, *.dcf) ● Modsoft (*.cfg) ● Concept 984 (*.asc) ● ProWORX Plus/ProWORX NxT (*.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 box.
5	Click **OK** in the **Conversion Complete** dialog box to return to ProWORX 32.

Note: ProWORX 32 does not support Modsoft SFC.

Note: For 584 databases, after importing/opening the Nxt or Modsoft 584 project with ProWORX 32 version 2.1 the project can be read, written, edited and saved with the following limitations:
- Loadables cannot be added to 584 projects.
- The Loadable library for 584 is not supported. If the 584 project imported has loadables, those will still be part of the imported project.
- Undo/Redo is not available in the Ladder Logic editor online, because the PRWX loadable cannot be written to the 584.
- Modbus is the only communication mode available.
- No access to Segment Scheduler (584 does not support this).
- Cannot ‘Change PLC Type’ from a 584 to another PLC type.
- The following ProWORX 32 features are not supported for the 584 projects:
  - Configuration Extensions
  - Loadables
  - Segment Scheduler
  - PRWX Ladder Logic block
  - Undo/Redo online in Ladder Logic editor
  - 584 is not available under the Select Controller Type in the New Project wizard
  - Change PLC Type

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 (see *p. 283*).

The following options are available by clicking **Server**, right-clicking the project in the navigation panel, or clicking the client toolbar icons of the ProWORX 32 client.

When Service Can Be Accessed	Transaction	Result
Client's Server pull down menu, client toolbar	**Login**	Allows access to the ProWORX 32 Server
Client's Server pull down menu, client toolbar	**Logout**	Removes access to the ProWORX 32 Server
Client's Server pull down menu, client toolbar, right-clicking the project name in the navigation panel	**Get from Server**	The project is copied to your local PC. If you plan to make changes to a project, you should get the project from the server with a lock.
Client's Server pull down menu, client toolbar, right-clicking the project name in the navigation panel	**Get from Server with Lock**	The 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.
Client's Server pull down menu, client toolbar, right-clicking the project name in the navigation panel	**Put to Server**	When you have finished making changes or you want to add a project to the server, use this function, which creates a copy of the project on the server.
Client's Server pull down menu, client toolbar, right-clicking the project name in the navigation panel	**Unlock Project**	The project is unlocked so that other clients can check it out of the server.
Client's Server pull down menu, right-clicking the project name in the navigation panel	**Get Previous Version**	A **Version Selection** window is opened, which allows you to select a previous version of your project from the server to overwrite your current project. **Note**: Click **View Audit Trail** in the **Version Selection** window to display the audit trail for the selected version. The audit trail provides a record of each project transaction between the ProWORX 32 client and server.
Client's Server pull down menu, right-clicking the project name in the navigation panel	**Get Backup Version**	A **Version Selection** window is opened. It allows you to select the backup version of your project from the server to overwrite your current project.

When Service Can Be Accessed	Transaction	Result
Client's Server pull down menu, right-clicking the project name in the navigation panel	**Get Previous Compare**	A **Version Selection** window is opened. It allows you to select a previously compared version of your project from the server. Click **OK** to display the results of the comparison.
Client's Server pull down menu, client toolbar	**Update Lock Status**	The status of files on the server you are connected to is displayed by selecting Update Lock Status in The ProWORX 32 Client's project navigation panel. A Red checkmark indicates checked out by you and Yellow, checked out by someone else. The Update Lock Status feature queries the Server to update the lock status of the files and it is appropriately displayed in the project navigation panel.

Note: You must be logged into the Server to make the Server transactions available. Transaction icons on the client toolbar, transaction items in the Server pull down menu, and transaction items displayed when right-clicking the project name in the navigation panel are either not available or greyed out when not logged into the Server.

Note: If the ProWORX 32 Client Security permission settings are set to be higher than the ProWORX 32 Server security settings for a project, the Server security settings will override the local ProWORX 32 Client Security when the project is retreived from the server and the user remains logged into the server. When the user logs out of the server, the Client Security settings are not restored until ProWORX 32 is closed and restarted. The security feature works as designed. And it is up to the end user to ensure that the proper access rights are invoked and controlled.

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

Right-click the project name in the navigation panel, and click **Project State** → **Offline**.

- or -

Click **Controller** → **Offline**.

- or -

Click the **Offline** toolbar button.

Projects in Online Mode

To work with a controller online, select a project, and change its mode to online. ProWORX 32 then attaches the communications settings provided to that controller. 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.

> **Note:** When you are in online mode, and you want to copy/paste logic between 2 projects, the register contents do not paste. The register contents can be copied and pasted in offline mode only (see *p. 274*)).

> **Note:** When printing in online mode, the contents of the offline database is printed.

> **Note:** When in online mode the Documentation Editor is read only.

Taking a Project Online

Right-click the project in the navigation panel, and click **Project State** → **Online**.

- or -

Click **Controller** → **Online**.

- or -

Click the **Online** toolbar button.

Direct to Online Mode

Note: Before you use Direct to Online, you must configure your communications (see *p. 80*) for a valid controller. Then, you may open any editor to view or edit online data.

To use the Direct to Online mode, double-click **Direct to Online** in the project navigation panel.

The **Direct to Online** mode allows you to work with a controller online without using an associated project. It is for online operations only.

Direct to Online is useful if you want to connect to a random controller quickly for simple maintenance or if you do not have access to the required projects.

Since no project is required for Direct to Online, any project-based data can not be accessed, including various Traffic Cop card information and all Documentation (including symbols).

Furthermore, you must rebuild the Address Used tables each time you connect to a controller using Direct to Online because the data is not directly stored in the controller.

Note: The following functions are not available when using Direct to Online.
- Global Replace
- Compare
- Documentation Utilities
- Change Controller Type
- Offline editing
- Emulation mode
- Combined mode
- Read data from a project
- Write data to a project

With the exception of the above functions, all online editors perform in the same manner as the project-based online mode.

To exit Direct to Online, click **File** → **Close**.

Projects in Emulation Mode

To work with a controller in emulation mode (see *p. 53*), 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 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.

Taking a Project to Emulation

Right-click the project in the navigation panel, and click **Project State** → **Emulation**.

- or -

Click **Controller** → **Emulation**.

- or -

Click the **Emulation** toolbar button.

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 is made directly to the controller. Work done in the logic editor, traffic cop, and register editors is 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 the changes.

Taking a Project to Combined Mode

Right-click the project in the navigation panel, and click **Project State** → **Combined**.

- or -

Click **Controller** → **Combined**.

- or -

Click the **Combined** toolbar button.

Setting the Project Properties

Step	Action
1	Ensure that the project is selected in the navigation panel. The currently selected project is appended to the ProWORX screen's title bar. Right-click the project.
2	Click **Properties**.
3	Click the **Project** tab.
4	Configure the project properties (see *p. 52*).
5	Click **OK** to save changes.

Project Properties Description

Property descriptions:

Property	Description
Detailed Project Name	Enter the detailed description of the current project. **Note**: 64-character maximum
Project	Enter a name (brief description) for the current project. **Note**: 64-character maximum
Client	Enter the name of the project's client if applicable. **Note**: 64-character maximum
Author	Enter the name of the project author. **Note**: 64-character maximum
Page Title	Enter a title that you want to appear at the top of the page when you use the print command. **Note**: 64-character maximum
6 Digit Addressing	**Auto**: Sets addressing to five digits unless the controller has addresses configured that require six. The Auto button is the default. **On**: Sets all addressing to six digits, allowing ProWORX 32 to enter and display constants greater than 9999. The display of 6 digit addressing is dependent upon the controller type that is configured.
Maximum Decimal Value	Restricts registers to a decimal value of either 9999 (default) or 65535.
Start Network	Configures the logic editor to go to the network/row/column entered by the user when the logic editor is started.
Save to Flash on Exit	If the controller supports flash memory, selecting this check box will save the controller's contents to flash memory on exit of online.
Enable Symbols	Enables or disables symbolic addressing (see *p. 64*).

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.

Note: ProWORX 32 emulation mode does not have the capability of a controller simulator.

Taking a Project to Emulation

Right-click your project in the project navigation panel, and click **Project State** → **Emulation**.

- or -

Click **Controller** → **Emulation**.

- or -

Click the **Emulation** toolbar button.

Setting up Emulation

Before you test your logic, set the default states or values into the emulator. Thus, 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

Step	Action
1	Right-click your project in the project navigation panel, and click **Properties**.
2	Click 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. To edit the Default Address Data Values table in the Emulation tab:

Step	Action
1	Enter an address or a range of addresses in the format (axxxx-axxxx) in the **Address Range** field.
2	If you have entered a 3x/4x 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** list.

Step	Action
3	If you have entered a 3x/4x analog address range, select a radix for the address range from the **Radix** 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.
5	To load the default address values while in Emulation mode, click **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 Control table in the Emulation tab:

Step	Action
1	Enter the address where you want the loopback in the **Ctrl Address** field.
2	Enter the state or value of the address in the **Condition** field.
3	Select the radix you want to enter your condition in from the **Radix** 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.
5	Enter the address range by typing 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.
6	For discrete addresses, select On or Off from the **Data Value** list.
7	Select the numeric system you want to enter your Destination in from the **Radix** list.
8	Click **OK** to save the changes.
9	To load the loopback table while in Emulation mode, click **Emulation** → **Load Loopback Table** from the logic editor right-click menu.
10	To enable or disable loopback while in Emulation mode, click **Emulation** → **Loopback Enabled** from the logic editor right-click menu.

Adjusting Scan Time

To adjust scan time in the Emulation tab:

Step	Action
1	Enter a scan time rate between 1 and 999 in the **Timer increment per scan of logic (ms)** 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.

Starting Emulation

To start emulation:

Step	Action
1	● Right-click your project, and click **Online Commands** → **Start/Stop**. - or - ● Click **Controller** → **Start/Stop**. - or - ● Click the **Start Controller** toolbar button.
2	Set the emulator's solve mode (see *p. 55*) in the **Start/Stop** dialog box.
3	Click **Start** to start emulation in continuous solve mode.

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 when certain logical conditions are true or not true.

You can change the solve mode by:

- Right-clicking your project, and clicking **Online Commands** → **Start/Stop**.
  - or -
- Clicking **Controller** → **Start/Stop**.

Select a solve mode button any time when emulation is in a stopped state.

Solving by Sweep

In the start/stop dialog box:

Step	Action
1	Click the **Sweep** button.
2	Enter the number of times you want the logic to be solved before stopping.
3	Click **Start**.

Solving by Network

In the start/stop dialog box:

Step	Action
1	Click the **Network** button.
2	Logic is solved network-by-network in order of networks, starting at segment one, network one.
3	Click **Start**.

Solving by Instruction

In the start/stop dialog box:

Step	Action
1	Click the **Instruction** button.

Step	Action
2	Logic is solved instruction-by-instruction in order of instructions, starting at segment one, network one, cell (1,1).
3	Click **Start**.

Solving to a Breakpoint

In the start/stop dialog box:

Step	Action
1	Click the **Breakpoint** button. Select one of the following break types.
2	To set a break when a particular value is reached in a register, click **Register** from the list. 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, click **Discrete** from the list. Enter the address in the **Address** field and select Off or On from the **Value** list.
4	To set a break when the solve reaches a certain instruction type in logic, click **Instruction** from the list. Select the instruction to break at from the **Instruction** list.
5	To set a break when a specific address is reached in logic, click **Address** from the list. Enter the address to break at in the **Address** field.
6	To break at the breakpoints set (see *p. 56*) in the breakpoint table, click **Breakpoint** from the list.
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, click **Start**.

Setting Emulator Breakpoints

To set a breakpoint at the cursor in the logic editor:

Step	Action
1	Click **Emulation** → **Breakpoint** from the right-click menu.
2	To delete a breakpoint, click **Emulation** → **Breakpoint Table** from the right-click menu.
3	Select the row of the breakpoint that you want to delete and click **Delete**.
4	Click **Close** to exit the breakpoint table.

Stopping Emulation

To stop emulation:

Step	Action
1	• Right-click your project, and click **Online Commands** → **Start/Stop**. - or - • Click **Controller** → **Start/Stop**.
2	Click **Stop**.

Instructions Supported in Emulation Mode

Overview

Following is an alphabetical list of instructions supported in 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 folder, named **EmulatorInst**, in the **ProWORX** → **32** directory.
2	Create a blank .ESF file in the **ProWORX** → **32** → **EmulatorInst** directory.
3	Name your .ESF file the same as the instruction that is to be solved. **Example**: 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.
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 default 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, click **View** → **Documentation**.

There are three sections of the documentation editor.
- Edit
- Summary
- Traffic Cop

To switch between sections, click the respective button at the top of the documentation editor.

Opening the Documentation Editor Properties Window

Step	Action
1	• Right-click your project or **Workspace**in the project navigation panel, and click **Properties**. - or - • Click **View** → **Properties**.
2	Click the **Documentation** tab.

Documentation Editor Properties

The following properties are listed under the Documentation tab:

Property	To Set:	Function
Display One Line Documentation Window	Select the **Display One Documentation Window** check box.	If the box is checked, the documentation editor will appear in one-line mode, and the address descriptors are not editable. If the box is cleared, the documentation editor will appear in edit mode, and the user can edit address descriptors.
Total Number of Descriptor Lines	In the **Total Number of Descriptor Lines** list, select a number between 3 and 9.	The descriptor field is a multi-line field that can be set from 3 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** list, select a number between 1 and the value of the total number of descriptor lines.	The descriptor field is a multi-line field that can be set from 1 to 9 lines of documentation.
Supported Fields	In the **Supported Fields** box, select the check boxes of the items that you want displayed.	If a box is cleared, the corresponding field will never be displayed. If a box is checked, the field will be displayed as long as dependent properties are set correctly. **Example**: If symbols are disabled for the project, the symbol field will not be displayed even though the box is selected.

Using the Documentation Editor

Edit Mode Overview

Edit mode is a completely customizable and editable visual representation of the current project documentation. Edit mode highlights items when the mouse passes over them, which are 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

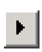
Enter an address in the **Reference** field to view the address’ documentation. To navigate through documented addresses, click

the previous documented address

and the next documented address buttons.

To navigate sequentially through addresses, click the previous address

and the next address buttons.



Using the Single-line Mode

The single-line documentation editor displays the currently selected address' descriptors. This mode is uneditable. To view the single-line documentation editor, click the **1 Line** button at the top right corner of the documentation editor, or:

Step	Action
1	Right-click your project.
2	Click **Properties**.
3	Click the **Documentation** tab.
4	Select the **Display One Line Documentation Window** check box.

To switch back to Edit mode:
- Click the **Edit** button at the top right corner of the documentation editor

- or -
- Clear the **Display One Line Documentation Window** check box in step 4 above.

Summary Mode

Summary mode shows the most common information for documented addresses. Click the address type list to 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 the appropriate row, and the documentation editor will switch to edit mode showing the selected address.

Using the Symbol Filter

In summary mode, when symbol has been selected in the address type 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 content 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 traffic cop mode, you can edit short comments for head, drop, rack and slot addresses.

Symbolic Addressing

Overview

Symbolic addressing allows you to replace numerical addresses for customized text, which provide more meaning for you. 0x, 1x, 3x, 4x, or constant addresses may have symbols.

> **Note:** Before using symbolic addressing, ensure that you selected the **Symbols** check box (see *p. 52*) in the Project tab of the Properties dialog box. Otherwise, the field will not appear in the documentation editor.

Documentation Symbols

Symbols, which are 32 characters long, represent numerical addresses. Symbols are displayed in upper and lower case.

> **Note:** While you can use upper and lower case when creating symbols, you cannot use the same word with different capitalization.
> **Example**: You cannot use PUMP1 and Pump1 as two different symbols.
> To move text between other fields, use **Cut (Ctrl+X)**, **Copy (Ctrl+C)**, and **Paste (Ctrl+V)**.

Adding Symbols to the Documentation Editor

Step	Action
1	In the **Reference** field, type the address to be associated with this symbol. You can either type the address in directly, or use the left and right arrow keys to scroll through the address. 0x, 1x, 3x, 4x, or constant addresses may have symbols.
2	In the **Symbol** field, type the associated symbol text. **Result**: The symbol is saved for its associated address. **Note**: Do not confuse the **Symbol** field with the **ISA Symbol** field. If you did not select the **Symbols** check box (see *p. 52*) in the Project tab of the Properties dialog box, the **Symbol** field will not appear in the documentation editor.

Adding Symbols in the Logic Editor

Step	Action
1	Open the logic editor (see *p. 159*).
2	Double-click an instruction with the address for which you want to assign a symbol. **Result**: The Address Edit dialog box opens.
3	In the address field, type the associated symbol text.
4	Click **OK**. **Result**: The Add Symbol dialog box opens.
5	In the address field, type the numerical address to associate with this symbol.
6	Click **OK**. **Result**: The symbol and its associated address are added to the documentation for the selected address.

Placing an Address or Symbol in the Network Logic

Step	Action
1	Open the logic editor (see *p. 159*).
2	Double-click an instruction with the address for which you want to assign a symbol. **Result**: The Address Edit dialog box opens.
3	In the address field, type the symbol text. **Result**: The symbol and its associated address will be set for the selected instruction.

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

To import documentation:

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

Exporting Documentation

To export documentation:

Step	Action
1	Right-click the project, and click **Export Documentation**.
2	In the Select Destination File dialog box, select a file type from the **Save as type** list (.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.
5	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 type 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 administrative 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 (see *p. 22*). You can access the security settings by right-clicking **Workspace** in the project navigation panel.

Setting Protected Registers

Follow the steps below to set protected registers.

Step	Action
1	Right-click your project, and click **Properties**.
2	Click 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.

Using Search

Overview

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

You may search for several items in your project. These include:

- addresses
- symbols
- functions
- disabled contacts and coils
- duplicate coils

Additionally, you can search in a number of different areas of your project. These include:

- entire project
- logic
- configuration
- traffic cop
- peer cop
- I/O scanner

Note: After you perform a search, you must save your project before you rebuild the address used tables so that the tables will be accurate.

Using Find/ Replace - Simple Search

Step	Action
1	• Click **Edit** → **Find** (Ctrl+F) or **Edit** → **Replace** (Ctrl+H). - or - • Click the **Find** or **Replace** toolbar buttons. - or - • Right click in the logic editor, and click **Search** → **Find** or **Search** → **Replace**.
2	In the Find What box, enter the value you want to find in the **Address** field. **Note**: Addresses must be within the valid range of addresses for the current project. Symbols must be a valid symbols format. **Note**: The default value type is Address.
3	If you clicked **Replace** in step 1, enter the replacement value in the **Replace With** field.
4	Enter values in the **Start** and **End** fields in the Network Range box to define a range of networks to search. A value of 1 to the maximum network number is allowed. **Example**: You can search for address 40001 in networks 10-20 only.

Step	Action
5	Click **Find** or **Replace** to complete the operation. ● If you click **Find**, the search results are displayed in the search panel. ● If you click **Replace**, the dialog box remains open, and a message indicating that a search has been completed appears in the Message Center window.

Using Find/ Replace - Advanced Search

Step	Action
1	● Click **Edit** → **Find** (Ctrl+F). - or - ● Click the **Find** toolbar button. - or - ● Right click in the logic editor, and click **Search** → **Find**.
2	Click **Advanced**.
3	In the **Search Where** box, click one of the following areas from the list. ● Entire Project ● Logic ● Traffic Cop ● Peer Cop ● I/O Scanner ● Configuration
4	In the **Search For** box, click one of the following value type buttons. ● Address ● Symbol ● Function/Address ● Function ● Disabled ● Duplicate Coils **Note**: The fields available in the **Find What** box are dependent on the value type button you click. **Note**: The **Symbol** button is unavailable by default. To search for symbols (see *p. 64*), make sure you select the **Enable Symbols** **(see *p. 51*)** check box in the Project tab of the Properties dialog box.
5	Enter the value you want to search for in the **Find What** field. **Note**: If you clicked the **Disabled** or **Duplicate Coils** button in step 4, no fields will appear in the Find What box.
6	If you clicked the **Function/Address** or **Function** button as the value type in the Search For box, a second field called **Instruction** will appear under the Find What box. Select an instruction from the **Instruction** list.
7	Enter values in the **Start** and **End** fields in the Network Range box to define a range of networks to search. A value of 1 to the maximum network number is allowed.
8	Click **Find** or **Replace** to complete the operation. ● If you click **Find**, the search results are displayed in the search panel. ● If you click **Replace**, the dialog box remains open, and a message indicating that a search has been completed appears in the Message Center window.

Using Step Search

You can only use the Step Search function in an advanced search (see *p. 70*).

Step	Action
1	Follow steps 1-7 in the table above.
2	Select the **Step Search** check box, and click **Find**.
3	When the search finds the first source address, click one of the following from the Step Search dialog box. ● **Find Next**: Continues the search for the next source address. ● **Mark**: Marks the current search result and adds it to the Mark table (see *p. 175*). ● **Find All**: Finds all results without displaying the Step Search prompt. ● **Stay**: Cancels the search, and remains at the current position. ● **Cancel**: Cancels the search, and returns to the position where the search started.

Using Goto Search

The Goto feature allows you to navigate to a specified item in your logic. You can specify any coil, network, or segment. If the specified item is found, your logic editor will automatically display the item.

Step	Action
1	● Click **Edit** → **Find** (Ctrl+F). - or - ● Click the **Find** toolbar button. - or - ● Right click in the logic editor, and click **Search** → **Find**.
2	Click the **Goto** tab.
3	Click one of the following buttons: ● **Coil** ● **Network** ● **Segment**
4	Enter a coil address, network number, or segment number depending on the choice you made in the previous step.
5	Click **Goto**. **Note**: If the specified location does not exist, a message will be displayed stating that the item was not found.

Using Documentation Search

The Documentation feature allows you to search for a specific text item in the current project. These items may be found in descriptors, symbols, short comments, long comments, or page titles.

Step	Action
1	● Click **Edit** → **Find** (Ctrl+F). - or - ● Click the **Find** toolbar button. - or - ● Right click in the logic editor, and click **Search** → **Find**.

Step	Action
2	Click the **Documentation** tab.
3	Enter a text string in the **Find What** field. **Note**: Text strings can contain any combination of alphanumeric characters including punctuation. Note that *****, **?**, and **#** are reserved characters, and will be treated as wild cards if they exist in the string. (The text strings search similarly to Microsoft Word searches.) The wild cards have the following properties. ● * - searches for any combination of characters ● ? - searches for any single character ● # - searches for any number
4	Select one or more of the following check boxes in the **Search Where** field. ● Descriptors ● Short Comments ● Long Comments ● Symbols ● Page Title **Note**: The search will find symbol matches even if Symbolic Addressing is turned off. **Note**: Short comments and descriptors include documentation for traffic cop. Traffic cop descriptors are not displayed or editable in the document editor; however, the search will find results in this documentation. Documentation search, therefore, can be used to find locations of traffic cop cards based on their names, which are stored in the descriptors.
5	Click **Find** to conduct a search based on the specified settings. The **All** tab of the Search Results panel appears.
6	Click **Close**.

Using the Search Results Panel

Step	Action
1	Click **View** → **Search**.
2	In the Search Results panel, select one of the following tabs. ● **All** - Shows all search results, preceded by the first letter of the area in which the results were found. **Example**: A peer cop result might be **P.L1,SO,Dev:01**. See *p. 73* below for more information on the format of the search results. ● **Logic** - Shows only logic search results. ● **TCop** - Shows only traffic cop search results. ● **Peer Cop** - Shows only peer cop search results. ● **I/O Scan** - Sows only I/O scan search results. ● **Config** - Shows only configuration search results. **Note**: Documentation search results always appear in the **All** tab.
3	Double-click the cell that contains the location of the address that you want to go to.
4	To close the Search Results panel, click **x** in the top, right-hand corner.

Search Results Information

Search results information are presented in one of the following formats:

Logic Search Results

Logic search results are in the format of INST.nnnn.r.cc. The following table shows the notation used:

Notation	Description
n	network number
r	row number
c	column number

Traffic Cop Search Results

Traffic Cop search results are in the format of Hhh,Ddd,Rr,Sss. The following table shows the notation used:

Notation	Description
h	head
d	drop
r	rack
s	slot

Peer Cop Search Results

Peer Cop search results are in the format of L1,XX,Dev:dd. The following table shows the notation used.

Notation	Description
L	link number
XX	link area
D	device number

I/O Scan Search Results

I/O Scan search results are in the format of Card:c,T:ttt. The following table shows the notation used.

Notation	Description
C	card number
ttt	transaction number

Documentation Search Results

Documentation search results are presented in a three-part notation such as **D-000009-Y**. In this example, the **D** denotes that this is a documentation search result. The second part of the notation, **000009** in this example, is a reference. The reference may be a normal address, a traffic cop location, a network number, or any other reference type that allows documentation. The third part, **Y**, represents the location where the text was found. In this case, Y refers to a symbol location (see the table below).

The following table shows types of references.

Addresses	0xxxxx, 1xxxxx, 3xxxxx, 4xxxxx
XMem	6ff,xxxx
Networks	Nxxxxx
Segments	Sxxxxx
Processor	Pxxxxx
Labels	Lxxxxx
TCop Head	Hxx
TCop Drop	HxxDxx
TCop Rack	HxxDxxRxx
TCop Slot	HxxDxxRxxSxx

The following table shows types of locations. Multiple locations may exist for each reference.

D	Descriptor
S	Short Comment
L	Long Comment
P	Page Title
Y	Symbol

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 its own cell in the address used grid.

The Address 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.

Note: If the project is in either offline or combined mode and you need to switch to online mode while the Address Used table is displayed, you must rebuild the Address Used table (see *p. 76*) before you can view the results.

Note: If you are using the Direct to Online (see *p. 50*) mode, you must rebuild the Address Used tables (see *p. 76*) each time you connect to a controller using Direct to Online because the data is not directly stored in the controller.

Using the Address Used Tables

Step	Action
1	Click **View** → **Address Used**.
2	To view an address type, click the corresponding tab. • 0xxxxx • 1xxxxx • 3xxxxx • 4xxxxx
3	To select an address for logic, click the address from the used table and drag and drop it into the instruction that you want to use the address.
4	• To display the address used legend, select the **Legend** check box. • To hide the address used legend, clear the **Legend** check box.

Address Used Legend Descriptions

The Address Used table displays the following information, as noted in the legend.

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

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

Rebuilding the Address Used Tables

To rebuild the Address Used table, click **Rebuild**.

Note: If you are in online mode, rebuilding the address used table requires a read from a PLC. The used tables are unavailable while being rebuilt.

The Knowledge Base

Overview

The Knowledge Base is a user-defined library 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

Double-click **Knowledge Base** in the project navigation panel.

- or -

Click **Project** → **Knowledge Base**.

- or -

Click the **Knowledge Base** toolbar button.

Note: Each project has its own knowledge base, i.e., the knowledge base is specific to the project.

Searching for Keywords in the Knowledge Base

In the Knowledge Base dialog box:

Step	Action
1	Enter a word in the **Keyword** field.
2	Click **Search**. **Result**: All fields in the knowledge base are searched for the keyword. **Note**: After you click **Search** the first time, the button changes to a **Find Next** button.
3	To find the next instance of the keyword, click **Find Next**. The search starts from the first record in the grid. **Note**: You may also search for partial word matches.

Note:
- If you click a different record while the search is processing, the search will continue from that location.
- If you click **Add**, **Delete**, **Edit**, or **Print** while the search is processing, the search will reset itself and the button will change from **Find Next** to **Search**.

Adding a Record to the Knowledge Base

In the Knowledge Base dialog box:

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

Deleting a Record from the Knowledge Base

In the Knowledge Base dialog box, select the record you want to delete and click **Delete**.

Printing the Knowledge Base

In the Knowledge Base dialog box, click **Print**. The ProWORX 32 print setup appears.

Communications Setup

4

At a Glance

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), you must configure ProWORX 32 for your communication protocol and settings.

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

Opening the Communications Setup

Double-click **Communications** in the project navigation panel.

- or -

Click **Project** → **Communications**.

- or -

Click the **Communications** toolbar button.

Setting the Default Communications Type

Click the tab of your communications protocol.
- Modbus
- Modbus Plus
- Gateway
- TCP/IP

Editing Communications Parameters

To edit a communications parameter:

Step	Action
1	• Double-click the parameter. - or - • Click the parameter, and click **Change Setting**.
2	Make the desired changes in the Edit dialog box, and click **OK** to save changes.

Communicating Using the Server

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 in the lower, left-hand corner.

Configuring Modbus Communications

Overview

Modicon's master/slave protocol is standard on 984 and many other controllers. In the Communications Setup dialog box, click the **Modbus** tab 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

Click 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	Defines 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 and 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	defines the data protocol (RTU or ASCII) for this communications mode. 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 three 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, p. 82*).

When you finish configuring the parameters, click **OK**.

Modbus Communications by Modem

Overview

Controllers in remote locations can be equipped with RS-232 modems. Your computer can 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 applicable, are set as follows

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 you configure 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 box:

Step	Action
1	Click the **Modbus** tab, and set the communications parameters (see *Configuring Modbus Communications, p. 81*). **Note**: The controller must have the same Modbus settings as the computer. Open **Configuration** in the project navigation panel. Click the **Ports** tab to set Modbus parameters for your PLC.
2	• Double-click **Port**. - or - • Click **Port**, then click **Change Setting**. From the **Value** list, select the computer port connected to the modem; otherwise, ProWORX 32 won't be able to locate it. Click **OK**.
3	The Modbus configuration (see *Modbus 10-bit Configurations, p. 84*) must send exactly 10 bits per data package to your modem. 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).
4	• Double-click **Modem Type**. - or - • Click **Modem Type**, then click **Change Setting**. From the **Value** list, select the type of modem (see *Modbus Modem Type Descriptions, p. 84*). Click **OK**.
5	To edit the modem parameters (see *Modbus Modem Parameter Descriptions, p. 85*), click **Modem Setup**. Edit the following fields as necessary. • Phone Number • Initialization • Dial Command • Command Suffix • Hangup Command Click **OK**.

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

Modbus 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 that 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 to which the PLC is attached.
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 finish configuring the parameters, click **OK**.

Configuring Modbus Plus Communications

Overview

In the Communications Setup dialog box, select the **Modbus Plus** tab if your computer is connected to a Modbus Plus network through a network adapter card such as an SA85.

Setting Modbus Plus Parameters

Click 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 finish configuring the parameters, click **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 Ethernet to Modbus Plus 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

In the Communications Setup dialog box, click the **Gateway** tab, and set the following communications parameters.

Parameter	Description
Gateway Type	• Double click **Gateway Type**. - or - • Click **Gateway Type**, then click **Change Setting**. From the **Value** list, select one of the following gateways. • SGATE (CEV200) • NR&D MEB • GATEWAY? • CEV300
Index	• Double click **Index**. - or - • Click **Index**, then click **Change Setting**. In the **Value** field, enter the destination index of the PLC.
IP Address	• Double click **IP Address**. - or - • Click **IP Address**, then click **Change Setting**. In the **Value** field, enter the TCP/IP address of the gateway.
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. • Double click **Timeout**. - or - • Click **Timeout**, then click **Change Setting**. In the **Value** field, enter the timeout.

When you finish configuring the parameters, click **OK**.

Configuring TCP/IP Communications

Overview

Some controllers can be equipped with Ethernet TCP/IP modules. In the Communications Setup dialog box, click the **TCP/IP** tab 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	• Double click **IP Address**. - or - • Click **IP Address**, then click **Change Setting**. In the **Value** field, enter a PLC's Ethernet address in standard TCP/IP format: four numbers ranging from 0 to 255, separated by periods. **Example**: 10.0.254.68 is a valid IP address.
Timeout	• Double click **Timeout**. - or - • Click **Timeout**, then click **Change Setting**. In the **Value** field, 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.
Starting IP Address	• Double click **Starting IP Address**. - or - • Click **Starting IP Address**, then click **Change Setting**. In the **Value** field, enter the starting IP address in standard TCP/IP format: four numbers ranging from 0 to 255, separated by periods.
Ending IP Address	• Double click **Ending IP Address**. - or - • Click **Ending IP Address**, then click **Change Setting**. In the **Value** field, enter the ending IP address in standard TCP/IP format: four numbers ranging from 0 to 255, separated by periods.

When you finish configuring the parameters, click **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

Step	Action
1	• Click **Utilities** → **Network Explorer**. - or - • Click the **Utilities** tab in the project navigation panel, then double-click **Network Explorer**. - or - • Double-click **Communications** in the project navigation panel, then click **Network Explorer** at the bottom right of any tab in the **Communications Setup** dialog box.
2	The **Communications Setup** dialog box opens. Select the default communications type (see *Communications Overview, p. 80*). • Click **OK** if you opened Network Explorer through the Utilities menu. - or - • Click **Network Explorer** if you are running this function through the **Communications Setup** dialog box.
3	To return to the **Communications Setup** dialog box at any time, click **Communications Setup**.
4	To switch between views, click either the **Graphical View** button or the **List View** button.
5	The following information is provided for each controller. • Address • Controller Type • PLC State: Running, Optimized, Stopped (the Stopcode is displayed). For more information, see *Stopcode Error Analysis, p. 329*. • Battery State: Good or Bad. • Memory Protect: On or Off. • PLC 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.

Configuring a Controller

5

At a Glance

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 New Project Wizard (see *p. 42*) to select the right type of controller. The options that appear in the configuration editor depend on the controller type, so select only those that your controller supports.

Configuring a Controller

Step	Action
1	• Double-click **Configuration** in the project navigation panel. - or - • Right-click **Configuration** in the project navigation panel, and click **Open Editor**. - or - • Click the **Configuration** toolbar button.
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	Click the parameter rows to update. • Press **Enter** to accept the changes. - or - • Press **Esc** to decline the changes.
4	When you close the configuration editor, a prompt appears asking if you want to **Save project changes**. • Click **Yes** to save the changes. • Click **No** to cancel the changes. • Click **Cancel** to stay in the configuration editor.

Controller Details for Online DIM Awareness Controllers

Overview

You may configure a controller that is in DIM awareness when you are in online mode with the controller. Some controllers may allow different executive details. You must provide the details of the current executive for your controller before you can successfully finish configuring it.

Configuring the Controller

Follow the steps below to configure the controller in online DIM awareness.

Step	Action
1	Open the configuration editor (see *p. 92*).
2	Review and edit the details for your controller by clicking them in the details list.
3	• Click **OK** to configure your controller with these settings. - or - • Click **Cancel** to abort the operation and leave your controller in DIM awareness.

General Tab

Overview

The general tab in the configuration editor allows you to configure a controller's memory. It contains many important options, including the number of coils, registers, segments of logic, 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 for 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 the number must be even. ● 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, 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 to 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 maintain 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 (see *p. 176*) value.
Config Extension Used	Displays the amount of config extension space used. This field is not editable.

Parameter	Description

Config 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 M1Es; 12 words/transaction.

Enable Skips	Click **True** to enable skips (segments can be skipped during solves).
Watch Dog Time	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.
Bridge Mode	Click **True** to enable Bridge Mode. Some controllers support Bridge Mode, which allows you to connect to a Modbus Plus network through their Modbus port 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 configuration editor, 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	Defines the data protocol (RTU or ASCII) for this communications mode. 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 prepares the receiving device for the next packet. The PC and controller must use the same number of stop bits. Default is 1.
Baud	Defines 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.
Address	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 with 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 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 a keyboard or non-keyboard device. This function allows you to modify the response of the ASCII port to match the type of device to which it is connected. In 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 input data is possible from a terminal. In non-keyboard mode, no data is echoed back. 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 its ports using the **Micro port** list. 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 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 *p. 101*), then selecting it from the library into the controller or project by selecting the loadables' check box in the loadables tab and saving changes.

Loadable Parameter

The following parameters are editable.

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

Two possible scenarios that require you to update a loadable:

- Periodically, new versions of loadables become available. If you try to delete an old loadable from the configuration, the configurator alerts you that it is already used in logic, and prevents the loadable's deletion. Since adding 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, right-click the loadable and click **Update**.

Copying a Loadable to a Controller

To copy a loadable to a controller or project:

Step	Action
1	Select the loadable's checkbox. **Result**: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 select will be added to the project when the configuration changes are saved. To use the loadables in a controller, write to the controller (see *p. 109*).
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, clear the loadable's check box.

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:
> **1.** reading it into a loadable library
> **2.** reading it into a controller or project (see *p. 99*)

> **Note:** You can not open the loadable library wizard while the configuration editor is open.

Using the Loadable Library

Step	Action
1	• Click the **Utilities** tab in the project navigation panel, and double-click **Loadable Library**. - or - • Click **Utilities** → **Loadable Library**.
2	Click one of the following buttons: • **Edit opcode**: (see *p. 102*) 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 an .exe into the loadables library. Also use this option to update the version of existing loadables in the loadable library.
3	Click **Finish** to complete the wizard.

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.

Smart Configuration

Overview

The Online Smart Configurator lets you make configuration changes without losing logic or traffic cop information stored in the controller.

The configurator will not let you save changes to the controller if:
- a reduction in controller memory for a particular setting reduces it below the amount used by logic
- modules, which are used in logic, are deleted

Example: The controller might contain logic addresses up to 10160, but you tried to reconfigure the number of 1x addresses to 32.

If this happens, you can either:
- Make changes to your new configuration so that the addresses currently used in the controller fall within the appropriate address ranges.
  - or -
- Send configuration changes to the controller without attempting a smart configuration. You will lose all logic and traffic cop information stored in the controller.

Changing your Configuration Online without a Loss of Information

Step	Action
1	Open the configuration editor (see *p. 92*).
2	In the configuration editor, select the required address ranges for your configuration.
3	To save the changes: ● Click **Apply**. - or - ● Close the configuration editor. **Result**: A dialog box opens, asking if you want to do a smart configuration.
4	Click **Yes** to proceed with a smart configuration, without losing logic or traffic cop information.
5	The smart configuration proceeds and requires a read from (see *p. 107*) and a write to (see *p. 109*) the controller. **Note**: This may take some time.
6	If the smart configuration encounters problems, like newly configured address ranges that are too small for the current logic, you will be notified and returned to the configuration editor.

Changing your Configuration Online with a Loss of Information

Step	Action
1	Open the configuration editor (see *p. 92*).
2	In the configuration editor, select the required address ranges for your configuration.
3	To save the changes: ● Click **Apply**. - or - ● Close the configuration editor. **Result**: A dialog box opens, asking if you want to do a smart configuration.
4	Click **No** to proceed with a normal configuration. **Result**: Logic and traffic cop information will be cleared.

Working with Controllers

6

At a Glance

Overview

This chapter explains how to use ProWORX 32 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.

Initializing Logic

Right-click your project in the project navigation panel, and click **Online Commands** → **Initialize Controller Logic**.

- or -

Click **Controller** → **Initialize Controller Logic**.

- or -

Click the **Initialize Logic in Controller** toolbar button.

Note: A prompt appears to inform you that this action cannot be undone. ● Click **Yes** to continue. ● Click **No** to cancel.

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

Note: 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, verify the communications settings for the correct address.

Step	Action
1	To read the logic, traffic cop, configuration, loadables, ASCII, state and disabled tables: ● Right-click your project in the project navigation panel, and click **Online Commands** → **Read** → **Read**. - or - ● Click **Controller** → **Read**. - or - ● Click **Read** from the **Read from Controller** toolbar button list.
2	To read only the extended memory registers: ● Right-click your project in the project navigation panel, and click **Online Commands** → **Read** → **Read Extended Memory**. - or - ● Click **Controller** → **Read Extended Memory**. - or - ● Click **Read Extended Memory** from the **Read from Controller** toolbar button list.
3	A dialog box prompts you to confirm that you want to read the selected controller. Click **Read** to read all PLC components. **Note**: If you wish to automatically rebuild the Address Used tables when the read is complete, select the **Rebuild Address Used Tables after Read** check box.
Note: To read a partial component of a PLC program separately, see *p. 107* below.	
4	When the read is complete, click **OK** to return to ProWORX 32.

Partial Reading from a Controller

You may read a partial component of a PLC program separately, including the following.

- configuration, including configuration extensions
- network logic, included used tables

- data states and values
- ASCII messages

When you select the **Enable Partial Read** check box, the following conditions apply.

If...	Then...
the ASCII messages have changed between the PLC and the database,	both ASCII messages and configuration must be read.
the configuration has changed between the PLC and the database,	the logic and configuration must be read.
both ASCII and configuration have changed,	only the state RAM option is available. The configuration and ASCII message check boxes are selected by default and cannot be cleared.
no changes have been made to the configuration or ASCII,	all options are available.

Based on the above conditions, the required check boxes are selected in the dialog box, and you cannot clear them. In addition, a message is appended to the text label explaining why an option is unavailable. For example, if your controller and project match but the ASCII messages have changed, the screen message states that the ASCII and configuration sections must be read.

To perform a partial read:

Step	Action
1	Follow steps 1-3 in the table above (see *p. 107*).
2	You are prompted to confirm that you want to read the selected controller. Select the **Enable Partial Read** check box. If the check box is selected, the four partial read options (configuration, logic, state RAM, and ASCII messages) are enabled based on the allowable conditions determined from the database vs. PLC changes. If the check box is cleared, all partial read options are checked and disabled, and a full read will be performed.
3	Select the **Configuration** check box to read this component.
4	Select the **Logic** check box to read this component.
5	Select the **State RAM** check box to read this component.
6	Select the **ASCII Messages** check box to read this component.
7	Click **Read**. **Note**: If you do not click any components for partial read, you will see an error message, and no read is performed. **Note**: If you wish to automatically rebuild the Address Used tables when the read is complete, select the **Rebuild Address Used Tables after Read** check box.
8	Click **OK** when the read is complete.

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

Note: 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, verify the communications settings for the correct address.

Step	Action
1	Follow this step to write the logic, traffic cop, configuration, loadables, ASCII, state and disabled tables. This command overwrites all existing PLC data. • Right-click your project in the project navigation panel, and click **Online Commands** → **Write** → **Write All**. - or - • Click **Controller** → **Write All**. - or - • Click **Write All** from the **Write to Controller** toolbar button list.
2	Follow this step 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): • Right-click your project in the project navigation panel, and click **Online Commands** → **Write** → **Relocate Logic and Data**. - or - • Click **Controller** → **Relocate Logic and Data**. - or - • Click **Relocate Logic and Data** from the **Write to Controller** toolbar button list.
3	Follow this step to write only the extended memory registers. Select all extended memory files or a specific extended memory file and click **OK**. • Right-click your project in the project navigation panel, and click **Online Commands** → **Write** → **Write Extended Memory**. - or - • Click **Controller** → **Write Extended Memory**. - or - • Click **Write Extended Memory** from the **Write to Controller** toolbar button list.

Step	Action
4	ProWORX 32 verifies that the controller and database match and the results are stated in the Project/Controller Validation dialog box. If the controller and database match, click **Write**. 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 may not be large enough. ● The controller instruction set may not match the database. ● The database may use duplicate coils, which most controllers do not support.
Note: To write a partial component of a PLC program separately, see *p. 110* below.	
5	Click **OK** when the write is complete.
6	If the write command was cancelled at any time, go back to step 1.

⚠ CAUTION

Unintended System Operation

Canceling the write operation while downloading default register values will result in partially written data and the PLC can be placed into run mode. If your application relies on default register values (coil states, disabled states, register values, history tables, etc.), you must complete a full write operation prior to placing the PLC into run mode.

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

Partial Writing to a Controller

You may write to a partial component of a PLC program separately, including the following.
- configuration, including configuration extensions
- network logic, included used tables
- data states and values
- ASCII messages

When you select the **Enable Partial Write** check box, the following conditions apply.

If...	Then...
the ASCII messages have changed between the PLC and the database,	both ASCII messages and configuration must be written.
the configuration has changed between the PLC and the database,	the logic and configuration must be written.
both ASCII and configuration have changed,	only the state RAM option is available. The configuration and ASCII message boxes will be checked and disabled.
no changes have been made to the configuration or ASCII,	all options are available.

Based on the above conditions, the required options are checked and disabled in the dialog box. In addition, a message is appended to the text label explaining why an option is disabled. For example, if your controller and project match but the ASCII messages have changed, the screen message would state that the ASCII and configuration sections must be written.

To perform a partial write:

Step	Action
1	Follow steps 1-4 in the table above (see *p. 109*).
2	You are prompted to confirm that you want to write to the selected controller. Select the **Enable Partial Write** check box. If the check box is selected, the four partial write options (configuration, logic, state RAM, and ASCII messages) are enabled based on the allowable conditions determined from the database vs. PLC changes. If the check box is cleared, all partial write options are checked and disabled, and a full write will be performed.
3	Select the **Configuration** check box to write this component.
4	Select the **Logic** check box to write this component.
5	Select the **State RAM** check box to write this component.
6	Select the **ASCII Messages** check box to write this component.
7	Click **Write**. **Note**: If you do not click any components for partial write, you will see an error message, and no write is performed.
8	Click **OK** when the write is complete.

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 because 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

Step	Action
1	• Right-click your project in the project navigation panel, and click **Online Commands** → **Write** → **Transfer to Flash/EEPROM**. - or - • Click **Controller** → **Transfer to Flash/EEPROM**. - or - • Click **Transfer to Flash/EEPROM** from the **Write to Controller** toolbar button list.
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 Exec Loader

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 Exec Loader application. The Exec Loader is a Windows based 32-bit program that allows you to update the executive firmware in a variety of Schneider Electric PLC modules.

To open Exec Loader:
- Click the **Utilities** tab in the project navigation panel, then double-click **Exec Loader**.
  - or -
- Click **Utilities** → **Exec Loader**.

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

Step	Action
1	• Right-click your project in the project navigation panel, and click **Online Commands → Write → Transfer to Flash/EEPROM**. - or - • Click **Controller → Transfer to Flash/EEPROM**. - or - • Click **Transfer to Flash/EEPROM** from the **Write to Controller** toolbar button list.
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

Step	Action
1	• Right-click your project in the project navigation panel, and click **Online Commands → Write → Transfer to Flash/EEPROM**. - or - • Click **Controller → Transfer to Flash/EEPROM**. - or - • Click **Transfer to Flash/EEPROM** from the **Write to Controller** toolbar button list.
2	• Click **Internal Flash** to transfer the current logic to flash memory. - or - • Click **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	Click **Stop** if the controller is currently running.

Starting and Stopping Controllers

Starting and Stopping a Controller

Step	Action
1	• Right-click your project in the project navigation panel, and click **Online Commands** → **Start/Stop**. - or - • Click **Controller** → **Start/Stop**. - or - • Click the **Start Controller** toolbar button.
2	For controllers that support it, you can select **Optimization Mode**. In the optimized mode, the ability to edit or show power flow is unavailable. 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.

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 *p. 332* for more information about status words.

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

Opening the PLC Status Viewer

Double-click **PLC Status** in the project navigation panel.

- or -

Click **Project** → **PLC Status**.

- or -

Click the **PLC Status** toolbar button.

Checking the Value of a Word

In the PLC status window:

Step	Action
1	Click **Update current node**.
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	Click **Record selected nodes**.
2	Select the check boxes beside the status word icons to select the word(s) that you want to log.
3	Click **Start Logging**.
4	Click **Stop Logging** to end the logging session.

Working with Logged Word Data

After logging word data:

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

Analyze Device

Overview

The analyze feature is very useful in diagnosing problems with your PLC that do not 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-system's 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, and Module Health checks. All potential problems are stored in 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 stored in 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

Step	Action
1	• Double-click **Analyze Device** in the project navigation panel. - or - • Click **Project** → **Analyze Device**. - or - • Click the **Analyze Device** toolbar button.
2	Click 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

7

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 has its 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 in the project and can be loaded at any time.

Available configuration extensions listed in the Active Extension panel:

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 PLCs.
Quantum VME Bus	Configures a VME-424/X controller for communications with a VME network.
Quantum Security	Allows additional security configuration of Quantum 140 CPU 434 12A and 140 CPU 534 14A controllers.

Note: Before setting config extensions, you must set the Configuration Extension Size (see *p. 94*) parameter in the configuration editor.

Using the Configuration Extensions Utility

Step	Action
1	• Double-click **Configurations Extensions** in the project navigation panel. - or - • Right-click **Configurations Extensions** in the project navigation panel, and click **Open Editor**. - or - • Click **Project** → **Configuration Extensions**. - or - • Click the **Configurations Extensions** toolbar button, and click **Open Editor**. **Result**: The Configuration Extension window appears, 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, clear the check box beside the extension icon.
4	To edit an extension, ensure that the extension's associated check box is selected. Then, select the extension that you want to edit from the extension panel. The status bar at the bottom of the Configuration Extension 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 you 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 Extension panel, it is not a valid extension for the current controller type.

Editing the Compact Phase II Extension

Step	Action
1	Select the **Compact Phase II** check box in the Active Extension panel.
2	Enter a Secure Data Area value between 0 and 128 in the **SDA Size (K Words)** field. A zero value indicates the feature is unavailable.
3	Enter a value between 0 and 50 in the **CTS Delay (x10 ms)** field. A zero value indicates the feature is unavailable. **Note**: This value is a factor of 10; if you enter 5, the PLC assumes you mean 50.
4	Enter a value between 0 and 50 in the **RTS Delay (x10 ms)** box. A zero value indicates the feature is unavailable. **Note**: This value is a factor of 10; if you enter 5, the PLC assumes you mean 50.
5	Enter a password consisting of a maximum of 16 characters (A-Z, 0-9 and _) in the **PLC Password** field. 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 Extension panel, it is not a valid extension for the current controller type.

Editing the Data Protect Extension

Step	Action
1	Select the **Data Protect** check box in the Active Extension panel.
2	Enter an address in the **0xxxx Starting Address** field. Default is 0:0001.
3	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** fields. **Example**: Suppose you type a Starting Address 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 Starting Address 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.
4	Enter an address in the **4xxxx Starting Address** field. Default is 4:0001.
5	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 **4xxxx Protected Ranges** fields.

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 CHS 110 00 modules. It also lets you set the Initial Command Register and the Non-Transfer Area.

This extension is only available for version 2.x Quantum controllers that contain the CHS loadable (see p. 100) 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

Step	Action
1	Select the **Quantum Hot Standby** check box in the Active Extension panel.
2	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.
3	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.

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

6	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.

7	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.
8	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.
9	Click the **Initial Command Register** tab.
10	Set the **Swap Port (x) Addresses** parameters to either Yes or No.
11	Set the **Controller (x) Mode** parameters to either Offline or Online.
12	Set the **Standby Mode (on logic mismatch)** to either Yes or No.
13	Set the **Executive Upgrade Switch** to either Enabled or Disabled.
14	Set the **Keyswitch Override** to either Enabled or Disabled.

I/O Scanner for Quantum Controllers (with NOE Cards)

Overview

The I/O Scanner extension provides data transfer between two or more controllers on a TCP/IP network. The I/O Scanner allows 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, this type of communication is very efficient.

Note: If the I/O Scanner extension does not appear in the Active Extension panel, it is not a valid extension for the current controller type.

I/O 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. See *p. 134* for more information.

Editing the I/O Scanner Extension

In the Active Extensions panel, select the I/O Scanner extension, then:

Step	Action
1	Select the **I/O Scanner** check box in the Active Extension panel.
2	Select a card to edit from the **Card Number** list. 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.
3	In the **Local Device** dialog box, 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.
4	Enter a 1xxxx or 3xxxx address that will receive health information in the **Health Block (1x/3x)** field.
5	Enter the number (1-16) of the slot in the backplane the selected card inhabits in the **Slot Number** field. This value should match the value in the TCP/IP extension for the selected card.
6	Click the **Device Control** field. **Result**: An address edit box appears to the right. Enter a valid address, which must be either a 3x or 4x address and within the project's configured range. The specified address appears in the Address Used table, if visible.
7	Select the **Enable Device Control** check box. When you select the check box, the Device Control Block field is enabled. When you clear the check box, the Device Control Block field is disabled.

Step	Action
8	Click **Show Registers**. **Result**: A Data Watch Window launches, which displays the health registers and the device control registers. Click the left or right arrow underneath **Current Page** to switch between health registers and device control registers. On the **Health Registers** page, you will see one of the following, depending on the address you entered in the Health Block field in step 3. ● (8) 3x registers, which hold 128 health bits for each of the 128 possible transactions. These registers are editable in any Radix, but default to Decimal. ● (128) 1x discretes, which hold 128 health bits for each of the 128 possible transactions. These registers are editable in any Radix, but default to Binary. On the **Device Control Registers** page, you will see one of the following, depending on the address you entered in the Health Block field in step 3. ● (8) 3x or 4x registers, which hold 128 health bits for each of the 128 possible transactions. These registers are editable in any Radix, but default to Binary. Click the **...** button to open the **Bit Display** editor.
9	On the **Device Control Registers** page, double click a data cell to edit the data. **Result**: The data edit box appears, and you can edit in whichever radix is defined for that row. Press **Enter** to accept or **Esc** to cancel the edit.
10	Double click a radix cell to edit the data. **Result**: The radix drop-down list appears, and you can select any new radix in the list. Press **Enter** to accept or **Esc** to cancel the edit. The data value will reflect the new radix.
11	Click the **...** button to launch the **Bit Display** editor.

Bit Display Editor

Step	Action
1	Double-click a bit to edit the data. The hex and decimal data values will change to reflect the new value.
2	Or, click the list to the right of the bit you wish to edit. Select the desired setting. The associated bit will change to reflect the new setting.
3	Click **OK** to accept the new value, or click **Cancel** to ignore the new value and close the Bit Display editor.

Select Transaction Dialog Box

Step	Action
1	The **Select Transaction** field displays up to 128 (64 for M1E PLCs (see *p. 133*)) transactions. • A transaction that is not configured is denoted by a red X. • A partially configured transaction is denoted by a yellow exclamation mark. • A configured transaction is denoted by a green check mark.
2	To configure a transaction, right-click anywhere in the transaction list and click **Add Transaction**. Transactions are configured in order, so, if you have three transactions and click **Add Transaction**, the fourth transaction can be configured.
3	To clear the configuration of the last transaction in the list, right-click anywhere in the transaction list and click **Delete Transaction**, or press **Delete**.

Remote Device Dialog Box

Step	Action
1	Enter the IP address of the remote device that you are communicating with in the **IP Address** field.
2	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 IDs. **Example**: 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 IDs match.
3	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.
4	Enter a millisecond value representing the length of time to wait for a reply for each transaction in the **Health Timeout (0-50k)** field.

Transaction Dialog Box

Step	Action
1	Select one of the following from the **Function** 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, one in each device.
2	Select one of the following from the **Fallback Value** list. ● 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.

Read From Remote Dialog Box

Step	Action
1	Enter the local data address receiving data from the remote controller in the **To** field.
2	Enter the remote address where the read data is coming from in the **From** field.
3	Enter the number of sequential registers to read in the **Length** field. Up to 125 registers are allowed.

Write To Remote Dialog Box

Step	Action
1	Enter the local data address that sends data to the remote controller in the **From** field.
2	Enter the remote address where the write data is going to in the **To** field.
3	Enter the number of sequential addresses to write in the **Length** field. Up to 100 registers are allowed.

I/O Scanner for Momentum Controllers

Editing the I/O Scanner Extension

The I/O Scanner configuration dialog box for M1 Ethernet controllers has the same functions as the dialog box for Quantum controllers (with NOE cards) (see *p. 128*) with the following 2 differences.

For M1 Ethernet controllers:
1. In the **Local Device** dialog box, the fourth field is **Diagnostic Block**, which functions the same way as Device Control (see *p. 128*) for NOE.
2. In the **Local Device** dialog box, the fifth field is **Enable Diagnostic Block**, which functions the same way as Enable Device Control (see *p. 128*) for NOE.

Data Watch Windows - Health and Diagnostic Registers

When you click **Show Registers**, the **Health Registers** page (page 1) (see *p. 128*) appears exactly as it does for Quantum controllers with NOE cards. However, the **Diagnostic Registers** page (page 2) appears differently for M1 Ethernet controllers.

Note: The Diagnostic Registers page in M1 Ethernet controllers displays 128-word length tables, unlike that in the Quantum controllers, which displays 8-word length tables.

Follow the steps below to edit the diagnostic registers.

Step	Action
1	Double-click a data cell to edit the data. **Result**: A list appears from which you can select any value. Press **Enter** to accept or **Esc** to cancel the edit. **Note**: The data values are read only for an NOE card. Changing this value will not change the way the corresponding NOE operates, which may simply reset the value back to its correct state.
2	Double-click a radix cell to edit the data. **Result**: A list appears from which you can select any radix. Press **Enter** to accept or **Esc** to cancel the edit. The data value will reflect the new radix.

I/O Scanner Wizard

Overview

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 I/O Scanner Wizard

CAUTION

Ensure online devices are stopped.

Online devices may be running! You must stop them before you modify their contents. Before you stop a device, ensure that it is safe to do so. The devices restart once the operation is complete. Modifications to the devices' content cannot be undone.

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

Step	Action
1	Click the **I/O Scanner Wizard** button in the Active Extension panel.
2	Read the on-screen instructions, and click **Next**.
3	Clicking one of the following to set the transaction type. • **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. Click **Next**.
4	• Enter an IP address in the **Local Device IP Address** field 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** list. Click **Next**.
5	To properly use the I/O Scanner extension, you must define target PLCs with which to communicate. These target PLCs are called remote devices. • Click **Add** to add a remote device. • Click **Remove** to remove a remote device. At least one remote device must be defined before proceeding.

Step	Action
6	If you click **Add** to add a remote device: ● Click **Browse** to select a project. Select a project from the **Remote Device/Database** list. ● Enter the IP address of the PLC for the remote device's project in the **Select an IP Address** field. ● 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** list. Click **Next** to return to the remote device summary screen.
7	Repeat the above step until all desired remote devices have been added. Click **Next** when you have finished adding remote devices to the I/O Scanner extension.
8	To transfer data from one device to another a transaction is required. Existing transactions cannot be modified using the I/O Scanner wizard and are disabled. Up to 128 transactions may be created, except if you are using the M1E PLCs, then only 64 transactions can be supported. ● Click **Add** to add a new transaction. ● Click **Edit** to edit a transaction created by the I/O Scanner wizard. ● Click **Remove** to remove a transaction created by the I/O Scanner wizard.

9	● After clicking **Add**, you are prompted to select a remote device. Click a remote device from the list, and click **Next**.
	● Now you can configure the new transaction.
	    ● First, select a function from the list.
	    ● Second, enter 4xxxx addresses into the **From** and **To** fields.
	    ● Third, enter numeric values in the **Number of Registers** field in the Read from Remote Device and Write to Remote Device areas.
	
	Click **Next** when you have finished editing the transaction.
	(To see descriptions of the functions and fields, see *p. 128*.)

10	The transaction summary screen displays a summary of all new transactions to be written to the local device as well as the various selected remote devices. Ensure the transactions are correct, and click **Next**. **Note**: Clicking **Next** proceeds with the modifications, which cannot be undone once completed. **Note**: Only offline databases are modified in this step.
11	Click **Update Online Devices** to update the physical devices defined as remote devices by the wizard. This does not update the local device, which must be done once the configuration extension editor is closed and all changes are saved. Click **Next**.

Finishing the I/O Scanner Wizard

Step	Action
1	Click **View Log File** 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.
2	Click **Finish** to close the wizard.

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, Momentum, and Quantum controllers equipped with NOM Ethernet adapters. 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 Extension panel, it is not a valid extension for the current controller type.

Peer Cop Wizard

ProWORX 32 includes a configuration wizard (see *p. 140*) to help you set your Peer Cop extensions.

Note: The Peer Cop wizard only applies to link 1.

Editing the Peer Cop Extension

Step	Action
1	Select the **Peer Cop** check box in the Active Extension panel.
2	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.
3	● Click **Add Link** to add a link. ● Click **Clear Link** to clear the configuration of a link. ● Click **Delete Link** to delete a link.

Step	Action
4	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** list. 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.
5	Select a value from the **Timeout (ms)** list. 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).
6	Click **Clear** or **Hold** from the **Last Value** list. 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: Click **View Data** to view the register data of any global input/output or specific input/output. The Data Watch window opens, 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	Click **Global Input** in the Links panel.
2	Double-click an input in the **Global Input** list. **Result**: The global input properties grid appears.
3	In the **Index** field, enter the starting point (1 through 32) of the broadcast data to read.
4	In the **Start** field, enter the destination for the received data (i.e., where the received data is to be stored).

Step	Action
5	In the **Length** field, enter the number of words (1 to 32) to read forwards from the Index value. **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. 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** list.

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	Click **View Subfields**.
2	Click a subfield from the **Global Inputs Subfields** list to edit its properties. (Subfields have the same properties as inputs.)
3	Click **Return** when you are finished editing the subfield's properties to return to the list of global inputs.

Editing Global Outputs

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	Click **Global Output** in the Links panel.
2	Double-click an output in the **Global Output** list. **Result**: The global output properties grid appears.
3	In the **Start** field, enter the destination for the received data (i.e., where the received data is to be stored).
4	In the **Length** field, enter the length (1-32) of the address range (i.e., the number of registers to broadcast).
5	Select either BIN (default) or BCD from the **Type** list.

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 in five words of 0xxxx memory area.

Note: Click **View Data** to view the register data of any global input/output or specific input/output. The Data Watch window opens, displaying the relevant data.

Editing Specific Inputs

Step	Action
1	Click **Specific Input** in the Links panel.
2	Double-click an input in the **Specific Input** list. **Results**: The specific input properties grid appears.
3	In the **Start** field, enter the starting address of the block of data to be placed from the source controller.
4	In the **Length** field, enter the number of words (1 to 32) to be received from the source controller.
5	Select either BIN (default) or BCD from the **Type** list.

Editing Specific Outputs

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

Step	Action
1	Click **Specific Output** in the Links panel.
2	Click an output from the **Specific Output** list. **Result**: The specific output properties grid appears.
3	In the **Start** field, enter the starting address for the block of data to be sent to the destination controller.
4	In the **Length** field, enter the number of words (1 to 32) to be sent to the destination controller.
5	Select either BIN (default) or BCD from the **Type** list.

Peer Cop Wizard

Overview

The Peer Cop Wizard guides 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

⚠ CAUTION

Ensure online devices are stopped.

Online devices may be running! You must stop them before you modify their contents. Before you stop a device, ensure that it is safe to do so. The devices restart once the operation is complete. Modifications to the devices' content cannot be undone.

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

Step	Action
1	Click the **Peer Cop Wizard** button in the Active Extension panel.
2	Read the on-line instructions, and click **Next**.
3	Enter a MB+ address (01-64).(00-64).(00-64).(00-64) in the **Local Device MB+ Address** field. Click **Next**.
4	Define target PLCs 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.
5	If you click **Add** to add a remote device: • Click **Browse** to select a project. Click a project from the list or click **Browse** to select a project in another directory. When you have selected a project, click **OK**. • Enter a MB+ address in the **Select MB+ Address for this Device** field. • 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.

<table>
<tr><th>Step</th><th>Action</th></tr>
<tr><td>6</td><td>The Specific Transactions List dialog box appears. The Specific Transaction List provides a list of all specific point-to-point transactions. To transfer data from one device to another, a transaction is required. Existing transactions cannot be modified using the Peer Cop Wizard and are disabled. Up to 64 read and 64 write transactions may exist.
Click Add to add a new transaction.
Click Edit to edit a transaction created by the wizard.
Click Remove to remove a transaction created by the wizard.</td></tr>
<tr><td>7</td><td>If you clicked Add to add a new specific transaction, the Specific Transaction dialog box appears, allowing you to configure the transaction.
Select Read or Write from the Function list. Read requests data from the remote device, and Write sends data to the remote device.
In the From field, enter the 4xxxx address where the data comes from. The address is from the remote device for a read function and from the local device for a write function.
In the To field, enter a 4xxxx address where the data is sent to. The address is from the local device for a read function and from a remote device for a write function.
In the Word Length field, enter the number of consecutive registers to transfer (1 through 32).
Click Next when you have finished configuring the specific transaction.</td></tr>
<tr><td>8</td><td>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 disabled.
Click Add to add a new global transaction.
Click Edit to edit a global transaction created by the wizard.
Click Remove to remove a global transaction created by the wizard.</td></tr>
<tr><td>9</td><td>If you clicked 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 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.
Click Next when you have finished configuring the global transaction.</td></tr>
</table>

Step	Action
10	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 you click **Next**. To overwrite any transactions in the remote device that would interfere with the new one, select the **Overwrite Existing Remote Transactions** check box. **Note**: Clicking **Next** proceeds with the modifications, which cannot be undone once completed. **Note**: Only offline databases are modified in this step.
11	Click **Update Online Devices** to update the physical devices defined as remote devices by the wizard. This does not update the local device, which must be updated after the configuration extension editor is closed and all changes are saved. Click **Next**.

Finishing the Peer Cop Wizard

Step	Action
1	Click **View Log File** to view all the changes made to the local and remote devices. This file (PeerWizard.log) may be saved or printed as needed.
2	Click **Finish** to close the wizard.

Profibus Extension

Overview

The Profibus configuration extension allows you to configure Profibus I/O in a ProWORX project. The extension has 2 major functions:

- importing a Profibus station from an exported .CNF file created with the SYCon software package
- editing the I/O parameters for the Profibus I/O using the Profibus configuration extension

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

Editing the Profibus Extension

Step	Action
1	Click **Profibus** in the Active Extension panel.
2	To begin importing an existing .CNF file, click **Import .CNF**. **Note**: ● For a standard slave (modular/compact), the maximum is 16 (bytes or words depending on the type of the slave/slot). ● For specific slaves (modular/compact), the maximum is 64 (bytes or words depending on the type of the slave/slot). These maximums are Profibus standard maximums, not ProWORX 32 specific (i.e., Concept or any other software should have the same maximums with regard to Profibus.). **Note:** If current extensions include an active Profibus extension, the screen will show how many words are used in this extension. **Note:** Importing a.CNF file will overwrite all of your existing settings.
3	You will be warned that any existing Profibus configurations will be cleared. ● Click **Yes** to continue. ● Click **No** to cancel. After import, the Profibus extension enters Edit Mode. This mode allows you to configure the Profibus I/O parameters.
4	In Edit Mode, select an item in the Device Tree (upper, left-hand side of the screen) to display its parameters. Three different devices may be available: ● Master ● Slave ● Modules
5	The **Device** field displays the device's name, bus address, and ID.
6	The **Master Parameters** window displays the I/O and diagnostic settings. You can edit all values in this window except Baud Rate. Valid ranges are indicated in the labels.

Further Editing in the Profibus Extension

You **can** edit the Profibus settings again if:
- You imported the associated .CNF file into your project using ProWORX 32, Version 2.0 or later.
- You are using a project as described above to edit in offline mode.
- You are using a project as described above to edit in online or combined mode with the correct controller.

You **cannot** edit the Profibus settings again if:
- If you did not import a .CNF file using ProWORX 32, Version 2.0 or later.
- You are using a project in direct to online mode.
- If you connect to a controller that does not have Profibus data matching the selected project.

Note: You can only edit the addresses, address types, and diagnostic information for the imported modules. The modules (master and slaves) are fixed, and can only be defined by importing a .CNF file. The modules cannot be edited using ProWORX 32. Importing a .CNF file will overwrite any existing settings for the selected card.

Setting the Presets

Step	Action
1	Click **Set Presets** to display a **Presets** frame, which allows you to select a starting address for all I/O and diagnostic addresses. All I/O settings will be cleared by this operation.
2	In the **Presets** frame, select a starting address for each address type. **Note**: Diagnostic settings are always either Boolean or Unsigned 8-bit integers. Only 3x addresses are allowed. **Note**: I/O settings may include discrete addresses for Boolean settings and register addresses for all others. Type allowed depends on the length and whether this device uses bytes or words. Lengths cannot be changed.
3	• Select the check box to preset addresses of the associated type. • Clear the check box to leave the address unchanged.
4	Click **Preset** to assign addresses to all Profibus I/O and diagnostic settings for all slaves and modules.
5	Click **Close** to close the **Presets** frame and return to the Profibus edit screens. Closing the configuration extensions after editing will automatically generate a valid Profibus extension.

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

Step	Action
1	Click **S980 Address** in the Active Extension panel.
2	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 Extension panel, it is not a valid extension for the current controller type.

Editing the SY/MAX Extension

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

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 *p. 88*.

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

Editing the TCP/IP Extension

Step	Action
1	Click **TCP/IP** in the Active Extension panel.
2	Select a card (1-6) from the **Card** list. **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.
3	Select a head number (1 through 16) from the **Head Number** list.
4	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.
5	Select either Ethernet II or IEEE 802.3 from the **Framing Type** list.
6	Select either Extension or BOOTP Server from the **IP Address Selection** list. ● **Extension** - Upon power up, the PLC reads its TCP/IP addressing information from this extension. ● **BOOTP** - Upon power up, the PLC requires 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 Extension panel, it is not a valid extension for the current controller type.

Editing the VME Bus Extension

Step	Action
1	Click **VME Bus** in the Active Extension panel.
2	In the **Slave Interrupt Level** field, enter the appropriate value. 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.
3	In the **Status ID** field, enter a value between 1 and 255. When the VME controller receives an interrupt while acting as a slave, this is the value it sends.
4	In the **Master Arbitration Type** list, select an appropriate value for master arbitration type. This field determines how the controller will operate. Valid settings are Not System Controller, Primary Mode (PRI) or Round Robin Mode (RRS).
5	In the **Master Release Mode** list, select an appropriate value for master release mode. 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.
6	In the **Master Bus Request Level** list, select the appropriate value for master VME Bus request level. 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).
7	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.

Quantum Security

Overview

The Quantum Security configuration extension allows additional security configuration in Quantum 140 CPU 434 12A and 140 CPU 534 14A controllers. The security and password extensions are used with 21 CFR Part 11 regulations issued by the U.S. Food and Drug Administration.

Editing the Quantum Security Extension

Step	Action
1	Click **Quantum Security** in the Active Extension panel.
2	In the **Auto Logout** list, select a time interval of 5, 10, 15, 20, 30, 45, 60, 75 or 90 minutes. Auto Logout forces the PLC to log out the current user after a specified time of inactivity.
3	Select the **Disable All writes from NOE/NOM cards** check box to force the PLC to ignore any attempt to write to it from the NOE or NOM card. Ethernet writes are thereby disabled.
4	Select the **Disable All writes from CPU Modbus ports** check box to force the PLC to ignore any attempt to write to it from an onboard Modbus port.
5	Select the **Enable Modbus+ Write Restrictions** check box to force the PLC to ignore any attempt to write to it from an onboard Modbus Plus ports.
6	In the **Enter New MB+ Address** field, enter any exceptions to Modbus Plus write restrictions.
7	• Click **Add** to add a Modbus Plus address to the exception list. • Click **Delete** to delete the selected Modbus Plus address from the exception list. • Click **Clear** to delete all Modbus Plus exception addresses except for local address (1.0.0.0.0) which cannot be deleted.
8	Click any of the Password fields in the **PLC Password** section to edit the password. Passwords are 16 alphanumeric characters and are not case sensitive. Both passwords must match for a new password to be accepted. **Note**: The **PLC Password** section is available only if you are online with a PLC. If no password is set, Old Password is not available.

Using the Logic Editor

8

At a Glance

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 controller 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 modes, 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, right-click in the logic editor, and click **View** → **Navigation Tree**.
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 modes, power flow will be drawn per cell based on the properties of the logic editor. The cursor tracks several features: ● instruction help placed in the Tracking Help window ● tracking documentation for the current address in the documentation editor ● 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, right-click in the logic editor, and click **View** → **Instruction List**.
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 contains only the name property. To display or hide the Properties panel, right-click in the logic editor, and click **View** → **Properties**.

Note:
The instructions, properties and network panels can be opened or closed:
- Right-click in the logic editor, and click **View** → **Instruction List**.
- Right-click in the logic editor, and click **View** → **Properties**.
- Right-click in the logic editor, and click **View** → **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. To open the logic properties dialog box:

Step	Action
1	• Right-click in the logic editor, and click **Logic Properties**. - or - • Right-click **Logic** → **Properties** in the project navigation panel. - or - • Click **View** → **Properties**.
2	Configure the logic editor properties (see *p. 153*) as desired.
3	Click **OK** to save and apply changes.

Logic Editor Display Properties

In the logic editor properties window:

Property	Description
View 1-4	The View 1-4 buttons allow Ladder Logic editor display to accommodate different views for users and for printing. Ladder Logic display fields in View 1 have default settings. Fields in Views 2-4 are initially set to clear The View 1 settings are the parameters used to print the Ladder Logic The four view icon resides on the standard toolbar; clicking the icon cycles between the four views.
Color Configuration	The color of the descriptor, symbol, data, back reference, cursor background, cursor foreground, logic background, logic foreground, and power flow are 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 **Default**. Clicking **Default** also sets 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.

Property	Description
Always Fit 7 Rows x 11 Cols	Select the check box to always see the full grid of instructions in the window. If the check box is cleared, the cells will be displayed at full size, and you will have to scroll to see the entire network.
Show Coils in Solve Column	Select the check box to see the coils where they are solved by the controller. If the check box is cleared, the coils will always be displayed in the 11th column attached to the solve column by dots.
Multi Function Naming	When you select the check box, 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 you select the check box, you can add as many instructions 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 you select the check box, you can access the Insert menu by pressing **Insert**. Likewise, when you select the check box, you can access the Delete menu by pressing **Delete**. When you clear the check box, these keys operate normally, and the menus are only accessible from the Edit menu.
Show Cross Reference Tips	When you select the check box, a tool tip will be visible showing the cross reference information for the address that your cursor is hovered over. The tool tip is in the format network.row.instruction.
ISA Symbols	When you select the check box, the use of ISA symbols is enabled in the logic view.
Auto Fill Address Type	When you select the check box, the address type is automatically entered in any coil where there is a known, defined address type.
Online Multiple Undo/Redo Enabled	When you select the check box, you can reverse or reapply as many as 10 actions. Can only be applied to the network that you are currently working on. See *p. 160* for more information.
State Flow	When you select the check box, you can see the state of each contact or coil immediately, without having to use the Data Watch Window. Instruction is highlighted if it solves true, regardless of whether instructions upstream are passing power.
Online Update Rate	Adjusts 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.

Hotkey Template

Overview

The hotkey template is used to select the type of hotkey support that you wish to use. The following tables list the supported hotkeys for ProWORX 32, Modsoft, ProWORXPLUS, and ProWORX NxT.

Changing the Hotkey Template

Step	Action
1	• Right-click **Workspace** and click **Properties**. - or - • Right-click your project and click **Properties**. - or - • Click **View** → **Properties**.
2	Click the **Logic** tab.
3	In the **Hotkey Template** list, click the template you want to use. • ProWORX 32 • ProWORXPlus • Modsoft • NxT
4	Click **OK**.

ProWORX 32 Hotkey Listing

ProWORX 32 generic hotkeys:

Hotkey	Operation
F1	Specific help for current topic
Ctrl+N	New project
Ctrl+S	Save project
Ctrl+Z	Undo
Ctrl+X	Cut
Ctrl+C	Copy
Ctrl+V	Paste
Ctrl+F	Find (search)
Ctrl+H	Replace
Ctrl+G	Go to
Ctrl+P	Print
Ctrl+Alt+I	Print preview
Ctrl+F2	Documentation editor

Hotkey	Operation
Alt+F1	Instruction help
Alt+F2	Address used
Alt+F4	Exit ProWORX 32
Shift+F2	Tracking help

ProWORX 32 logic editor specific hotkeys:

Hotkey	Operation
Alt+R	Open register editor
Alt+left mouse click	Move entire logic block to another network location
Ctrl+left mouse click	Copy address from one logic block to another
Ctrl+Home	Go to first network of segment
Ctrl+End	Go to last network of segment
Ctrl+E	Enable discrete
Ctrl+D	Force discrete off
Ctrl+Q	Force discrete on
=	Insert horizontal short
+	Insert vertical short
-	Clear vertical short
Ins	Insert popup menu (if insert/delete key menu property is on)
Del	Delete popup menu (if insert/delete key menu property is on)

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	

Hotkey	Operation	ProWORX 32 Equivalent
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+Page Up	Previous segment	
Ctrl+Page Down	Next segment	
Ctrl+Home	Go to first network of segment	
Ctrl+End	Go to last network of segment	
Ctrl+F8	Configuration	

ProWORXPLUS Hotkey Listing

Hotkey	Operation	ProWORX 32 Equivalent
Alt+A	Address used	
Alt+C	Coil rebuild (offline), coil column (online)	
Alt+G	Global addressing	Replace
Alt+H	Help	
Alt+J	Jump to mark	
Alt+L	Log book	
Alt+O	Locate coil	
Alt+R	Register editor	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	

ProWORX NxT Hotkey Listing

Hotkey	Operation
Ctrl+Home	Go to first network of segment
Ctrl+Page Up	Go to previous network of segment
Ctrl+End	Go to last network of segment
Ctrl+Page Down	Go to next network of segment
Ctrl+R	Register editor **Note**: This hotkey is context sensitive. It displays the contents for the currently selected instruction **or** the Data Watch Window if no instruction is selected.
Ctrl+G	**Go To** dialog box
Ctrl+M	Mark location
Ctrl+L	Local coil (when on a 0x address)
Ctrl+E	Enable Discrete
Ctrl+D	Force Discrete Off
Ctrl+Q	Force Discrete On
Shift++	Insert vertical short
Shift+|	Insert vertical short
=	Insert horizontal short
-	Delete vertical short
+	Insert vertical short

Using the Logic Editor

Overview

The level to which you can edit in the logic editor is set in the client security settings (see *p. 22*).

Opening the Logic Editor

Double-click **Logic** in the project navigation panel.

- or -

Right-click **Logic** in the project navigation panel, and click **Open Editor**.

- or -

Click **Project** → **Logic**.

- or -

Click the **Logic** toolbar button.

Undoing and Redoing Edits

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

Note: The undo/redo feature works in the logic editor and traffic cop (see *p. 194*) only.

Note: You can only undo or redo one logic block at a time. You cannot select multiple logic blocks simultaneously and click **Edit** → **Undo** or **Edit** → **Redo**. If you try, an error message stating **Nothing to Undo** appears.

Note: If you receive the message **Undo information not recognized, clearing undo/redo information**, a possible cause could be that the register ranges, which are set for the PRWX loadable, are being overwritten by the Traffic Cop, Peer Cop, MSTR, or other instruction addresses that are already used. Search for address conflicts with the Used Address (see *p. 75*) feature.

To Undo/ Redo an Edit

Step	Action
1	• Right-click in the logic editor, and click **Edit** → **Undo** or **Edit** → **Redo**. - or - • Click **Edit** → **Undo** or **Edit** → **Redo** from the main menu. - or - • Click the **Edit** or **Redo** toolbar buttons.

Step	Action
2	Select **Edit** → **Undo** or **Edit** → **Redo**. The Undo/Redo Stack dialog box appears.
3	In the list, click the starting point of the actions you wish to redo/undo. The rows (actions) above the selected action are also selected.
4	Click **OK** to undo or redo the selected actions.

Undoing/ Redoing Online

While working online or in combined mode, the undo/redo feature only works when:

- The Online Multiple Undo/Redo Enabled (see *p. 153*) check box is selected in the logic properties dialog box.
- 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

Step	Action
1	Ensure that the Online Multiple Undo/Redo Enabled (see *p. 153*) check box is selected in the logic properties dialog box.
2	Attach to a valid controller. The **PRWX Loadable** dialog box appears.
3	In the **Command** field, type an unused register to be used by ProWORX 32 to control the loadable, or you can click **Used** to find one.
4	In the **Table** field, type an unused register of a starting range (i.e., 4xxxx to 4xxxx+150) to be used by ProWORX 32 to transfer data into the loadable.
5	• The **Function** field has the name of the function. • The **Length** field provides the length of the table. These values cannot be changed.
6	In the **Add the PRWX instruction to network number** 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.
7	• Click **OK** to add the PRWX instruction to your project's logic. - or - • Click **Cancel** to cancel adding the PRWX instruction.

Working with Networks

Overview

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

Note: You can tailor your screen for viewing purposes by using the **Zoom Out**, **Zoom In**, and **Full Screen** toolbar buttons.

Inserting Networks

Step	Action
1	To insert a network into a blank segment, right-click in the **Network Navigator** panel and click **Insert Network**.
2	To insert a network after the current network, right click in the logic editor, and click **Insert** → **Next Network**.
3	To insert a network previous to the current network, right-click in the logic editor, and click **Insert** → **Previous Network**.

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. These functions can be selected by right-clicking the **Network Navigator** panel or by clicking the respective toolbar buttons.

Deleting Networks

Step	Action
1	In the **Network Navigator** panel, click the network you wish to delete.
2	• Right-click in the **Network Navigator** panel, and click **Delete Network**. - or - • Right-click in the logic editor, and click **Delete** → **Network**. **Result**: The selected network is deleted, and any remaining networks are shifted up one network.

Working with Network Rows and Columns

Step	Action
1	To insert a row or column, right-click in the logic editor, and click **Insert** → **Row** or **Insert** → **Column**. 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, right-click in the logic editor, and click **Delete** → **Row** or **Delete** → **Column**. 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. **Note**: **Delete** → **Row** and **Delete** → **Column** only deletes empty rows. You must delete all elements from the row or column before you can delete the row or column. To do this, highlight the row or column, right-click in the logic editor, and click **Delete** → **Element**.

Initializing Logic

Step	Action
1	To initialize logic (delete all existing logic and networks from the current project), right-click in the logic editor, and click **Initialize Project Logic**. The **Initialize Project Logic** dialog box opens, asking if you want to continue. Click **Yes** or **No**.

Instructions

Overview

The instructions panel contains all available logic instructions. Click an instruction to drag and drop it into the logic editor.

Press **Alt+F1** for specific instruction help.

Displaying the Instruction List

Right-click in the logic editor, and click **View** → **Instruction List**.

Adding an Instruction to a Network

Click the instruction you wish to add, and drag-and-drop it to any point in logic.

- or -

Click an empty cell, then click an instruction toolbar button to add an instruction.

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. These functions can be selected by right-clicking **Edit** in the logic editor or by clicking the respective toolbar buttons.

Finding Instructions

Step	Action
1	Set the logic editor cursor to the bottom node of the instruction that you want to search for.
2	Right-click in the logic editor, and click **Search** → **Instruction Search**. **Example**: To find all ADD instructions in logic, set your cursor to the bottom node of an ADD instruction anywhere in the logic. Right-click in the logic editor, and click **Search** → **Instruction Search**.
3	**Results**: All instructions found are listed in the logic tab of the Search panel 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 panel.

Deleting an Instruction from a Network

Click the instruction you want to delete from the network, and press **Delete**.

- or -

Right-click the instruction you want to delete from the network, and click **Delete** → **Element**.

Configuring an Instruction

Step	Action
1	In the **Properties** panel, click the property you wish to configure.
2	Enter an appropriate value for each field (see below).
3	Press **Enter** to update the instruction's properties.

Instruction Properties

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

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. - or - You can also change the address for a specific cell by editing the **Type** and **Offset** fields in the Properties panel.
2	To edit a batch of addresses across networks, right-click in the logic editor, and click **Search** → **Replace** (Ctrl+H).
3	Enter the address to replace in the **Find What** field and the address that is to replace it in the **Replace With** field Click **Replace**. **Results**: The **Replace** dialog box opens.
4	• Click **Find Next** to find the next instance of the address. • Click **Replace** to replace the address. • Click **Replace All** to replace addresses.

Using Symbolic Addressing

To use symbolic addressing in the logic editor, see *p. 64*.

Finding Addresses in Ladder Logic

Note: For more information on searches, particularly using the step search and stay functions, see *p. 71*.

In the logic editor:

Step	Action
1	To find a specific address, right-click in the logic editor, and click **Search** → **Find** (Ctrl+F).
2	Enter the address you want to search for in the **Find What** field.
3	Click **Find** to find the address in logic.
4	To find all like addresses in ladder logic, highlight a cell that contains the address that you want to search for.
5	Right-click **Search** → **Address Search**. **Example**: To find all 10001 addresses in logic, highlight a cell containing the address 10001, and right-click **Search** → **Address Search**.

Step	Action
6	**Results**: 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** panel.

Tracking Ladder Logic Addresses in the Data Watch Window

Step	Action
1	To track the address at the cursor: ● Right-click **Data** → **Add Watch**. - or - ● Right-click **Data** → **Track** → **Address**.
2	To track all addresses in an instruction, right-click **Data** → **Track** → **Instruction**.
3	To track all addresses in a network, right-click **Data** → **Track** → **Network**.
4	To track all discrete addresses in a network, right-click **Data** → **Track** → **Discretes**.

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 on in a network, right-click **Data** → **Disable On** (Ctrl+Q).
2	To force discretes off in a network, right-click **Data** → **Disable Off** (Ctrl+D).
3	To return control of a discrete's state back to logic, right-click **Data** → **Enable** (Ctrl+E).

Using Addresses from the Documentation Editor

Step	Action
1	Click the **Summary** button in the documentation editor.
2	Click an address in the **Reference** field, 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

Step	Action
1	• Right-click your project in the project navigation panel, and click **Properties**. - or - • Right-click **Workspace**, and click **Properties**. - or - • Click **View** → **Properties**.
2	Click the mnemonic you wish to edit, and click **Edit**.
3	Type in the new mnemonic.
4	Click outside of the field or press **Enter** to save changes. **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	l OPEN	vertical open
VTS	l SHRT	vertical short
HSH	-SHRT	horizontal short
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)

Mnemonic	Description	
ADD	ADD	addition
SUB	SUB	subtraction
MUL	MULT	multiplication
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

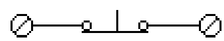
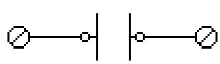
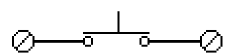
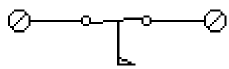
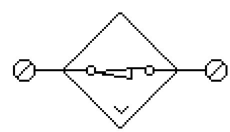
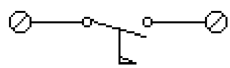
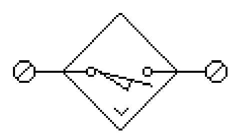
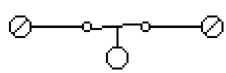
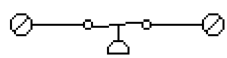
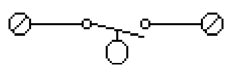
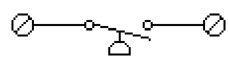
If the ISA Symbol Name field in the project is set up to support discrete addresses, the network editor draws the ISA symbol instead of the ladder logic instruction.

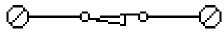
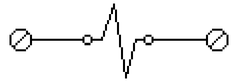
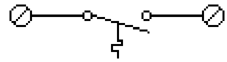
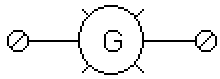
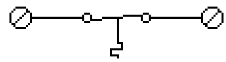
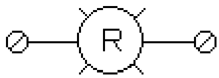
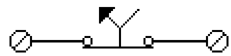
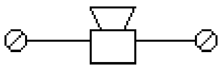
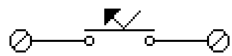
Attaching an ISA Symbol to a Discrete Device

Step	Action
1	Select a discrete device in the logic editor.
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 used to find dependencies of a particular output coil (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	In the logic editor, highlight the address you wish to trace, and right-click **Search** → **Diagnostic Trace**.
2	To move to an address’ cross reference, select the cross reference from the address list. 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.

Each address object within the trace contains a list of cross references for the address.

The address object includes the network number, row, and block type. For multi-node blocks, an S or D is placed before the block type to indicate source or destination. For example, 1.3 S(BLKM). This indicates the address object in network number one, row three, and the source node of the block move instruction.

If there is no block type indicator, that means that the address object is a coil instruction; for example, (1.2), where one is the network number and 2 is the row.

If you click one of these cross references in the drop-down list, the logic editor moves to that network, row and column. The address objects are also colored to quickly find a problem. A check of the address state as well as instruction type is performed to determine the correct color of the address object.

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 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

Step	Action
1	Right-click in the **Network Navigator** panel, and click **Sweep**.
2	In the **Sweep Mode** field, click the **Constant Sweep** button.
3	In the **Time** field, enter the target time (in 10s of milliseconds) for each scan.
4	In the **Register (4xxxx)** field, enter a 4xxxx register to hold the target time value. 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

⚠ WARNING

Single sweep will stop PLC without setting outputs to a predefined state.

Invoking single sweep will stop a running PLC after a set number of scans. The outputs are frozen in their last state of the last scan. Be sure it is appropriate to stop the process without setting outputs to a predefined state.

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

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, and waits until you manually trigger the sweep.

Performing a Single Sweep

Step	Action
1	Right-click in the **Network Navigator** panel, and click **Sweep**.
2	In the **Sweep Mode** field, click the **Single Sweep** button.
3	In the **Time** field, enter the target time (in 10s of milliseconds) for each scan. **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	In the **Scans** field, enter the number of scans (1-15) to be performed during the sweep.
5	Click **OK**.
6	When you are ready to perform the sweep, right-click in the **Network Navigator** panel, and click **Sweep**.
7	Click one of the following 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**. **Result**: 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 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 Mark 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

Step	Action
1	Right-click the cell in the logic editor that you wish to mark.
2	Click **Search** → **Mark**. **Result**: The cell is added to the Bookmark Table.

Going to a Marked Cell

Step	Action
1	Right-click in the logic editor.
2	Click **Search** → **Goto Mark**. **Result**: The Goto Mark dialog box opens.
3	Click the mark you wish to go to, and click **Goto**.

Deleting a Bookmark

Step	Action
1	Right-click in the logic editor.
2	Click **Search** → **Goto Mark**. **Result**: The Goto Mark dialog box opens.
3	Click the mark you wish to delete, and click **Delete**.

Setting a Mark Using Step Search

You can also set a Mark in logic using the Step Search (see *p. 71*) function.

Hardware Clock

Overview

Many controllers have a built-in time of day clock. You can set these clocks if the controller's starting register is configured in the configuration editor (see *p. 94*), you have the necessary rights, and the controller is running.

Configuring the Hardware Clock

Step	Action
1	• Right-click in the **Network Navigator** panel, and click **Hardware Clock**. - or - • Click **Controller** → **Set Hardware Clock**. **Note**: If you choose this means to open the Hardware Clock, the logic editor must be open. Otherwise, the Hardware Clock option will not be available in the Controller menu.
2	In the **First Day of Week** list, click the day the controller will use as the first day of the week.
3	Do one of the following: • To synchronize the controller's date and time with your computer, click **Auto Set**. • In the **Controller Date** field, type the date in mm-dd-yy format. In the **Controller Time** field, type the time in hh-mm-ss format.
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

Step	Action
1	Right-click in the **Network Navigator** panel, and click **Segment Scheduler**.

2	Click the **Control Input** field, and select an input from the list.
	• 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.

3	Click the **Drop In** field, and select the input drop associated with the segment in this row during the solve from the list.
4	Click the **Drop Out** field, and select the output drop associated with the segment in this row during the solve from the list. **Note**: For S901 projects/controllers, the Drop In is replaced with Channel In and Drop Out is replaced with Channel Out.
5	Click **OK**.

Equation Network Structure

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.

Note: Controllers do not allow blank equation networks. Since ProWORX 32 allows blank equation networks, please note that they will not be saved to the controller.

Creating an Equation Network

Step	Action
1	In the **Network Navigator** panel, click the network where you want to insert the equation network.
2	Right-click in the logic editor, and click **Insert** → **Equation Network**. An equation network occupies a whole network, regardless of the contents of the equation network.

Using the Equation Network

Step	Action
1	Enter the equation.
2	In the **Properties** panel, click the **Input Type** field, and select an input type from the list.
3	In the **Input Offset** field, enter the input reference.
4	Set the register address for the output coils. You can enter either the direct address (in X:Y numeric format) or a symbolic address (see *p. 64*). You can also insert addresses from the Symbols panel, Used Register Address table, and the Descriptor Summary. See below for coil descriptions.
5	To enter an equation into the network: • Click the ellipsis box in the **Equation** field. - or - • Double-click anywhere in the Equation Network Editor.

Coil Descriptions

Enter a 0x reference.

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	The error coil 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 (see *p. 179*).

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.

Error Coil Messages

Error Message	Meaning
Invalid operation	An internal error generated by the math coprocessor.
Overflow	A value is too large to be represented in its specified data type.
Underflow	A number is too small to be represented in FP format (for floating point data only)
Divide by 0	The variable, constant, or result of a function directly to the right of a / operator has a value of zero.
Invalid operation with boolean data	Occurs when a boolean value is entered in an argument to a function.

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 (see *p. 64*) for the enable contact coil. This field is only available if the enable contact type is a normally-open or normally closed contact.

Equation Network Content

The content of the equation network is in the form:

`result = algebraic expression`

where the

result is	a variable contained in 1 or 2 4x registers. It may be a signed or unsigned 16-bit short integer, a signed or unsigned 32-bit long integer, or a floating point number.
algebraic expression is	a syntactically correct construction of variable and/or constant data, standard algebraic operators, and/or functions. Parentheses can be used to define the order in which the expression is evaluated and indicate arguments to functions within the expression.

Equation Network Size

An equation network can contain a maximum of 81 words, which are used according to the following rules:

Each...	Consumes....
enabling input	1 word
normally open or normally closed contact	1 word
horizontal short used as input	no words
output coil	1 word
16-bit register and/or discrete reference	1 word
opertaor in the equation window	1 word
function in the equation window	1 word
short integer	1 word
floating point or long constant	2 words
open/closed parenthetical pair	2 words

Mathematical Equations in Equation Networks

Equation Format

Equation elements appear in specific formats. 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	Data Type	Applies to
B	Boolean (binary)	Constants, 1x, or 0x
U	16-bit unsigned short integer	Constants, 3x, or 4x
S	Signed short integer	Constants, 3x, or 4x
L	32-bit signed long integer	Constants, 3x, or 4x
UL	32-bit unsigned long integer	Constants, 3x, or 4x
F	32-bit floating point number	Constants, 3x, or 4x

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.

Variable Data

Variable data within an equation network can be in 0x and 1x discrete references and in 3x and 4x registers.

Data Type	Variable Type	Words Consumed	Registers Consumed
Boolean	0x or 1x	One	N/A
Unsigned 16-bit variable	3x or 4x	One	One
Signed 16-bit variable	3x or 4x	One	One
Unsigned long (32-bit) variable	3x or 4x	One	Two
Signed long (32-bit) variable	3x or 4x	One	Two
Floating point variable	3x or 4x	One	Two

Note: When contiguous 3x or 4x registers are used for 32-bit long integers, the value still consumes only one word in the equation network.

Note: When 3x or 4x registers are used for a floating point number, the value requires one word for complete definition.

Entering Variable Data in an Equation Network

When entering a 0x or 1x references as a discrete variable in an equation network, the reference is assumed to be boolean, and you do not need to append the suffix B to the reference. Thus, the entires 000010 and 000010B are equivalent.

No other suffixes are legal with a 0x or 1x reference.

When you enter a 3x or 4x register in an equation network, the following rules apply:

If you enter a register . .	then . .
without a suffix,	it is assumed to represent a signed 16-bit integer variable. You do not need to append the suffix S to the reference. Thus the entries 400023 and 400023S are equivalent.
with the suffix U (e.g., 300004U),	you indicate that a single register containing an unsigned 16-bit integer variable is used.
with the suffix L,	you indicate that two contiguous registers containing a signed 32-bit long integer variable are used (e.g., 400012L implies that register 400013 is also used).
with the suffix UL,	you indicate that two contiguous registers containing an unsigned 32-bit long integer variable are used (e.g., 300006UL imples that register 300007 is also used).
with the suffix F,	you indicate that two contiguous registers containing a floating point variable are used (e.g., 400101F implies that register 400102 is also used).

Note: You cannot append a 3x or 4x register with the suffix B.

Constant Data

Constants can also be used to specify data in an equation network. Long (32-bit) constants and floating point constants always require two words. The least significant byte (LSB) is always in the first of the two words. Both words must have the same data type.

Data Type	Words Consumed	Valid Range of Values
Boolean	One	0, 1
Signed 16-bit constant	One	-32,768 ... +32,767
Unsigned 16-bit constant	One	0 ... 65,535
Signed long (32-bit) constant	Two	-2 x 109 ... +2 x 109
Unsigned long (32-bit) constant	Two	0 ... 4,294,967,295
Floating point constant	Two	8.43 x 1037 ≤ |x| ≤ 3.402 x 1038

Entering Constant Data in an Equation Network

A constant is prefaced with a # sign and appended with a data type suffix (see *p. 181*). All constant values are in decimal format. Hexadecimal values are not allowed in ProWORX.

If you enter a constant in an equation network without a suffix, it is assumed to a signed short integer. For example, the entries #-3574 and #-3574S are equivalent.

A boolean constant must have the suffix B. The only two valid boolean constants are #0B and #1B. No other values are legal boolean constants.

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 operator 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 operator 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 operator 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 operator These operators perform 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 to.
	=>	Greater than or equal to.
	>	Greater than.
Conditional operator 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.	()	

How an Equation Network Resolves an Equation

An equation network calculates its result in one of two ways, depending on the operator types used in the expression.

Single Expression

Evaluate a single expression and execute it by copying the derived value to the result register.

Conditional Expression

Evaluate the validity of the first of three arguments in a conditional expression and execute it by copying the value from either the second or third argument in the conditional expression to the result register.

If the expression being evaluated contains only some combination of unary, exponentiation, mathematical, and/or logical bitwise operators, it is treated as a single argument and is solved via single expression. For example, in the equation

```
400001 = (#16 ** #2 - #5) * #7
```

the square of 16 (256(minus 5 (251) is multiplied by 7, and the result (1,757) is copied to register 400001.

If you use one or more of the six relational operators shown in the previous table, you create the first of three arguments that comprise a conditional expression. The conditional operators must be used to create then/else arguments in the expression, and conditional expression is used to execute the result. For example, in the equation

```
400001 = 400002 >= #100 ? 300001 : 300002
```

the value in register 400002 is evaluated to see if it is greater than or equal to 100. This is the first argument in the conditional expression. If the value is greater than or equal to 100, the second argument is executed and the value in register 300001 is copied to register 400001. It is less than 100, the third argument is executed and the value in register 300002 is copied to register 400001.

Operator Precedence

In a string of data types and operators, the order or precedence in the expression determines the order in which operations will be evaluated. Review the following examples:

```
400001 = 300001F ** 300002F * 300003 + 300004 & 300005 > 300006 ? 300007 : 300008
```

The operations in the first argument of the conditional expression are evaluated from left to right in the order they appear. First, the value in register 300001 is raised to the power of the value in register 300002, then multiplied by the value in register 300003. That result is added to the value in register 300004, then logically ANDed with the value in register 300005 and compared with the value in register 300006.

If the > comparison is true, the second argument in the conditional expression is executed, and the value in register 300007 is copied to register 400001. If the > comparison is false, the third argument in the conditional expression is executed and the value in register 300008 is copied to register 400001.

```
400001 = 300002U > 300003 & 300004U + 300005F * 300006F ** 300007 ? 300008 : 300009
```

Operator precedence forces the opposite effect on the first argument of the conditional expression.

Here the first operation to be evaluated is the exponentiation of the value in register 300006 by the value in register 300007, followed by multiplication by the value in register 300005, then adition with the value in register 300004, then logically ANDing the result with the value in register 300003, and finally comparing teh result with the value in register 300002.

If the > comparison is true, the second argument in the conditional expression is executed, and the value in register 300008 is copied to register 400001. If the > comparison is false, the third argument in the conditional expression is executed, and the value in register 300009 is copied to register 400001.

When operators of equal precedence appear in an expression, they are generally evaluated in the order form from left to right and top to bottom in the equation network.

Using Parentheses in an Equation Network Expression

You can alter the order in which an expression is evaluated by enclosing portions of the expression in parentheses. Parenthetical portions of the expressions are evaluated before portions outside the parentheses. Notice how the following expressions are evaluated with and without parentheses:

```
400001 = 300001U < 300002U | 300004U & 300001U + 300003U ? 300004 : 300005
```

This expression is evaluated by the precedence

300001U < ((300002U | 300004U) & (300001U + 300003U)) ? 300005 : 300006

where the sum of the values in registers 300001 and 300003 is ANDed with the logical OR of the values in registers 300002 and 300004.

```
400001 = 300001U < ( 300002U | 300004U & 300001U ) + 300003U ? 300004 : 300005
```

This expression is evaluted by ORing the values in registers 300002 and 300004, then ANDing the result with the value in register 300001, and finally adding the value in register 300003.

Nested Parentheses

When multiple levels of parenthetical data are nested in an expression, the most deeply nested parenthetical data is evaluated first. An equation network permits up to 10 nested levels of parentheses in an expression.

For example, the order in which the second expression above is evaluated can be seen more clearly when parentheses are used.

300002U > (300003U & (300004U + (300005U * (300006F ** 300007F)))) ? 300008 : 300009

Entering Parentheses in an Equation Network

Equation network will echo back to you the expression as you enter it. It does not prevent you from entering additional levels of parentheses even when they may not be necessary to make the expression syntactically correct. For example, in the expression

((((300004U + 300005U)))) / 300006U

equation network maintains the four nested level of parentheses in the expression even when only one set of parentheses may be needed.

> **Note:** The expression must have an equal and balanced number of open and closed parentheses in order to compile properly. If it does not, a compiler error will be generated and the equation network will not function.

Each pair of open and closed parentheses consumes two words in the equation network.

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.

Entering Functions in an Equation Network

A function must be entered with its argument in the following form in the equation network expression:

function name (argument)

where the function name is one of those listed in the table above and the argument is entered in parentheses immediately after the function name. The argument may be entered as:
- one or more unary operations
- one or more exponential operations
- one or more multiplication/division operations
- oneo or more addition/subtraction operations
- one or more logical operations
- one or more relational operations

- any legal combination of the above operations

For example, if you want to calculate the absolute value of the sine of the number in FP register 400025 and place the result in FP register 400015, enter the following in the equation network:

400015F = ABS (SIN (400025F))

See *p. 185* for more details about these operations.

Limits on the Argument to a Function

The argument to a function in an equation network is resolved to a floating ponit (FP) number. The FP value must be in the following range, depending on the type of function.

Function	**Argument**	**Range**
ABS	FP value	-3.402823 x 1038 ... +3.402823 x 1038
ARCCOS	FP value	-1.00000 ... +1.00000
ARCSIN	FP value	-1.00000 ... +1.00000
ARCTAN	FP value	-3.402823 x 1038 ... +3.402823 x 1038
COS	FP value	-3.402823 x 1038 ... +3.402823 x 1038
COSD	FP value	-3.224671 x 104 ... +3.224671 x 104
EXP	FP value	-87.33655 ... +88.72284
FIX	FP value	-2.147484 x 109 ... +2.147484 x 109
FLOAT	FP value	-3.402823 x 1038 ... +3.402823 x 1038
LN	FP value	0 ... 3.402823 x 1038
LOG	FP value	0 ... 3.402823 x 1038
SIN	FP value	-3.402823 x 1038 ... +3.402823 x 1038
SIND	FP value	-1.724705 x 104 ... +1.724705 x 104
SQRT	FP value	0 ... 3.402823 x 1038
TAN	FP value	-3.402823 x 1038 ... +3.402823 x 1038, not p/ 2 x n (where n is an integer value)
TAND	FP value	-1.351511 x 104 ... +1.351511 x 104, not 90 x n (where n is an integer value)

Using the Traffic Cop

9

At a Glance

Overview

The Traffic Cop is used to visualize and configure I/O stations (drops). Each I/O series (Quantum, Momentum, SY/MAX, 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 stations (drops). Each I/O series (Quantum, Momentum, SY/MAX, 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

The navigation panel shows a text-based representation of the Traffic Cop. The panel is enabled regardless of which I/O station is selected. The panel provides a hierarchical view of configured drops, racks and slots. Navigate through the panel to select a drop or rack to view or to edit its configuration in the Drop or Slot Properties panel. Use the panel view to insert, delete, and move any of the 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 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 any slot to access that slot's properties in the Slot Properties panel.
- Overview - 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.

Opening the Traffic Cop

Double-click **Traffic Cop** in the project navigation panel.

- or -

Right-click **Traffic Cop** in the project navigation panel, and click **Open Editor**.

- or -

Click **Project** → **Traffic Cop** → **Open**.

- or -

Click the **Traffic Cop** toolbar button.

Initializing the Traffic Cop

In the Traffic Cop navigation panel:

Step	Action
1	In the Traffic Cop navigation panel, right-click the I/O station you wish to initialize.
2	Click **Initialize**.

⚠ CAUTION

Loss of I/O Configuration Data

Reconfigure Traffic Cop prior to placing PLC into run mode.

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

Working with Drops and Racks

Drop Properties Panel

The drop properties panel, in the lower right side of the Traffic Cop editor, lists user-editable and calculated properties pertaining to the selected drop.

In the Traffic Cop navigation panel, click the drop you want to work with. Available drop properties are:

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

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

Working with Drops

The following functions are available when you right-click a drop in the Traffic Cop navigation panel.

Function	Action	Comment
To insert a drop:	Click **Insert Drop**.	Inserts a drop above the selected drop and moves existing drops down.
To clear a drop:	Click **Clear Drop**.	Clears all racks from the selected drop.
To delete a drop:	Click **Delete Drop**.	Deletes the currently selected drop, and moves the remaining drops up.

You can edit the currently selected drop at any time by editing properties in the Drop properties panel.

Working with Racks

The following functions are available when you right-click a rack in the Traffic Cop navigation panel.

Function	Action	Comment
To insert a rack:	Click **Insert Rack**.	Inserts a rack above the selected rack and moves existing racks down.
To clear a rack:	Click **Clear Rack**.	Clears all slots from the selected rack.
To delete a rack:	Click **Delete Rack**.	Deletes the currently selected rack and moves remaining racks up.

You can edit the currently selected rack at any time by editing the rack property in the Drop properties panel.

Using Cut/Copy/Paste/Undo/Redo

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.

The following functions are available when you right-click in the Traffic Cop navigation panel.

- 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.
- Undo - Undoes your last action. The last 10 actions are stored.
- Redo - Redoes the last undo.

Note: If you undo 10 actions, you can redo 10 actions. However, if you undo 10 actions, redo 5 of them and insert another card, you can no longer redo any action until you perform more undos.

Note: After you perform an undo or a redo, you must save your project before you rebuild the address used tables so that the tables will be accurate.

Export/Import Traffic Cop

The **Export Traffic Cop** feature allows you to transfer a Traffic Cop to another project. **Import Traffic Cop** enables you to bring a Traffic Cop into your project.

Step	Action
1	Right-click in the Traffic Cop navigation panel.
2	Click **Export Traffic Cop** or **Import Traffic Cop**.
3	A dialog box appears that allows you to navigate to the appropriate source .mdb file for import or export.
4	Select the .mdb file for import or export, and click **Save**.
5	Upon completion of import or export, the message **Export completed successfully** or **Import completed successfully** appears in the Message Central window.

Module Menu

The Module menu allows you to organize Traffic Cop cards by type.

Step	Action
1	Right-click in the Traffic Cop navigation panel.
2	Click **Module Menu**.
3	Click the arrow in the **Module Menu** dialog box, and click one of the following module categories. Some module categories are not available for all modules ● All ● Analog Input ● Analog Output ● Discrete Input ● Discrete Output ● I/O Network Adapter ● Intelligent ● LAN Adapter ● Miscellaneous Adapter ● Motion ● Counter ● Power ● I/O Adapter
4	The **Module Menu** dialog box displays a list of modules based on your selection in the step 3.
5	Click a slot in your rack in the Traffic Cop navigation panel.
6	Double-click a module in the **Module Menu** dialog box. **Result**: The selected module now appears in the slot in your rack.
7	The selected module now appears in the slot in your rack.

Auto Configure (Momentum/ Compact Only)

The auto configure tool polls the controller to see what modules are in the rack. This function then displays the modules in a report form. You can use the report form to configure your controller, which saves you time because you don't have to access each slot and configure each controller manually.

Auto configure is available only online in a stopped Momentum or Compact controller.

Step	Action
1	Right-click in the Traffic Cop navigation panel.
2	Click **Auto Configure**. **Result**: The **Automatic Traffic Cop Configuration** dialog box appears.
3	The **Automatic Traffic Cop Configuration** dialog box summarizes a list of modules that are detected. Modify the addresses, if necessary.
4	• Click **OK** to accept the auto configuration. **Result**: The new Traffic Cop will be programmed automatically. - or - • Click **Cancel** to reject the auto configuration.

Working with Slots

Slot Properties Panel

The slot properties panel, in the lower center of the Traffic Cop editor, lists user-editable and calculated properties pertaining to the selected slot.

In the Traffic Cop navigation panel, click the slot you want to work with. Available slot properties are:

Property	To Edit...
Module	Select a module.
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 list.
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 list.
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 list.
Bypass remote	Select TRUE or FALSE from the bypass remote list.
Card Config	Displays hex parameter data. To edit, click **Browse**.

Note: Not all properties are available for all slots, i.e., a discrete card will not have an **Output Data Mode** property.

Working with Slots

The following functions are available when you right-click a slot in the Traffic Cop navigation panel.

Function	Action	Comment
To insert a slot:	Click **Insert**.	Inserts a slot above the selected slot and moves existing slots down. **Note**: If you leave the Slot Properties panel without selecting a module while in a Momentum Traffic Cop, the insert will be cancelled.
To edit a slot:	Click **Edit**.	You can edit the currently selected slot at any time by editing properties in the Slot Properties panel.
To clear a slot:	Click **Clear**.	Clears the card from the selected slot.
To delete a slot:	Click **Delete**.	Deletes the currently selected slot and moves remaining slots up.
To drag and drop a slot:	Click the slot and drag and drop it into its new position.	You can use drag and drop in drop view or in rack view. Additional options for drag and drop include: ● **Ctrl** + dragging will copy the slot, incrementing the addresses. ● **Shift** + dragging will copy the slot, keeping the addresses. **Note**: Drag and drop is available for all I/O series except Momentum.

Launching the AS-I Device List

To launch the device list for the EIA921-00 AS-I interface module:

Step	Action
1	In the slot properties panel, click **Card Status**.
2	Select **Click to View AS-I Device List** in the list. Then, click the **ellipsis** button.
3	The AS-I Device List dialog box launches.

Editing the AS-I Device List

When the AS-I Device List opens, all initial data for all slaves are filled and available. The first row is highlighted by default. The addresses correspond to the addresses defined for the card in the Traffic Cop. The remaining data values must match those found in the Card Config dialog box.

Step	Action
1	To edit a slave, double-click any field, or click any field then click **Edit**. The edit panel opens with the correct initial data. The editable fields are: ● Projected Slave List: Select **Slave Not In LPS** or **Slave In LPS** from the list. ● Slave Profile (ID.IO): Select **0**- **F** (in hex format). ● Slave Parameter Data: Select **0**- **F** (in hex format). Click **OK** to save the settings for the selected slave to the Traffic Cop. Click **Cancel** if you do not want to save the settings for the selected slave to the Traffic Cop.
2	Click **Terminal** to open the Data Watch Window, which displays the terminal block for the EIA921-00 card.
3	Click **Card Config**. A confirmation message appears if you have made changes. ● Click **No** to return to the AS-I Device List. ● Click **Yes** to accept the changes, close the AS-I Device List, and open the Card Config dialog box. **Note**: If you made no changes, the AS-I Device List will close, and the Card Config dialog box opens.
4	Click **OK** to save the current settings to the Traffic Cop. Click **Cancel** if you do not want to save the current settings to the Traffic Cop.

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. **Result**: The correct slot will be selected in the Module property list in the slot properties panel.
2	Press **Enter** to accept the selected slot.
3	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. See *p. 359* for more information on creating I/O drawings.

Setting up the I/O Drawing Generator

Step	Action
1	• Right-click your project in the project navigation panel, and click **Properties**. - or - • Right-click **Workspace**, and click **Properties**. - or - • Click **View** → **Properties**.
2	Click the **I/O Drawing Generator** tab.
3	Select the **Overwrite Existing Drawings** check box to discard the existing drawings and save the new ones in their place.
4	Default directories are listed for the **Symbol (see *p. 361*)**, **Master (see *p. 362*)**, **Intermediate (see *Intermediate Drawings, p. 360*)**, and **Final (see *p. 360*)** I/O drawings. • If you do not want to use these default directories, create folders where you want to save the drawings. • Then, click the ellipsis (**...**) button in the **Directories** field, and navigate to the folder you created to save the drawings. • Click the folder, and click **Open**. • Follow the above two steps for each file type. **Result**: The I/O drawings created reside in the selected path in a subdirectory that has the same name as the project from which the drawings are created.
5	This property determines how ProWORX 32 handles a missing master drawing while the I/O drawings are being created. Click one of the following buttons in the **Master Drawings** field. • Ignore Missing Drawings • Break on Missing Drawings • Notify of Missing Drawings Click **OK**.

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: ● Right-click **Traffic Cop**, and click **I/O Drawing Generator** → **Intermediate Drawings**. - or - ● Click **Utilities** → **I/O Drawing Generator** → **Intermediate Drawings**.
3	To generate a final drawing: ● Right-click **Traffic Cop**, and click **I/O Drawing Generator** → **Final Drawings**. - or - ● Click **Utilities** → **I/O Drawing Generator** → **Final Drawings**.
4	To generate both intermediate and final drawings: ● Right-click **Traffic Cop**, and click **I/O Drawing Generator** → **Both Drawings**. - or - ● Click **Utilities** → **I/O Drawing Generator** → **Both Drawings**.

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 you first launch the materials list, 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. When you launch the materials list a second time, the data will be read from the project rather than generated. You can add prices and comments to existing materials and add new materials. The materials list can then be printed or saved to HTML, MS Excel, or MS Word.

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

Using the Materials List

Step	Action
1	• Right-click **Traffic Cop** in the project navigation panel, and click **Materials List**.
2	Enter up to six lines of text in the **Header** field. 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, right-click the materials grid, and click **Generate**.
5	To inset a row at the current cursor position, right-click the materials grid, and click **Insert**.
6	To clear the currently selected row, right-click the materials grid, and click **Clear**.
7	To delete the currently selected row and shuffle the remaining rows up, right-click the materials grid, and click **Delete**.
8	To save the materials list to another format, right-click the materials grid, and click **Save As**.
9	To print out the materials list, right-click the materials grid, and click **Print**.
10	Close the materials list to save the changes.

Recommended Cable Part Numbers

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 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

10

At a Glance

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 which 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, logging information, running/stopped state, trigger info, and clamping info.

Opening the Data Watch Window

Step	Action
1	Expand **Data Editors** in the project navigation panel.
2	• Double-click **Data Watch Window**. - or - • Right-click **Data Watch Window**, and click **Open Data Watch Window**.

Adding Addresses to Track in the Data Watch Window

Step	Action
1	In the Data Watch Window, double-click or press **Enter** in the first available **Address** cell.
2	Enter a valid address in the **Address** cell.
3	Press **Enter** to insert the address or **Esc** to cancel the entry. **Result**: 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

Right-click in the Data Watch Window, and click **Clear**. All addresses are cleared.

Loading Addresses and Data from a Log File

Step	Action	Result
1	Right click in the Data Watch Window, and click **Load LOG file**.	The Datawatch Log dialog box opens.
2	Navigate to a log file, select the file, and click **Open**.	All addresses from the file are added to the Data Watch Window.

Filling the Data Watch Window with Addresses

Step	Action	Result
1	Right-click in the Data Watch Window, and click **Fill Addresses**.	The Add Addresses dialog box opens.
2	Enter an address in the **Starting Address** field.	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** field.	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

Step	Action
1	Right-click the radix you want to change, and click **Set Radix**. **Result**: The Set Radices dialog box opens.
2	Select a radix from the list.
3	Click **OK**. **Result**: All selected radices are updated to the specified radix.

Deleting Addresses

In the Data Watch Window, right-click the addresses you want to delete, and click **Delete Addresses** or press **Delete**.

Jumping to a Specific Address

Step	Action
1	Right-click in the Data Watch Window, and click **Goto Address**. **Result**: The Goto Address dialog box opens.
2	Enter an address in the **Select an Address to find** field.
3	Click **OK**. **Result**: The specified address is selected in the Data Watch Window.

Copying Data Values from One Range of Addresses to Another

Step	Action	Result
1	Right-click in the Data Watch Window, and click **Data Utilities** → **Copy Data**.	The Data Utilities dialog box opens.
2	Enter an address in the **Start Address** field.	The value of this address is the first in the range to be copied.
3	Enter an address in the **End Address** field.	The value of this address is the last in the range to be copied.
4	Enter an address in the **Destination Address** field.	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

Step	Action	Result
1	Right-click in the Data Watch Window, and click **Data Utilities** → **Move Data**.	The Data Utilities dialog box opens.
2	Enter an address in the **Start Address** field.	The value of this address is the first in the range to be copied.
3	Enter an address in the **End Address** field.	The value of this address is the last in the range to be copied.
4	Enter an address in the **Destination Address** field.	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

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

Searching for a Data Value

Step	Action	Result
1	Right-click in the Data Watch Window, and click **Data Utilities** → **Search Data**.	The Search Data dialog box opens.
2	Enter a numeric value in the **Data Value** field.	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 Box

Step	Action

1	• Right-click your project in the project navigation panel, and click **Properties**.
	- or -
	• Right-click **Workspace** in the project navigation panel, and click **Properties**.
	- or -
	• Right-click **Logic** in the project navigation panel, and click **Properties**.
	- or -
	• Click **View** → **Properties**.
	- or -
	• Expand **Data Editors** in the project navigation panel. Right-click one of the following:
	  • **Data Watch Window** → **Properties**
	  • **Register Editor** → **Properties**
	  • **PID Summary** → **Properties**
	  • **Drum/ICMP Summary** → **Properties**
	  • **HMI View** → **Properties**

2	Click the **Data Watch** tab.
3	Edit the fields, which are described below, as necessary. • Click **OK** to save the changes and close the Properties dialog box. - or - • Click **Apply** to save the changes and remain in the Properties dialog box.

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 cleared, 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.

To change the view (single radix versus multi radix):

Step	Action
1	In the Properties dialog box, select the **Multi Radix View** check box.
2	Select the radix check boxes you want to view. ● Hex (Hexadecimal) ● Bin (Binary) ● Asc (ASCII) ● Float ● Long
3	Click **OK** to save the changes and close the Properties dialog box. Click **Apply** to save the changes and remain in the Properties dialog box.

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 computer's responses will become more sluggish. This rate also affects the rate that data points are logged. The minimum sample rate is one read every 60 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.

To set the sample rate:

Step	Action
1	In the Properties dialog box, 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 close the Properties dialog box. Click **Apply** to save the changes and remain in the Properties dialog box.

HMI Window Setup

For more information on editing this parameter, see *p. 221*.

Track Logic

For more information on editing this parameter, see *p. 228*.

Track Traffic Cop

For more information on editing this parameter, see *p. 229*.

Logging

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.

To set the log file size limit:

Step	Action
1	Enter a numeric value (in megabytes) in the **Maximum Log File Size** field.
2	Click **OK** to save the changes and close the Properties dialog box. Click **Apply** to save the changes and remain in the Properties dialog box.

Trending

For more information on editing this parameter, see *p. 225*.

Viewing and Recording Data

Overview

You can view either *live* data or previously recorded *logged* data in the Data Watch Window. Live data are the current data values in the PLC while in online or combined mode. Logged data represents previously recorded data stored in a .LOG file. You create .LOG files by recording live data from the Data Watch Window.

Viewing a .LOG File

In the Data Watch Window:

Step	Action
1	• Right click in the Data Watch Window, and click **Load LOG file**. - or - • Click the **Live/Log** toolbar button. **Result**: The Datawatch Log dialog box opens.
2	Navigate to the appropriate file, and click **Open**.
3	The log file is loaded. **Note**: Once a log file is loaded, you are viewing logged data and NOT live data.

Recording Data to a .LOG File

While in the Data Watch Window (in combined, online, or emulation mode):

Step	Action
1	In the **Address** fields, enter addresses that you want to track.
2	Click the **Record** button on the Data Watch Window toolbar to begin recording data. **Result**: The Datawatch Log dialog box opens.
3	Select a .LOG file to save the data. Once a .LOG file is selected, data recording begins. **Note**: While data is being recorded, it is still *live*, and the user may continue to edit data as needed. **Note**: A data record is created in the .LOG file when at least one data value changes. If no data values change, no data will be recorded.
4	Click the **Pause** toolbar button to pause recording data. No new data will be added to the LOG file even if the data is changing. Click **Pause** again to resume recording.
5	Click the **Stop** toolbar button to cease recording data. You will now be viewing the data for the new .LOG file.
6	To return to viewing live data, close the .LOG file.

Triggers and Clamps

Overview

The Triggers/Clamps dialog box allows you to change the settings for triggers and clamps.

- Trigger allows you to track the value of a specific address.
- Clamps force all tracked data values inside or outside of a specified range.

Triggers

Select the **Enable Trigger** check box to track the value of a specific address. 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 **Enable Trigger** check box is cleared, the Data Watch Window automatically tracks and/or logs values.

Setting a Trigger

Step	Action
1	Double click **Trigger** or **Clamps** on the Data Watch Window status bar.
2	Select the **Enable Trigger** check box.
3	In the **Address** field, enter the address that you would like to track.
4	In the **Repeat Options** field: ● Click **Once Only** to begin tracking only when the **Start Condition** is met. Tracking will continue indefinitely. ● Click **Continuous** to start tracking/logging based on the values that you enter in the **Start Condition** and **Stop Condition** fields. **Example**: You can set the data logger to start recording when the value for register 40001 reaches 10 and stop recording if the value exceeds 20.
5	In the **Start Condition** field: ● Click the **<=** or **>=** button. ● Enter a numeric value in the **State** field
6	If you clicked the **Continuous** button in the **Repeat Options** field in step 4, select the **Stop Condition** check box, and enter a numeric value in the **State** field.
7	Click **OK** to save the changes.

Clamps

Select the **Enable Clamps** check box to force all tracked data values inside or outside the specified range. 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 **Enable Clamps** check box is cleared, all data values are displayed as their actual data value.

Setting a Clamp

Step	Action
1	Double click **Trigger** or **Clamps** on the Data Watch Window status bar.
2	Select the **Enable Clamps** check box.
3	Enter a numeric value in the **Low Clamp** field.
4	Enter a numeric value in the **High Clamp** field.
5	Click the **Capture Inside** or **Capture Outside** button.
6	Click **OK** to save the changes.

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

Step	Action
1	Click the Data Watch tab (see *p. 215*) in the Properties dialog box.
2	In the HMI Window Setup field, click the Background Color **Select** button.
3	Click a color from the Color dialog box.
4	Click **OK** to close the Color dialog box.
5	• Click **OK** to save the changes and close the Properties dialog box. - or - • Click **Apply** to save the changes and remain in the Properties dialog box.

Setting the Cell Size

Step	Action
1	Click the Data Watch tab (see *p. 215*) in the Properties dialog box.
2	In the HMI Window Setup field, select the **Fixed Cellsize** check box. **Result**: When you select this check box, the **Width** and **Height** fields are available, and you can manually select the cell size.
3	Enter a value (in pixels) from 1 to 240 in the **Width** field, or move the slider (lower value to the left; higher value to the right) to select a width.
4	Enter a value (in pixels) from 1 to 240 in the **Height** field, or move the slider (lower value to the left; higher value to the right) to select a height.
5	• Click **OK** to save the changes and close the Properties dialog box. - or - • Click **Apply** to save the changes and remain in the Properties dialog box.

Creating Bitmap Files to Associate with Register Type Addresses (3x/4x)

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.

Creating Bitmap Files to Associate with Discrete Type Addresses (0x/1x)

Discrete addresses may use any bitmap, regardless of name.

Opening the HMI View

Step	Action
1	Expand **Data Editors** in the project navigation panel.
2	• Double-click **HMI View**. - or - • Right-click **HMI View**, and click **HMI View**.

Editing Cell Data

Step	Action
1	Right-click in the HMI panel, and click **Edit Data**. **Result**: The Edit HMI Data dialog box opens.
2	Enter a value in the **Picture** list. **Result**: This will update the value of the address associated with the picture.
3	Enter a value in the **Monitor** list. **Result**: This will update the value of the address being monitored.
4	Click **OK** to save changes.

Associating a Picture with an Address Value

Step	Action
1	Right-click in the HMI panel, and click **Edit Cell**.
2	Select the **Picture Enabled** check box.
3	Enter an address in the **Address** field.
4	Select from the **Stretch Picture** list how you want the pictures to be displayed. ● **None**: Trims the bottom and right-side of the picture to fit. ● **Fit Cell**: Makes the entire picture fit the cell. ● **Fit Width**: Trims the bottom of the picture. ● **Fit Height**: Trims the right-side of the picture.
5	Click **OK** to save changes.

Follow the steps below after you entered an address to associate a picture with.

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

Adding a Caption to a Cell

Step	Action
1	Right-click in the HMI panel, and click **Edit Cell**.
2	Select the **Caption Enabled** check box.
3	Enter the text you want displayed in the cell in the **Caption** field (maximum 20 characters).
4	Click the **Foreground** button to select the text color. Select a color, and click **OK**.
5	In the **Alignment** list, click the positioning of the caption. ● Top ● Middle ● Bottom
6	Click **OK** to save changes.

Adding a Value to Monitor

Step	Action
1	Right-click in the HMI panel, and click **Edit Cell**.
2	Select the **Data Monitor Enabled** check box.
3	Enter an address in the **Address** field. (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. Select a color, and click **OK**.
5	Enter numeric values in the **Actual Range** fields. (These are the low and high values you expect or know the address will hold.)
6	Enter numeric values in the **Scale Range** fields. (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	In the **Alignment** list, click the positioning of the caption. ● Top ● Middle ● Bottom
8	Click **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

Step	Action
1	Click the Data Watch tab (see *p. 215*) in the Properties dialog box.
2	• Select 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 in the **Y Axis Minimum** and **Y Axis Maximum** fields to manually set the Y axis range.
3	• Click **OK** to save the changes and close the Properties dialog box. - or - • Click **Apply** to save the changes and remain in the Properties dialog box.

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.

Step	Action
1	Click the Data Watch tab (see *p. 215*) in the Properties dialog box.
2	Enter a numeric value in the **Resolution** field.
3	• Click **OK** to save the changes and close the Properties dialog box. - or - • Click **Apply** to save the changes and remain in the Properties dialog box.

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.

Step	Action
1	Click the Data Watch tab (see *p. 215*) in the Properties dialog box.
2	Enter a numeric value in the **Lo Alarm** and/or **Hi Alarm** fields.
3	• Click **OK** to save the changes and close the Properties dialog box. - or - • Click **Apply** to save the changes and remain in the Properties dialog box.

Setting the Setpoint Value

The setpoint value is a baseline value that can be used as a reference.

Step	Action
1	Click the Data Watch tab (see *p. 215*) in the Properties dialog box.
2	Enter a numeric value in the **Setpoint** field.
3	• Click **OK** to save the changes and close the Properties dialog box. - or - • Click **Apply** to save the changes and remain in the Properties dialog box.

Setting the Trend Colors

Step	Action
1	Click the Data Watch tab (see *p. 215*) in the Properties dialog box.
2	Click one of the following trend elements from the **Color Setup** list. • Background • Foreground • Grid • Menu • Cursor
3	Click the **Select** button.
4	Click a color in the **Color** dialog box, and click **OK**.
5	Repeat steps 2 to 4 for all other trend elements.
6	• Click **OK** to save the changes and close the Properties dialog box. - or - • Click **Apply** to save the changes and remain in the Properties dialog box.

Using the Trend 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 from which you want to work.
3	Hold-and-drag to manipulate the on-screen view of the data.

Trend Functionality

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 you select the **Track Logic** check box in the Properties dialog box, the specified addresses in logic are automatically added to the Data Watch window and their values are tracked. When the cursor position in logic is changed, the previously tracked addresses are removed and a new set of addresses are tracked.

Select any of the check boxes below to track.
- 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 cleared, you must manually enter addresses in the Watch Window in order for them to be tracked.

Tracking Logic Editor Addresses in the Data Watch Window

Step	Action
1	Click the Data Watch tab (see *p. 215*) in the Properties dialog box.
2	Select the **Track Logic** check box.
3	Click the option button (**Network**, **Instruction**, **Discretes**, or **Address**) that you want to track.
4	• Click **OK** to save the changes and close the Properties dialog box. - or - • Click **Apply** to save the changes and remain in the Properties dialog box.
5	Ensure that the Logic Editor and Data Watch Window are open.

Track Traffic Cop

Track Traffic Cop

When you select the **Track Traffic Cop** check box in the Properties dialog box, the specified addresses in the Traffic Cop are automatically added to the Data Watch window and their values are 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 **Track Slot**. When you select this check box, 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 cleared, you must manually enter addresses in the Watch Window in order for them to be tracked.

Tracking Traffic Cop Addresses in the Data Watch Window

In the Data Watch Window Properties dialog box:

Step	Action
1	Click the Data Watch tab (see *p. 215*) in the Properties dialog box.
2	Select the **Track Slot** check box.
3	• Click **OK** to save the changes and close the Properties dialog box. - or - • Click **Apply** to save the changes and remain in the Properties dialog box.
4	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 with a user-defined VB script. These scripts are editable and may be used to modify the on-screen display.

Viewing an Instruction in the Instruction Editor

The instruction editor works 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 editor

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 editor works 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 editor.

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

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**. **Example**: Call Editor.scAddGrid.
4	Save the script in the ProWORX\32\Scripts directory using the naming conventions described below.

Naming a Display Script File

Rules and guidelines:

Step	Action
1	Script files must be saved with a .ucs extension. **Example**: VMER.ucs
2	Instruction scripts must be saved using their machine name. **Example**: Correct: MSTR.ucs, Incorrect: Master.ucs
3	Script file names cannot have spaces or punctuation in them. **Example**: 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.
Example: Call Editor.scAddGrid

Note: All strings must be surrounded by quotes.
Example: 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	The radix in which to display the data. Valid entries are: ● Hexadecimal ● Binary ● ASCII ● Float ● Long ● Signed ● BCD ● Decimal

scGetText (TextIndex)

This function 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.

scGetData (Address as Variant)

This function retrieves a data value for a given address.

Variable	Type	Variable Description
Address	String	This is a string containing the address to get data for. All 0x, 1x, 3x, 4x and 6x addresses are allowed.

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 box that gives detailed 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 list for a specified bit in the specified Bit Display. This field 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. **Example**: 110110

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

This function will create a functional equation in a box. Up to five 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. **Example**: "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 in which to display the equation data (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 function will create an error box that displays an error message, which is visible only if an error condition is met. Conditions are specified using the scAddErrorFieldText 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 function 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 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 (TextString)

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.

Opening the Register Editor

Step	Action
1	Expand **Data Editors** in the project navigation panel.
2	• Double-click **Register Editor**. - or - • Right-click **Register Editor**, and click **Register Editor**.

Changing the Displayed Address Type

In the task bar of the Register Editor panel, click one of the buttons (**0x, 1x, 3x, 4x, 6x**) to select an address type.

Note: Extended memory addresses are defined by memory file.

Displaying Extended Memory Addresses

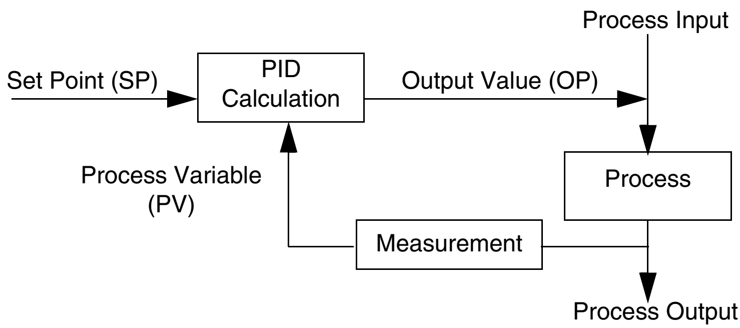
Step	Action
1	In the task bar of the Register Editor panel, click the **6x** button.
2	Click the **File** list to select an extended memory file.

PID Tuner

PID and PID2 Blocks Overview

PID and PID2 blocks are software programming blocks that allow a process to be 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.

Opening the PID Summary

Step	Action
1	Expand **Data Editors** in the project navigation panel.
2	• Double-click **PID Summary**. - or - • Right-click **PID Summary**, and click **PID Summary**.

Adjusting the Setpoint Value

Step	Action
1	In the PID Summary panel, click **Adjust**.
2	Click and drag the slider up to increase the setpoint and down to decrease the setpoint.
3	Press **Enter** to accept the changes.

Jumping to the Currently Selected PID Block in the Logic Editor

Step	Action
1	In the PID Summary panel, click the row of the PID or PID2 instruction that you want to jump to.
2	Click **Goto**. **Result**: The logic editor opens, and the cursor is positioned on the selected PID block.

Editing PID Data

Step	Action
1	In the PID Summary panel, click the row of the PID or PID2 you want to edit.
2	Click **Tune**. **Result**: The instruction editor opens, containing the selected PID or PID2 instruction. Here you may edit all data values related to the instruction.
3	Click the **PID Summary** tab to exit the instruction editor.

Trending PID Data

Step	Action
1	In the PID Summary panel, click the row of the PID or PID2 you want to trend.
2	Click **Trend**. **Result**: The trend window opens, showing the trend data of the selected PID or PID2.
3	Click the **PID Summary** tab to exit the instruction editor.

Setting the PID Contact

Step	Action
1	In the PID Summary panel, select 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	Click one of the following buttons. ● **Auto** = on ● **Manual** = off The default contact setting is Auto. To toggle the contact, click the **Auto/Manual** button, which disables the contact immediately in front of the top node of this PID instruction and forces it on or off. The label on the button specifies the current state of the contact.

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.

Opening the Drum/ICMP Summary

Step	Action
1	Expand **Data Editors** in the project navigation panel.
2	• Double-click **Drum/ICMP Summary**. - or - • Right-click **Drum/ICMP Summary**, and click **Drum/ICMP Summary**.

Selecting a Step

In the Drum Summary panel, select an address from the left panel. All applicable instructions referencing that address will be displayed.

Editing Drum Summary Data

Step	Action
1	In the Drum Summary panel, double-click the **Steps Used**, **Machine ID**, or **Profile ID** cell that you want to edit.
2	Enter a value in the cell.
3	Press **Enter** to save the changes or **Esc** to cancel the changes.

Editing Instruction Address Data Value

Step	Action
1	In the Drum Summary panel, select the instruction you want to edit.
2	Click **Sequencer**.
3	In the instruction panel, double-click the **Data** cell that you want to edit.
4	Enter a value in 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 panel.

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

Step	Action
1	Right-click in the Data Watch Window (see *p. 211*).
2	Click **Data Utilities** → **Import Data**. **Result**: The Import From dialog box opens.
3	Navigate to a folder to select a file (.txt or .csv) to import.
4	Click **Open**.
5	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

Step	Action
1	Right-click in the Data Watch Window (see *p. 211*).
2	Click **Data Utilities** → **Export Data**. **Result**: The Export To dialog box opens.
3	Enter a new file name or navigate to a folder to select an existing file (.txt or .csv).
4	Click **Open**.
5	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

11

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	Double-click **Configuration** in the project navigation panel. - or - Right-click **Configuration** in the project navigation panel, and click **Open Editor**. - or - Click **Project** → **Configuration**. - or - Click the **Configuration** toolbar button.
3	Click the **General (see *p. 94*)** tab.
4	Configure the controller's ASCII parameters (Total Messages, Message Words, and ASCII Ports).
5	Click the **Ports (see *p. 98*)** tab.
6	Ensure your ASCII ports are configured correctly.

Opening the ASCII Editor

Click **Project** → **ASCII Messages**.

- or -

Click the **ASCII Messages** toolbar button.

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 panel.

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

Right-click in the Editor/Preview panel:

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

Editor / Preview Panel

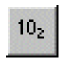
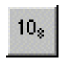
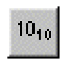
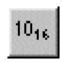
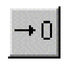
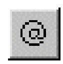
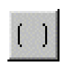
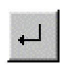
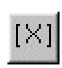
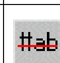
The editor panel is a WYSIWYG message editor. Enter instructions into the editor by using either the toolbox buttons or the keyboard hot keys. The preview panel is a view-only preview display of the currently selected ASCII message. To toggle between the editor and preview panels, right-click the desired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

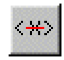
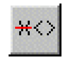
Note: Instructions placed after a carriage return will be ignored.

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 hotkey. 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 tool's properties will automatically update the message editor and preview panels.

Working with Macros

12

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 (example: 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 (see *p. 42*)** from the ProWORX menu.
2	Navigate to the folder where you want to save the new project, enter the name of the new project in the **File name** field, and click **Open**. **Result**: The **New Project** wizard opens.
3	Select the **Use as a Macro** checkbox
4	Click **Next** to complete the remaining new project wizard steps.
5	Once you have created a macro project, 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
- Configuration 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.

To sort parameters in numerical order, click the column header.

Using Macros in Logic

Adding Macro Projects to Logic

Insert macros into logic while working offline in the logic editor.

Step	Action
1	Take your project offline (see *p. 49*).
2	Open the logic editor (see *p. 159*).
3	Right-click in the logic editor, and click **Insert** → **Macro**. **Result**: The Available Macros dialog box opens.
4	Select a macro from the list, and click **OK**. **Result**: The Macro Parameters dialog box opens.
5	For each parameter, enter a Modicon address in the **Address** column.
6	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** window.

Removing Macro Projects from Logic

To remove a macro from a ProWORX 32 project:

Step	Action
1	Select the macro you want to delete.
2	Right-click in the Network Navigator panel, and click **Delete Macro**. **Result**: A confirmation dialog box opens.
3	Click **Yes**. **Result**: The macro is removed from the project.

Note: Deleting a macro from a project doesn't erase the macro file from your hard drive; it removes an inserted macro's logic from your main logic.

To remove a macro completely from your hard drive:

Step	Action
1	Follow steps 1 - 3 in the table above to remove the macro from your main logic.
2	Right-click the macro in the project navigation panel, and click **Delete**.

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. **Result**: The Macro Overview window opens, 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	Right-click in the Network Navigator panel, and click **Update Macro**. **Result**: 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	In the logic editor, move the cursor onto the macro you want to unlink. **Result**: The Macro Overview window opens.
2	Right-click in the Network Navigator panel, and click **Unlink Macro**.
3	To unlink all macros, right-click in the Network Navigator panel, and click **Unlink All Macros**.
4	Click **Yes** to confirm the unlink. **Result**: The macro is unlinked and the Macro Overview window closes. You return to the logic editor.

ProWORX 32 Utilities

13

At a Glance

Overview

This chapter explains ProWORX 32 Utilities.

What's in this Chapter?

This chapter contains the following topics:

BM85 Configuration

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 Configuration utility is used to configure a BM85 device. BM85 Configuration 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.

Opening the BM85 Configuration Utility

Click the **Utilities** tab in the project navigation panel, and double-click **BM85 Configuration**.

- or -

Click **Utilities** → **BM85 Configuration**.

Working with the BM85 Configuration Utility

In the BM85 Configuration dialog box:

If you want to...	Then...
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

Step	Action
1	In the BM85 Configuration dialog box, select a Communications Port from the **Communications Port** list.
2	In the **File Name** field, enter a path and file name, or click **Browse** to find a .mux file.
3	To create a new .mux file, click **Browse**, navigate to the folder in which you want the file to reside, and enter a file name (*.mux) in the **File Name** field. 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 box:

If you want to...	Then...
Add a routing path,	Select a table from the **Table** list and an address from the **Address** list. Enter a routing path in the **Installed Routing Path** field. Click **Add**.
Remove a routing path,	Select a routing path from the **Address** list. 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 Utility

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 utility lets you record and configure a device's IP Address and, optionally, the Gateway IP Address and Sub network mask.

Opening the BootP Utility

Click the **Utilities** tab in the project navigation panel, and double-click **BootP**.

- or -

Click **Utilities** → **BootP**.

Using the BootP Utility

In the BootP dialog box:

Step	Action
1	To enable active pinging of devices in the list, select the **Enable Active Device Ping** check box.
2	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**.
3	To exit the BootP 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 utility 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 dialog box:

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

Automatically Checking IP Addresses

In the BootP dialog box, select the **Enable Active Device Ping** check box. 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 dialog box:

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 in the available **Device Info** and **Optional Parameters** fields. For parameter descriptions, see *p. 260*.
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 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.

Parameter	Description
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, between two projects, or between two controllers. This utility ensures that your controllers are using the right logic, are configured properly, and 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

Opening the Compare Utility

Click the **Utilities** tab in the project navigation panel, and double-click **Compare**.

- or -

Click **Utilities** → **Compare**.

Using the Compare Utility

In the Compare Setup dialog box:

Step	Action
1	To compare two projects: ● Click the **Browse** button to the right of the **Compare** field, and select a project from the My Projects list in the Select Master Project dialog box or use the Browse button to locate a project not in the ProWORX 32 projects directory. ● Click the **Browse** button to the right of the **To** field, and select a project from the My Projects list in the Select Compare Project dialog box or use the Browse button to locate a project not in the ProWORX 32 projects directory. ● Clear both **Online** check boxes, and click **OK**.
2	To compare a project to a program installed in a controller, follow step 1, but select the online check box to the right of the **To** field.

Step	Action
3	To compare an element of a project, select the respective check box in the **Compare Options** field. • Networks • Controller Configuration • DX Instructions • Traffic Cop • Segment Scheduler • ASCII Port Parameters • ASCII Messages • Coil Used • Coil State • Input State • 3xxxx Registers • 4xxx Registers • Coil Disable • Input Disable
4	To compare all elements, click **Toggle**.
5	To view the master database's existing compare report, click **View Report**.
6	To compare two controllers, follow step 1, but select both **Online** check boxes to the right of the **Compare** and **To** fields.
7	To run the compare, click **OK**. **NOTE:** When comparing a project to a program installed in a controller, insure to put project in the compare field.

Using the Compare Report

Step	Action
1	After clicking **OK** in the Compare Setup dialog box, the compare report opens 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, click **File** → **Print** from the compare index page. • To include the whole report, click **Print all linked documents** under the **Options** tab in the print dialog box, and then click **Print**.

I/O Drawing Viewer Utility

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.

Opening the I/O Drawing Viewer Utility

Click the **Utilities** tab in the project navigation panel, and click **I/O Drawing Viewer**.

- or -

Click **Utilities** → **I/O Drawing Viewer**.

Using the I/O Drawing Viewer Utility

In the I/O Drawing Viewer dialog box:

Step	Action
1	• To pan across the drawing, click **View** → **Pan**, or click the **Pans** toolbar button. • 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.
2	• To zoom into the display, click **View** → **Zoom In**, or click the **Zooms in** toolbar button. • Click 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.
3	To zoom out of the display, click **View** → **Zoom Out**, or click the **Zooms out** toolbar button.
4	• To select a different .DXF drawing, from the I/O Drawing Display window, click **Open**. • The File Open dialog box opens. • Select the .DXF to display, then click **OK**.
5	To print a drawing, from the I/O Draw Display window, click **Print**. The drawing prints to your default printer.
6	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 helps diagnose problems with the TCP/IP communications and determine a device's existence. Ping options are saved to the ProWORX.INI file.

Opening the Ping Utility

Click the **Utilities** tab in the project navigation panel, and double-click **Ping**.

- or -

Click **Utilities** → **Ping**.

Using the Ping Utility

In the Ping dialog box:

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

MBP Stat Utility

Opening the MBP Stat Utility

Click the **Utilities** tab in the project navigation panel, and double-click **MBP Stat**.

- or -

Click **Utilities** → **MBP Stat**.

Overview

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

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.

Status and Diagnostic Tools	Tool Tabs	Description
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.
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**.

CodeGen Utility

Overview

CodeGen is a utility that allows users to build databases from macros by using a script. To use CodeGen, first create a special .CGF batch file that specifies which macros to insert into your project.

CodeGen can be used with a program consisting entirely of macros. You can write several macros at once, create a .CGF script, then use CodeGen to insert the macros into your project.

⚠ CAUTION

Unintended Application Program Changes

When CodeGen runs a script file, it appends new macros to the end of the main logic database. Unintended application program changes can occur when expanding a macro multiple times or when halting the expansion of a macro (expanding only part).
Review your application program before placing a PLC intro run mode after expanding a macro, or halting the expansion of a macro.

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

Opening the CodeGen Utility

Click **Start** → **Programs** → **ProWORX 32** → **CodeGen**.

Result: The CODEGEN Macro Processing Utility dialog box opens.

Opening a CodeGen Database

To open a CodeGen access database:

Step	Action
1	In the CODEGEN Macro Processing Utility dialog box, click **File** → **Open**.
2	Navigate to the folder where your file is located, click the file, and click **Open**. **Note**: The CodeGen database contains the list of macro projects as well as information, e.g. title, ProWORX 32 project, for each entry on the list.

Creating .CGF Files with CodeGen Compiler

To create a .CGF file for CodeGen:

Step	Action
1	Click **Start** → **Programs** → **ProWORX 32** → **CodeGen.** The CODEGEN Macro Processing Utility dialog box opens.
2	To add an item to the CODEGEN Macro Processing Utility dialog box: ● Right-click on a project in the **ProWORX 32 Project** column, then click **Edit**. - or - ● Click **Project** → **Add**. **Result**: The Script Editor dialog box opens.
3	In the **Title** field, type the title of your script.
4	In the **ProWORX 32 Project** field, type the name of your project, or click **Browse** to locate your project. This is the project into which your macro/script will be inserted.
5	In the **CodeGen Script File** field, type the path and name of your script file, or click **Browse** to navigate to your file name.

6	Next, in the CGF Script editor, in the field where you view/edit the contents of the CGF script file, type your macro using the following format:
	`<Mode>`
	`# MacroName PathToMacro`
	`ParameterName Address`
	`ParameterName Address`
	`...`
	`#MacroName PathToMacro`
	`ParameterName Address`
	`ParameterName Address`
	`...`

7	In the **Notes** field, type notes about your script.
8	Click **OK** to process the .CGF file.
9	If you need to make further changes to the .CGF file, click **Project** → **Edit**. **Result**: You will return to the Script Editor, and can change any of the values in this screen. Otherwise, proceed to the following step.
10	In the CODEGEN Macro Processing Utility dialog box, select the check box at the left side of an entry. When a check box is selected, the line will be processed when Start Build is activated. Click **Actions** → **Check all** to select all of the check boxes at once so CodeGen runs all the scripts. Click **Actions** → **Uncheck all** to clear all the check boxes.
11	Click the **Start Build** button (the arrow facing to the right) - or - Click **Actions** → **Start Build** to begin executing each task in the CODEGEN Macro Processing Utility dialog box.
12	To stop the build, click the **Stop Build** button (the square) on the toolbar. If the build stops, a red X appears to the right of the check box where the build stopped.
13	The results are displayed in the Results field. **Note**: The macro's log file will be displayed in this field.

Running CodeGen from a Command Line

To compile a macro and database without opening CodeGen:

1. Click **Start** → **Run**.
2. Click **Browse** to navigate to the CodeGen executable. Click the CodeGen.exe file, and click **Open**.
3. Using the default format below, type the path and file names of the macro configuration (.CFG) and the destination project (.PWX) files.
   ```
   Codegen /cgf:c:\prwx32\<Filename>.cgf /
   db:c:\prwx32\<projectname.pwx>
   ```
   <Filename> contains the name of your .CGF file
   <projectname.pwx> contains the full path and file name of your database.
4. Click **OK**. CodeGen appends the macros defined by the .CGF to the master project as a background task

.CGF Batch Files

Below are the descriptions for the formats for a .CGF file:

Mode can be:

- <Create New>: Clears the source database of all documentation and logic and inserts macros at the beginning of the logic.
- <Overwrite>: Leaves the documentation for the source database, but the macro documentation can overwrite the source database's documentation.
- <Add To>: Leaves the documentation for the source database, but the macro documentation that matches the source is ignored.

Macroname: The file name of the macro that you want to insert.

PathToMacro: The path name to the macro database, including the back slash \character at the end of the path.

ParameterName: An identifier for the macro's parameter. This can be either the parameter name (such as @001) or the symbol for it.

Address: The Modicon address that is substituted for the parameter preceding it on the same line.

Documentation Utilities

Overview

The documentation utility allows you to copy, move, and delete documentation records. Each operation (copy, move, and delete) is explained in detail below.

For all operations (copy, move, and delete), the following features apply:

- Before clicking **Start**, make sure you fill in each required address field.
  - For the copy and move operations, fill in the **Source Starting Address** and the **Source Ending Address** fields. The **Destination Ending Address** field is calculated automatically.
  - For the delete operation, fill in the **Source Starting Address** and the **Source Ending Address** fields.
- The addresses you enter in the respective fields must be within the address range specified in the CPU configuration.
- The **Source Starting Address** and the **Source Ending Address** should be the same type address.
- In the **Options** section, you can specify **All** or **Partial** documentation records. Some fields do not exist for specific address types; therefore, they are enabled or disabled depending on the addresses you enter.
- Click **Start** to perform the required operations on the address ranges you specified.

Copy Documentation

To copy documentation:

Step	Action
1	Click **Edit** → **Documentation Utilities**.
2	Click the **Copy** button.
3	In the **Source Starting Address** field, type the address from where you want to start copying records.
4	In the **Source Ending Address** field, type the address from where you want to end copying records.
5	In the **Destination Starting Address** field, type the address to where you want to copy the records.
6	Click **Start**.

Note: The Destination Ending Address is calculated automatically. To copy more than one record, type a different Source Ending Address.

Note: You can copy documentation from one type of database record to another. However, any field, which is not supported by both address types, will not copy.

Move Documentation

To move documentation:

Step	Action
1	Click **Edit** → **Documentation Utilities**.
2	Click the **Move** button.
3	In the **Source Starting Address** field, type the address from where you want to start moving records.
4	In the **Source Ending Address** field, type the address from where you want to end moving records.
5	In the **Destination Starting Address** field, type the address to where you want to move the records.
6	Click **Start**.

Note: The Destination Ending Address is calculated automatically. To move more than one record, type a different Source Ending Address.

Note: You can move documentation from one type of database record to another. However, any field, which is not supported by both address types, will not move.

Documentation Options

The table below describes the allowable documentation features for different address types. For example, if you copy or move documentation from an 0x address type to a 3x address type, the Page Title, Long Comments, and ISA Symbol features do not copy or move.

Address Type	Descriptors	Short Comments	Long Comments	ISA Symbol	Page Title	Symbols	HMI
0x, 1x	yes	yes	yes	yes	yes	yes	yes
3x, 4x	yes	yes	no	no	no	yes	yes
@x	yes	yes	no	no	no	no	no
#x	yes	yes	no	no	no	yes	yes
6x	yes	yes	yes	yes	yes	no	no

Delete Documentation

To delete documentation:

Step	Action
1	Click **Edit** → **Documentation Utilities**.
2	Click the **Delete** button.
3	In the **Source Starting Address** field, type the address from where you want to start deleting records.
4	In the **Source Ending Address** field, type the address from where you want to end deleting records.
5	Click **Start**.

Global Replace

Overview

Global Replace lets you copy or move addresses (their descriptors and register contents) from a project database to the currently active project database.

Note:
- Global Replace is available only in offline mode.
- Global Replace cannot be undone.
- Global Replace will not work if the configuration editor is open.
- The addresses you enter in the respective fields must be within the address range specified in the CPU configuration.
- The **Source Address Range** → **Start** and the **Source Address Range** → **End** should be the same type address.

Using Global Replace

Step	Action
1	• Click **Edit** → **Global Replace.** - or - • Click the **Global Replace** toolbar button.
2	In the **Source Database** field, click **Browse** to select a project from which you want to copy or move descriptors and register contents. This field defaults to the currently active project.
3	In the **Source Address Range** field: • Type the starting address of the block you want to copy/move in the **Start** field. • Type the ending address of the block you want to copy/move in the **End** field. **Note**: **Start** and **End** addresses should be the same address type. **Note**: 0xxxx, 1xxxx, 3xxxx, and 4xxxx registers can all be used as source addresses for an address copy/move. Each of these types of addresses can also have their descriptors copied or moved. If 4xxxx holding registers are specified, the register contents can also be copied or moved.
4	In the **Destination Address Range** field: • Type the starting addres of the block (in the current database) to be overwritten by the copy/move in the **Start** field. • The **End** field is calculated automatically, based upon the size of the block you specified in step 3. **Note**: **Start** and **End** addresses should be the same address type.
5	Select the **Replace Logic** check box if you want to change the source addresses to the destination addresses in the ladder logic program. • In the **Starting Network** field, type the network number from which the address will be copied/moved. • In the the **Ending Network** field, type the network number to which the addresses wil be copied/moved. **Note**: By default, the starting network is the minimum network number, and the ending network is the maximum network number. • Finally, select the **Step Replace** check box to confirm every change to the ladder logic program. The check box is cleared by default. If not selected, all changes will ocur without confirmation.

Step	Action
6	In the **Options** field, click one of the following options from the **Documentation** list. ● **Ignore**: Does not transfer the documentation to the destination project. ● **Move**: Transfers the documentation into the destination project and deletes it from the source project. The descriptors are deleted from the source project only when moving within the same project, i.e., the source and destination projects are the same. ● **Copy**: Transfers the documentation into the destination project and retains it in the source project as well. **Note**: The documentation consists of descriptors, and short and long comments.
7	In the **Options** field, click one of the following options from the **Register Contents** list. This field is disabled if it does not apply. ● **Ignore**: Does not transfer the register contents to the active database. ● **Move**: Transfers the register contents into the active database and deletes them from the source project. The register contents are deleted from the source project only when moving within the same project, i.e., the source and destination projects are the same. ● **Copy**: Transfers the register contents into the active database and retains them in the source database as well.
8	In the **Options** field, click one of the following options from the **Discrete States** list. ● **Ignore**: Does not transfer the discrete states to the destination project. ● **Move**: Transfers the discrete states into the destination project and deletes them from the source project. The discrete states are deleted from the source project only when moving within the same project, i.e., the source and destination projects are the same. ● **Copy**: Transfers the discrete states into the destination project and retains them in the source project as well.
9	In the **Options** field, click one of the following options from the **Forced/Disabled** list. This field is disabled if it does not apply. The field only applies when the source and destination addresses are 0x and/or 1x types. ● **Ignore**: Does not transfer the forced/disabled discretes to the active database. ● **Move**: Transfers the forced/disabled discretes into the active database and deletes them from the source database. The forced/disabled discretes are deleted from the source project only when moving within the same project, i.e., the source and destination projects are the same. ● **Copy**: Transfers the forced/disabled discretes into the active database and retains them in the source database as well.
10	Click **Start**.

Note: You can copy or move registers and discretes from one type of project to another. However, these fields will be available/unavailable depending on the combination of address types.

ProWORX 32 Reporting

14

Reporting

Overview

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

Ensuring Proper Monitor Settings

Printing documentation requires a monitor setting of 96 dpi to operate correctly. If you change the setting to 120 dpi, your networks will only print out approximately 6 rows by 9 columns, instead of the full 7 rows by 11 columns. To ensure your monitor is set to 96 dpi, follow these steps.

Step	Action
1	• Click **Start** → **Settings** → **Control Panel**, and double-click **Display**. - or - • Right-click on your desktop (with all windows minimized), and click **Properties.**
2	Click the **Settings** tab.
3	Click **Advanced**.
4	Click the **General** tab.
5	In the **Display** field, click **Normal size (96 DPI)** from the **DPI setting** list.
6	Click **OK**.
7	Click **OK** to close the Display Properties dialog box.

Using the Printing Menu

Step	Action
1	To send the currently selected documentation to the printer: ● Click **File** → **Print**. - or - ● Click the **Print** toolbar button.
2	To view the current report as it will be printed: ● Click **File** → **Print Preview**. - or - ● Click the **Print Preview** toolbar button.
3	To edit the content and documentation that will make up the report: ● Click **File** → **Report Setup**. - or - ● Click the **Report Setup** toolbar button.

Quick Picks

In the **Report Options** field, select one of the following check boxes to include in your report.

- Title Page
- Table of Contents
- Report Options

The list below these check boxes contain quick picks, which are pre-defined sets of reporting options. Click an option in the list, 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

Step	Action
1	• Click **File** → **Report Setup**. - or - • Click the **Report Setup** toolbar button.
2	Select the check boxes of the report options you want to include. • Customize Page Format • Networks • Descriptor Ranges • Documentation Tables • Configuration Tables • Traffic Cop • Register Content Ranges • Address Used Tables • Mismatch Tables
3	Set the parameters within each report option that you have selected. (To see further details pertaining to each report option, see below.)
4	To select all parameters or deselect all parameters within a report option, click **Toggle All**.
5	Click **Save Settings** to save the current report options.
6	Click **Print Preview** to preview the report as it will be printed.
7	Click **Close** when you are finished setting the report options. Click **Yes** to the ProWORX 32 dialog box prompting you to save changes.

Customize Page Format

In the Report Setup dialog box:

Step	Action
1	Select the **Customize Page Format** check box in the **Report Options** field.
2	In the **Customize Page Format** field, select the following check boxes if you want these options inluded in your report. • Page Title • Report Sections Click **Font** to the right of both these check boxes to change the font.
3	In the **Select** field, click each of the buttons below to customize. • Left Page Header • Right Page Header • Title Page When you click each button, a dialog box opens to the **ProWORX** → **32** → **Bmp** → **Report** directory. Select a graphic to use for each element, and click **Open**. The selected graphic appears to the right of the respective button.

Networks

In the Report Setup dialog box:

Step	Action
1	Select the **Networks** check box in the **Report Options** field.
2	• In the **Print Networks** field, type All to print all networks in the current project. • In the **Print Networks** field, type None to print none of the networks in the current project. • In the **Print Networks** field, type a specific number or a range of numbers to print one network or a range of networks in the current project.
3	Select the **One Network per Page** check box if you want one network to print per page.
4	If you select **One Network per Page**, you can then select the following check boxes. • **Network Long Comment**: Prints long comments for the particular network. • **Cross References**: Prints all of the cross references that are associated with the particular network. • Select the **All** button or the **Coil** button to define the type of cross references you want to print.

Descriptor Ranges

In the Report Setup dialog box:

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

Documentation Tables

In the Report Setup dialog box:

Step	Action
1	Select the **Documentation Tables** check box in the **Report Options** field.
2	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

In the Report Setup dialog box:

Step	Action
1	Select the **Configuration Tables** check box in the **Report Options** field.
2	Select any combination of the following configuration tables check boxes: ● Configuration ● Segment Scheduler ● ASCII Messages ● Configurations Extensions
3	If you selected the Configuration Extensions check box, you can select any combination of the following check boxes: ● Data Protect ● S980 Address ● Peer Cop ● Profibus ● Hot Standby ● TCP/IP ● I/O Scanner ● SY/MAX ● Compact TSX Phase 2 ● VME

Traffic Cop

In the Report Setup dialog box:

Step	Action
1	Select the **Traffic Cop** check box in the **Report Options** field.
2	Select any combination of the following traffic cop check boxes: ● Drop Summary ● Rack Overview ● Slot Summary
3	If you selected the Slot Summary check box, you can select any combination of the following check boxes: ● Descriptors ● Symbols ● Cross References ● Short Comments

Register Content Ranges

In the Report Setup dialog box:

Step	Action
1	Select the **Register Content Ranges** check box in the **Report Options** field.
2	Enter a range of register contents to print in the address (3xxxx, 4xxxx, and 6xxxx (file 1 - 10)) fields. Valid entries include **1-100**, **None**, and **All**.

Address Used Tables

In the Report Setup dialog box:

Step	Action
1	Select the **Address Used Tables** check box in the **Report Options** field.
2	Select the check boxes of the addresses you want to include in the report from: **0xxxx**, **1xxxx**, **3xxxx**, and **4xxxx**.
3	Select the **Disable References** check box to include the addresses that have been disabled in logic.

Mismatch Tables

In the Report Setup dialog box:

Step	Action
1	Select the **Mismatch Tables** check box in the **Report Options** field.
2	Under the **Described But Not Used In Logic** heading, select the check boxes of addresses that have descriptors, but are not used in logic, that you want to include in the report. ● 0xxxx ● 1xxxx ● 3xxxx ● 4xxxx
3	Under the **Used In Logic But Not Described** heading, select the check boxes of addresses that are used in logic, but do not have descriptors, that you want to include in the report. ● 0xxxx ● 1xxxx ● 3xxxx ● 4xxxx

Color Printing

In the Report Setup dialog box, select the **Color Printing (using Logic Property colors)** check box to print in color. If you clear the check box, the report will print in black and white.

Note: With color foregrounds and backgrounds set in the Logic Editor, the Network (report) printout may be difficult to read. To avoid illegible reports, uncheck the color printing checkbox in the Report Setup. This will cause the colors used in the Ladder Editor to be ignored and printed in black and white.

ProWORX 32 Server

15

At a Glance

Overview

The ProWORX 32 server (see *p. 47*) 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 in to the ProWORX 32 Server

In the ProWORX client menu:

Step	Action
1	Click **Server** → **Login**.
2	In the **Name** field, enter the user name given to you by the system administrator. The default name is **Administrator**.
3	In the **Password** field, enter your password. The default password is **Administrator**.
4	Click **Login**.

Logging out of the ProWORX 32 Server

In the ProWORX server menu:

Step	Action
1	Click **File** → **Logout**.
2	Click **File** → **Close** to exit the ProWORX 32 Server.

Using the ProWORX 32 Server Toolbar

See *p. 31* for more information on the ProWORX 32 server toolbar.

Using the ProWORX 32 Server to Manage Projects

See *p. 47* for more information on the project transactions that can occur between a ProWORX 32 client and server.

Setting the Server Port

Step	Action
1	Click **File** → **Set Server Port**.
2	Select the communications type from either **TCP/IP** and/or **Modbus Plus** that the server uses to communicate with the clients. **Note**: If you need to access projects, which are stored on the server, from the locally installed client, you must install a second Modbus Plus Adapter.
3	If you selected TCP/IP, enter the appropriate TCP/IP port number in the **TCP/IP Port Number** field.

Step	Action
4	If you selected Modbus Plus, click either the **All** or the **Selected** button. ● Click the **All** button if you want the server to automatically start using Modbus Plus adapters 0 and 1 (if installed). ● Click the **Selected** button if you want to dedicate fewer than the number of installed adapters to serving clients. Then, select an adapter in the Adapter List beneath the Selected button.
5	Click **OK**. To make the communications changes effective, you must restart the ProWORX 32 Server.

Setting the Project Folder

Step	Action
1	Click **File** → **Set Projects Folder**.
2	Type a new path in the New Path to Project Folder entry window or click the Browse button to browse for a new Projects Folder.
3	Check the 'Move existing projects to the new location' checkbox. This causes the ProWORX 32 software to move all the projects in the default or current projects directory to a new directory and delete the projects and the default or current projects directory from the 'Server/Projects' folder.
4	The default for the checkbox is checked. If the box is unchecked the existing projects will be copied to the new Server projects directory and all projects in the Server projects directory will be inaccessible. All moves will take effect when the Server is restarted. There are several additional directories in the Server folder for ProWORX 32. The only directory that will be moved is the 'Projects' directory. All the projects stored, via the Server, must be in the same directory.The Server must be restarted in order for the directory change to take place. Also, the projects will not get moved, until the Server is restarted. This insures that no one is connected to the Server and projects will not get moved without the user's knowledge. All files in the \Projects folder are moved to the new \Projects directory and the old \Projects folder is deleted. For example, if the directory moving from is C:\Server\Projects, and the destination directory selected is K:\PLC1, the projects will be moved to K:\PLC1\Projects. The \Projects folder is created because the Server expects the projects to be in a \Projects directory.

Configuration Examples

The following examples represent suggestions for different types of configurations:

Configuration	Comment
Flexible Project Access	If you configure the server for both Modbus Plus and TCP/IP, then users can access projects from the plant floor via Modbus Plus or from the office via TCP/IP.
PLC Access for Users without Modbus Plus Adapters	For users without Modbus Plus adapters, the server can be configured to serve on TCP/IP. With a Modbus Plus adapter in the server, users can use the server as a gateway to the PLC's on the Modbus Plus network attached to the server's Modbus Plus adapter.
Simultaneous Users	If you have two users going online simultaneously to several controllers, you may run out of paths with just a single Modbus Plus adapter in the server. Install a second Modbus Plus adapter in the server. Have one user use Adapter 0 in the communications setup for his projects, while another user configures her projects to use Adapter 1.
Commissioning	Commissioning can be greatly simplified if project members access all projects from one server. Temporarily install a server on a laptop computer in the area where work is being done. Let the server record changes and control access to projects. If a change is not working out, restore a PLC to a previous good version saved on the server.
Bridge	Connect two Modbus Plus adapters to the server. Connect each Modbus Plus adapter to a different Modbus Plus LAN. Users can attach to the server through one adapter and select the other adapter in the Communications Setup for their projects. This configuration allows users to bridge from one Modbus Plus LAN to another without the requirement for the usual BP85 bridge device.
Bridging beyond a, b, c, d, e	Place a server on LAN d at address e. Log into the server at Modbus Plus address a, b, c, d, e. When logged in through the server, your projects see the Modbus Plus network from the servers's perspective. For example, LAN d could be connected to LAN x, which cold then be connected to LAN y with a Modbus Plus device z on it. In Communications Setup, set the Modbus Plus path to be x, y, z. This will provide you with a much further reach than is otherwise possible with Modbus Plus.
Backups and Clients	In this example, you have two Modbus Plus adapters in the server. You need to do server PLC backups and you want to support some users on Modbus Plus via the server. Have the users use adapter 0 for project/PLC data access, i.e., use adapter 0 in Communications Setup and log in at Modbus Plus address 0. On the server, select the check box for Modbus Plus and click the **Selected** button. Put a check mark beside adapter 0. This means that the server will only listen for clients on adapter 0, which will leave adapter 1 free for backups. Next, set up the backup tasks on the server. The backup allows you to select communications options to override those in the project. Set the override for adapter 1. This helps ensure that the backups won't be interrupted by a lack of access to the Modbus Plus network caused by a server servicing clients.

Working with Projects

Step	Action
1	Click the **Projects** tab.
2	Click a project in the project navigation panel.

Step	Action
3	Click the **Project Info** tab to see the following display: ● Project Name: a short project name ● Project Status: checked out/locked status ● Project Description: a detailed description of the project ● Detailed Project Name: a longer, more descriptive project name ● Client: the end-user of the project ● Author: the author of the project ● Controller Type ● Controller Address: communications type and address
4	Click **View Audit Trail (see *p. 293*)** to view the transaction history of the project.

Manual Backup/ Compare

To perform a manual backup or compare:

Step	Action
1	Click the **Projects** tab.
2	Click the **Backup/Compare** tab.
3	Click a project in the project navigation panel.
4	Click **Backup Now** to perform an immediate backup of the selected project.
5	Click **Compare Now** to compare the selected project to the configured controller.
6	Click **View Latest Compare Results** to view the most current compare results.

Scheduled Backup/ Compare

Step	Action
1	Click the **Projects** tab.
2	Click the **Backup/Compare** tab.
3	Click a project in the project navigation panel.
4	Select the **Backup** check box. **Note**: Select the **Sync Backups and Compares** check box to perform a backup, then a compare, to that backed-up version of the project
5	Click the **Date/Time Wizard** button to schedule a time for the backup.
6	Select the **Compare** check box.
7	Click the **Date/Time Wizard** button to schedule a time for the compare.

Step	Action
8	In the **Master** field, click one of the following buttons: • **Compare Latest Version**: the latest version of a project • **Compare Previous Version**: an earlier version of the project If you clicked the **Compare Previous Version** button, click the ellipsis button to the right to open a selection dialog box. Select the previous version you want to compare, and click **OK**.
9	In the **To** field, click one of the following buttons: • **Compare to PLC** • **Compare to File** If you clicked the **Compare to File** button, click the ellipsis button to the right to open a selection dialog box. Select the file you want to compare, and click **OK**.
10	In the **Compare Options** field, select one or more of the following check boxes to set up the compare options (see *p. 262*). • Networks • Controller Configuration • DX Instructions • Traffic Cop • Segment Scheduler • ASCII Port Parameters • ASCII Messages • Coil Used • Coil State • Input State • 3xxxx Registers • 4xxxx Registers • Coil Disable • Input Disable
11	Select the **Override Communication Parameters** check box if you want to override project communication parameters and the server is located on a different part of a Modbus Plus LAN.
12	Click **OK** to save your settings and close the dialog box.

Creating ProWORX 32 Users

Step	Action
1	Click the **Users** tab.
2	Click the **Add User** button.
3	In the Add User dialog box, enter the new user's name in the **New User Name** field.
4	Enter a distinct password in the **Password** field.

Step	Action
5	Reenter the password in the **Re-enter Password** field.
6	Click **OK** to save the new user and close the Add User dialog box.
7	• To edit a user name or user password, click the user name in the left-hand Users panel, and click **Edit User**. Make the necessary changes, and click **OK**. • To delete a user, click the user name in the left-hand Users panel, and click **Remove User**.

Creating ProWORX 32 User Groups

Step	Action
1	Click the **Users** tab.
2	Click the **Add Group** button.
3	In the Group Rights dialog box, enter the name of the new group in the **Group Name** field.
4	Select **Rights** for the group.
5	Click **OK** save the new group and close the Group Rights dialog box.
6	• To edit a user group or group rights, click the user group in the middle User Groups panel, and click **Edit Group Rights (see *User Rights, p. 290*)**. Make the necessary changes, and click **OK**. • To delete a user group, click the user group in the middle User Groups panel, and click **Remove Group**.

Working with ProWORX 32 Users and User Groups

Step	Action
1	Click the **Users** tab.
2	To add a user to a user group: • Click a user group from the middle User Groups panel. • Click a user name in the left-hand Users panel. • Click the **Add user to group** button.
3	To remove a user from a user group: • Click a user name in the middle User Groups panel. • Click the **Remove user from group** button.

User Rights

To associate rights with users, follow the steps below.

Step	Action
1	Click the user group, for which you want to associate rights, in the middle User Groups panel, and click **Edit Group Rights**.
2	Select or clear any of the check boxes, defined in the table below. ● Click the **Check All** button to select all check boxes. ● Click the **Uncheck All** button to clear all check boxes.
3	Click **OK** to save changes and close the dialog box.

User rights descriptions:

User Rights	Descriptions
Enabled Functionality	
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 Editor	The ability to edit logic.
Forcing	The ability to force contacts and coils. This feature is allowed without online editing enabled.
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 edit protected registers.
Configuration Extensions	The ability to edit the configuration extensions.
ASCII Editor	The ability to edit the ASCII messages.
Documentation	The ability to change any of the documentation.
PLC Communication Settings	
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.
Online Editing	The ability to make any changes when the project mode is online or combined.
Server Access Settings	

User Rights	Descriptions
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.
Add/Edit Users/Groups	The ability to add user groups.
Delete Users/Groups	The ability to delete user groups.

Current Status

The Activity tab, while in View Current mode, displays project communications information, and is divided into Communications Activity and Backup/Compare Results.

The Communications Activity section displays the following fields.
- 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

The Backup/Compare Results section displays the following fields.
- Project: the project on which the backup/compare operation was performed
- Action: either backup or compare
- Date/Time: date and time of the backup/compare operation
- Result: results of the backup/compare operation

Click **View Activity Log** to switch to the Activity Log viewer.

Activity Log

The Activity tab, while in View Activity Log mode, displays a list of operations that have been performed via the server. These operations may have been performed on the server itself or an attached client.

The log shows:
- the time an operation was performed
- the user who performed the operation
- the activity that was performed
- additional information

The log is called ServerActivityLog.txt, and can be found in the **ProWORX** → **32** → **Server** installation folder.

Each time you start the server, a new file is created. Old files are saved and archived with a new name, which includes a time stamp of when the log was archived, in the **ProWORX** → **32** → **Server** → **Logs** installation folder.

You can manually view or edit a log file using any text editor or spreadsheet application.

- Click **View Current Status** to switch to the Current Status view.
- Click **Refresh** to refresh the displayed log if new activity has occurred.

Related Documents

The Related Documents tab displays all related documents for all projects. It lists all files other than projects that are stored on the server. Related Documents displays the following fields:

- Document Name: the selected document name in full
- Document Status: the lock status of the document
- Plant Layout Section: displays the lock status of the Plant Layout configuration file

Deleting Projects

Step	Action
1	Click the **Projects** tab.
2	Right-click the project you want to delete.
3	Click **Delete Project**.

Undo Checkout

Step	Action
1	Click the **Projects** tab.
2	Right-click the project you want to undo checkout.
3	Click **Undo Checkout**.

Undo Checkout for PlantLayout.INI

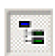
Step	Action
1	Click the **Related Documents** tab.
2	Click the **Undo Checkout** button in the Plant Layout section.

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

Step	Action
1	Click the **Projects** tab.
2	Click the **Project Info** tab.
3	Click a transaction from the list in the project navigation panel to view a specific transaction's information.
4	Click the **View Audit Trail** button.
5	The transaction's information: ● 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.
6	Click the view tree button to hide or view the navigation panel. 
7	Click **Print** to print the current audit trail.
8	Click the **Clear Audit Trail** button to clear all transaction audit trails.
9	Click **Close** when you are finished.

Schneider Alliances

16

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

Opening Schneider Alliances

In Windows Explorer, open the **Schneider_Alliances.exe** file located in the **ProWORX** → **32** installation folder.

Adding an I/O Module

In the Schneider Alliances dialog box:

Step	Action
1	In the **I/O series** list, select an I/O system.
2	Click **Add**. **Result**: Certain default values are entered in 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 Module

In the Schneider Alliances dialog box:

Step	Action
1	In the **I/O series** list, select an I/O system.
2	In the **Module** list, select an existing card. **Result**: The current card data is entered in the parameters list.
3	Click **Edit**.
4	Edit the parameters (see *p. 296*) you wish to update (see below).
5	Click **Update** to save the new data, or click **Cancel** to undo the changes you have made.

Editing an I/O Module Parameter

While adding or editing an I/O module:

Step	Action
1	Press **Enter** or click the **Value** column of the desired parameter. **Result**: The selected parameter is now be editable.
2	Type a valid value or select a value from the list. (Some parameters require that you click the ellipsis box for further configuration.)
3	Press **Enter** to accept the new parameter, or press **Esc** to cancel the change.

Deleting an I/O Module

In the Schneider Alliances dialog box:

Step	Action
1	Click **Delete**. **Result**: The Schneider Alliances Delete dialog box opens.
2	In the **Delete Options** field, click one of the following buttons: ● **All**: Allows the users to delete all modules. ● **I/O series**: Allows the user to delete a specific series. ● **Modules**: Allows the user to delete a specific module.
3	If you click **I/O Series**, select a series from the list.
4	If you click **Modules**, select a module from the list. **Note**: Only user-defined modules can be deleted; no modules from the main traffic cop database can be removed.
5	Click **OK** to delete the selected modules.

Importing an I/O Module

In the Schneider Alliances dialog box:

Step	Action
1	Click **Import**. **Result**: The Schneider Alliances Import dialog box opens.
2	In the **Import Options** field, click one of the following buttons to import modules from a Schneider Alliances Export file (.SAF): ● **Prompt to overwrite existing modules** ● **Overwrite existing modules** ● **Ignore existing modules** **Note**: The .SAF file will contain modules and any corresponding existing scripts or bitmaps.
3	Click **OK**.

Exporting an I/O Module

In the Schneider Alliances dialog box:

Step	Action
1	Click **Export**. **Result**: The Schneider Alliance Export dialog box opens.
2	In the **Export Type** field, click one of the following buttons: ● **All**: Allows the users to export all modules. ● **I/O series**: Allows the user to export a specific series. ● **Modules**: Allows the user to export a specific module.
3	If you select **I/O Series**, select an I/O series from the list.
4	If you select **Modules**, select a module from the list.

Step	Action
5	In the **E-Mail Options** field, click one of the following buttons: ● **Do not e-mail** ● **E-mail to Schneider Electric**: Uses the default e-mail client to send the file to a predetermined Modicon e-mail address. ● **E-mail to other**: Brings up the e-mail client with all fields filled in except the recipient.
6	Click **OK**.

Using the MCS Simple 2 Editor

This parameter is only editable for Quantum, SY/MAX, and Compact I/O series (not available for 800, A120, or Momentum I/O series).

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

Using the Default Parameter Data Editor

This parameter is only editable for Quantum, SY/MAX, Momentum, and Compact I/O series (not available for 800 or A120 I/O series).

Step	Action
1	In the **Default Parameter Data** field, click the ellipsis button. **Result**: The Data Values dialog box opens. It shows the current number of rows in the Number of Parameters Used parameter and the current value in the Default Parameter Data parameter.
2	To edit the contents of a row, 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
3	Click **Add**.	A blank cell is added to the end of the grid.
4	Click **Remove**.	The currently selected row is deleted, and the cells below are shuffled up.
5	Click **Move Up**.	The contents of the currently selected cell are moved up one cell.
6	Click **Move Down**.	The contents of the currently selected cell are moved down one cell.

I/O Card Parameters

The parameters displayed in the Name column of the Schneider Alliances dialog box depends on the I/O series you select.

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.
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

In the script editor dialog box:

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	Move the control by clicking the control’s center selection handle and dragging the control to the desired location.
4	Resize the control by clicking and dragging the control's perimeter selection handles to the desired size.

Common 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 to which the control is anchored. **Note**: You can anchor a control to either the form (pbEditor) or to any frame. When a control is anchored to a frame, the control’s 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 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 grid has a unique initialize function, which is executed when the form is opened. You can hide controls using the .visible property, enable and disable controls using the .enabled property, and perform other standard VB functions.

Step	Action
1	Click the ellipsis button in the Event property of a control.
2	Enter VB script code into the event window.
3	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: option buttons, check boxes, data edit boxes, and combo boxes.
2	Select a word from the 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 control's 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.

Option Button

Option buttons are used on the grid or on a frame to display a limited set of options. Only one option 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 option button is clicked.

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 selected.
DataUnchecked	The value that the bits are set to if the check box is cleared.

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 button, which, when clicked, opens up a combo box configuration. The combo box allows you to enter the contents and related values of the items in the list.

Creating a List for the Combo Box

In the combo box configuration:

Function	Action
1	To add an item to the list, click **Add**.
2	To edit the Combo List Item and Item Data fields, double-click 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 a frame to allow the user to enter any valid value. Valid values are determined by the radix that 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.

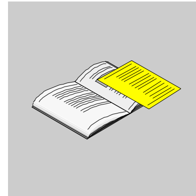
Command

The command button is seldom used, but can be very useful for batch processes. For example, you can have a button that will select or clear 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 time state list to set the parameter to **User Defined** or **Last Value**.

Appendices



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)	**B818-032**	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 220-250	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)	**DAU 202**	2 Channel Register Output (+/-10V)
ADU 205	4 Channel Register Input (+/-10V)	**DAU 204**	4 Channel Analog Output, Opto-Isolation
ADU 206	4 Channel Register Input	**DAU 208**	8 Channel Register Output (+/-10V)
ADU 210	4 Channel Analog Input Module	**DEO 216**	24 VDC 16 Point Input Module
ADU 211	8 Channel Analog Input Module	**DEP 208**	230 VAC 8 Point Input Module
ADU 212	8 Channel Analog Input Module	**DEP 209**	120 VAC 8 Point Input Module
ADU 214	4 Channel Multi Range A/D Input	**DEP 210**	115 VAC 8 Point Input Module
ADU 216	8 Channel Thermocouple	**DEP 211**	115 VAC 8 Point Input Module
ADU 257	8 Channel Thermocouple	**DEP 214**	12-60 VDC 16 Point Input Module
BKF 202	Interbus S Slave	**DEP 215**	5 VDC TTL 16 Point Input Module
BKF201-16	16 Word Interbus S Master	**DEP 216**	24 VDC 16 Point Input Module
BKF201-64	64 Word Interbus S Master	**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 211	120 VAC 4 Point Output Module	**KOS260-64**	Universal Communications Module

Card	Description	Card	Description
DAP 212	24 VDC 8 Point Input/4 Point Output	**MOT 201**	1 Slot 1 Axis Motion Control Module Encoder
DAP 216	24 VDC 16 Point Output Module	**MOT 202**	2 Slot 1 Axis Motion Control Module Resolver & Encoder
DAP 217	5-24 VDC 16 Point Output Module	**P120 000**	Power Supply
DAP 218	24-240 VAC 16 Point Output Module	**P120 125**	Power Supply
DAP 220-250	24 VDC 8 Point Input/Output Module	**VIC 200**	4 High Speed Pulse or 4 VRC Inputs
DAP 252	LowTemp 24 VDC 8 Point Input/4 Point Output	**VIC 205**	4 High Speed Pulse or 4 5V TTL Inputs
DAP 253	LowTemp 110VDC 8 Point Input/4 Point Output	**VIC 212**	4 High Speed Pulse or 12 VDC Inputs
DAP 292	60 VDC 8 Point Input/4 Point Output	**VIC 224**	4 High Speed Pulse or 24 VDC Inputs
FRQ 204	Frequency and Speed Measurement	**ZAE 201**	High speed Counter/Positioner (2 Relay)
KOS260-24	Universal Communications Module	**ZAE 204**	4 Channel High speed Counter/Positioner

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 +10V
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	**AMM090-0x**	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
AMM090-0x	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	**NWM100-00**	Ethernet 10/100 Megabit
DDI353-00	24 VDC 32 Input Module	**QSPXM**	Seriplex Master
DDI353-10	24 VDC True Low 32 Input Module	**QUCM-SE**	Programmable communications module
DDI364-00	24 VDC 6x12 Fast Input Module	**SERX53-00**	Sequence Of Events Recorder
DDI673-00	125 VDC 24 Point I/P Module	**XCP900-00**	Battery Backup

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 Relay Output
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

Power Supplies

B

Power Supplies

Power Supplies

Power Supply	Source Voltage	Type	Bus Current	Maximum per Rack
CPS 111 00	115 ... 230 VAC	Standalone	3A	1
CPS 114 x0	115 ... 230 VAC	Standalone/summable	8A	2
CPS 114 20	120 ... 230 VAC	Standalone	11A	2
		Summable	10A	
CPS 124 x0	115 ... 230 VAC	Standalone/redundant	8A	3
CPS 124 20	120 ... 230 VAC	Standalone/redundant	11A	3
		Summable	10A	
CPS 211 00	24 VDC	Standalone	3A	1
CPS 214 00	24 VDC	Standalone/summable	8A	2
CPS 224 00	24 VDC	Standalone/redundant	8A	3
CPS 414 00	48 VDC	Summable	8A	2
CPS 424 00	48 VDC	Redundant	8A	3
CPS 511 xx	100 ... 150 VDC	Standalone	3A	1
CPS 524 xx	125 VDC	Standalone/redundant	8A	3

Compatibility Issues

With the exception of standalone models, power supplies with the same model number are always compatible when installed in the same backplane.

- Do not mix different power supply models on the same backplane.
- Do not mix DC input power supplies with their respective AC versions on the same backplane.
- Do not use standalone (only) power supplies with any other power supply on the same backplane.

You can use a standalone or a summable power supply with a DIO drop, but you can not use a redundant power supply with the DIO drop.

- The added power supply must not be included in the system I/O map.
- The added power supply does not have to be the same type as the DIO adapter. You can use AC power supplies with DC type adapters. (The reverse is true too.)
- DIO module current load with an added power supply is typically 200mA.

Redundancy Rules

If you have...	Then, the I/O power budget should be...
(2) CPS 124 20 modules	10A
(3) CPS 124 20 modules	20A
(1) CPS 124 20 module + (1) CPS 224 00 module - or - (1) CPS 424 00 module	8A
(1) CPS 124 20 module + (2) CPS 224 00 modules - or - (2) CPS 424 00 modules	16A
(2) CPS 124 20 modules + (1) CPS 224 00 module - or - (1) CPS 424 00 module	16A

Summable Rules

- (1) CPS 114 20 module is 11A in standalone
- (2) CPS 114 20 modules are 20A in summable
- (1) CPS 114 20 module + (1) CPS 114 10 module are 16A in summable

Troubleshooting

C

At a Glance

Overview

This chapter includes various tools and resources for troubleshooting networks, ladder logic, I/O cards, etc. Contact customer support (see *p. 24*) if you require further information about I/O cards.

What's in this Chapter?

This chapter contains the following sections:

C.1 General Troubleshooting

At a Glance

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 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	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: ● 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 (see *p. 24*).

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.

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.

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:

LED Pattern	Description
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.

C.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.

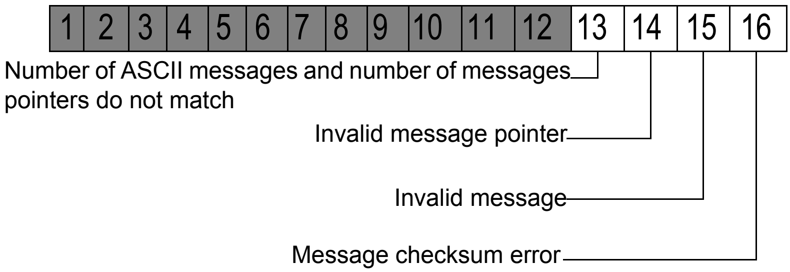
What's in this Section?

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.

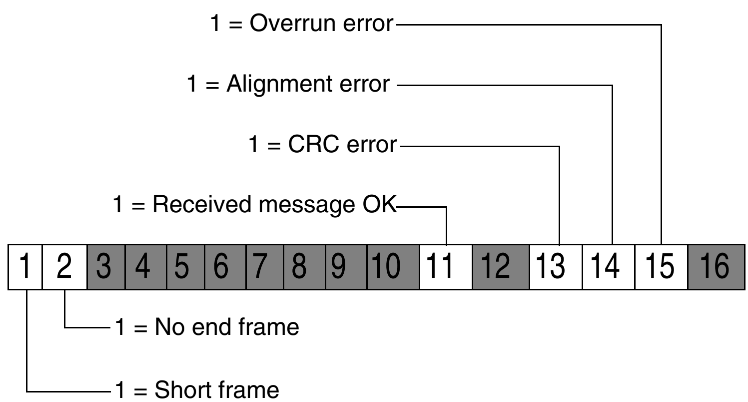


Cable A Errors

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.

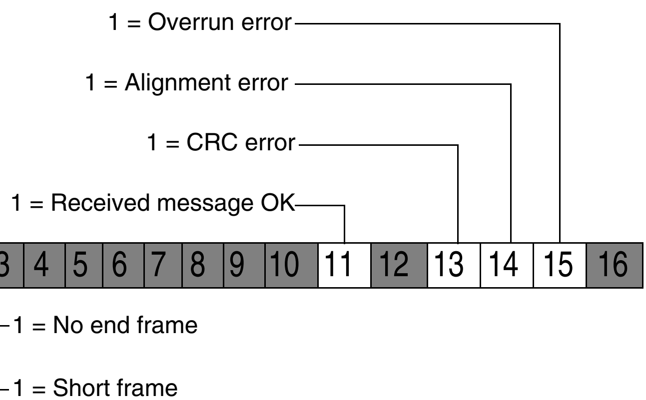


Cable B Errors

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.

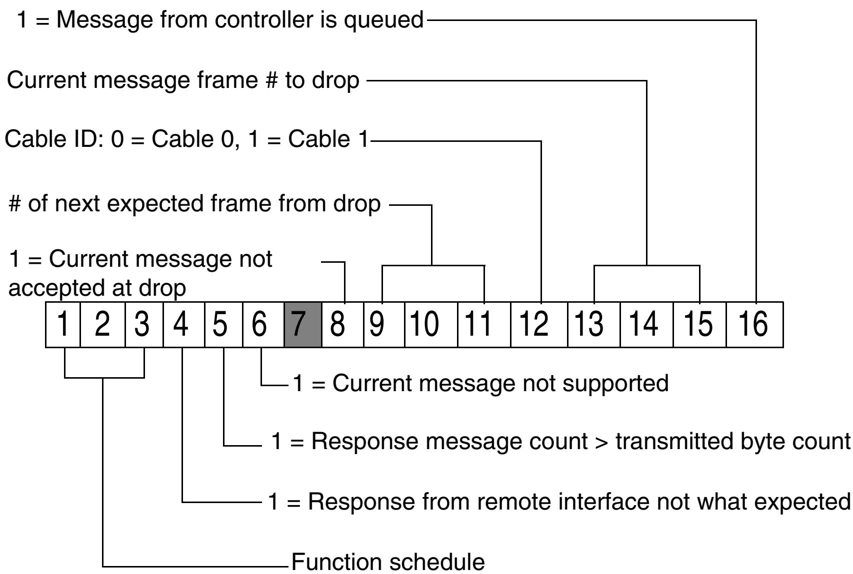


Communication Status

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).



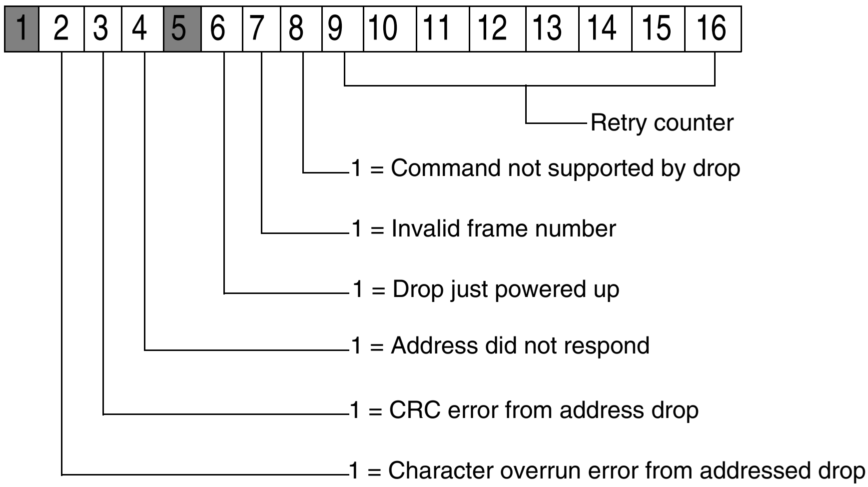
Function schedule:

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.

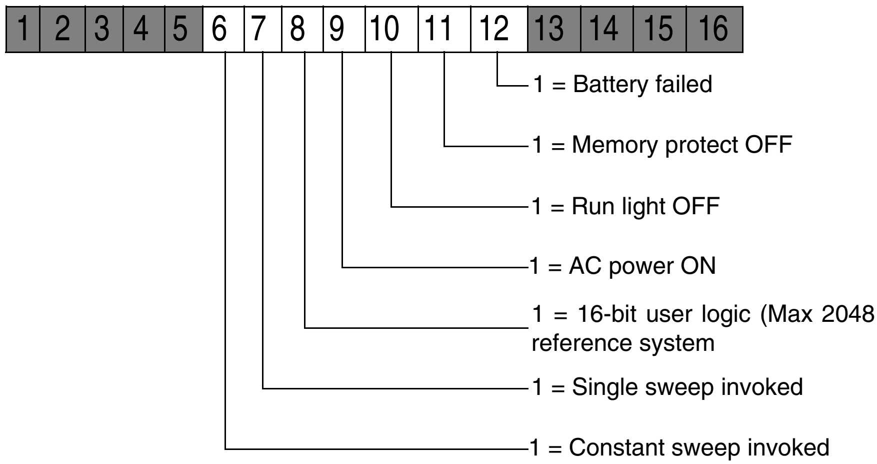
Module health will show as **0**. If communication is re-established, this error count and error word is not cleared. The only way to clear this word is to cycle power on the controller or issue a start and stop command.



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.)

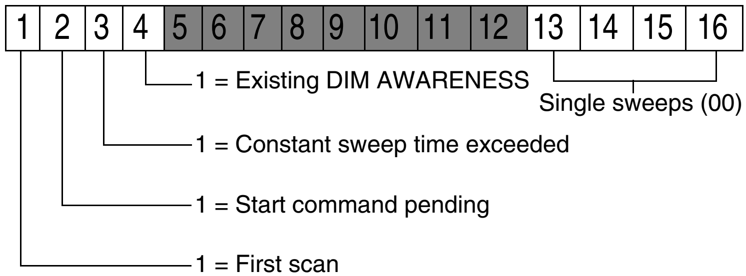
D0	Reserved
D1	Set offline mode
D2	Set data exchange active
D3	Operating mode

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.

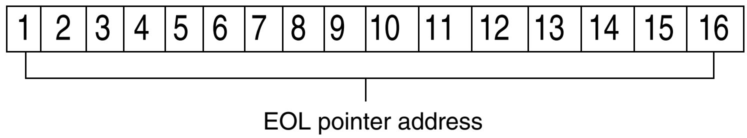
Word 3 (4xxxx + 2) - General controller status:



EOL (End of Logic) Pointer

Word 6B Hex (107 Decimal)

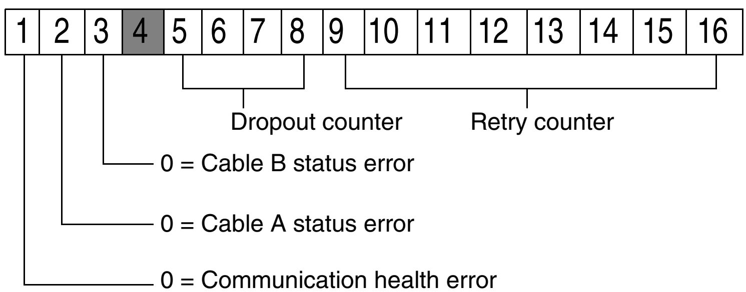
This location contains the end of logic pointer. The EOL pointer provides the hexadecimal address of the end of user logic.



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 (168) 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.



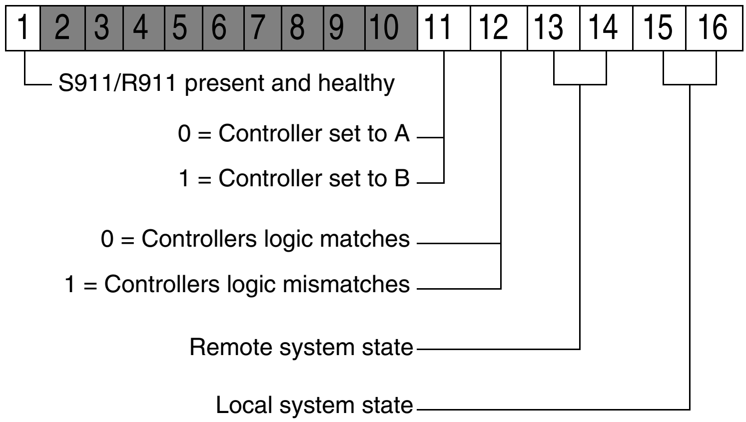
Note: It is possible for bits 2 and 3 to be **1** and bit 1 to be **0** cables (171).

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:

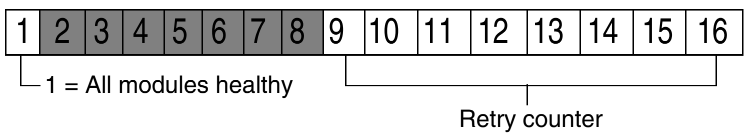
Binary Number	Description
01	Offline
10	Primary
11	Secondary

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.

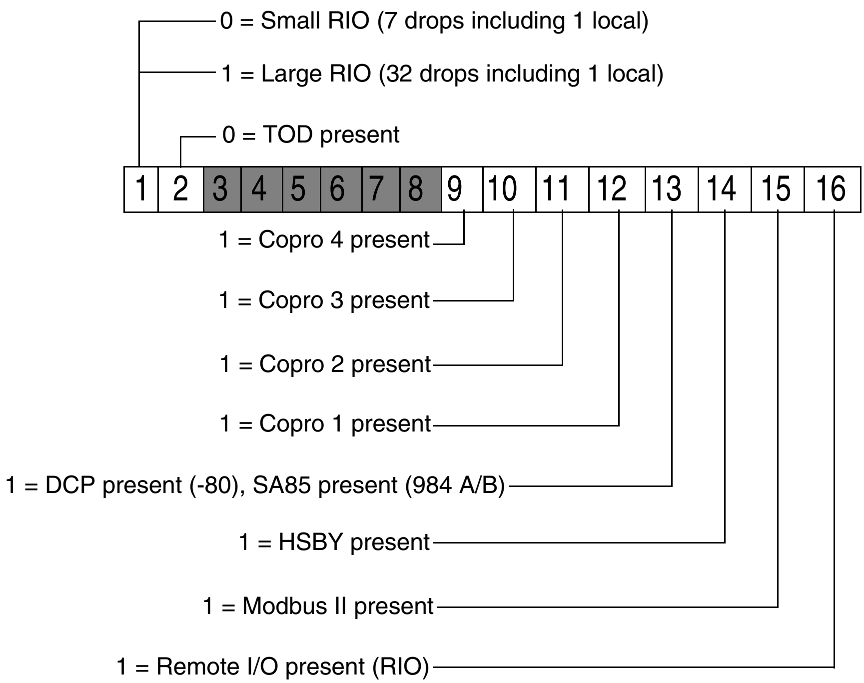


Machine Configuration

Word 61 Hex (97 Decimal)

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.



Module Health

S908 Controller

⚠ WARNING

Incorrect Health Bit Status

On systems using J890/J892s with PROM revision 1000, slot 1 status will be the LSB. J890/J892s with PROM revisions greater than 1000 slot 1 status will be the MSB. Ensure your program uses the health bits consistent with the PROM revision.

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

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.

Note: If a module is configured in the traffic cop and active, then the bit will be 1.

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

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.

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 *p. 329*.
S901 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 *p. 329*.

Editing .DIF Files with Microsoft Excel

D

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	Right-click your project in the project navigation panel.
2	Click **Properties**.
3	Click the **Documentation** tab.
4	Enter 9 in the **Total Number of Descriptor Lines** field.
5	Click **OK** to save the changes.

Step Two

Export your ProWORX 32 project as a .dif file.

Step	Action
1	Right-click your project in the project navigation panel.
2	Click **Export Documentation**.
3	In the **Select Destination File** dialog box, navigate to the respective folder, and click a file name to enter in the **File name** field.
4	Click **Open** 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	Click the cell.
4	From the Excel menu, click **Edit** → **Copy**.
5	Select the temporary column by clicking its header. **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, click **Edit** → **Paste**. **Result**: 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 to undo. The temporary column now contains the same values as column A, but formatted as text instead of numbers.
7	Click the entire temporary column again.
8	From the Excel menu, click **Edit** → **Copy**.
9	Click Column A.
10	From the Excel menu, click **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 to undo.
11	Click the entire temporary column.

Step	Action
12	From the Excel menu, click **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 to 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	Right-click your project in the project navigation panel.
2	Click **Import Documentation** → **Append** or **Overlay** or **Create New**.
3	In the **Select Documentation File** dialog box, navigate to the respective folder, and click the .dif file containing the changed documentation.
4	Click **Open**. **Result**: The documentation of the current project is updated.

Building and Modifying I/O Drawings

E

Building and Modifying I/O Drawings

Overview

The I/O Generator is used to create CAD drawings of 800, Micro, Quantum, and A120 cards based on your project's Traffic Cop data. The drawings are in a .dxf format that is supported by most CAD programs. In some cases, a drawing may need to be modified to fit your application. In other cases, there is no supplied drawing for a new or custom I/O card. You may use an existing I/O drawing template and modify it to suit your needs. The following information will help you to design your own custom I/O drawings.

Set Drawing Parameters

The Drawing Parameters option is used to set the paths where the CAD program, and Master drawings and created (intermediate and final) drawings will reside. A controller prefix is set here, which will become the first two characters of the drawings that are created. An Overwrite Existing drawings option is set here to allow or disallow existing drawings to be replaced. If a small change is made to the Traffic Cop or documentation, it is faster to delete the affected drawings and set this option to No. The Drawing Parameter window is always displayed before drawing generation to confirm that the proper parameters are set.

Intermediate Drawings

The Intermediate Drawings option is used to create drawings that are specific to the Traffic Cop in the selected database. The appropriate Master .dxf drawing is modified by placing drop, rack, and slot references into replaceable text strings.

800, Compact, and Micro series drawings are saved with a new name in the form **CCDDRS.dxf**, where
- CC is the controller prefix.
- DD is the drop (01 to 32).
- R is the rack (1 to 5).
- S is the slot (1 to B).

Quantum series drawings are saved with a new name in the form **CCHDDRS.dxf**, where
- CC is the controller prefix.
- H is the head number (1 to h, representing head 0 to 16).
- DD is the drop (01 to 64).
- R is the rack (1 to 5).
- S is the slot (1 to G, representing slot 1 to 16).

Once the intermediate .DXF drawings are created, they can be imported using your CAD program. If you use AutoCAD, you can automatically import these drawings by exiting to DOS, moving to your AutoCAD directory and, at the DOS prompt, entering ACAD nul CCint where CC is the controller prefix. This uses AutoCAD's .scr file format.

These drawing can then be modified, resized, and combined. They may be renamed as long as:

1. the first two characters (controller prefix) remain
2. the length does not exceed seven characters
3. the last character is not an F

This is because the Final Drawings will have the same name as the Intermediate drawings, with an F added to the end. If you edit your intermediate drawings, be sure to export them back to .dxf format so correct final drawings can be generated.

Final Drawings

The Final Drawings option is used to create drawings that contain descriptors and field devices from the selected database. The Intermediate drawings are modified by replacing text strings with actual descriptors, short comments, database configuration, and field devices from this database. The drawing is then saved with a new name which is the name of the Intermediate drawing with an F added to the end.

Once the final .dxf drawing are created, they can be imported using your CAD program. If you are using AutoCAD, you can automatically import these drawings as described in the Intermediate Drawings section.

Using Symbols in Drawings

The files included with the program include a number of symbol diagrams that can be incorporated into your CAD drawings. They are placed into the drawings via a reference code in the appropriate descriptor record.

Each code must be prefixed with a $ (dollar sign). More than one symbol code can be entered into the descriptor records. Each symbol code (one per descriptor line) represents a field device and is ordered by occurrence.

Example: To include a push button (normally open) as part of the wiring diagram for input 10004, you can enter the descriptor editor from logic or the I/O configurator, then enter the symbol code into the descriptor record (you would enter $PBNO into the descriptor record).

The following table lists the available symbols.

LTR	light red
LTG	light green
PBNO	push button normally open
PBNC	push button normally closed
CRNO	coil relay normally open
CRNC	coil relay normally closed
HORN	horn or siren
LSNO	limit switch normally open
LSNC	limit switch normally closed
FSNC	level switch normally closed
FSNO	level switch normally open
PRSNO	proximity switch normally open
PRSNC	proximity switch normally closed
PSNC	pressure switch normally closed
PSNO	pressure switch normally open
TASNO	temperature switch normally open
TASNC	temperature switch normally closed
FLSNO	flow switch normally open
FLSNC	flow switch normally closed
SOL	solenoid
TGSNO	toggle switch normally open
TGSNC	toggle switch normally closed

AutoCAD Information - Master Drawings

Master drawings are drawings of each type of card. They have three layers defined:

1. 0
2. DUMMY
3. REPLACE

Layer 0 contains drawing elements that remain the same from Master drawing to Final drawing.

Layer DUMMY is not used at this time.

Layer REPLACE contains text that is replaced with other text that is unique to each database. Replaceable text begins and ends with a / (forward slash).

The following list contains examples of replaceable text. Note that the preceding letter denotes the point at which the replaceable text is manipulated: (I) is for the intermediate stage and (F) is for the final stage.

F	/D1-101/	Descriptor #1 of the 1st input address
F	/D2-R/	Descriptor #2 of the rack
F	/D23-S/	Descriptors #2 and #3 of the slot
F	/D123-S/	Descriptors #1, #2, and #3 of the drop
F	/D23-O16/	Descriptors #2 and #3 of the 16th output address
I	/A1-O02/	The actual address of the 2nd output address, e.g., 00018 or 40004-02
F	/A1-S/	The actual address of the slot, e.g., S0124 (Drop 01 Rack 2 Slot 4)
F	/N2-O13/	The 2nd line of the Short Comment field of the 13th output address
F	/N12-S/	The 1st and 2nd lines of the Short Comment field of the slot
F	/F1-I03/	Field device of the 3rd input address. Field device is a descriptor prefixed with a $. (e.g., $PBNO field device is the 1st descriptor prefixed with a $, not necessarily descriptor 1).
I	/HEAD/	The head number
I	/DROP/	The drop number
I	/RACK/	The rack number
I	/SLOT/	The slot number
I	/PLC/	The controller number assigned to this database
F	/CLIENT/	The client field from the database configuration
F	/PROJECT/	The project field from the database configuration
F	/TITLE/	The title field from the database configuration
F	/DATE/	The date
F	/TIME/	The time

I	/RANGE/	The range of addresses used in the card
I	/RANGE2/	The 2nd range of addresses for bidirectional card
I	/MASTDRAW/	The name of the Master Drawing
I	/INTERDRAW/	The name of the Intermediate Drawing
F	/FINALDRAW/	The name of the Final Drawing
I	/LABEL-AA/	
I	/LABEL-N/	Neutral wire label
I	/LABEL-X/	Hot wire label

The examples from the previous list cover possibilities. Any combination of descriptors, short comments, or field devices of the drop, rack, slot, input addresses, or output addresses can be included in a drawing. You can modify or create Master drawings with the following restrictions:

1. The name of the drawing should remain the same. Or, in the case of new drawings, the name must match the card number (e.g., 804-016.dxf)
2. No replaceable text can reside in a layer other than REPLACE.
3. Replaceable text string must not have a start point that touches any other drawing element

AutoCAD Information - Intermediate Drawings

Intermediate drawings are created from Master drawings, one for each slot with a card defined in the Traffic Cop and follows this format:

CCDDRS.DWG where:

CC= Controller Prefix (2 characters)

DD= Drop number (01-32)

R = Rack number (1-5)

S = Slot number (1-9, A, B)

In general, the replaceable text in the Master drawing will be modified to include the drop, rack, and slots (e.g., /D1-I01/ will become/D1-101-0123/ for Drop 0, Rack 2, Slot 3). Addresses are placed into the drawing at this time. The Intermediate drawings may be modified or combined, with the following restriction to the naming of drawings:

1. The first two characters of a name must be a controller prefix.
2. Names can not have more than seven characters.
3. Names must not have an F as the last character. This is because the Final drawings will use the same name appended with an F.

Using the LABEL Field

The LABEL replaceable text field is used for a labeling individual wires on an I/O drawing. There are three types of labels:
- signal
- hot
- neutral

LABEL fields, like others used by ProWORX 32, are put into the Master drawings on the REPLACE layer.

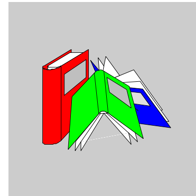
Labels can be entered as:

Signal Wire	/LABEL-AA/ where AA is a 2-digit number for the point on the card
Hot Wire	/LABEL-X/
Neutral Wire	/LABEL-N/

The LABEL field for a signal wire produces a wire label in the following format.
- MMDDRSSPPMM is the machine designation.
- DD is the drop.
- R is the rack.
- SS is the slot.
- PP is the I/O card point.
- /LABEL-25/ in a drawing for a controller with a machine ID of AC with the I/O card in drop 21, rack 3, slot 7 appears in the final drawing as AC2130725.

The LABEL field for a hot or neutral wire produces a wire label in the following format.
- MMWDDRSSMM is the machine designation.
- W is the wire type (N for neutral, X for Hot).
- DD is the drop.
- R is the rack.
- SS is the slot.
- /LABEL-N/ in a drawing for a controller with a machine ID of AC with the I/O card in drop 21, rack 3, slot 7 appears in the final drawing as ACN21307.

Glossary



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 with **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.

---

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.

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.
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.

control address The instruction address in the logic that is checked for a condition while the logic is being emulated and loopback is enabled.

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.

---

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.

data value The new state or value to be placed in a destination address range when the loopback control condition is true.

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.

destination The range of addresses to be driven when the loopback control condition is true.

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 with **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.

EEPROM Electrically erasable 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.

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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.

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global address change An operation in the logic editor, which substitutes one address or a range of addresses for another or several others.

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/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.

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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.
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.

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.

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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.

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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.

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quick print	A function that allows you to print a network to a printer, with or without documentation.

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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)	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.

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save To store information on a disk.

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.

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 with **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 with **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.

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.

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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.

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word 16 bits of data (two bytes). Also called a **machine word**.

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