ProWORX NxT

User's Guide

Version 2.10

31001952

Schneider Electric

1 Welcome

In this chapter

Welcome to ProWORX NxT 2.0

ProWORX NxT is the most advanced programming software available for Modicon logic controllers. It gives you the power to program online and offline in a familiar Microsoft Windows environment. If you know how to use a mouse, you can work in ProWORX NxT quite easily!

About this manual

This manual is a guide for installing and operating ProWORX NxT. It does not contain information about specific controllers, I/O cards, or ladder logic instructions. This kind of hardware and ladder logic information is available in the NxT help system.

This guide uses the following conventions:

- "Click" and "double-click" mean click the left mouse button once or twice (respectively) while the cursor is positioned on a button or item. "Right-click" means click the right mouse button once while the cursor is positioned on a button or item.
- **Bold** is used to emphasize fields and buttons, and to give instructions.
- Keystrokes are presented inside angle brackets. For example, "Press ENTER" means press the Enter key on your keyboard.

If you are new to Microsoft Windows

ProWORX NxT uses the same operating conventions as most other Windows programs. You should be familiar with these conventions before starting to use NxT. This manual assumes that you can:

- Use a mouse to click, double-click, and perform drag-and-drop operations.
- Select items using menus, toolbars, checkboxes, and drop-down lists.
- Navigate through standard open and save dialog boxes.
- Locate items in an online help system.

❖ If you're new to Windows or haven't used some of these features before, refer to your Windows documentation for instructions.

Installing ProWORX NxT

System requirements

To run ProWORX NxT (Online and Offline), you require:

- A PC-compatible computer with a 33 MHz 80386DX or faster processor (Pentium system recommended).
- Microsoft Windows 3.1, 95, or NT 3.51 or later.
- 4 MB of RAM.
- 25 MB of available hard drive space (45 MB with drawings).
- An asynchronous adaptor (RS-232 serial port or an SA85 card) for direct communication with programmable controllers.
- A printer port and compatible printer to generate document listings.
- One or more Modicon controllers.

How to install ProWORX NxT

You can install ProWORX NxT in one easy step from the CD. The CD also allows you to make a set of floppy disks so you can install ProWORX NxT on PCs which do not have a CD-ROM.

➢ **To install ProWORX NxT from the CD:**

- See the directions in the booklet that comes with your CD.

Windows 95 and NT 4.x only

The Installer updates your **Start** menu to include the ProWORX NxT Online and Offline Editors, Drawing (DXF) Viewer, and Product Authorization Wizard. It does not create any other shortcuts.

➢ **To create a shortcut on the Windows desktop:**

1. Right-click the desktop.
2. Click **New**, then click **Shortcut**.
3. In the **Command Line** field, type the full path and file name of the version of NxT to which you want a shortcut. If you used the standard NxT install options, this is **c:\proworx\nxt\nxton.exe** or **nxt.exe**.

4. Click **Next**.
5. Type **ProWORX NxT Online** or **ProWORX NxT** as the shortcut name, then click **Next**.
6. Select an icon, then click **Finish**.

You can also make shortcuts from the folder where you installed NxT. Click the icon of an NxT editor and select **Create Shortcut** or right-click the icon of an editor and select **Create Shortcut**. Now move the new shortcut to where you want it.

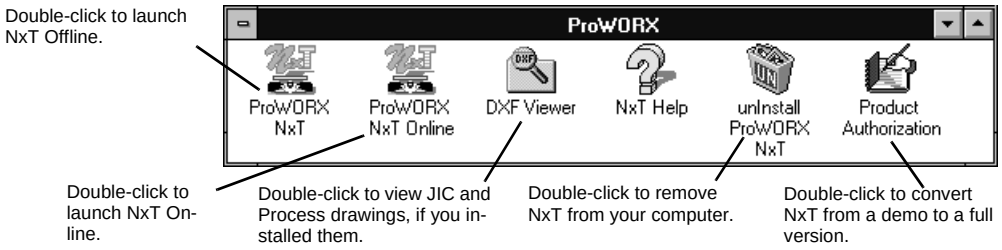
Registering your product

If you received one, please take a few moments to fill out the registration card in your software package. Registering helps us notify you of updates to this product.

Starting ProWORX NxT

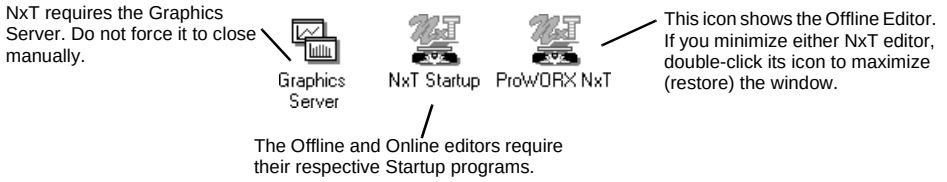
Windows 3.1 and Windows NT 3.51

Once you have installed ProWORX NxT, open its Program Group (**ProWORX** by default), then double-click the program item (icon) of the editor you want.



When you start either the Offline or Online Editor, a minimized program called "Graphics Server" appears in the Program Manager next to the editor's icon. A second minimized program appears in the Program Manager when you

- Open a database in the Offline Editor (in which case the minimized program is called "NxT Startup").
- Connect to a controller in the Online Editor (in which case the minimized program is called "NxTOn Startup").

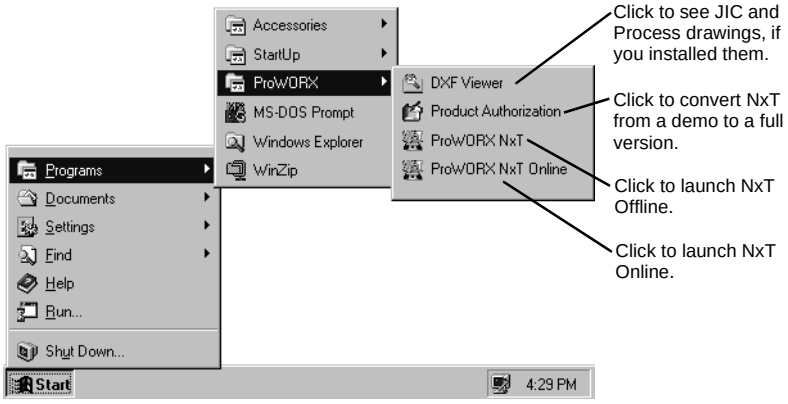


Do not force either minimized program to close as NxT requires them to operate. They close automatically when you exit NxT.

Windows 95 or Windows NT 4.x

Once ProWORX NxT is installed, start the application in one of these ways:

- Click **Start**, then **Programs**. Select the folder where you installed NxT (**ProWORX** by default), then select the editor you want.



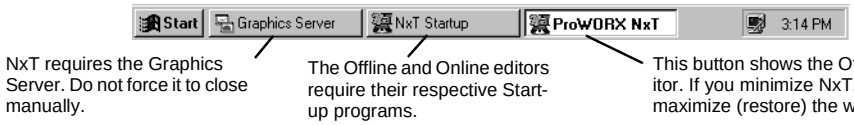
- Click **Start**, then **Run**. Type the path of the folder where you installed NxT (C:\ProWORX\NXT by default), followed by **\NXT** for the Offline Editor or **\NXTON** for the Online Editor. For example, if you installed NxT into its default location and want to start the Offline Editor, at the Run prompt, type:

  c:\proworx\nxt\nxt

- If you created shortcuts to NxT's Online and Offline editors during the installation procedure, double-click the icon of the editor you want.

When you start either the Offline or Online Editor, a minimized program called Graphics Server appears in the Taskbar next to the Editor's button. A second minimized program appears in the Taskbar when you

- Open a database in the Offline Editor (in which case the button is labelled "NxT Startup").
- Connect to a controller in the Online Editor (in which case the button is labelled "NxTOn Startup").



NxT requires the Graphics Server. Do not force it to close manually.

The Offline and Online editors require their respective Start-up programs.

This button shows the Offline Editor. If you minimize NxT, click to maximize (restore) the window.

Do not force either minimized program to close as NxT requires them to operate. They close automatically when you exit NxT.

Authorizing ProWORX NxT

Until you authorize your copy of ProWORX NxT, it runs in demonstration mode. You have access to all NxT features, but are limited to 25 networks of logic per database. When you authorize your copy, you can use up to 5,000 networks of logic per database.

You can authorize NxT with either a software or hardware key.

➢ **To authorize NxT with a software key:**

1. Have the serial number for your copy of NxT ready.

If you don't know your serial number, start NxT, then select **About** on the **Help** menu to find it.

2. The Product Authorization window appears when you do one of the following:
   - Start NxT, then on the **Help** menu, click **Authorize Product**.
   - From the Windows 95 or NT 4.x Desktop, click **Start**, point to **Programs**, then select the folder where you installed NxT (**ProWORX** by default). Select **Product Authorization**.
   - In Windows 3.1 or NT 3.51, double-click  in the Program Group where you installed NxT (**ProWORX** by default).
3. Click **Software Keys**. A list of registered products appears.
4. Click **Add** to start the Product Authorization Wizard.
5. Do one of the following:
   - If you have already received a Key Code on a 3½" disk, select **Authorize by Disk**, then click **Next**.
   - If you do not yet have a Key Code, select **Authorize by Phone/Fax**, then click **Next**.
6. Follow the instructions as they appear on your display.

➢ **To authorize NxT with a hardware key:**

1. Locate the hardware key and the 3½" disk labelled "NxT Hardware Key Authorization" included with your installation package.
2. Insert the NxT Hardware Key Authorization disk into your 3½" drive.
3. From the Windows Explorer or Program Manager, run A:\SETUP (or B:\SETUP). The Install Wizard authorizes NxT to run with the key.
4. Plug the hardware key into the parallel port (also called the LPT1 printer port) of your PC. This "pass-through" hardware key will not interfere with other devices attached to the port.

➢ **To confirm that your hardware key is working correctly:**

1. Have the serial number for your copy of NxT ready.

If you don't know your serial number, start NxT, then select **About** on the **Help** menu to find it.

2. Do one of the following:
   - Start NxT, then on the **Help** menu, click **Authorize Product**.
   - From the Windows 95 or NT 4.x Desktop, click **Start**, point to **Programs**, then select the folder where you installed NxT (**ProWORX** by default). Select **Product Authorization**.
   - In Windows 3.1 or NT 3.51, double-click  in the Program Group where you installed NxT (**ProWORX** by default).

   The Product Authorization window appears.
3. Click **Hardware Keys**. The Hardware Key Viewer checks the key in your PC's parallel port. It displays the names, serial numbers, and options of the products configured on the key.
4. Confirm that the products and serial numbers listed for the key match yours, then click **Exit**.

Customer support

Customer support is available to registered ProWORX NxT users.

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

Schneider Electric

One High Street

North Andover, MA 01845

Internet:	http://www.proworx.com
Email:	customercentral@schneiderautomation.com
Support Hotline:	(888) 266-8705
Telephone:	(978) 794-0800
Fax:	(978) 975-9301

Leave NxT running on your computer and call from a telephone near it. To help us assist you as quickly as possible, we suggest you have the following information ready:

- The version and serial number of your copy of NxT. To find this information, on the **Help** menu, click **About** in the NxT Title Screen or Network Editor.
- What you were doing when the problem occurred, whether you can repeat the problem, and any error messages you received.
- Information about your computer, including its processor type, memory, hard drive size, video card type, and I/O boards.
- Your version of Windows. To find this information:

Windows 95 or NT 4.x: click **Start**, then **Settings**. Select **Control Panel**. When the Control Panel window opens, double-click **System**. When the System window opens, select the **General** tab. Your version of Windows is listed under the heading *System*.

Windows 3.1 or NT 3.51: From the Program Manager, on the **Help** menu, click **About the Program Manager**.

2 Working with a Database

In this chapter

Working with a database: Overview

ProWORX NxT holds information about each of your controllers in a *database*. The database consists of a group of files which store

- The controller's configuration;
- Its networks of ladder logic; and
- Descriptors of the controller and ladder logic.

The files making up one database have the same file name but different file extensions.

❖ To learn how these file extensions identify the parts of a database, see Appendix B - File Extensions on page 351.

To work with a controller offline, you must create a database for it. This database stores the controller's Traffic Cop and configuration information, its ladder logic, and descriptors of the controller and ladder logic. As you work, the Offline Editor modifies this data. Because the Offline Editor is not connected directly to the controller, changes made in it do not take effect immediately. Instead, when you have finished programming, you write all your changes to the controller in one pass.

To work with a controller online, you do not have to open its database. The Online Editor reads ladder logic, Traffic Cop information, and the controller's configuration directly from the controller and writes back to it, so the database is not needed. However, descriptors are stored in a controller's database, not the controller itself, so if you do not have its database open, you cannot read or edit a controller's documentation. For this reason, it is usually a good idea to open a controller's database while working online. Opening a controller's database may also help remind you that changes made in the Online Editor take effect in the controller immediately, but **don't** appear in its database until you *read* the new logic from the controller.

❖ For more information on reading and writing to a controller, see page 102.

Creating a new database

This section tells you how to create a new, empty database from either the Online or Offline Editor. You can also create a new database to contain ladder logic and configuration information as you read it from a controller.

❖ To learn how, see Reading from a controller on page 102.

Creating a new database in the Offline Editor consists of entering summary information, setting the number and length of the database's descriptor fields, and specifying the type of controller the database describes and its options (its address, additional memory, I/O cards, etc.).

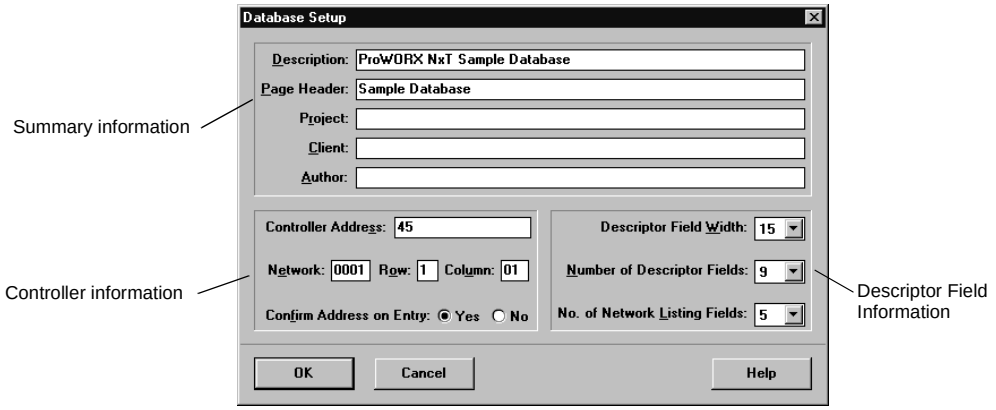
To create a new database in the Online Editor, you must be attached to a controller. You are prompted for summary information and the number and length of descriptor fields you want, but not for a controller type or options (the Online Editor reads this information from the controller itself). The first time you open the database in the Offline Editor, you are prompted for the additional controller information.

Part 1: For both the online and offline editors

➢ **To create a new database:**

1. The New dialog box appears when you do one of the following:
   - From the Title Screen of the Offline Editor, on the **File** menu, click **New**.
   - From the Network Editor, on the **File** menu, click **New**.
   - In the Network Editor, click  on the toolbar.
2. Type a path and file name for the new database.

3. Click **OK**. The Database Setup dialog box appears.



4. Enter summary information for the database:
   - In the **Description** field, type a short description of the database (its purpose, logic, process, etc.).
   - In the **Page Header** field, type a title for the database. This text will appear at the top of printouts from the database.
   - In the **Project** field, type a project identification code or number.
   - In the **Client** field, type the name of a client.
   - In the **Author** field, type the name(s) of the person(s) creating the database.
5. Enter information about the controller for this database:
   - In the **Controller Address** field, type the address of the controller that the database describes. The format of the address depends on whether the controller is part of a Modbus, Modbus Plus, or Ethernet network. NxT does not assign the address in this field to the controller; it is for reference only.

❖ To assign a Modbus address to a controller, see Controller configuration - Ports tab on page 60.

   - In the **Network**, **Row**, and **Column** fields, type the location of a ladder logic network. The Online Editor jumps to this location when it starts up.

- In the **Confirm Address on Entry** field, select whether NxT automatically connects to the controller in the **Controller Address** field when you enter the Online Editor or displays the Select Device window (where you can manually select a controller).

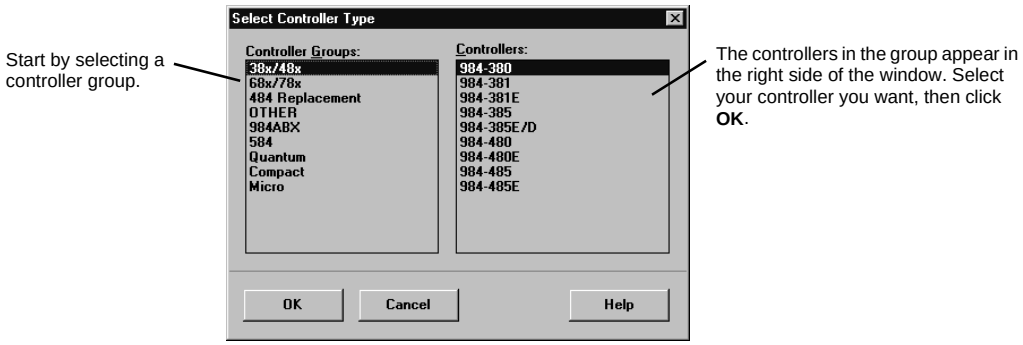
6. Set the number and width of descriptor fields for the database:
   - In the **Descriptor Field Width** field, type the maximum number of characters (9, 12, or 15) each descriptor field can hold.
   - In **Number of Descriptor Fields**, type the number of descriptor fields (5 to 9) that will be available for each instruction in logic.
   - In **No. of Network Listing Fields**, type the number of descriptor fields (3 to 5) for each instruction in logic that print when you print a ladder logic network.
7. Click **OK**.
   - **If you are working in the Online Editor,** NxT creates your database. The first time you open this database in the Offline Editor, you will be prompted for more information about the controller.
   - **If you are working in the Offline Editor,** go on to Part 2.

Part 2: For the offline editor only

Because the Offline Editor is not connected directly to the controller, it requires more information than the Online Editor before it can set up a database. After you select options for your database, NxT prompts you for information about the type of controller you have.

➢ **To specify a controller type for a new database:**

1. When you click **OK** in the Database Setup window, the Select Controller Type dialog box appears.



2. From the list on the left, select a controller group. A list of controllers in the group appears on the right.
3. From the list on the right, select the type of controller for the new database.
4. Click **OK**. Depending on the controller type you select, the Edit Controller Details dialog box may appear. If so, complete Steps 5 and 6.
5. With the drop-down menus, type details about your controller.
6. Click **OK**. NxT sets up your database. For your convenience, the Controller Configuration window opens so you can set up your controller.

   ❖ For more information, see Configuring a controller on page 54.

   To configure your controller later and return to the Network Editor, click **OK**.

Opening an existing database

In addition to its own databases, ProWORX NxT can open databases from ProWORX*PLUS* v1.40 or later directly.

Databases from ProWORX, early versions of ProWORX*PLUS*, Modsoft, or competitive products must be converted to NxT's format before they can be opened.

➢ **To open an existing database:**

1. Do one of the following:
   - From the ProWORX NxT Title Screen or the Network Editor, on the **File** menu, click **Open**.
   - In the Network Editor, click  in the toolbar.
   - From the Title Screen, on the **Controller** menu, click **Select Device**, then click **Select Setup**.

   The Open window appears.
2. Type the path and file name of the database, then click **OK.**

NxT lists the last nine databases you have opened at the bottom of the File menu. You can open any database from the list by clicking its name.

Converting an older ProWORX database

ProWORX NxT includes a stand-alone utility for converting logic in ProWORX and older ProWORX*PLUS* databases to NxT's format. Databases from ProWORX*PLUS* v1.40 or later are fully compatible with NxT and do not require conversion.

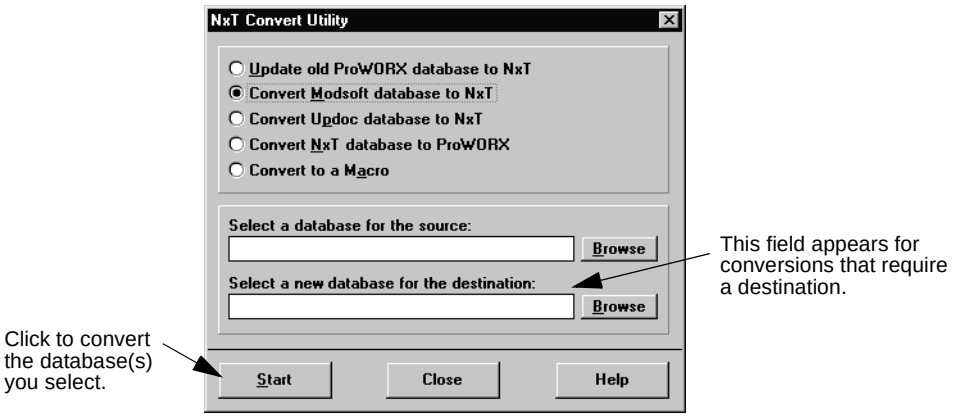
The **Import/Export** command found on the **File** menu under **Utilities** does not import logic into ProWORX NxT, only documentation.

❖ For more information, see "Importing database documentation into ProWORX NxT" on page 221.

➢ **To convert logic to the NxT:**

The database you select receives data from the converted file. **It will be completely overwritten.**

1. Click **Start**, point to **Programs**, then to **ProWORX** and click **NxTConv**. The NxT Convert Utility dialog box.



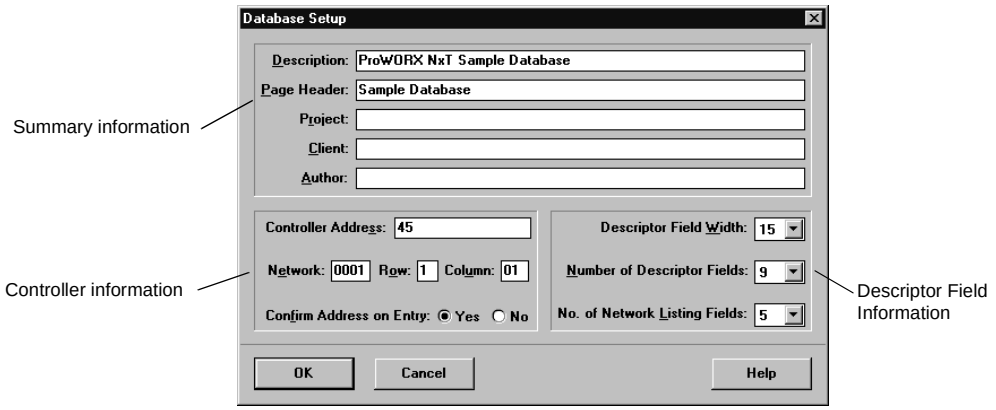
2. Select one of the following:
   - Update an old ProWORX database to NxT.
   - Convert a Modsoft database to NxT.
   - Convert an Updoc database to NxT.
   - Convert an NxT database to ProWORX.
   - Convert an NxT database to a macro.
3. Type the path and file name of the source database or click **Browse** to navigate to it.
4. If the conversion requires a destination, type the path and file name of the destination or click **Browse** to navigate to it.
5. Click **Start**. The database or macro is converted.

Editing the setup of a database

At times, you may need to change the setup of an existing database because of a change in the address of the database's controller, for example, or to add additional descriptor fields. You can easily modify the summary, controller, and descriptor field information of a database.

➢ **To edit the setup of a database:**

1. From the Network Editor, on the **File** menu, click **Utilities**, then click **Database Setup**. The Database Setup dialog box appears.



2. Make changes to the summary information for the database:
   - In the **Description** field, type a short description of the database (its purpose, logic, process, etc.).
   - In the **Page Header** field, type a title for the database. This text will appear at the top of printouts from the database.
   - In the **Project** field, type a project identification code or number.
   - In the **Client** field, type the name of a client.
   - In the **Author** field, type the name(s) of the person(s) creating the database.

3. Make changes to the controller information for the database:
   - In the **Controller Address** field, type the address of the controller that the database describes. The format of the address depends on whether the controller is part of a Modbus, Modbus Plus, or Ethernet network. NxT does not assign the address in this field to the controller; it is for reference only.

❖ To assign a Modbus address to a controller, see Controller configuration - Ports tab on page 60.

   - In the **Network**, **Row**, and **Column** fields, type the location of a ladder logic network. The Online Editor jumps to this location when it starts up.
   - In the **Confirm Address on Entry** field, select whether NxT automatically connects to the controller in the **Controller Address** field when you enter the Online Editor or displays the Select Device window (where you can manually select a controller).
4. Set the number and width of descriptor fields for the database:
   - In the **Descriptor Field Width** field, type the maximum number of characters (9, 12, or 15) each descriptor field can hold.
   - In **Number of Descriptor Fields**, type the number of descriptor fields (5 to 9) that will be available for each instruction in logic.
   - In **No. of Network Listing Fields**, type the number of descriptor fields (3 to 5) for each instruction in logic that print when you print a ladder logic network.
5. Click **OK**. You may be prompted to confirm your changes. To keep them, click **OK**.

Saving and deleting a database

NxT saves changes to the open database **automatically** and frequently. It saves your work whenever you exit the Traffic Cop or Controller Configuration windows, move from one network of logic to another, close your database, or change between Online and Offline editing. You therefore do not need to save your work manually.

Use the **Save As** command to create a copy of a database before, for example, making significant changes to it. The **Database Backup/Restore** function can also create a copy of a database, but the **Save As** command may be faster as it does not compress the database's files.

➢ **To save a copy of a database:**

1. From the Network Editor, on the **File** menu, click **Save As**. The Save As dialog box appears.
2. Type a path and file name for the database.

   To save your copy in the same folder as the original database, give the copy a different name.
3. Click **OK**. NxT saves a copy of your database.

Deleting a database (offline only)

Deleting a database erases all database files, including logic, traffic cop information and documentation. You can only delete a database while offline.

➢ **To delete a database:**

1. From the ProWORX NxT Title Screen or the Offline Network Editor, on the **File** menu, click **Delete**.
2. Type the name of the database file in **File Name** or browse to the database file you want to delete.
3. Click **OK**.

Backing up and restoring a database (offline only)

The Database Backup function compresses a copy of all the files making up a database to a single .ZIP file. The Restore function expands a previously-compressed .ZIP file into a usable set of database files.

Use the **Database Backup/Restore** function to create a small copy of a database to store, for example, on removable media. The **Save As** command can also create a copy of a database, but it does not compile the database's files into one file or compress them.

The Database Backup and Restore functions are not available while you have a database open or while you are working with a controller online. To backup or restore an active database, first close it (it's saved automatically), then follow the procedures below.

➢ **To back up a database:**

1. From the ProWORX NxT Title Screen, on the **File** menu, click **Database Backup/Restore**. The Database Backup/Restore dialog box appears.

2. Click **Backup**.
3. Type the path and file name (with a .DCF extension) of the database to back up or click **Browse** to navigate to it.
4. Type the path where the compressed .ZIP backup file is to be created or click **Browse** to select a path.
5. Click **Start**. A temporary DOS window appears, and the database files are compressed.

➢ **To restore a database:**

1. From the ProWORX NxT Title Screen, on the **File** menu, click **Database Backup/Restore**. The Database Backup/Restore window appears.
2. Click **Restore**.
3. Type the path and file name of the compressed .ZIP backup file to restore or click **Browse** to navigate to it.
4. Type the path where you want to restore database or click **Browse** to navigate.
5. Click **Start**. A temporary DOS window appears and the database files are decompressed.

Keeping NxT secure

The NxT Security Settings restrict access to certain functions of ProWORX NxT. A password is required to change the settings to make those functions accessible. This can be useful if multiple users are likely to work on the same machine and you don't want all of them to have access to every single feature.

If the SecurWORX or fxManager products from Total Control Products (Canada) Inc. are installed, the NxT Security Settings will have no effect.

❖ For more information on fxManager, see "Appendix G - NxT and fxManager" on page 383.

➢ **To change the security settings:**

1. Do one of the following:
   - From the main startup screen, on the **File** menu, click **Security**.
   - Attempt to access a restricted function and click **Yes** when NxT asks if you want to change the Security Settings.
2. Type the Supervisor Password. If this is the first time anyone has tried to access the Security Settings, the password is PROWORX. The Security Options dialog box appears.

It is strongly recommended that you change the default password as soon as possible.

3. Type a new **Supervisor Password**, if desired. The password can be up to 32 characters long. Type the same thing in **Confirm Password**.
4. Select or clear the desired Security Options. Selecting an option allows unlimited access to the given function. Clearing an option prevents users from accessing the function.
   - **ALT+P Function Active (Monitor/Program Mode):** If selected, the user can switch to Program Mode in the Online Editor.
   - **Online Logic Editing:** If selected, the user can modify logic while in the Online Editor.
   - **Start/Stop Controller:** If selected, the user can start or stop a controller.

- **Read From Controller:** If selected, the user can read information from a controller. This option also affects operations that require NxT to read from the controller, such as comparing databases.
- **Write To Controller:** If selected, the user can write information to a controller. This option also affects operations that require NxT to write to a controller, such as initializing logic.
- **Traffic Cop Editing:** If selected, the user can configure I/O with the Traffic Cop. If this option is cleared, the user can view Traffic Cop information, but can't change anything.
- **Controller Configuration:** If selected, the user can save changes in configuration to the controller. If this option is cleared, the user can view the configuration, but can't make any changes.
- **Enable Protected Registers:** If cleared, the user has read and write access to all register addresses. If selected, the user has read-only access to addresses within the list of "Protected" ranges. The user still has both read and write access to addresses outside of those ranges. To change the Protected addresses list, click **Edit List**.

5. Click **OK**. If you typed a new Supervisor Password, you're prompted to type the password again before the new settings are accepted.

If you forget your password, contact Customer Support.

❖ For more information on contacting Customer Support, see page 10.

Editing the protected register address list

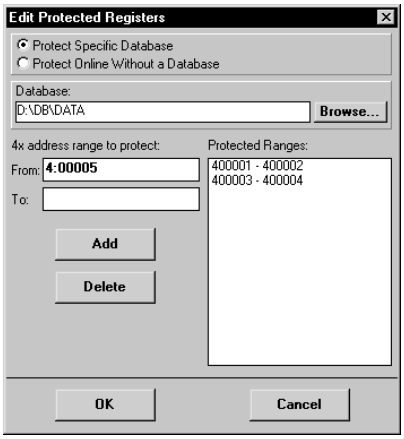
You change the list of protected addresses from the Edit Protected Registers dialog box.

If **Enable Protected Registers** is cleared in the Security Options dialog box, the address ranges you enter here will have no effect.

➢ **To secure registers in all databases:**

1. From the ProWORX NxT Title Screen, on the **File** menu, click **Security**.

2. Click **Edit List**. The Edit Protected Registers dialog box appears.



3. Select **Protect Online Without a Database**.
4. Type the first address of the range in the **From** box.
5. Type the last address of the range in the **To** box.

   The protected address ranges apply regardless of which (if any) database is currently open, and of whether ProWORX NxT is online or offline. Thus, you must type an entire six-digit address in the From and To boxes.
6. Click **Add**. The new range is added to the list displayed in the Protected Ranges box.

➢ **To secure registers in a specific database:**

1. From the ProWORX NxT Title Screen, on the **File** menu, click **Security**.
2. Click **Edit List**. The Edit Protected Registers dialog box appears.
3. Select **Protect Specific Database**.
4. Type the path and file name of the database you want or click **Browse** to navigate to it.
5. Type the first address of the range in the From box.
6. Type the last address of the range in the To box.

The protected address ranges apply regardless of which (if any) database is currently open, and of whether ProWORX NxT is online or offline. Thus, you must enter an entire six-digit address in the From and To boxes.

7. Click Add. The new range is added to the list displayed in the Protected Ranges box.

➢ **To remove a range of addresses from the list:**

1. In the Protected Ranges box, select the range to be deleted.
2. Click **Delete**.

Year 2000 compatibility check

The Year 2000 (Y2K) Compatibility Check checks your databases to see if it will function correctly after midnight, Dec. 31, 1999. The Y2K problem occurs because most early software stored only the last two digits of years to conserve memory. Normally this works fine, since the computer revolution has so far taken place in the same century. However, when the turn of the millennium occurs, a non-Y2K compliant software program will think that the current year (stored as "00") is older than the previous year (stored as "99").

➢ **To check databases for Year 2000 Compatibility:**

1. From the Network Editor, on the **Tools** menu, click **Y2K Compatibility**.
2. Click **Browse** and navigate to the directory containing databases you want to check.
3. Click **Check DB's**. All databases in the chosen directory are tested.

   Databases that are Y2K compliant are marked as "Yes" in the **Year 2000 Compliant** column. Databases that might not be Y2K compliant are marked with "Suspect".

The Year 2000 Compatibility Check works by checking whether a database uses a Time of Day clock, marking those that do as "Suspect". Thus, a "Suspect" database will not necessarily fail to work at the turn of the century — it's just that the possibility exists.

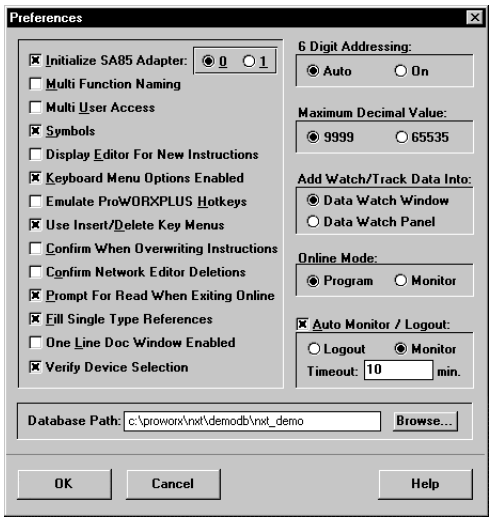
4. You can click **Print** to send a report of the results to the default printer.
5. Click **Close** when you're finished.

Setting system preferences

You can change several of NxT's configuration settings in the system Preferences dialog box. These options affect how NxT works with databases and how it behaves when it starts up.

➢ **To configure your preferences:**

1. From the Title Screen or Network Editor, on the **File** menu, click **Preferences**. The Preferences window appears.



2. Select the system preferences you want:

   - **Initialize SA85 Adapter:** The SA85 Network Card driver may sometimes interfere with Modbus communications. This option helps reduce conflicts as you move between Modbus and Modbus Plus networks:
     - When Modbus networking is selected, NxT disables the SA85 driver at startup to prevent conflicts.
     - When Modbus Plus networking is selected, NxT resets the SA85 driver at startup to ensure it is working.
     - If you're using two SA85 cards, you must specify which card you want to initialize: Adapter 0 or Adapter 1.

- **Multi Function Naming:** This option replaces function identifier constants in your ladder logic with four-letter descriptions of the function operation.
- **Multi User Access:** Select this option if other users can edit your NxT databases over a network. When you open a database, NxT locks it so that no one else can edit it at the same time. When this option is clear, other users can access your databases even if you are already working in them.
- **Symbols:** This allows you to use symbols (which you configure) instead of addresses while editing ladder logic.
- **Display Editor for New Instructions:** NxT automatically displays the Edit Instruction dialog when you place a new instruction into logic so you can assign addresses to it immediately. If this function is not enabled, the Network Editor displays the instruction's unassigned addresses as question marks.
- **Keyboard Menu Options Enabled:** Functions that you normally access with keystroke combinations (for example, Goto Assembly Register) are also placed in menus.
- **Emulate ProWORX*PLUS* Hotkeys:** This option enables the following shortcut keys available in ProWORX*PLUS* (the DOS version of ProWORX Nxt).
  - **ALT+S** to open the Search dialog box to the address highlighted by the logic cursor.
  - **ALT+O** to open the Locate Coil dialog box. This hotkey only works if the logic cursor is highlighting a 0xxxx discrete function.
  - **ALT+R** to open a Register Editor for the function block located at the logic cursor. If the cursor isn't on a function block, the Generic Register Editor is opened instead.
  - **ALT+T** to add the address at the cursor position into the Data Watch Panel or Data Watch Window.
  - **ALT+W** to toggle between the Network Editor and the Data Watch Panel.
- **Use Insert/Delete Key Menus:** When selected, you can access the Insert menu by pressing the INSERT key and the Delete menu by pressing the DELETE key. When cleared, these keys operate normally and the menus are only accessible from the Edit menu.

- **Confirm When Overwriting Instructions:** NxT prompts you to confirm each time you overwrite an existing ladder logic instruction with a new one. This security feature is useful when working online.
- **Confirm Network Editor Deletions:** When selected, NxT asks you to confirm each time you try to delete an instruction from ladder logic as you work in the Network Editor. Use this function to protect your ladder logic, especially while working online.
- **Prompt for Read When Exiting Online:** When selected, you're prompted each time you exit from the Online Network Editor to perform a read when the controller's contents have changed.
- **Fill Single Type References:** When selected, the Instruction Editor automatically fills only single address types and positions the cursor in the entry of the address offset.
- **One-Line Doc Window Enabled:** The small One-Line Documentation Window replaces the standard Documentation Editor at the bottom of the Network Editor.
- **Verify Device Selection:** When selected and when the memory protect state is toggled, you're prompted to verify the device after connecting to a controller. This ensures you've attached to the right controller. This feature is only available to users working with SecurWORX or fxManager.
- **6 Digit Addressing:** When **On**, sets all addressing to six digits, allowing NxT to enter and display constants greater than 9999. **Auto** is the default, which sets addressing to five digits unless the controller has addresses configured that require six.
- **Max Decimal Value:** Restricts registers to a decimal value of either 9999 (default) or 65535.
- **Add Watch/Track Data Info:** This setting determines where Data Watch address and tracking request additions go, either to a Data Watch Window or the Data Watch Panel. These additions are done through the **Watch** and **Track** items on the **Data** menu.

❖ For more information on the Data Watch Panel, see page 122. For more information on Data Watch Windows, see page 276.

- **Online Mode:** This allows you to set the default startup mode when going Online. You can start up in either Program or Monitor mode.

- **Auto Monitor/Logout:** When selected with **Logout**, the Online Network Editor closes after the specified amount of inactive time and the main menu opens. When selected with **Monitor**, the Online Network Editor closes after the specified amount of inactive time and Monitor mode is activated.
- **Database Path:** This setting determines the default directory (folder in Windows 95) for ProWORX NxT database projects. You can type the path name manually or click **Browse** to search for the folder you want. NxT uses this folder as the initial directory for creating, saving and loading database projects.

3 Connecting to a Controller

In this chapter

Connecting to controllers: Overview

ProWORX NxT can communicate with controllers in several ways. This chapter explains how to configure NxT for several common types of network connections:

- **Modbus:** Modicon's master/slave protocol, standard on 984 and many other controllers. Select this option if your computer is connected to a controller's Modbus port, either directly or through a modem.
- **Modbus through a modem:** Controllers in remote locations can be equipped with RS-232 modems. Your computer can then connect to the controller (by telephone, radio, or microwave systems) using its own modem. Once the connection is established, the computer and controller behave as if they were connected directly through a Modbus network.
- **Modbus Plus:** Modicon's fast peer-to-peer protocol, standard on many 984 and other controllers. Select this option if your computer is connected to a Modbus Plus network through a network adapter card such as an SA85.
- **Ethernet Gateway:** A *gateway* connects two networks that would not normally be able to communicate with each other. NxT supports Modicon's EMBP Gateway, which bridges your computer's TCP/IP Ethernet to the controller's Modbus Plus network.
- **TCP/IP:** Some controllers can be equipped with TCP/IP cards. Select this option if *both* your computer and controller use TCP/IP networking, regardless of whether they are on the same network or are connected by a gateway.

This chapter also tells you how to select and *attach* to a controller, both directly and by scanning your entire network for devices.

Setting up communications for your PC

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

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

In the Communication Setup dialog box, you select the communication system your computer uses to connect to your network of PLCs. You also set communication parameters for your PC.

Configuring Modbus communications

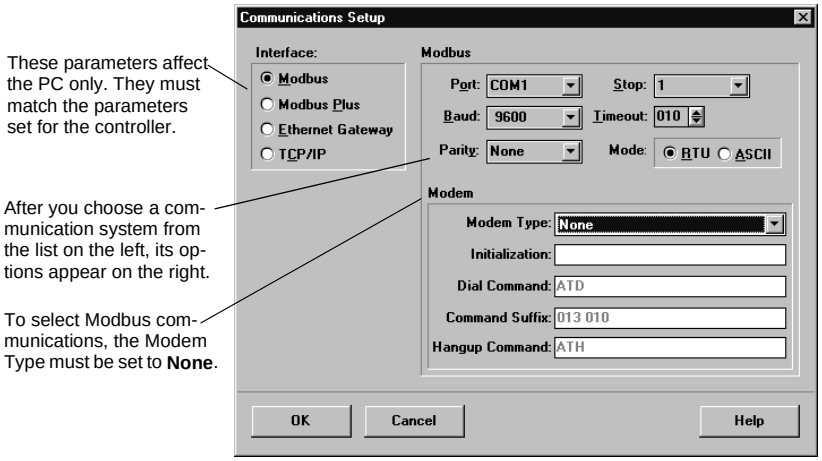
The Modbus Communications Setup dialog box is divided into two parts: Modbus parameters (top) and Modem settings (bottom). Set the Modbus parameters if your computer is connected directly to a controller's Modbus port **or** if it connects to a controller's Modbus port through a modem.

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.

❖ For more information, see "Controller configuration - Ports tab" on page 60.

➢ **To select and configure Modbus communications:**

1. From the ProWORX NxT Title Screen or the Offline Network Editor, on the **Controller** menu, click **Communication Setup**. The Communications Setup dialog box appears.



2. From the Interface list on the left, select **Modbus**.
3. Set the parameters for your Modbus communication system:
   - **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:** Sets the data transfer speed of your PC's serial port in bits per second. The PC and controller must be set to the same baud. Default is 9600.
   - **Parity:** Adds a check bit to a packet to make the number of binary ones always either odd (**Odd** parity) or even (**Even** parity). If parity is set to **None**, the check bit is not added. The PC and controller must use the same parity. Default is Even.
   - **Stop Bit:** Sets the number of bits at the end of a packet prepares the receiving device for the next packet. The PC and controller must use the same number of stop bits. Default is 1.
   - **Timeout:** Specifies the length of time the PC will wait for successful communication with a controller before displaying an error message. Default is 2 seconds.

- **Mode:** Identifies which data protocol (**R**emote **T**erminal **U**nit or ASCII) to use. Both the PC and controller must use the same data protocol. Default is RTU.

4. Do one of the following:
   - If your computer is connected directly to the controller, set the **Modem Type** drop-down menu to **None**, then click **OK**.
   - If your computer connects to the controller's Modbus port through a modem, set the parameters in the **Modem** box.

Modbus communications by modem

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

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

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

After configuring NxT 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, NxT asks you for a phone number to dial or, if your modem uses a dedicated line, opens a connection automatically.

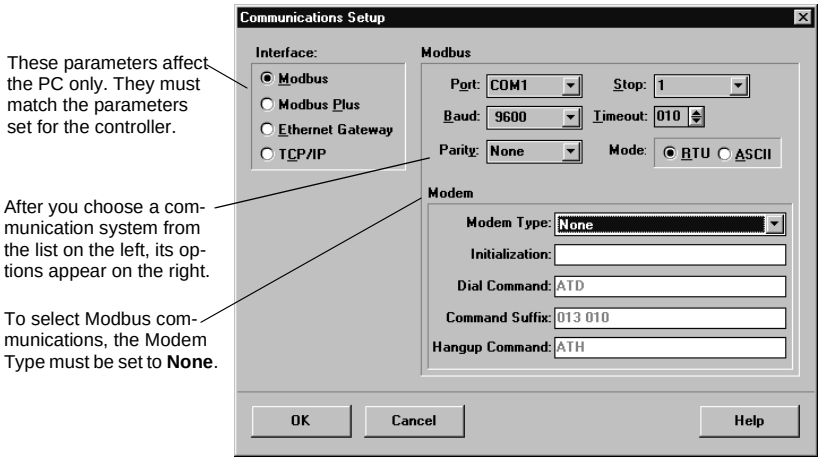
- If it finds a connection (or after opening one), you can choose to select a Modbus device or close the connection and open a new one.

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.

NxT uses the same information to configure modems as ProWORX*PLUS*, so users going from one program to the other can copy the settings directly.

➢ **To select and configure Modbus communications using modems:**

1. From the ProWORX NxT Title Screen or the Offline Network Editor, on the **Controller** menu, click **Communications Setup**.



2. From the Interface list on the left of the Communications Setup dialog box, select **Modbus**.

3. Set Modbus communication parameters for your network.

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.

❖ For more information, see "Controller configuration - Ports tab" on page 60.

- The Modbus **Port** setting must show the computer port connected to the modem; otherwise, NxT won't be able to locate it.

❖ For more information, see the **Modbus** table on page 36.

- The Modbus configuration 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 NxT 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).

  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
2		2 bits	
Parity: None		0 bits	0 bits
Odd or Even	1 bit		
Total	10 bits	10 bits	10 bits

4. Choose settings for your modem.

- **Modem Type:** Specifies the kind of modem connected to your computer.
  - **None** (default setting): for direct Modbus connections between the PC and controller without a modem. This setting disables the other modem options.
  - **Dial-Up:** For standard modems which do not require a password. **If you are unsure, try this setting first.** When you select a device, NxT 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, NxT 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.
- **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 NxT 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, NxT 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.

5. Click **OK**.

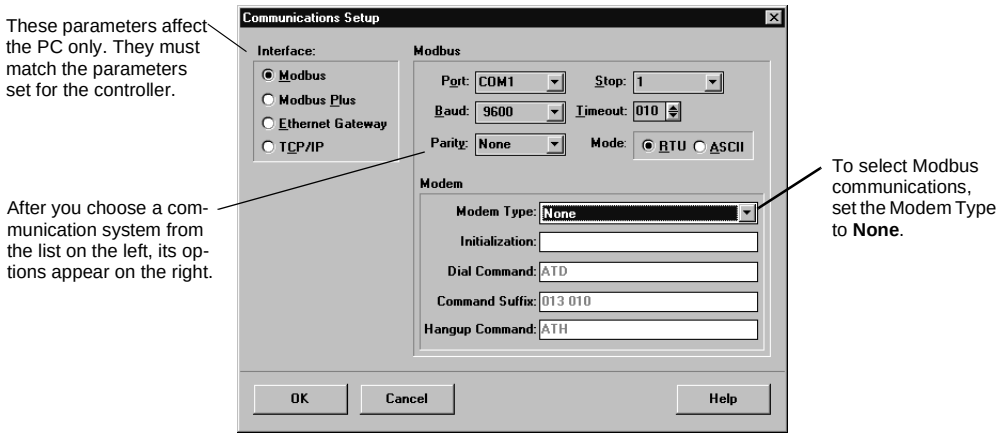
Configuring Modbus Plus communications

To connect to a Modbus Plus network, your computer uses a network adapter card such as an SA85.

Before configuring the Modbus Plus settings, make sure the card is installed properly and has a unique Modbus Plus address assigned to it through its DIP switches.

➢ **To select and configure Modbus Plus communications:**

1. From the ProWORX NxT Title Screen or the Offline Network Editor, on the **Controller** menu, click **Communications Setup**.
2. From the Interface list on the left of the Communications Setup dialog box, select **Modbus Plus**.



3. Enter your settings, then click **OK**:
   - **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 NxT must be the same as in the Device command in the PC's CONFIG.SYS file. Default is 0.
   - **Interrupt:** Sets (in hexadecimal) the location in the PC's memory of a software interrupt for an SA85 Network Card. The interrupt vector in NxT must be the same as in the Device command in the PC's CONFIG.SYS file. Default is 5C.
   - **Timeout:** Specifies the length of time the PC will wait for successful communication with a controller before displaying an error message. Default is 2 seconds.

Configuring Ethernet Gateway communications

Select this option if Modicon's EMBP Gateway bridges your computer's TCP/IP Ethernet to your controller's Modbus Plus network. Once configured for an Ethernet Gateway, NxT behaves as if it were connected directly to a Modbus Plus network.

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

➢ **To select and configure Ethernet Gateway communications:**

1. From the ProWORX NxT Title Screen or from the Offline Network Editor, on the **Controller** menu, click **Communications Setup**.
2. From the Interface list on the left of the Communications Setup dialog box, select **Ethernet Gateway**.
3. Enter your settings, then click **OK**:
   - **Gateway IP Address:** The TCP/IP address of the computer linking your PC's Ethernet to your controller's Modbus Plus network.
   - **Timeout:** Specifies the length of time the PC will wait for successful communication with a controller before displaying an error message. Default is 2 seconds.

Configuring TCP/IP Communications

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

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).

If you use TCP/IP networking to connect to your controllers:

- The Select Device dialog box doesn't accept controller addresses unless they are in standard TCP/IP format: four numbers ranging from 0 to 255 separated by periods (for example, 10.0.254.68 is valid).
- The Net Scan function in Select Device dialog boxes is unavailable.

- You must install the TCP/IP Configuration Extension into your controllers to set TCP/IP addresses for their communication cards.

❖ For more information, see "TCP/IP extension" on page 79.

➢ **To select and configure TCP/IP communications:**

1. From the ProWORX NxT Title Screen or from the Offline Network Editor, on the **Controller** menu, click **Communications Setup**.
2. From the Interface list on the left of the Communications Setup dialog box, select **TCP/IP**.
3. In Timeout, enter a type that specifies the length of time the PC will wait for successful communication with a controller before displaying an error message. Default is 2 seconds.
4. Click **OK**.

Selecting a device on the network

Before you can start programming, reading, or writing logic in the Online Editor, you must first select or *attach to* the controller you want to work with. Selecting a controller connects your PC to it so the Online Editor can read its ladder logic, Traffic Cop information, and configuration, and write your changes back to it. Unless you have selected **Confirm Address on Entry** in the database's setup, opening a database in the Online Editor connects you automatically to its controller.

❖ For more information, see "Editing the setup of a database" on page 19.

You cannot see or edit descriptors in the Online Editor unless you open a controller's database as well as attach to it. Also, changes made to a controller's logic as you work online do **not** appear in its database until they are *read* into it.

❖ For more information, see "Reading from a controller" on page 102.

You do not have to select a device to work in the Offline Editor because the controller's information is already stored in its database. You need to attach to a controller only when you want to read its ladder logic, write changes to it, monitor its health, or compare its logic to a database.

If your computer connects to your network through a Dial-Up or Dial-Chat modem (and you do not have an active connection), NxT asks you for a phone number to dial when you select a device. If your computer has a direct connection to your network, the Select Device dialog box appears immediately.

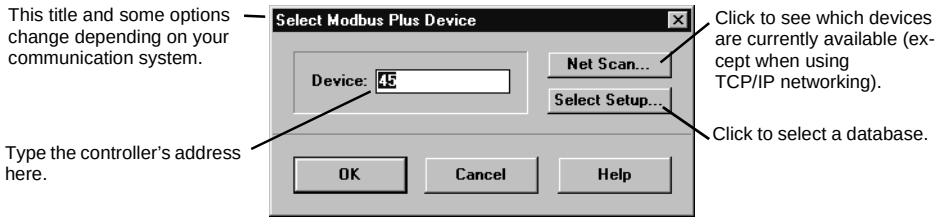
Ensure your communications setup is configured correctly before trying to select a device.

❖ For more information, see "Setting up communications for your PC" on page 35.

➢ **To select a device with a direct connection to a controller or network:**

1. Do one of the following:
   - From the ProWORX NxT Title Screen, on the **Controller** menu, click **Select Device**.
   - From the Network Editor, on the **Controller** menu, click **Change Device**.

   NxT displays the Select Device window.



2. In the Device field, type the address of a controller.

For	Type
Modbus	A Modbus address (1 to 247) for a controller on the local network. …a one-address Modbus "routing path", if your Modbus network is connected to a Modbus Plus network through a controller in Bridge Mode or a Bridge Multiplexer. The controller or BM85 interprets the Modbus address as a routing path using its internal Address Map or Implicit Attach Addressing.
Modbus Plus	A Modbus Plus address (1 to 64) for a controller on the local network. …a five-address Modbus Plus routing path to a device on another network. Type the address of the bridge first, followed by addresses for additional Modbus Plus networks, Modbus Plus devices on those networks, or Modbus devices bridged to the Modbus Plus networks. Separate the addresses in the routing path with commas (for example: 10, 3, 21, 0, 0).

For	Type
Ethernet Gateway	A Modbus Plus address (1 to 64) for a controller on the local network or a five-address Modbus Plus routing path for a device on another network, exactly as you would if your computer had a direct Modbus Plus connection.
TCP/IP	A TCP/IP address for a single device. In TCP/IP notation, an address is four numbers from 0 through 255 separated by periods (for example, 10.0.254.68 is a valid path).

- If you do not know the address of a device, but you do know the location and name of its database, click **Select Setup**. Navigate to the database, select it, then click **OK**. NxT automatically enters the controller's address in the Device field.
- If you do not know the address of a device or the name of its database, click **Net Scan** to scan for devices on the network.

Net Scan is not available if you are using TCP/IP networking.

3. Click **OK**. Once NxT attaches to your controller, it displays the Network Editor.

➢ **To select a device with a modem connection to a controller or network:**

1. Do one of the following:
   - From the ProWORX NxT Title Screen, on the **Controller** menu, click **Select Device**.
   - From the Network Editor, on the **Controller** menu, click **Change Device**.
   - **If your modem is already connected to a network or controller**, the Select Device dialog box appears.

   Select a Modbus device just as you would with a direct connection.

   Type:
   - A Modbus address (1 to 247) for a controller on the local network.

- A one-address Modbus "routing path", if your Modbus network is connected to a Modbus Plus network through a controller in Bridge Mode or a Bridge Multiplexer. The controller or BM85 interprets the Modbus address as a routing path using its internal Address Map or Implicit Attach Addressing.

To close the connection and dial a new phone number, click **Hangup**.

- **If you are using a dedicated line modem**, NxT automatically opens a connection. The Select Device dialog box appears.

To use a dedicated line modem, select **Line/J478** or **LineRTS** as your *modem type* in the Modbus Communications Setup dialog box.

❖ For more information, see "Setting up communications for your PC" on page 35.

Select a Modbus device just as you would with a direct connection.

Type:

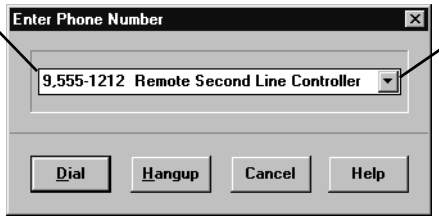
- A Modbus address (1 to 247) for a controller on the local network.
- A one-address Modbus "routing path", if your Modbus network is connected to a Modbus Plus network through a controller in Bridge Mode or a Bridge Multiplexer. The controller or BM85 interprets the Modbus address as a routing path using its internal Address Map or Implicit Attach Addressing.

To close the connection, click **Hangup**.

- **If NxT cannot find a modem connection** or if you close an old connection in the Select Device dialog, NxT displays the Enter Phone Number window:

When you select a device, NxT waits for you to type a phone number and an optional description. Type the phone number first. Use only numbers and these special characters:

- **Use a comma (,)** to pause the dialing for half a second.
- **Use a dash (-)** to separate the prefix and number.
- **Use a space ( ) to** mark the end of the phone number.



NxT stores a list of the phone numbers you enter. Click to select from it.

Type a short description after the number so you can recognize it in the list later. Separate the number and description by a <space>.

2. In the Enter Phone Number window, do one of the following:
   - Select a number from the drop-down menu.
   - In the field, type a phone number, then a short description for the controller you want to connect to.

     Separate the phone number and description with a space. The first space in the field marks the end of the phone number, so do not use spaces in the number itself. You can separate parts of the phone number with a hyphen (-).

     To pause dialing for half a second, type a comma. **Don't** use any other punctuation in the number.
3. Click **Dial**. NxT connects to the controller.
   - If you have selected **Dial-Up** as your modem type, the Select Device dialog box appears.

     Select a Modbus device just as you would with a direct connection.

     Type:
     - A Modbus address (1 to 247) for a controller on the local network.
     - A one-address Modbus "routing path", if your Modbus network is connected to a Modbus Plus network through a controller in Bridge Mode or a Bridge Multiplexer. The controller or BM85 interprets the Modbus address as a routing path using its internal Address Map or Implicit Attach Addressing.

     Click **Hangup** to terminate a connection. NxT automatically hangs up if you type a new number and click **Dial** or exit NxT. Hanging up can take up to three seconds.
   - If you have selected Dial-Chat as your **Modem Type**, the Dial-Chat window appears.

If NxT connects to your network but the Select Device dialog does not appear, your network or modem may be expecting a password. Try changing your modem type to **Dial-Chat**, then connect again.

❖ For more information, see "Choose settings for your modem." on page 39.

4. To terminate a connection, click **Hangup**. NxT disconnects you from the controller. This process can take up to three seconds.

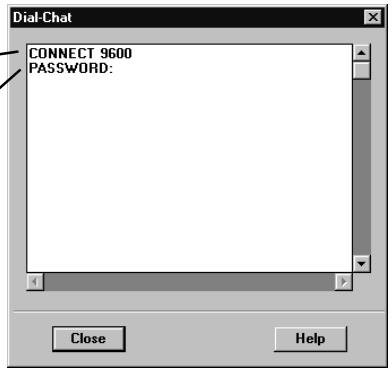
➢ **To type a password in the Dial-Chat window:**

If you've selected **Dial-Chat** as your modem type, the Dial-Chat window appears as NxT connects to your network through a modem. It lets you type a password so you can log on to your network.

❖ For more information, see "Choose settings for your modem." on page 39.

The first line displays information about the connection.

Type your password when you are prompted for it.



NxT sends each letter to the modem *as you type it.* You cannot correct a mistake by pressing BACKSPACE or DELETE, or overwrite an error by moving the cursor back using the arrow keys. Although these actions *appear* to work on the screen, they do not actually correct the error.

To correct a mistake, press ENTER and type your password again when you are prompted.

1. In the Dial-Chat window, carefully type your password when you are prompted for it.
   - Do not try to correct typing mistakes with pressing the BACKSPACE or DELETE keys and do not use the cursor keys to move around the screen. NxT sends each character to the modem as you type it, so although these actions may *appear* to fix an error on the screen, the modem does not understand the correction.
   - To correct a mistake, press ENTER and type your password again when you are prompted.
2. Click **Close** when your password is accepted.

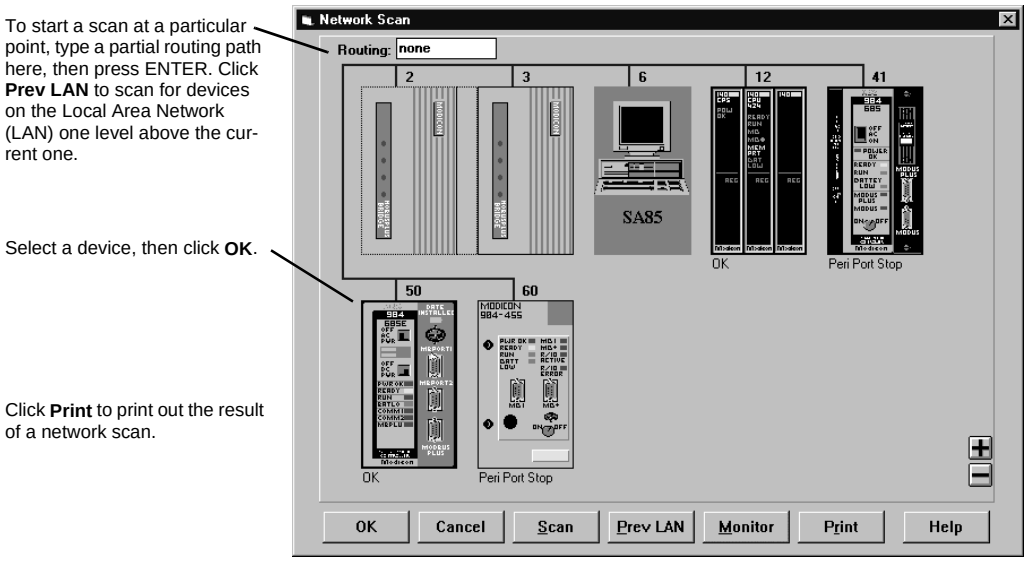
Performing a network scan

The Network Scan function finds controllers, bridges, bridge multiplexers, and other devices attached to Modbus and Modbus Plus networks. NxT displays the devices it finds by their address number and also shows their type, mode, and status.

If you use TCP/IP networking to connect to your controllers, the Net Scan function is unavailable.

➢ **To scan for devices on your network:**

1. In the Select Device window, click **Net Scan**. NxT displays the Network Scan window and begins to search for devices.



You do not have to wait for NxT to interrogate each device address. When NxT finds and displays the device you want, click **Cancel** to stop the scan. To rescan the network, click **Scan**.

2. Double-click the graphic of a device to select it or click the graphic, then click **OK**.

   - If you selected Modbus Plus or Ethernet Gateway in the Communications Setup dialog box, selecting a bridge or bridge multiplexer scans the network attached to that device.

➢ **To scan for devices one Local Area Network (LAN) above the current one:**

- Click **Prev LAN**.

  For example, if you typed 10, 15, 9 as the base routing path for a scan, click **Prev LAN** to scan for devices with a base routing path of 10, 15.

➢ **To check that status lights in the graphics match your controllers:**

1. Click **Monitor**. NxT scans the controllers continuously to make sure that the status lights in the on-screen graphics show the actual condition of your controllers. The graphics correctly show the Run and Battery Low lights on the controller. Underneath the controller, NxT shows whether the controller is OK or in Dim Awareness or if the controller is stopped, the Stop Code.
2. To stop monitoring, press ESC.

Clicking **Monitor** in the Net Scan window ***is not the same*** as selecting **Monitor** from the Tools menu. The first only checks the status lights of controllers. The second monitors the health of controllers and I/O systems.

❖ For more information, see Chapter 15 Monitoring your Hardware on page 317.

➢ **To see more or fewer devices in the Net Scan display:**

1. Click  to zoom out the view. You can see up to 30 devices at a time.
2. Click  to zoom in the view. NxT always displays at least 10 devices.

4 Configuring a Controller

In this chapter

Configuring a controller

Before you can put your controller to work, you need to configure it for your network and I/O devices. Most of this is done in the Controller Configuration dialog box.

The Controller Configuration dialog box is divided into five tabs, each with a different set of options. Select a tab by clicking it. The options available under each tab depend on the type of controller you selected for the database.

➢ **To configure a controller:**

1. In the Network Editor, from the **Configuration** menu, click **Configuration** or click  on the toolbar.
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.
   - **Controller:** Configures your controller's hardware options. You can also select a new controller here, if needed.
   - **User Loadables:** Moves *user loadables* from your Loadable Library into your database so they can be used with a controller, or removes them from the database.
   - **Loadable Library:** Converts *user loadables* into NxT format and adds or removes them from your Loadable Library.
3. Enter the new parameters.
4. Click **OK** to save your changes.

Controller configuration - General tab

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

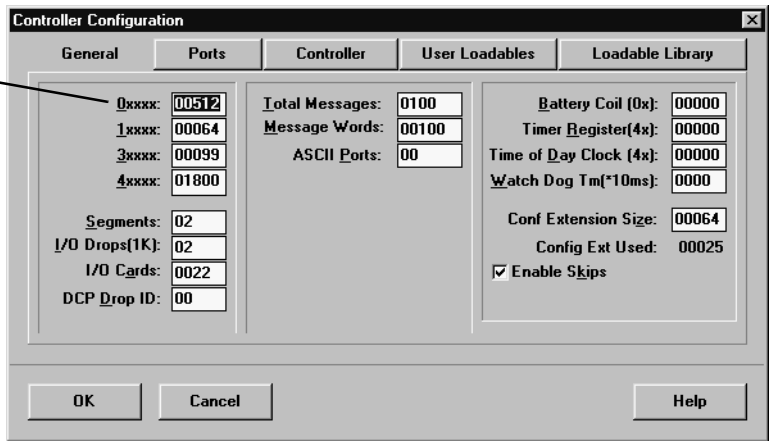
Configuring a controller's memory can be time consuming. It's a good idea to keep the controller's user's manual nearby in case you need to refer to it.

Before you begin, make sure you have the right type of controller selected for your database. The controller's type appears in the Status Bar at the bottom of the Network Editor. The options that appear in the General tab depend on the controller type, so if the wrong one is selected, you can spend time configuring options your controller does not support.

- To change the type of controller for your database, see "Controller configuration - Controller tab" on page 64.

Select the value you want to change, then type a new one.

The configuration options that appear depend on the controller you select in the Controller tab.



Set the following parameters for your controller:

Parameter	General tab – Left side of window
Registers	For each of the 0xxxx, 1xxxx, 3xxxx, and 4xxxx register fields, type the number of registers the controller will use. The controller polls all of these registers each scan, so to keep your controller scanning quickly, set up only as many registers as you need.
Segments	Type the number of logic segments the controller will use.
I/O Drops	Different controllers use different I/O drops: • If you have a controller that uses Channels instead of I/O Drops, type the number the number of channels the controller I/O will use. Channels always come in pairs, so this must be an even number. • If you have a Micro series controller in parent mode, type the number of children (0 to 4) associated with it. • If you have a Micro series controller in child mode, type the Child ID (1 to 4).
I/O Words	Quantum 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.
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.

Parameters	General tab – Center of window
Total Messages	Controllers that support ASCII messaging only: Type the total number of ASCII messages the controller will use.
Message Words	Controllers that support ASCII messaging only: Type the length (in machine words) of your controller's ASCII messages. One machine word is equal to two ASCII characters.
ASCII Ports	Type the number of ASCII ports on the controller. This setting must be an even number.
B984 Controller	Select the type of B984 controller you have: B884 or B886.
Input Latched	Select this option if you want the controller to freeze the input state on power-down. Inputs remain frozen for one scan when the controller is powered back up.

Settling Time	Group Settling Time allows you to set parameters for input digital filtering.
	• Each input value is polled through a filter based on a *time window*. You can set the duration of the time window between 200 microseconds (µs) and 19.8 ms (in 200 µs increments).
	• The module samples each input every 200 µs 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

Parameters	General tab – Right side of window
Battery Coil	Type the control address for the controller's battery.
Timer Register	Type the register used to store the controller's timer value.
Time of Day Clock	Type the register used to store the controller's clock value.
Watch Dog Timer	Type the timeout 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.

Configuration Extension Size	Type the amount of memory (in machine words) to be set aside for Configuration Extensions. Use the following information to calculate the minimum Configuration Extension size:
	• **Configuration Overhead:** 1 word
	• **Extension Overhead:**
	  • **TCP/IP:** 100 words
	  • **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

Skips	Select this option to enable skips (segments can be skipped during solves).

Smart Configurator (online only)

While online, when you change the settings for a previously- configured controller, ProWORX NxT can attempt a Smart Configuration. This lets you make configuration changes without losing any logic or Traffic Cop information stored in the controller.

The Smart Configurator prevents you from saving changes to the controller if:

- A reduction in controller memory for a particular setting reduces it below the amount used by logic.

  For example, the controller might contain logic addresses up to 10160, but you tried to reconfigure the number of 1xxxx addresses to 32.

- Modules are deleted that are used in logic.

If this happens, you have two choices:

- 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.

➢ **To change your configuration without a loss of information:**

1. The **Smart Configurator** dialog box displays the required address ranges for a successful Smart Configuration. Make a note of the values displayed in the "Conf" column.
2. Click **Configurator** to return to the controller configuration dialog box.This resets the configuration values to their original values.
3. Allocate controller memory again, making sure the amount for each address type meets or exceeds the values required.

   For example, if you need 100 3xxxx registers, you would have to allocate at least 100 addresses in the 3xxxx section.
4. Click **OK**. You're prompted to attempt a Smart Configuration.
5. Click **Yes**. The new configuration is saved, with no loss of logic data.

➢ **To change your configuration, accepting a loss of information:**

1. Click **Configurator** to return to the Controller Configuration dialog box. This resets the configuration values back to their original states.
2. Allocate controller memory again, using the values you require, then click **OK**. You're prompted to attempt a Smart Configuration.
3. Click **No**. The controller is reconfigured. Logic and Traffic Cop information will be lost.

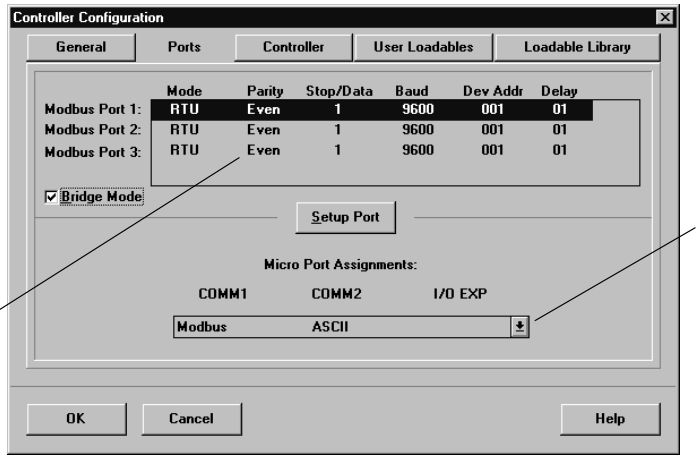
Controller configuration - Ports tab

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

The communication parameters for your PC and PLC must be the same. Set communication parameters for your PC in the Communications Setup dialog box.

❖ For more information, see "Setting up communications for your PC" on page 35.

Some controllers support Bridge Mode, which allows you to connect to a Modbus Plus network through their Modbus ports 1. If a Bridge Mode check box appears in the *Controller Configuration - Ports Tab* dialog, your controller supports Bridge Mode while its MEM/DIP switch is in the MEM position. Select to enable Bridge Mode.



➢ **To edit a communication port's parameters:**

The controller's MEM/DIP switch determines if its communication parameters are taken from memory or an internal DIP switch. If the MEM/DIP switch is in the DIP position, the controller ignores the parameters you set here.

1. Double-click the parameters of the port or select the parameters for the port, then click **Setup Port**.
2. For each parameter, select a value from its list:

Parameter	Description
Mode	Identifies which data protocol (**R**emote **T**erminal **U**nit or ASCII) to use. Both the PC and controller must use the same data protocol. Default is RTU. If you select **ASCII** protocol for a port, you can only configure its Parity, Stop/Data bits, and Baud settings.
Parity	Adds a check bit to a packet to make the number of binary ones always either odd (Odd Parity) or even (Even Parity). If parity is set to None, the check bit is not added. The PC and controller must use the same parity. Default is Even.
Stop/Data	Sets the number of bits at the end of a packet which prepare the receiving device for the next packet.The PC and controller must use the same number of stop bits. Default is 1.
Baud	Sets the data transfer speed of the controller's Modbus port in bits per second. The PC and controller must be set to the same baud rate. Default is 9600.
Head	Quantum controllers only: sets the slot number on the local drop backplane where the CPU resides.
Dev Addr	Assigns the Modbus address for the port. Default is 1.

Parameter	Description
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.

3. When you are finished, do one of the following:
   - Press ESC. The lists for each parameter disappear.
   - Click another port. The first port's lists disappear.
   - Click another Controller Configuration tab. The Ports tab closes.
   - Click **OK**. The Controller Configuration window closes.

➢ **To change Micro port assignments for 311, 411, 512, or 612 controllers:**

- Select port settings from the Micro Port Assignments drop-down 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 Edit Details section of the Controller tab in the Controller Configuration window.

❖ For more information, see "Editing a controller's hardware details" on page 65.

Configuring 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.

Set communication parameters for simple ASCII ports in the Ports tab of the Controller Configuration window.

Set the number of simple ASCII ports your controller has in the ASCII Ports field of the General tab. Otherwise, the ASCII ports will not appear in this window.

❖ For more information, see "Controller configuration - General tab" on page 55.

➢ **To edit simple ASCII port parameters:**

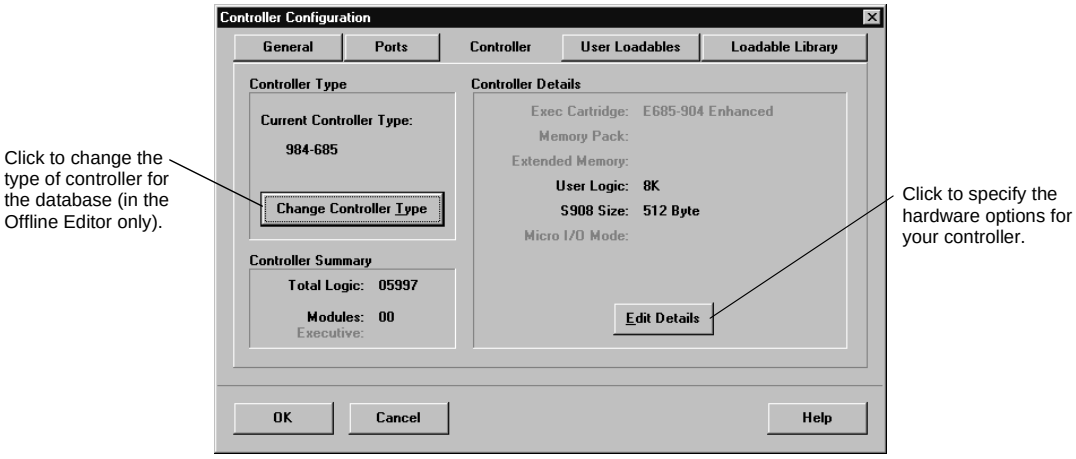
1. Do one of the following:
   - Double-click the parameters for the port to edit.
   - Select the parameters for a port, then click **Setup Port**.
2. For each parameter, select a value from its drop-down list:

Parameter	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 con-troller 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.

3. When you are finished, do one of the following:
   - Press ESC. The drop-down lists for each parameter disappear.
   - Click another port. The first port's drop-down lists disappear.
   - Click another Controller Configuration tab. The Ports tab closes.
   - Click **OK**. The Controller Configuration window closes.

Controller configuration - Controller tab

This tab in the Controller Configuration window contains a summary of the hardware options you have chosen for your controller, the amount of memory it has available for logic (in machine words), and how many User Loadable modules are currently loaded into it.



The controller tab also allows you to change your hardware options and controller type, if needed.

You can only change your controller type in the Offline Editor.

Editing a controller's hardware details

Many Modicon controllers accept executive cartridges or optional upgrades such as memory packs. These hardware options should be specified in the Edit Controller Details dialog box so that NxT can adjust your database for them.

➢ **To specify hardware options for a controller (Offline Editor only):**

1. In the Controller Tab, click **Edit Details**. NxT displays the options that your controller supports.
2. Select a new value from the drop-down lists.

Parameter	Description
Executive Cartridge	Cartridges which determine the controller's instruction set. Select the one installed in your controller.
Memory Pack	The amount of both Extended and User Logic memory in the controller. Select the amount installed in your controller.
Extended Memory	Additional memory providing 6xxxx registers. Select the amount installed in your controller.
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.
S908	Select either 512 or 1024 (1k) input and output points per drop.
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.

3. When you are finished, click **OK**.

Changing the type of controller for your database

Change your controller type. You may need to do this if you replace an older controller with a new one (say, that is faster or handles more I/O) but want to keep the same ladder logic, or if the wrong controller type was selected while setting up a database. For example, you can convert a database from a 584 controller to a 984 controller, or from S901 remote I/O to S908 RI/O.

The settings in the Configuration Window - General tab **must be valid** for the new controller or NxT does not allow the change.

- For information on adjusting the General tab settings, see "Controller configuration - General tab" on page 55.

➢ **To change the controller type for a database (Offline Editor only):**

1. In the Controller tab, click **Change Controller Type**. The Change Controller Type dialog box appears.
2. From the list on the left, select a controller group. A list of controllers in that group appears on the right.
3. From the list on the right, select the type of controller for the database, then click **OK**.

Controller configuration - User loadables tab

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 database to be used.

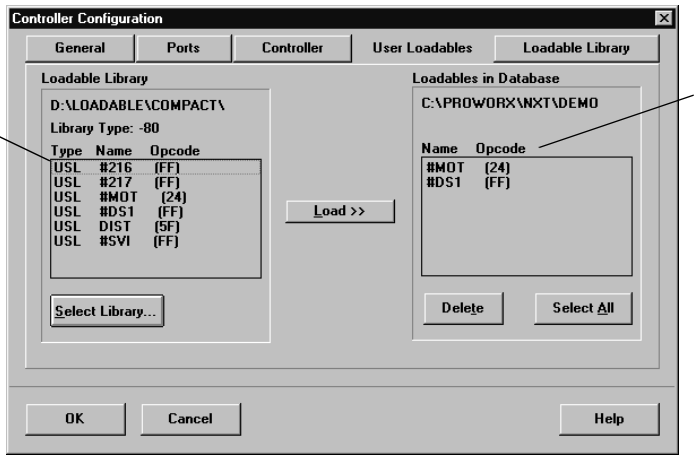
You can only copy loadables that are already part of a loadable library. Using a loadable is a two-step process: reading it into a loadable library, then copying it from the library into the controller or database. To read a loadable from a disk, translate it into NxT format and place it into a library.

❖ For more information, see "Controller configuration - Loadable library tab" on page 69.

In the User Loadables Tab, you copy user loadables from a *loadable library* into a controller or database. You can also delete loadables from your controller or database, if needed.

Select a loadable from the list and click **Load** to copy it into your database (Offline) or controller (Online).

Click **Select Library** to switch to another library.



Loadables in the controller (Online Editor) or database (Offline Editor) are listed here.

To delete a loadable, select it, then click **Delete**.

➢ **To copy a user loadable into a controller or database:**

1. In the User Loadables tab, click **Select Library**. The Open dialog box appears.
2. Type the path and file name of the library or navigate to it, then click **OK**. NxT reads the loadables in the library, and displays them in the left column.

Loadables are meant to be used only with a certain controller. If you try to copy a loadable into the wrong type of controller, you receive an error message. The Library Type line tells you which family of controllers the library is meant for: 584, A, B, X, or x80 (which includes controllers such as 381, 685, 785e, and so on).

3. Select the loadables you want to place into your database or controller from the list.
4. Click **Load**. NxT copies the loadables into the database or controller, then displays them in the right column.

Each loadable is identified in the controller by a unique number called an *opcode*. If a loadable's opcode is already used in the database or controller, NxT prompts you to select a new one.

5. Click **OK**.

➢ **To delete a user loadable from a controller or database:**

You can only delete a loadable from your controller or database if it is not used anywhere in your ladder logic. If you try to delete a loadable that is still in use, you receive an error message.

1. In the right column of the User Loadables tab (labelled Loadables in Controller or Loadables in Database), select the loadable to delete.

   Click **Select All** to delete all loadables in a controller or database.
2. Click **Delete**.
3. When NxT prompts you, click **Yes** to confirm the deletion or **Cancel** to exit without deleting the loadables.

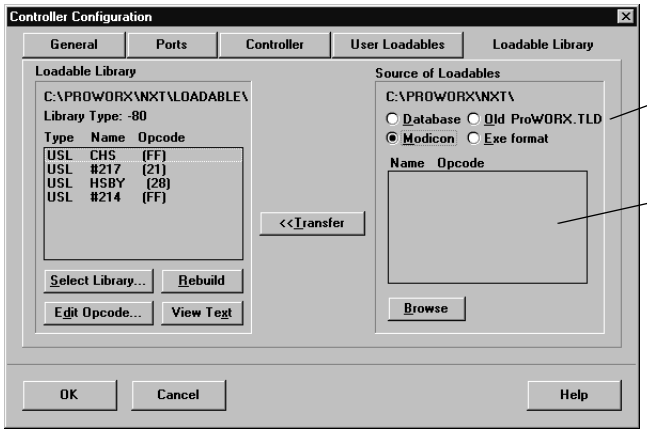
Controller configuration - Loadable library tab

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

In Loadable Library tab, you read a loadable from disk, translate it to NxT format, and move it into a library. You can read loadables from an existing database, a third-party disk or a ProWORX .TLD library file.

Reading a user loadable into a loadable library does not copy it into your controller or database. Using a loadable is a two-step process: reading it into a loadable library, then copying it from the library into the controller or database.

❖ For more information, see “Controller configuration - User loadables tab” on page 67.



➢ **To transfer loadables from a source file into a library:**

1. In the Source of Loadables column, select the type of source file (the file containing the user loadables) to translate to NxT format. You can read loadables from an existing database, a third-party disk, or a ProWORX .TLD library file.
2. Click **Browse** to navigate to the source file, then click **OK**. Most often, source files from other vendors come on floppy disks. NxT reads the loadables in the source file, then displays them in the right column.
3. Select the loadables you want to transfer to a library. You can select more than one loadable at a time.

4. In the **Loadable Library** column, click **Select Library**. The Open dialog box appears.
5. Type the path and file name of a library or navigate to it, then click **OK**. If NxT can't find the path and library name you typed, a new library is created with that name.
6. Click **Transfer**. NxT translates the loadables and copies them into the library.

➢ **To display the manufacturer's notes for a loadable (if available):**

1. Select a loadable from the **Loadable Library** column on the left.
2. Click **View Text**. If it is available, the manufacturer's documentation for the loadable appears.
3. To close the window, click **OK**.

Editing the opcode for a user loadable

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

➢ **To edit the opcode for a user loadable:**

1. Select a loadable from the **Loadable Library** column on the left.
2. Click **Edit OpCode**. The Edit Opcode window appears, displaying the Function Name, Current Opcode associated with the loadable, and a list of additional opcodes to select from.
3. Select an opcode, then click **OK**.

Rebuilding a damaged library

On rare occasions, a library of loadables can become damaged (for example, when a computer crashes and files are corrupted). NxT allows you to recreate a library from its .USL and .MSL files.

➢ **To rebuild a damaged library:**

- Click **Rebuild**. NxT recreates the damaged library. This operation may take a few moments.

Don't rebuild libraries that are not damaged. Doing so may cause certain loadables not to function or to function erratically.

Configuring ASCII messages

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 NxT's ASCII Message window to enter and edit the messages you want your controller or database to send.

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

- Confirm that your controller supports them.
- In the General tab of the Controller Configuration window:
  - Set the **Total Messages** field to the number of messages you want to use.
  - Set the **Message Words** field to the number of machine words you want to allocate for each message. One word is equal to two ASCII characters. Remember that the SPACEBAR counts as one character.

❖ For more information, see "Controller configuration - General tab" on page 55.

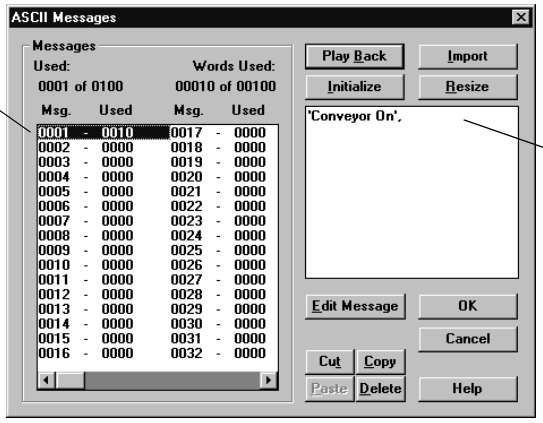
- Ensure your ASCII ports are configured correctly in the Ports tab of the Controller Configuration window.

❖ For more information, see "Controller configuration - Ports tab" on page 60.

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).

➢ **To display a controller or database's current ASCII messages:**

1. From the Network Editor, on the **Configuration** menu, click **ASCII**. The ASCII Messages window appears.



To type a new message or edit an existing one, select it, then click **Edit Message**.

NxT displays the codes for the selected ASCII message.

2. Select a message to view. The raw codes for the message appear on the right.
3. Click **Play Back**. The Message Playback window appears, showing the message as it will appear on a screen, on printer output, or in a text file on a hard drive.

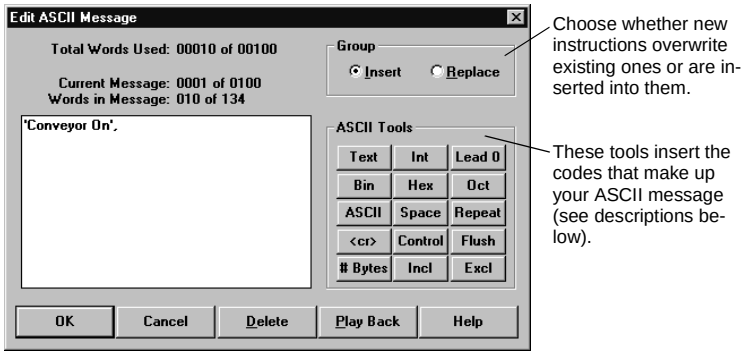
   Click **Next** and **Previous** to scroll through the other messages in the controller or database.
4. Click **Close** to close the Message Playback window.

➢ **To remove the ASCII messages in the controller:**

- Click **Initialize**. All the ASCII messages are deleted from the controller.

➢ **To edit the ASCII messages in a controller or database:**

1. From the Network Editor, on the **Configuration** menu, click **ASCII**. The ASCII Messages window appears.
2. Select a message to edit, then click **Edit Message** or double-click a message to edit. The Edit ASCII Message window appears.



3. Select **Insert** to add new instructions before the selected instruction or **Replace** to overwrite the selected instruction with new instructions.
4. Enter your edits with the ASCII Tools:

Tool	Description
Text	Enters up to 128 text characters (except for 584 controllers, which accept up to 254 text characters). Spaces at the end of the text are ignored.
Int	Inserts an *integer field*, a placeholder for an integer which is defined in ladder logic by a WRIT instruction.
Lead 0	Inserts a *leading zero integer field*, a placeholder for a leading zero integer which is defined in logic by a WRIT instruction.
Bin	Inserts a *binary field*, a placeholder for a binary number which is defined in ladder logic by a WRIT instruction.
Hex	Inserts a *hexadecimal field*, a placeholder for a hexadecimal number which is defined in logic by a WRIT instruction.
Oct	Inserts an *octal field*, a placeholder for an octal number which is defined in ladder logic by a WRIT instruction.

Tool	Description
ASCII	Inserts an *ASCII field*, a placeholder for ASCII characters defined in ladder logic by a WRIT instruction. You can also use this function to send ASCII characters you cannot enter into a text field (for example, line feeds and tabs).
Space	Inserts from one to 99 consecutive blank spaces. These are represented in code by the number of spaces followed by the symbol X (for example, the code for 42 spaces is 42X).
Repeat	Repeats an item. Click Repeat to start the function. NxT prompts you for the number repetitions. Type the items to repeat, then click Repeat again to end the function.
Control	Inserts a three-digit decimal control character (ranging from 000 - 255) or a three-digit octal control character (ranging from 000 - 377).
<cr>	Inserts a carriage return, represented by the symbol "/".
Flush	The message buffer contains a 256-byte data field. These bytes contain data values ranging from 0 to FF hexadecimal. The four *Flush* commands (*Flush*, # *Bytes*, *Incl*, and *Excl*) clear the message buffer. The Flush clears all characters.
# Bytes	This flush command removes from 1 to 255 bytes from the beginning of the message buffer.
Incl	This flush command 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.
Excl	This flush command clears the buffer until a match is found for the terminating character pair. It doesn't flush the match characters. Excl uses 2 registers: the first holds a type identifier and the second hexadecimal values of the terminating pair. Hexadecimal values range from 0000 to FFFF. The controller searches for this range in the buffer. If the second character of the matched pair is not a NUL (00), the next character in the buffer must be equal or the search continues. If the last character tests equal or null, the flush is performed up to, but not including the matched terminators.

5. Click **Play Back** to preview the message as it will appear on a screen, on printer output, or in a text file on a hard drive.
6. Click **OK** to save your changes or click **Cancel** to exit without saving your changes.

➢ **To delete ASCII messages from a controller:**

1. Confirm that the controller is stopped.
   ❖ For instructions, see "Stopping the controller" on page 110.
2. In the ASCII Message window, select a message to delete.

   To delete a range of messages, select the first one, then hold the SHIFT key and click the last one. All the messages in the range will be selected.
3. Click **Delete**. NxT prompts you to confirm the deletion.

In the Online Editor, click **Initialize** to delete all the messages in a controller.

In the Online Editor, you can adjust the amount of memory a controller has set aside for ASCII Messages.

➢ **To change controller memory for ASCII messages:**

1. In the ASCII Message window, click **Resize**.
2. Type the amount of memory (in machine words) to set aside in the controller for ASCII messages, then click **Resize**.

➢ **To import ASCII messages from another database:**

1. From the Network Editor, on the Configuration menu, click **ASCII**. The ASCII Messages window appears.
2. Click **Import**. The Import Messages window appears.
3. Select a database from the list, type the database's path and file name, or click **Browse** to navigate to it.
4. In the **Source** area, select a range of messages to import.
5. In the **Destination** area, type a location for the first imported message.

The other messages follow sequentially. The range for this value is from 1 through the maximum number of messages your controller can support, less the total number of messages you are importing.

6. Select **Replace Always** to overwrite a message without being warned or **Prompt on Replace** to receive a warning message when an existing message is about to be overwritten.
7. Click **Start Import**. If you have enabled Prompt on Replace, a warning dialog box appears when an existing message is about to be replaced by an imported one. Click **Yes** to replace the current message or **No** to skip the message and continue with the import.

Using configuration extensions

Configuration extensions are utilities which can be loaded into a controller.

Before using a configuration extension, set the configuration extension size in the General tab of the Controller Configuration window.

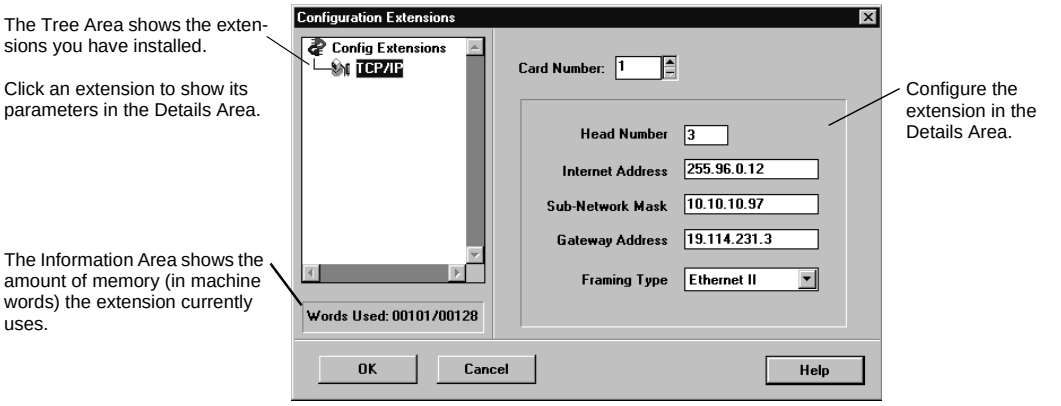
❖ For more information, see Controller configuration - General tab on page 55.

Available configuration extensions include:

- **TCP/IP:** Configures controllers to connect to a TCP/IP network through a communication card.
- **Data Protect:** Prevents specific blocks of 0xxxx and 4xxxx references from being modified by general Modbus data write commands.
- **S980 Address:** Specifies the S980 station address.
- **Quantum Hot Standby:** Allows additional configuration of the Quantum Hot Standby setup.
- **Peer Cop:** Allows you to configure data blocks to be transferred between controllers on a Modbus Plus network.
- **VME Bus:** Configures a VME controller for communications with a VME network.
- **Profibus:** Configures a Quantum controller for Profibus communications.
- **SY/MAX:** Configures a Quantum controller for communication with SY/MAX drops.
- **Cyclic Data Exchange:** Allows you to configure data blocks to be transferred between controllers on a TCP/IP network.

➢ To add a Configuration Extension:

1. From the Network Editor, on the **Configuration** menu, click **Config Extensions**. The Configuration Extensions dialog box appears.



The dialog box is divided into three areas:

- **Tree Control:** Shows the extensions are already configured for this controller.
- **Details:** Displays extension-specific parameters.
- **Information:** Displays the machine words of memory used (out of total words allocated).

2. Click **Add Extension** or right-click in the Tree Control area, then select **Add Extension**. The Add Configuration Extension dialog box appears.
3. Select the extension you want to add by clicking it, then click **OK**. You're returned to the Configuration Extensions window.
4. Click **OK** to complete the addition.

➢ **To delete an extension:**

1. From the Network Editor, on the **Configuration** menu, click **Config Extensions**. The Configuration Extensions window appears.
2. Click **Delete Extension** or right-click in the Tree Control area, then select **Delete Extension**. The Delete Configuration Extension dialog box appears.
3. Click the extension you want to delete, then click **OK**. You are returned to the Configuration Extensions window.
4. Click **OK** to complete the deletion.

TCP/IP extension

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.

➢ **To set up the TCP/IP configuration extension:**

1. From the Network Editor, on the **Configuration** menu, click **Config Extensions**. The Configuration Extention dialog box appears.
2. In the Tree Control area of the window, click **TCP/IP**. The TCP/IP configuration parameters appear in the **Details** area.
3. In the **Card Number** field, select a communication card to set up.

Different controllers support different numbers of communication cards:

- Quantum 113 Rev. 2 and 213 Rev. 2 controllers support two cards
- Quantum 424 Rev. 2 supports up to six.
- M1E Momentum controllers only support one card and the Head Number is fixed at 1.

4. In the **Head Number** field, type the number (from 1 - 16) of the slot where the communication card is installed. If you have not yet installed a communications card or you do not want use an installed card, type **0**.
5. Type the TCP/IP address you want the card to have into the **Internet Address** field.

6. If your network uses a sub-network mask, type its address into the **Sub-Network Mask** field. This address is assigned by your network administrator when a network gateway is set up. It, in conjunction with the TCP/IP address, identifies which network the controller is on.
7. If a gateway connects the PLC to your PC's network, type its address in the **Gateway** field. A gateway connects two networks that would not normally be able to communicate with each other. Its address is assigned by your network administrator when the gateway is set up.
8. Select the framing protocol your network uses. Your network administrator determines this protocol when the network is set up.
9. Click **OK**.

Data Protect extension

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.

➢ **To edit a data protect extension:**

1. From the Network Editor, on the **Configuration** menu, click **Config Extensions**. The Configuration Extensions window appears.

If the Data Protection extension does not appear in the Tree Control area, it is not yet installed.

2. In the Tree Control area of the window, click **Data Protection**. The Data Protect dialog box appears in the **Details** area of the window.
3. In the **Start (0X)** field, type the first address in the unprotected range.
4. In the **Length** field (of the 0x area), type the number of references to be left unprotected. NxT shows the address ranges left protected (the ranges of addresses outside the range you just specified).

   Suppose you type a Start value of 00017, and a Length of 1024. The first *protected* range will be from 00001 (the first possible value) to 00016 (the last value before the Start value you entered).

There will then be an *unprotected* range from 00017 to 01040 (00017 + 1024). All references above 01041 are also *protected*.

If you enter a length that is too high (goes beyond the addresses configured for the controller) NxT automatically sets the value to include all addresses above the Start field.

5. In the **Start (4X)** field, type the first address in the unprotected range.
6. In the **Length** field (of the 4xxx area), type the number of addresses to be left unprotected. NxT shows the address ranges left unprotected (the ranges of addresses outside the range you just specified).
7. Click **OK**. With Symbols turned on in system Preferences, when you enter an address to be protected and the address has a symbol reference, the symbol appears. If you forget the address for the symbol displayed, you can disable the symbol function in system Preferences.

S980 Address extension

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.

If the S980 Address extension does not appear in the Tree Control area, it is not yet installed.

➢ **To enter the S980 Address:**

1. From the Network Editor, on the **Configuration** menu, click **Config Extensions**. The Configuration Extensions window appears.
2. In the Tree Control area of the window, click **S980 Address**. NxT displays the current S980 address in the **Details** area of the window. If this is the first time you have activated the S980 Address function, a default address of 000000000 appears.
3. Type the new S980 address.
4. Click **OK**.

Quantum Hot Standby extension

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

If the Quantum Hot Standby extension does not appear in the Tree Control area, it is not yet installed.

➢ **To configure the Quantum Hot Standby extension:**

1. From the Network Editor, on the **Configuration** menu, click **Config Extensions**. The Configuration Extensions dialog box appears.
2. Select the HSBY extension from the tree control. If the HSBY extension is not in the Tree Control, you have to add it, by clicking **Add Extension**, then selecting **Quantum Hot Standby**.
3. In the **Command Register Address** field, type the 4xxxx address of the command register used to configure the hot standby system. 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.
4. In the **Non-Transfer Start Address** field, type the starting address of the range of registers that are not to be transferred from the primary controller to the standby. 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.

5. In the **Non-Transfer Area Length** field, type the length of the non-transfer register range. This value can be from 4 through the total number of registers configured in the controller.
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. In the **Scans Needed to Transfer** field, type the number of scans (1-255) needed for the primary controller to transfer the extra transfer tables to the standby, then click **OK**.

VME Bus extension

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.

If the VME Bus extension does not appear in the Tree Control area, it is not yet installed.

➢ **To configure an installed Quantum VME Bus extension:**

1. From the Network Editor, on the **Configuration** menu, click **Config Extensions**. The Configuration Extensions dialog box appears.
2. Select **VME Bus** from the list.
3. Type the appropriate value in the **Slave Interrupt Level** field. Boards on a VME Bus can send and respond to messages on seven interrupt levels, numbered from 1 to 7. This field determines which interrupt level the board uses when it's acting as a slave.
4. Type a value between 1 and 255 in the **Status ID** field. When the VME controller receives an interrupt while acting as a slave, this is the value it sends.
5. 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. 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).
7. Select the appropriate value for **Master VMEBus 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).

8. 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.
9. Click **OK**.

Profibus extension

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

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

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

Installing the Profibus configuration extension

Step 1

Ensure your database is configured properly for your Quantum controller by checking:

- Your controller has Revision 2.xx or later executive Flash RAM.
- Enough controller memory is set aside for configuration extensions. If you do not have enough configuration extension memory available, you will receive an error when you transfer your Profibus configuration into your NxT database (Step 5).
- Your Profibus DP or Profibus FMS card is configured in the Traffic Cop.

Step 2

Start the NxT Profibus Utility and create a Profibus Station from your NxT database's .MDF file.

A Profibus Station is a collection of Profibus configuration files contained in a specific directory structure. These files contain such information as:

- Controller configuration;
- Profibus bus and communication parameters;
- Profibus network topology; and
- Profibus-to-Modicon address maps.

➢ **To create the Profibus Station in the NxT Profibus Utility:**

1. In the **.MDF File** box of the NxT Profibus utility, type the name and path of your NxT database's .MDF file or click **Browse** to navigate to it.
2. In the **Profibus Station** area, select a drive for your Profibus Station from the drop-down menu.
3. Do one of the following:
   - Use existing Plant and Station Directories by selecting them from the drop-down menus.
   - Create new directories by typing a Plant name in the **Plant Directory** box, then a Station name in the **Station Directory** box.
4. In the **Options** area, select **Create a Profibus Station** for use with the SPU Software.
5. Click **Start**. The Profibus Utility creates a Profibus Station in the target directories with information from the .MDF file. Its progress is displayed in the Status box.

Step 3

Start the PROFI-KON software you received with your Profibus hardware and configure your Profibus network with it. Refer to its manual for more information. Save your work as a .CNF file to use in Step 4.

To set up a Profibus network, you must have Softing's PROFI-KON software. You received the correct version with your Profibus hardware:

Network	Software	Also called
Profibus DP	PROFI-KON-DP	SPU832
Profibus FMS	PROFI-KON-FMS	SPU932

When you save your work, PROFI-KON generates the .CNF file required by the SPU931 software, which you use in the next step.

Use PROFI-KON-DP to:

- Load device-specific data from .DDB files;
- Set Profibus Master/Slave communication parameters and addresses;
- Edit bus parameters; and
- Check the configuration.

Use PROFI-KON-FMS to:

- Load device master data from .DMD files;
- Edit bus parameters, vectors, communication relationships, and object dictionaries; and
- Define your network's topology.

Step 4

Start the SPU931 software you received with your Profibus hardware. Navigate to and open the Profibus Station you created in Step 2, then the .CNF file you created in Step 3. Map Profibus addresses to Modicon addresses. Refer to the SPU931 manual for more information. Save your work to your Profibus Station.

To set up a Profibus network, you must have Modicon's SPU931 software. You should have received the correct version of Modicon's SPU931 software with your Profibus hardware.

SPU931 requires two files:

- A .CFG file created by the Profibus Utility as part of your Profibus Station; and
- A .CNF file generated by the PROFI-KON software.

SPU931 can only save a Profibus configuration to an existing .CFG file, not create a new one. Create a .CFG file with the Profibus Utility before configuring your Profibus network with SPU931.

When you save your work, SPU931 updates the Profibus Station's .CFG file. The Profibus Utility then imports the updated information from the .CFG file back into your NxT database in Step 5.

Use SPU931 to:

- Map Profibus I/O points and diagnostics to registers in your controller's memory; and
- Assign bus controllers and the map the topology of the bus.

Step 5

In the Profibus Utility, transfer information from the updated Profibus Station into your NxT database. NxT now shows the Profibus configuration extension in the Configuration Extensions area.

➢ **To transfer a Profibus Station:**

1. In the **.MDF File** box, type the name and path of your NxT database's .MDF file or click **Browse** to navigate to it. The Profibus Utility transfers the Profibus configuration to this file.
2. In the **Profibus Station** area, select the drive where your Profibus Station is located from the drop-down menu.
3. Select your Profibus Station's **Plant** and **Station Directories**, from the drop-down menus. The Profibus Utility reads the Profibus configuration from the .CFG file in the Station Directory.
4. In the **Options** area, select **Move Profibus configuration to ProWORX database**.
5. Click **Start**. The Profibus Utility transfers the Profibus configuration from the Station Directory to your database's .MDF file. Its progress is displayed in the Status box. NxT now shows the Profibus configuration extension in the Configuration Extensions area.

Editing your Profibus configuration

To edit your Profibus configuration:

- Without changing your controller configuration, start again at Step 3.
- After changing your controller configuration, start again at Step 2.

Peer Cop extension

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 (i.e. 32*16) I/O points can be transferred to or read from a controller at a time. Peer Cop is supported by the A145 and all E-Series and Quantum controllers. Up to 3 Links of the Peer Cop can be configured and edited.

Adding links in the Peer Cop extension

The Peer Cop extension can be configured for up to 3 links. When you add a link you will have access to the 64 possible devices on another peer-to-peer network.

- Link 1 is the internal link; all devices on the local Modbus Plus network can be accessed from Link 1.
- Links 2 and 3 are remote links through S985 cards.

➢ **To add a Peer Cop link**

1. From the Network Editor, on the **Configuration** menu, click **Config Extensions**. The Configuration Extensions window appears.
2. In the Tree Control area of the window, click **Peer Cop**. Peer Cop details appear in the **Details** area of the window
3. Click **Add a New Link**. When you add a new link, the new link is also automatically added to the tree control display. Each link includes a Global I/O and Specific I/O transfer.

Editing links in the Peer Cop extension

You can edit the following components of the link:

- General link information;
- Global I/O; and
- Specific I/O.

General link information

The three general components of a link are the **Last Value**, **Timeout**, and **Head Number**.

- **Last Value** specifies whether or not to hold the last value. When **On**, 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).
- **Timeout** specifies the health timeout 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 timeout 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).
- **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.

Global I/O

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.

There are two components to Global I/O:

- **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).

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

Global Output

Global Output broadcasts the specified range of discretes or registers onto the Modbus Plus network. Each device used to access the data must also be configured to accept Global Input from the broadcasting device.

➢ **To edit the Global Output:**

1. From the Network Editor, on the **Configuration** menu, click **Config Extensions**. The Configuration Extensions window appears.
2. In the Tree Control, select the Global I/O to edit by clicking it. The **Global I/O** fields appear in the Details area of the window.
3. Do one of the following:
   - Select the **Global Output** field by clicking it, then click **Edit**.
   - Double-click the **Global Output** field.

   The Global Output dialog box appears.
4. In **Length**, type the length (1-32) of the address range (i.e., the number of registers to broadcast).
5. In **Reference**, type the starting address (5 or 6 digit) for the range to broadcast.
6. If required, click **BIN/BCD** to toggle between binary and binary coded decimal modes.

Global Input

Controllers use the Global Input function to receive global data from any device communicating peer-to-peer on a Modbus Plus network.

➢ **To set a Global Input:**

1. From the Network Editor, on the **Configuration** menu, click **Config Extensions**. The Configuration Extensions dialog box appears.

Ensure the necessary Peer Cop links are defined before continuing.

2. In the Tree Control, select the Global I/O to edit by clicking it. The **Global I/O** fields appear in the **Details** area.
3. Select a **Global Input**, then click **Edit** or double-click the **Global Input** you want to edit. The Global Input dialog box appears.
4. In **Index**, type the starting point (1 to 8) of the broadcast data to read.
5. In **Length**, type the number of words (1 to 32) to read forwards from the Index value.

   For example, suppose the source controller is broadcasting 10 words of data using the Global Output function, but the receiving controller only uses words 3 to 7. You would type an **Index** value of 3 and a **Length** of 5.

   The length plus the index must be less than or equal to 33. In the **Reference** field, type the destination for the received data (i.e., where the received data is to be stored).
6. Select either **BIN** (default) or **BCD**. One entry is available for each device (1-64).

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.

➢ **To edit subfields:**

1. From the Configuration Extensions dialog box, select the **Global I/O** of the link you want to edit by clicking it.
2. Click the global input you want to edit from the **Global Input** area of the Configuration Extensions window.
3. Click **Subfields**. The Global Input Subfields window appears with a list of the subfields for the selected input. Select the subfield you want to edit.
4. Do one of the following:
   - Select a subfield and click **Edit**.
   - Double-click the subfield.

   The Global Input dialog box appears when you.
5. Type the new global input parameters.
6. (Optional) Click **Data** to view the data currently in the input registers.

Specific I/O

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

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

➢ **To edit a Specific Output:**

1. From the Network Editor, on the **Configuration** menu, click **Config Extensions**. The Configuration Extensions window appears.

Ensure the necessary Peer Cop links are defined before continuing.

2. In the Tree Control, click the Specific I/O to edit. The **Specific Input** and **Specific Output** fields appear in the **Details** area of the window.
3. In the **Specific Output** list, select a source controller (i.e., the output device) by clicking it.
4. Click **Edit**. The Specific Output window appears, with the selected controller shown in the **Device** field.
5. In the **Length** field, type the length of the data block (1-32) to be sent to the destination controller.
6. In the **Reference** field, type the starting address for the block of data to be sent to the destination controller.
7. Click **OK** to close the Specific Output window.
8. If required, click **BIN/BCD** to toggle between binary and binary coded decimal.
9. Click **OK**.

➢ **To edit a specific input:**

1. From the Network Editor, on the **Configuration** menu, click **Config Extensions**. The Configuration Extensions dialog box appears.

Ensure the necessary Peer Cop links are defined before continuing.

2. In the Tree Control, click the Specific I/O to edit. The **Specific Input** and **Specific Output** fields appear in the **Details** area of the window.
3. In the **Specific Input** list, select a destination controller (for example, the input device) and click **Edit**. The Specific Input dialog box appears, with the selected controller shown in the **Device** field.
4. In **Length**, type the length of the data block (1-32) to be received from the source controller.
5. In **Reference,** type the starting address of the block of data to be placed from the source controller.
6. Click **OK** to close the Specific Input dialog box.
7. If required, click **BIN/BCD** to toggle between binary and binary coded decimal.
8. Click **OK**.

➢ **To view the data for a reference address:**

1. In the Tree Control, click the Specific I/O to edit. The **Specific Input** and **Specific Output** appear in the Details area of the window.
2. In the **Specific Output** or **Specific Input** box, select a reference and click **Data**. Data associated with the reference address appears. This is a read-only function—you cannot edit the data.

Clearing and deleting links

There are two different functions available to reset or remove links:

- Clearing links deletes all Global I/O and Specific I/O entries within a link, but does not delete the link itself.
- Deleting a link removes the link itself from Peer Cop.

➢ **To clear all references within a link (keeping the link in the Peer Cop extension):**

1. From the Network Editor, on the **Configuration** menu, click **Config Extensions**. The Configuration Extensions window appears.
2. In the Tree Control area, select the Peer Cop link you want to clear. You can click the link itself, or the Global I/O or Specific I/O in the link.
3. Click **Clear Link**. NxT will prompt you to confirm the operation.
4. Click **OK**.

➢ **To delete a link from the Peer Cop extension:**

You cannot delete Link 1, the internal link.

1. From the Network Editor, on the **Configuration** menu, click **Config Extensions**. The Configuration Extensions window appears.
2. Do one of the following:
   - In the Tree Control, select the link you wish to delete by clicking it, then click **Delete Link**.
   - In the Tree Control, select Peer Cop by clicking it, then click **Delete a Link**.

   The Delete Link window appears.
3. Select the link you want to delete by clicking it.
4. Click **OK**. The link is automatically deleted from the tree control display along with its accompanying Global and Specific I/O.

SY/MAX extension

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 Rev. 2 or later controllers.

➢ **To configure the SY/MAX extension:**

1. From the Network Editor, on the **Configuration** menu, click **Config Extensions**. The Configuration Extensions dialog box appears.
2. Select the SY/MAX extension from the Config Extensions tree.

   If the SY/MAX extension is not in the Config Extensions tree, you have to add it. Select Config Extensions on the tree, click **Add Extension**, then select SY/MAX.
3. In **Card Number**, select the particular SY/MAX RIO card you want to configure. The Module Drop Number, Backplane Slot, Retry Count and Timeout values change to reflect the current settings of the selected card.

The actual value for the Card Number has no effect, as long as you choose a different Card Number for each SY/MAX RIO card you configure.

4. In **Module Drop Number**, type the number of the drop that the selected RIO card controls.

   Type "-1" if the RIO card has no drop to control.
5. In **Backplane Slot**, type the slot number that the RIO card inhabits on the local rack.

   If set to 0, the SY/MAX extension assumes that no card exists.
6. In **Retry Count**, type the number of times the controller will try to communicate with the RIO card before it gives up.
7. In **Timeout**, type the number of 10s of milliseconds the controller will wait for communications from the RIO card before it gives up.
8. Click **OK**.

➢ **To remove an RIO card from the SY/MAX extension:**

1. From the Network Editor, on the **Configuration** menu, click **Config Extensions**.

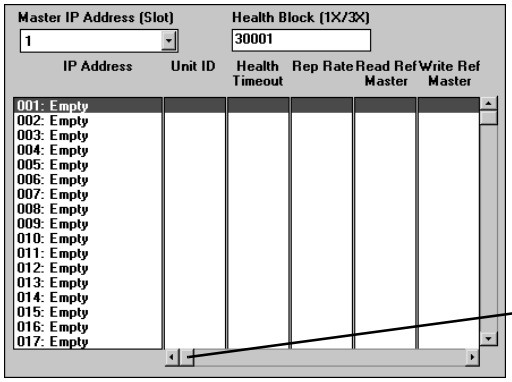
   The **Configuration Extensions** dialog box appears.
2. Select the SY/MAX extension from the Config Extensions tree.
3. In **Card Number**, select the number of the RIO card you want to remove.
4. In **Drop Number**, type "-1".
5. In **Backplane Slot**, type 0, then click **OK**.

Cyclic Data Exchange

The Cyclic Data Exchange (CDE) extension for provides data transfer between two or more M1E controllers on a TCP/IP network. CDE allow you to simultaneously configure up to 64 communication transactions. Because the TCP/IP connection is established only once and remains connected during an entire session, it makes this type of cyclic communication very efficient.

➢ **To configure the Cyclic Data Exchange extension:**

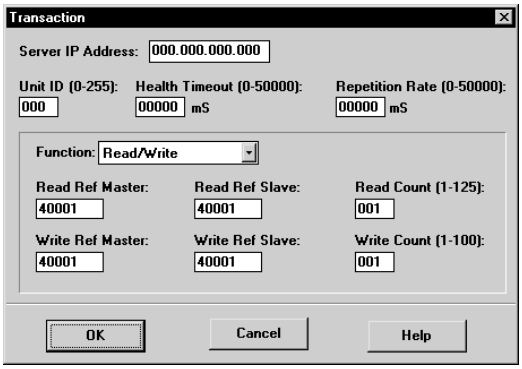
1. From the Network Editor, on the **Configuration** menu, click **Config Extensions**. The Configuration Extensions dialog box appears.
2. In the Config Extensions tree, right-click on **Config Extensions** and select **Add Extension**.
3. Select **Cyclic Data Exchange**. The parameters for the CDE appear in the details area.



4. In the **Health Block** field, type a 1xxxxx or 3xxxxx address.

All 1xxxxx addresses are based on a 16-bit boundary. For example, 100001, 100017, 100033, etc.

5. Double-click on an empty transaction to add a new transaction or double-click on an existing transaction to edit it. The Transaction dialog box appears.



6. Configure the transaction parameters.

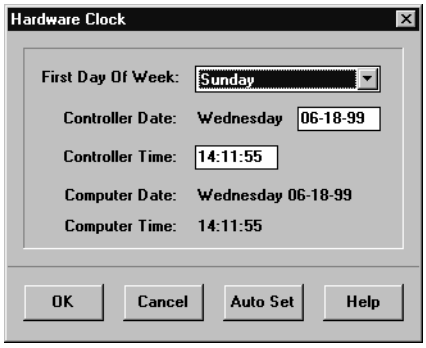
Configuring the hardware (or time of day) clock

Many controllers have a built-in Time of Day clock. You can set these clocks if:

- You have configured its starting register in the **General** tab of the **Controller Configuration** window;
- ❖ For more information, see Controller configuration - General tab on page 55.
- NxT is set to Program Mode; and
- The controller is running.

➢ **To configure the hardware clock:**

1. From the Network Editor, on the **Configuration** menu, click **Hardware Clock**. The **Hardware Clock** dialog box appears.



2. In **First Day of Week**, type 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 **Controller Date**, type the date in *mm-dd-yy* format. In **Controller Time**, type the time in *hh-mm-ss* format.
4. Click **OK**.

The Time of Day clock requires eight 4xxxx registers in your controller.

This register…	Contains…
4xxxx	Control information. From the left: **Bit 1:** Set Clock Values **Bit 2:** Read Clock Values **Bit 3:** Done **Bit 4:** Error
4xxxx+1	Day of the week (from 1 to 7)
4xxxx+2	Month
4xxxx+3	Day
4xxxx+4	Year

This register…	Contains…
4xxxx+5	Hour (in 24 hour format)
4xxxx+6	Minutes
4xxxx+7	Seconds

5 Working with Controllers

In this chapter

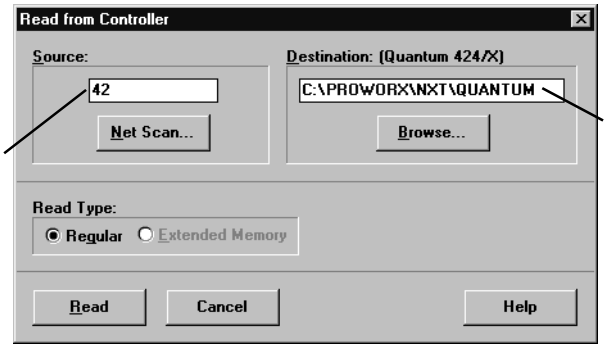
Working with the controller

Reading from a controller

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.

➢ **To read from the controller:**

1. From the ProWORX NxT Title Screen or the Network Editor, on the **Controller** menu, click **Read from Controller**. The Read from Controller dialog box appears.



Type the device address here. Click **Net Scan** to display all currently available devices.

Type the path and file name where the read information is to be stored. You can click **Browse** to select an existing database.

2. In **Source**, type the Modbus Plus routing path or Modbus address. If you're unsure of the routing path or address, click **Net Scan**.
3. In **Destination**, type the path and file name for the database.

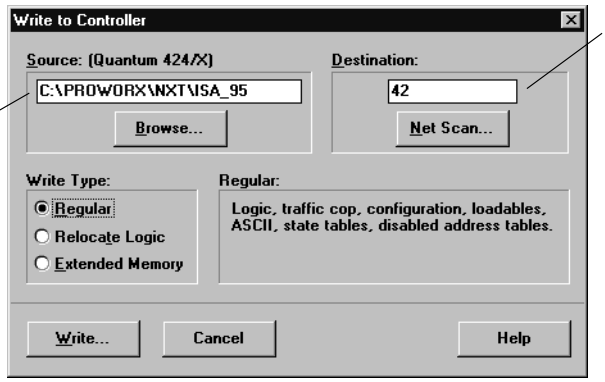
   If you're unsure of the path and file name, click **Browse** to navigate to the database. If you have a database open, it becomes the default destination database for the controller read. Ensure this is the database you want to use before continuing.
4. Click the desired **Read Type**.
   - **Regular** reads logic, traffic cop, configuration, loadables, ASCII, state and disabled tables.
   - **Extended Memory** reads only the extended memory registers.
5. Click **Read**.

Writing to a controller

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.

➢ **To write to the controller:**

1. From the ProWORX NxT Title Screen or the Network Editor, on the **Controller** menu, click **Write to Controller**. The Write to Controller window is displayed.



Type the path and file name of the database to be written to the controller. You can click **Browse** to select a database.

Type the device address here. Select **Net Scan** to view the currently available devices.

2. In **Source**, type the path and file name of the source database.

   If you're unsure of the path and file name, click **Browse** and navigate to the database. If you have a database open, it appears here automatically. Ensure this is the database you want to use before continuing.

3. In **Destination**, type the Modbus Plus routing path or Modbus address of the destination controller. If you're unsure of the routing path or address, click **Net Scan**.

You cannot write to a controller from a database that is associated with an incompatible controller type. For example, you cannot write to a Quantum controller from a database configured for a Micro controller.

4. Click the desired **Write Type**.

   - **Regular** writes logic, traffic cop, configuration, loadables, ASCII, state and disabled tables. This option overwrites any existing addresses.

- **Relocate Logic** writes the contents of a database to 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.
- **Extended Memory** writes only the extended memory registers.

5. Click **Write**. NxT displays the Database/Controller Validation window before writing to a controller. Database/Controller Validation compares the controller and the database to confirm that they are compatible. Potential problems to consider are:
   - The controller being written to may not have enough memory for the logic being written.
   - The controller address ranges many not be large enough
   - The controller instruction set many not match the database
   - The database may use duplicate coils, which most controllers do not support
6. Ensure your controller and database match.
7. Click **Write**.

Initializing logic in a controller

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.

➢ **To initialize logic:**

You are about to erase the contents of your controller. If you want to save any information stored in the controller, ensure that its contents have been read to a database.

1. From the ProWORX NxT Title Screen or the Network Editor, on the **Controller** menu, click **Initialize Logic**. A confirmation dialog box appears.
2. Click **Yes**.

Transferring memory contents to controller EEPROM

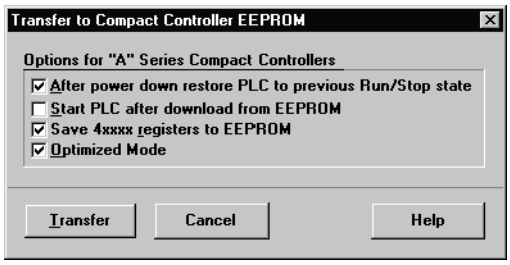
This function works only with Compact controllers. Do not attempt the transfer operation if the controller's battery is LOW as the processor contents may be lost.

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

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.

➢ **To transfer controller memory to EEPROM:**

1. From the ProWORX NxT Title Screen or the Network Editor, on the **Controller** menu, click **EEPROM/Flash**. The Transfer to Compact Controller EEPROM dialog box appears.



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 Optimized Mode is selected, the controller can't be edited while Online.

2. Click **Transfer**. You're prompted to stop the controller, if it is currently running.

Transferring memory contents to Flash RAM

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.

➢ To transfer to Micro controller Flash RAM:

1. From the Main Screen or Network Editor, on the Controller menu, click **EEPROM/Flash**. NxT displays the Transfer to Micro Controller Flash dialog box.

2. If the controller is currently running, click **Stop**.
3. Click **Transfer**. You are asked whether or not you want NxT to start the controller after loading to flash RAM:
   - Click **Yes** to have NxT 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.

Transfer internal flash or PCMCIA to controller flash

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.

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.

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.

➢ **To transfer the controller's memory contents to controller Flash or PCMCIA memory card:**

1. From the Main Screen or Network Editor, on the **Controller** menu, click **Flash/PCMCIA**. The Transfer to Controller FLASH dialog box appears.

2. If the controller is currently running, click **Stop**.
3. Select **Internal Flash** to transfer the current logic to flash memory or **PCMCIA** to transfers the current logic to the PCMCIA memory card.

4. Compact controllers have enhanced options that may be set prior to transferring.
5. Set the parameters for internal flash and PCMCIA settings:
   - **Start PLC after download from:** 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.
6. 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.
7. Click **Transfer** to transfer the logic to flash memory or the PCMCIA card. You're prompted to stop the controller, if it is currently running.

Click **Clear Flash** to clear the logic stored in the flash memory or the PCMCIA card.

Transferring the Flash RAM executive

Some devices store their executive firmware (the instructions that tell the device how to work) in Flash RAM, rather than EPROM. You can copy a controller's Flash RAM Executive to and from disk as a backup to guard against potential data loss. This may also come in handy if the manufacturer releases an updated version of the controller's executive.

Saving the executive firmware to disk is a read operation. Copying an executive from a disk file to a device is a write operation. Currently, the only devices that contain their executive firmware in flash RAM are Quantum, Micro, and E Series controllers and certain Quantum series Remote I/O and Distributed I/O processors.

It is highly recommended that you only attempt Flash RAM Executive operations if you are directly connected to the device by:

- The local Modbus or Modbus Plus port of the controller; or
- The local Modbus port of the device.

You may not be able to establish the needed connection through any other port.

➢ **To read a controller's Flash RAM Executive into a disk file:**

1. From the ProWORX NxT Title Screen, on the **Controllers** menu, click **Executive Flash**. The **Flash RAM Executive** dialog box appears.
2. Click **Read**.
3. In the **Source** box, type the device number of the device whose executive you want to copy to disk. Alternatively, click **Net Scan** to scan the network for available devices.

Flash RAM operations are not supported over Ethernet networks — only Modbus and Modbus Plus.

4. In **Device Type**, click the type of the device from which to read.
5. If you are reading from a Local Head or RIO Drop Card, in the appropriate boxes, type the device's **Head Number** and **Drop Number**.
6. In **Destination**, type the full path and file name or click **Browse** to the file to save the device's executive. This file must have a .BIN extension.

This file will be completely overwritten.

7. Click **OK**. After a check to see if the specified device exists, you are prompted to confirm the read operation. Click **Yes** and the device's executive firmware is copied into a disk file.

➢ **To write a device's Flash RAM Executive from a disk file:**

1. From the ProWORX NxT Title Screen, on the **Controllers** menu, click **Executive Flash**. The **Flash RAM Executive** dialog box appears.
2. Click **Write**.
3. In the **Source** box, type the full path and file name or **Browse** to the file in which to save the device's executive. This file must have a .BIN extension.

4. In the **Destination** box, type the device number of the device whose executive you want to update. Alternatively, click **Net Scan** to scan the network for available devices.

Flash RAM operations are not supported over Ethernet networks — only Modbus and Modbus Plus.

5. In the **Device Type** section, select device type to which to write.
6. If you are writing to a Local Head or RIO Drop Card, in the appropriate boxes, type the device's **Head Number** and **Drop Number**.
7. Click **OK**. ProWORX NxT checks to see if the specified device and file exist.
8. You're prompted to confirm the write operation. Click **Yes** and ProWORX NxT begins updating the executive firmware.

If you abort a Flash RAM Executive Write operation, the device will be unusable and will remain in Kernal Mode. To return the device to regular operation, start and finish a Write Flash RAM executive operation from the beginning.

Stopping the controller

This function stops a controller from solving logic, or performing I/O functions. The controller remains in the ready state.

Stopping a controller may have a major impact on your process. Always consider fully the possible consequences of stopping a controller (that is, is it performing a critical operation?) before proceeding.

➢ **To stop a controller:**

1. From the ProWORX NxT Title Screen or the Network Editor, on the **Controller** menu, click **Start/Stop**. If you're in a procedure which requires the controller to be stopped, you may be prompted with a dialog box to stop the controller. In this case you can select **Stop** from the dialog box.
2. Click **Stop**. NxT displays a "Controller Stopped" prompt to tell you the operation was successful. Click **OK** to clear the prompt. If the operation is unsuccessful, an error message displays the problem.

Starting the controller

➢ **To start the controller:**

1. From the ProWORX NxT Title Screen or the Network Editor, on the **Controller** menu, click **Start/Stop**.
2. (Optional) If you are using a 984 controller, select whether to start in Optimized Mode.

   In the optimized mode, the ability to edit or show power flow is disabled. You may have to stop the controller to make logic changes. The 685E and 785E controllers have a 2k buffer allowing editing during optimized mode. Once this buffer is full, no further changes can be made until the controller stops.
3. Click **Start**. NxT displays a "Controller Running" prompt to tell you the operation was successful. Click **OK** to clear the prompt. If the operation is unsuccessful, an error message displays the problem.

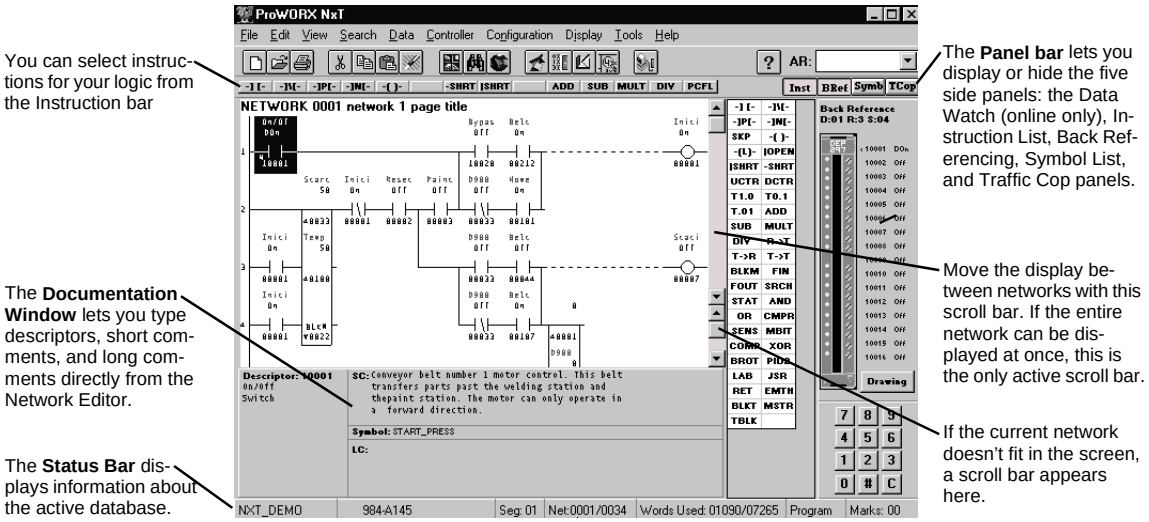
6 Using the Network Editor

In this chapter

Using the Network Editor

The Network Editor is used to enter logic elements, edit register values, display input/output data, and add descriptors and comments to a network. The Online Network Editor gathers its data from the controller instead of a database (as Offline does).

In the Online editor, each instruction is sent to the controller as it is entered, whereas in the Offline editor, an entire network is saved at a time.



About the toolbar

Many common Network Editor functions are available from the toolbar. The toolbar's buttons depend on whether you are working online or offline and whether there is an active database. Possible toolbar buttons are:

New		Creates a new database.
Open		Opens an existing database.

Print		Prints the active network.
Cut		Moves the selected cells (or text in a field) to the clipboard.
Copy		Copies the selected cells (or text in a field) to the clipboard.
Paste		Pastes the cells (or text) in the clipboard into the selected cells in logic (or selected text field).
Change View		Toggles between four configured views of the network.
Search		Displays the Search window, where you can search logic for specific items (addresses, data values)
Global Replace		Offline only. Allows global address changing.
Change Device		Online only. Lets you select a different controller.
Traffic Cop		Displays the Traffic Cop window, where you configure your I/O.
Configurator		Opens the Controller Configuration window, which has a set of tabbed pages used to select and configure a controller.
Documentation Editor		Available only with an active database. Displays the Documentation Editor, where you can edit all documentation components.
Register Editor		Displays the Register Editor window for the selected cell.
Goto Offline		(Available in Online only) Switches NxT to Offline Mode when running the Offline/Online system.

Goto Online		(Available in Offline only) Switches NxT to Online Mode when running the Offline/Online system.
Help		Displays the NxT online help for the selected window or item.

Shortcut menus

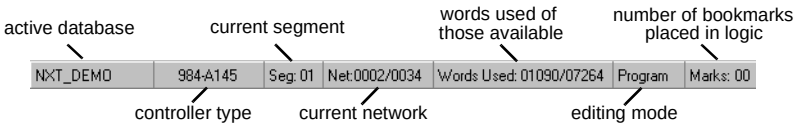
Several functions can also be accessed from a shortcut menu. Right-click anywhere in the Network Editor and the shortcut menu appears. Functions accessible from the shortcut menu are:

- Cut, Copy, and Paste
- Find
- Set Mark
- Documentation Editor
- Register Editor
- Instruction Help

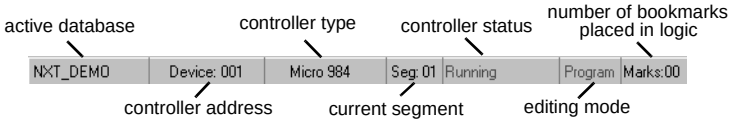
About the status bar

The Status Bar displays helpful information about the open database or, in the Online Editor, the selected controller.

In the **Offline Editor**, the Status Bar shows you...



In the **Online Editor**, the Status Bar shows you...

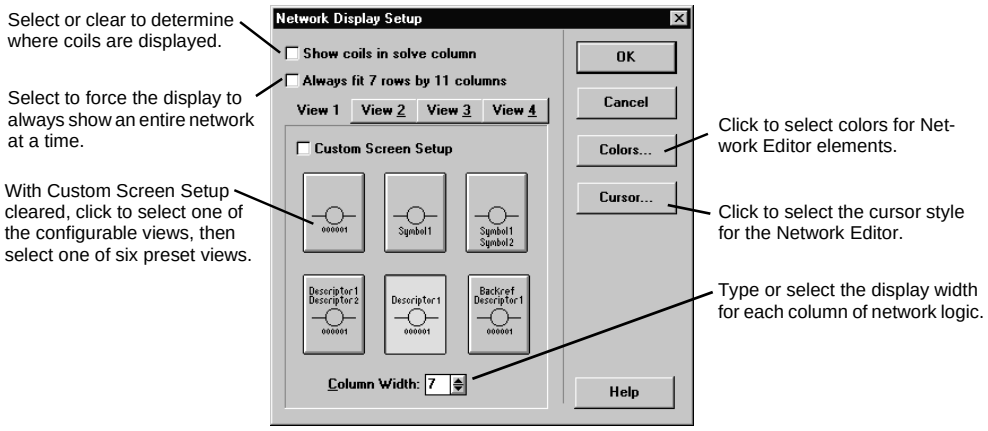


Customizing the network display

The Network Display Setup dialog box tells NxT how to display each cell in a network. There are four configurable display styles, called views, available. These four views can be configured to display logic cells of user-defined size, with or without symbols, descriptors, addresses, data values and back referencing information.

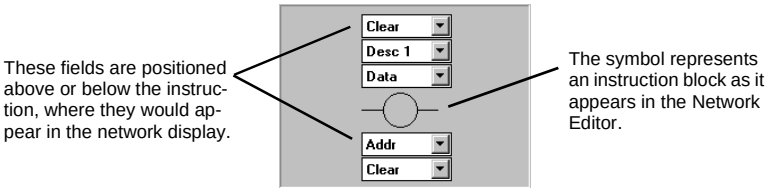
➢ **To configure a network view:**

1. From the Network Editor window, on the **View** menu, click **Network Display Setup**. The Network Display Setup dialog box appears.



2. Do one of the following:

   - With **Custom Screen Setup** cleared, click one of the six preset views.
   - With **Custom Screen Setup** selected, set up your own view manually.



Up to 5 lines are available for each element, 3 lines above the instruction and 2 below it. For each line, select one of the following:

- The instruction's address.

- Back referencing information.
- One of nine possible descriptors.
- The address's data.
- Up to two lines of symbol text.
- Clear (leave the line blank).

3. In **Column Width**, select the column width for the five lines of cell description. Increasing the width allows less instructions to fit on the screen, but more descriptor, data and symbol information to be displayed.
4. Select or clear the **Show coils** check box:
   - If you select the check box, coils are shown where they are solved by the controller.
   - If you clear the check box, coils are always placed in column 11, attached to the solve column by dots.
5. Select or clear the **Always fit** check box:
   - If you select the check box, NxT adjusts the size of display elements so that you always see a full network. The disadvantage is that display elements may shrink beyond legibility, especially when using lower screen resolutions.
   - If you clear the check box, scroll bars will appear when a network is too large to display at once.
6. Click **OK**. Other than the **Always fit** option, changes made affect only the view selected.

➢ **To change views (toggle between the four views):**

- Click  in the toolbar.

Customizing the Network Colors

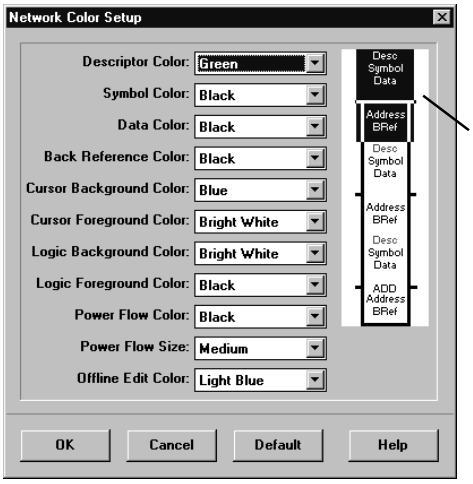
This function allows you to select the display colors for:

- Descriptors
- Symbols
- Back Referencing
- Data
- Power Flow (Online only)
- Logic Foreground and Background
- The Network Cursor

You can also set the size of the Online Editor's Power Flow display.

➢ **To set the network colors:**

1. From the Network Editor window, on the **View** menu, click **Network Display Setup**. The Network Display Setup dialog box appears.
2. Click **Colors**. The Network Color Setup dialog box appears.



Power Flow Color, Power Flow Size, and Offline Edit Color appear only in the Online editor.

3. For each **Color** box, select a color for the network item.
4. In **Power Flow Size**, select the width of the line used to show power flow from the drop down box.
5. Click **OK**.

Customizing the network editor cursor

The Network Editor cursor can be set to a solid block (default) or a rectangular outline. In both cases, the color of the cursor and of selected text depend on settings in the Network Color Setup dialog box, accessible from the Network Display Setup window.

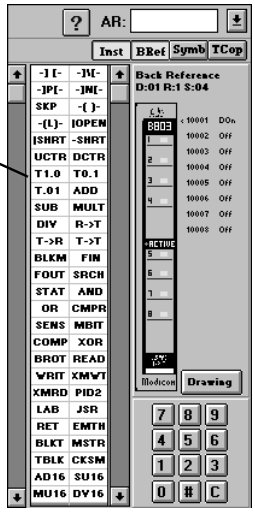
➢ **To set the Network Editor cursor:**

1. From the Network Editor window, on the **View** menu, click **Network Display Setup**. The Network Display Setup dialog box appears.
2. Click **Cursor**. The Network Cursor Setup dialog box appears.
3. Click the style (**Solid** or **Outline**) you prefer for the Network Cursor, then click **OK**.

Network editor panel descriptions

Back Referencing panel

The Back Referencing panel displays the I/O card, location and data (if they exist) for a selected address in logic. The 800, Quantum and A120 cards (if available) are also shown.



You can drag and drop these instructions right into your logic.

The Back Reference panel keeps track of your physical I/O by obtaining the physical location of an address used in the network logic.

If a physical location (for example, I/O point) exists, it is displayed in the form of Head (Quantum), Drop, Rack and Slot for an S908 system or Channel, Slot for a 584 or S901 system.

➢ **To display the Back Referencing panel:**

- Click **BRef** (directly under the AR).

Instruction List panel

The Instruction List contains all available logic instructions. You can use the instruction list to drag and drop instructions into logic, or onto the instruction bar.

➢ **To display the Instruction List:**

- Click **Inst** (directly under the AR).

➢ **To enter an instruction from the Instruction List:**

- In the Network Editor, drag the instruction from the Instruction List to:
  - A cell in logic, to enter the instruction there.
  - A button on the Instruction Bar, to use that button as a shortcut for inserting that instruction later.

Symbol Summary panel

The Symbol Summary panel displays user-defined symbols and their corresponding addresses. Symbols let you assign names to addresses to make them easier to remember. To work with symbols, the **Symbols** check box in System Preferences must be selected.

➢ **To display the Symbol Summary panel:**

- In the Network Editor, do one of the following:
  - On the **View** menu, click **Symbol List**.
  - Click **Symb** (in the panel toolbar).

❖ For more information, see "Symbolic addressing" on page 164.

Data Watch panel

The Data Watch Panel (available only in the online editor) performs many of the same functions as the Data Watch Window, but is displayed as a side panel next to the Network Editor. With it, you can monitor changes in values stored at up to 60 addresses at a time. Any settings you change or addresses you add to the Data Watch Panel are saved when you leave the current database.

If the Add Watch/Track Data Info option in System Preferences is set to Data Watch Panel, operations that would normally add addresses and tracking information to the Data Watch Window will add them to the Data Watch Panel. The following instructions assume this option is set to Data Watch Panel.

❖ For more information, see "Using the Data Watch Window" on page 276.

You can edit binaries easily by just double-clicking on the bit to change it or click on it and enter a new value.

➢ **To display or hide the Data Watch Panel:**

- On the **View** menu, click **Data Watch Panel** or click **Data** in the panel toolbar.

➢ **To add an address in the Network Editor to the Data Watch Panel:**

1. Move the cursor to the address that you want to add to the Data Watch Panel list.
2. On the **Data** menu, click **Add Watch**. The address is added to the Data Watch Panel.

You can also track addresses and functions from the Data Watch Panel.

➢ **To track a single logic element in the Data Watch Panel:**

1. Move the cursor to the address or instruction that you want to track.
2. On the **Data** menu, click **Track**. The address or instruction is added to the top of the Data Watch Panel.

➢ **To track all addresses in the Data Watch Panel:**

- On the **Data** menu, click **Track Network**. The first 60 addresses in the network will be added to the Data Watch Panel. All other addresses are ignored.

➢ **To track all discrete addresses in the Data Watch Panel:**

- On the Data menu, click **Track Discrete**. The first 60 discrete addresses in the network will be added to the Data Watch Panel. All other addresses are ignored.

➢ **To make changes to a discrete address from the Data Watch Panel:**

1. Click the discrete address you want to change in the Data Watch Panel. Three buttons appear at the bottom of the panel: Force On, Force Off, and Enable.

You can also right-click on a discrete address and select **Force On** or **Force Off** from shortcut menu. This shortcut menu is available with or without a database open.

2. Make the changes you want:
   - **Force On:** Click to force the discrete state to on. This disables the address.
   - **Force Off:** Click to force the discrete state to off. This also disables the address.
   - **Enable:** Click to re-enable the address.

➢ **To make changes to an analog address from the Data Watch Panel:**

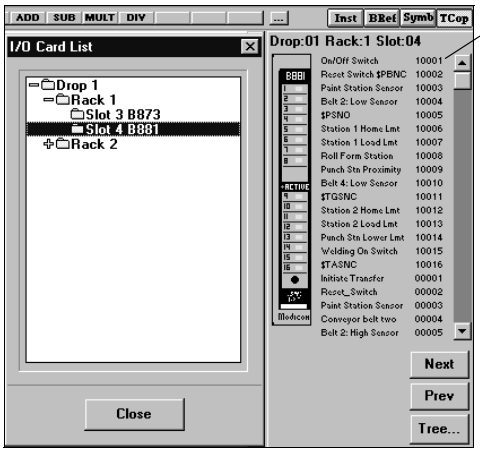
1. Click the analog address you want to change in the Data Watch Panel. Two buttons appear at the bottom of the panel: **Edit** and **Radix.**
2. To edit the value stored at the address, click **Edit**. To edit the radix of the address value, click **Radix**. Addresses can be viewed as Decimal, Hexadecimal, Binary, ASCII, Floating Point, Long Integer (32 bits), Signed Integer and BCD.

Traffic Cop Display panel

The Traffic Cop display enables you to place addresses from the I/O cards in the Traffic Cop into your network logic. You can browse through the cards in your Traffic Cop 800, A120 or Quantum series.

➢ **To display the Traffic Cop panel:**

- On the **View** menu, click **TCop List** or click **TCop** in the panel toolbar.



➢ **To place an address or symbol into logic from the Traffic Cop panel:**

1. In the Traffic Cop panel, navigate to the I/O card you want:
   - **Next:** Click to go to the next programmed card.
   - **Prev:** Click to go to the previously programmed card.
   - **Tree:** Click to display the I/O card list, then click a card to select it.
2. Click the symbol/address to insert. Keep the mouse button pressed.
3. Still holding the mouse button down, drag the symbol/address from the Traffic Cop panel to its destination in logic.

Power and Power/State flow toggle (Online only)

This function lets you toggle the Network Editor display between power flow and a combination of power/state flow:

- **Power flow:** An instruction only passes power (is selected) if it solves true and if the instructions to the left of it also pass power.
- **State flow:** An instruction is selected if it solves true, regardless of whether instructions "upstream" are passing power. State flow lets you see the state of each contact or coil immediately, without having to use the Data Watch window.

State flow is slightly slower than power flow because it requires NxT to poll the PLC and determine the state of each instruction.

➢ **To toggle between Power flow and Power/State flow:**

- On the **View** menu, click **State Flow**.

Setting the update rate (online only)

Online allows the update rate (or poll rate) to be specified for data/server updates. This Update Rate is used by all data gathering functions in NxT (but not directly in the Data Watch window) such as the traffic cop, terminal block, and register editors.

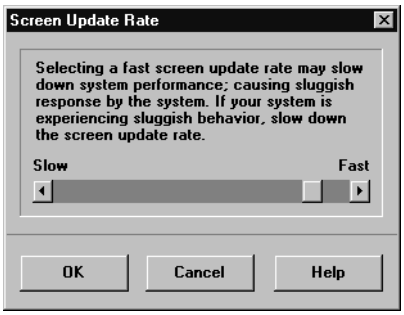
Some systems may become sluggish with requests for data happening as fast as the system can manage. These multiple requests will slow the system response speed down. By setting the Update Rate lower (scrolling to the left), you free your system to respond to other tasks.

The Update Rate set in the Network Editor effectively limits the Update Rate in the Data Watch window. This is because the Data Watch window polls NxT (not the controller directly) for data. This means that the actual update rate of the Data Watch Window (despite what it may be set at) can only be as fast as the Update Rate set in NxT (which is providing the data). Typically, users should maintain a higher Update Rate in NxT than in the Data Watch window.

Realistically, the fastest update rates will approach 55 ms. This is because of overhead from concurrent processes (for example, the operating system).

➢ **To set the update rate:**

1. From the Network Editor, on the **Edit** menu, click **Update Rate**. The Screen Update Rate dialog box appears.



   - Change the rate in the scroll bar by moving the scroll box. You can move the scroll box by clicking and dragging it with the mouse, clicking in the scroll bar, or by pressing ← or →. To slow down the update rate, move the scroll thumb to the left. To speed up the update rate, move the scroll slider to the right.

2. Click **OK**.

Editing instructions in logic

Editing modes in the ProWORX NxT online editor

There are three editing modes in **NxT Online**:

- **Program Mode:** Allows you to edit the controller's logic and configuration in real time.
- **Monitor Mode:** Shows a view-only display of the controller's logic and configuration.
- **Offline Edit Mode:** Lets you perform minor edits on one network without updating the controller in real time. You can only edit logic in Offline Edit Mode if NxT is also in **Program Mode**.

➢ **To toggle between Program Mode and Monitor Mode:**

- From the Network Editor, on the Edit menu, click **Program Mode** or click the Program/Monitor area 

in the status bar.

About Offline Edit mode

Offline Edit Mode lets you make changes (e.g., entering instructions with undefined addresses or duplicate coils) to network logic in the Online Editor without updating the controller in real-time. This gives you some breathing room when performing small edits without having to go offline.

➢ **To switch to Offline Edit mode:**

- From the Network Editor, on the **Edit** menu, click **Offline Edit Mode**.

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

➢ **To edit logic in Offline Edit mode:**

- Use the same editing conventions and procedures as the NxT Offline editor does.

  Remember, however, that you cannot edit more than one network without either cancelling the edit or writing the edit to the controller.

  The Program Mode/Monitor Mode rules still apply to Offline Edit Mode. (You cannot edit logic in Offline Edit Mode unless NxT is also in Program Mode.)

➢ **To exit Offline Edit mode:**

1. Do any of the following:
   - From the Network Editor, on the **Edit** menu, click **Offline Edit Mode**.
   - Exit the Network Editor.
   - Access another section of ProWORX NxT (for example, the Traffic Cop).
2. NxT then prompts you about writing your changes to the controller:
   - If you click **Yes**, NxT will check the new network for undefined addresses and duplicate coils. If none are found, NxT deletes the original network in the controller, and sends the new network (created in Offline Mode) to the controller.
   - If you click **No**, NxT returns to Program Mode.
   - If you click **Cancel**, NxT returns to Offline Edit Mode.

Entering instructions

You can enter instructions into your network logic using the Instruction Bar, Instruction List, and Assembly Register (AR).

➢ **To enter instructions using the Instruction toolbar:**

1. Select the cell where you want the instruction to be entered.
2. Click the instruction in the Instruction toolbar.

If the instruction is not on the toolbar, you have the option of adding it.

➢ **To place an instruction in the Instruction bar:**

- Drag the instruction from the Instruction List to the instruction bar.

➢ **To enter instructions using the Instruction list:**

- Drag the instruction to insert from the Instruction List to its destination cell in the network.

➢ **To enter instructions using the assembly register:**

1. Click the Assembly Register. The cursor appears in the **AR** field.
2. Type the instruction mnemonic.
3. Select the cell in logic (by clicking it) where you want to place the instruction, then press ENTER.

➢ **To enter addresses using the assembly register:**

1. Click the Assembly Register. The cursor appears in the **AR** field.
2. Type the address into the AR.

   If the Back Referencing panel is currently displayed, you can enter the address by clicking numbers in the numeric keypad at the bottom of the panel.
3. Press CTRL+ENTER or drag the instruction from the AR field title to its destination cell in the network.

Undoing changes to a network (offline only)

When you make changes to a network, always keep in mind that you can only undo the last change you made. Also, you can only Undo an action while you remain in the same network. If you move to another network, the Undo command is not available.

➢ **To Undo an action:**

- On the Edit menu, click **Undo** or click  in the toolbar.

If you use the Undo command to cancel an action, selecting Redo on the Edit menu performs the action again, cancelling the Undo command.

About address entry in NxT

NxT formats most register addresses automatically. For example, if you type 4 then 7 in a blank address field, a colon delimiter is added between the type and value as well as padding the value with zeroes. The colon is used to select the destructive wrap mode in operation: if after the 7 a 1 is typed, the address field will contain 4:0071. Any additional digits will wrap the value.

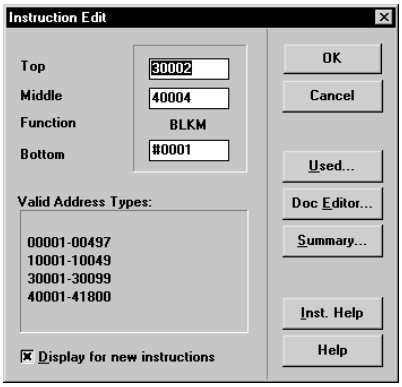
In wrap mode, when the backspace key is pressed, the last character entered is removed from the right end of the value and a zero is inserted as the first digit in the value. For example, 4:0071 results in 4:0007.

When pressing the HOME, END, ←, or → keys the colon is removed. For example, 4:0007 results in 40007.

➢ To edit an instruction in your logic:

1. Do one of the following:
   - Click the instruction to edit, then on the **Edit** menu, click **Edit Instruction**.
   - Double-click the instruction to edit.
   - If you have the **Display Editor for New Instructions** option selected in the system Preferences, simply add the new instruction to the network.

   The Instruction Edit dialog box appears, containing:



   - An entry field for each instruction node. The number of nodes you can edit depends upon the instruction. Click **Inst. Help** for details on a particular instruction.

- **Valid Address Types** for the selected entry field.
- The function name.

2. Click the box of the node to edit.
3. For each node, type the address, symbol (if the **Use Symbols** option is selected in the system Preferences), or value.
   - If the value begins with a pound sign (#), NxT assumes you are entering a value rather than an address.
   - If you type a non-numeric character or a value outside of 0 - 9 in an address field, NxT assumes you are entering a symbol, and allows up to 32 characters in the field.
   - Click **Doc Editor** to open the Documentation Editor to edit the instruction's documentation.
   - NxT also provides a table showing which addresses and coils are used. To display the table, click **Used**. You can double-click an address in the table to type it in the selected instruction node.

If the Address Used table does not appear, then it hasn't been built yet. From the **Display** menu, click **Used Table**.

❖ For more information on the Address Used Table, see page 158.

   - To edit or display documentation for this instruction, click **Summary**.

4. Click **OK**.

➢ **To edit a multiple subfunction instruction:**

1. Follow steps 1-3 for editing an instruction.
2. For the bottom node for EMTH, MATH and DMTH, click the arrow to the right of the entry field. A list of all valid subfunctions appears.

   The PCFL instruction has its subfunctions on the top node of the instruction.
3. Select a subfunction, then click **OK**.

Moving instructions

You can move an instruction from one area in the network to another area by holding the ALT key down and dragging the instruction to its new destination. When you select the instruction while pressing ALT, your cursor changes to the instruction's icon. While pressing ALT, move the cursor to the cell in logic where you want to place the instruction, then release the mouse button.

You can also cut, copy, and paste an instruction (or a block of instructions) by selecting it and clicking the **Cut**, **Copy**, or **Paste** command from the **Edit** menu (or clicking  ,  , or  in the toolbar).

Deleting instructions

To delete an instruction or block of cells from logic, simply select it and press the DELETE key.

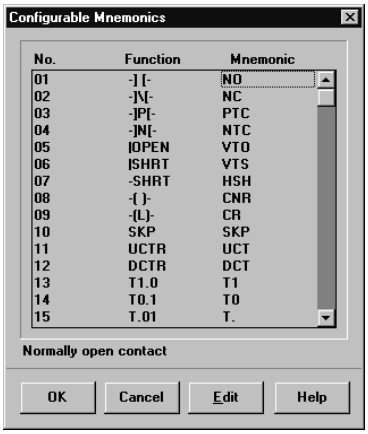
Configuring mnemonics for instructions

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

➢ **To edit a mnemonic:**

1. From the Network Editor, on the **File** menu, click **Utilities** then click **Mnemonics**. The Configurable Mnemonics window appears.

   When you select a mnemonic, a short description of the instruction appears at the bottom of the window.



2. Select the mnemonic to edit and click **Edit** or double-click the mnemonic to edit.
3. Type in the new mnemonic.
4. Click outside of the field or press ENTER.

   If you try to type an existing mnemonic, NxT displays a warning and will not continue the edit.
5. Click **OK**.

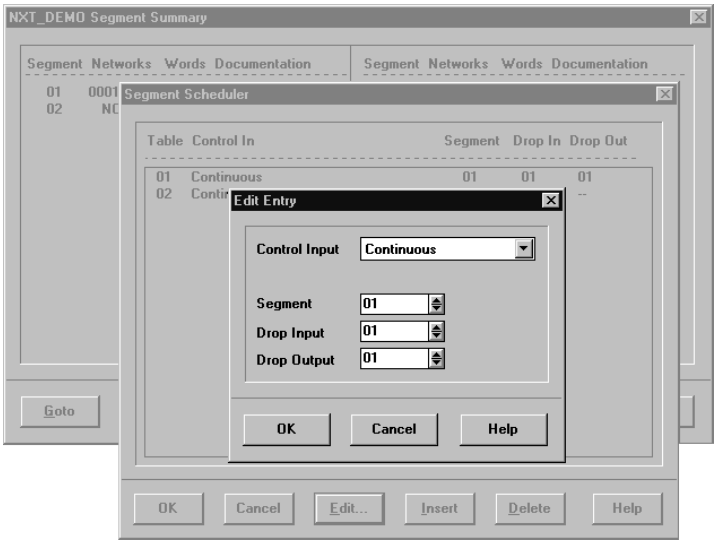
Using the Segment Scheduler

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 database is set in the General tab of the Controller Configuration window.

By default, the segments are solved in numerical order (segment one first, segment two next, and so on). The drop input/output numbers correspond to the segment number.

➢ **To edit a row in the table:**

1. From the Network Editor, on the **Display** menu, click **Segments**. The Segment Summary dialog box appears.
2. Click **Scheduler**. The Segment Scheduler window appears. The table shows the numeric order of solve (for example, whichever segment is in row 1 of the table is solved first, row 2 is solved second, etc.).
3. Do one of the following:
   - Click the row to edit then click **Edit**.
   - Double-click the row to edit. The Edit Entry window appears.



4. Select the Control Input:

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

5. In **Segment**, type the segment to be solved in this row. The valid range is 1 to the number of segments configured.
6. In **Drop Input**, type the input drop associated with the segment in this row during the solve.
7. In **Drop Output**, type the output drop associated with the segment in this row during the solve. Depending on what controller you are using, drops or channels may be used. The valid range for drops/channels is 1 to the number of configured drops/segments.
8. Click **OK**.
9. Click **OK**.

➢ **To add a row to the table:**

1. Select the row ahead of where you want the new row to be inserted.
2. Click **Insert**. NxT adds a row, with a Watchdog Timer Reset as the default control. You can then edit the row as required.

➢ **To delete a row from the table:**

1. Click the row to delete.
2. Click **Delete**. NxT prompts you to confirm the deletion.
3. Click **Yes** to confirm the deletion. The rows following the deleted row are shifted up.

Moving networks in segments

➢ **To move networks across segment boundaries:**

1. From the Segment Summary window, select the segment containing the network you want to move.
2. Click **Move**. The Move Networks in Segment window appears.
3. Type the number of the networks to move.
4. Do one of the following:
   - **Forward:** Click to move the network to the next segment.
   - **Backward:** Click to move the network to the previous segment.
5. Click **OK**.

Editing register contents

The Register Editor lets you edit register contents in a table format. You can enter data for the register as binary, hexadecimal, ASCII, IEEE floating point, or 5-digit decimal.

Some instructions have special data representations. For example, EMTH shows the equation and results in floating point form, and a maximum of 10 variables per equation are allowed. The IEEE floating point number (used with instructions supporting 32-bit floating point registers) is represented by two consecutive input or holding registers.

So, in the IEEE Floating Point column the value displayed for register 40005 is the floating point representation of the 32-bit number stored in registers 40005 and 40006; the value displayed for register 40006 is the value stored in 40006 and 40007, and so on. This is why editing a floating point number in one register also affects the display for the next register as well.

There are three types of register editors:

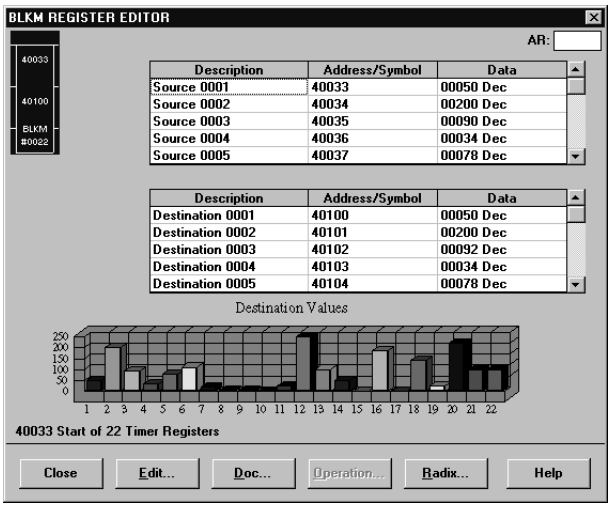
- User Configurable Register editor
- Extended Memory Register editor
- Generic Register editor

User Configurable Register editor

The User Configurable Register editor is used to edit instruction-specific data that you format in a .URF file. There is a .URF file for each instruction, which contains all the text and formatting information needed to display the register edit screen and the desired register values. The .URF file also contains the register where the operation mode is stored.

➢ **To edit a register value using the edit window:**

1. From the Network Editor, select the instruction to edit.
2. On the **Data** menu, click **Register Editor**, or click  . The Register Editor window appears, with an instruction-specific template.



3. Do one of the following:

   - Select the row (either the Description, Address/Symbol, or Data field) of the register to edit and click **Edit**.
   - Double-click the row (either the Description, Address/Symbol, or Data field) of the register to edit.

   An edit window appears, specific to the radix of the your selection (the radix of each register is displayed in the table's Data field).

4. In **Register Value**, type the value to be placed into the register (using the appropriate radix).

   If you are typing a binary value, you cannot type in the new value directly. Instead, set the state of individual bits by selecting it and clicking either Set (1) or Reset (0). You can also click Set All to set all bits to 1, or Reset All to set all bits to 0.

5. Click **OK**.

➢ **To edit a register value using the Assembly Register:**

1. From the Network Editor, on the **Data** menu, click **Register Editor**. The Register Editor window appears.
2. Click in the **AR** box.
3. Type the new register value.

You can't use the AR to enter values in binary. Instead, use the edit window (described above). If you try to enter an AR value into the binary field, it will be treated as a decimal value.

4. Do one of the following:
   - Select the data field in the register where the value is to be placed, then press CTRL+ENTER.
   - Click the **AR** field title (beside the entry field), and hold the mouse button down. Still holding the mouse button down, drag the cursor to the appropriate radix of the destination register, then release the mouse button.
5. Click **OK**.

➢ **To edit documentation for registers:**

1. From the Network Editor, on the **Data** menu, click **Register Editor**. The Register Editor window appears.
2. Select the register for the documentation you want to edit.
3. Click **Doc**. The Documentation Editor window appears. Type your documentation.

➢ **To edit the operation for a register:**

1. From the Register Editor window, click **Operation**.
2. Select an operation.
3. Click **OK**.

➢ **To change the radix of a register value:**

1. From the Register Editor window, select the register you want to change the radix for.
2. Click **Radix**.
3. Select the new radix.
4. Click **OK**. The value in the data field is automatically displayed in the new radix.

➢ **To display a single bit for a register value:**

1. From the Register Editor window, select the register you want to change the radix for.
2. Click **Single Bit**.
3. Type the bit number (between 1 and 16) you want to display, then click **OK**. The value in the data field is automatically displayed in the new radix.

➢ **To print a screen of register contents:**

- From the Register Editor window, click **Print**. The addresses, symbols and data currently displayed on the screen are sent to the default printer.

  Printer settings can be changed with the Printer Setup dialog box in the Lister window (see page 263), they cannot be changed from inside the Register Editor dialog box.

Creating a .URF file for an instruction

There is a .URF file for each instruction, which contains all the text and formatting information needed to display the register edit screen and the desired register values.The .URF file also contains the register where the operation mode is stored. These .URF files must be stored in the same directory as the NxT application.

➢ **To create a template:**

1. Launch a text editor application and create a text file. The text file usually has the instruction name for a file name, and *must* have a .URF extension.
2. Type the text and formatting information for the instruction according to the following template:

Text	Description
BASE VALUE	Location of the register to display. Set to T, M, or B, representing Top, Middle, and Bottom nodes respectively.
BIT TO MODIFY	If the data type is set to T (bit) then this value determines which bit you want to display. This may be from 1 to 16, with 1 being the Most Significant Bit, 16 being the Least Significant Bit. Set to 0 if not a bit data type.
COLUMN	Column number on screen to place the register. Use a number between 1 and 78. If the total length of the displayed register data exceeds the available column space, the starting point of the column is moved to the left so the entire column fits on the line.
DATA TYPE	Sets the radix of the data type. Use the following characters to represent the following data types: F Floating Point A ASCII S Signed Integer H Hexadecimal B Binary L 32-bit (Long) Integer I Integer T Bit
ERRORFIELD	Gives you the ability to report any errors on the instruction. Errorfield has the same format as the Windowtable.

Text	Description
FUNCTION "XXX"	Begin the template with this line. Within the quotations, insert the name of the instruction for which the template is intended. Save the template by this name with a .URF extension.
GRAPHFIELD	Allows you to graph data. A Graphfield line has the following format: GRAPHFIELD, R,C, T, H, B, O, M, P where: R = Row C = Column T = Type of graph 1 - 2 dimensional pie graph 2 - 3 dimensional pie graph 3 - 2D bar graph 4 - 3D bar graph H = Graph height B = Maximum number of entries in the window, the B represents the bottom node O = Offset M = Number of points on the graph P = Offset
HEIGHT #	This refers to the height of the register function block. A height of one refers to a single node instruction (for example, SKP). A height of three refers to a three node instruction (for example, ADD).
NUMLINES #	#,"XXX" The first digit stands for the line number of the location of the text on the screen. For example: Using the number 8 places the line of text on the eighth row of the screen. Put text within the quotation marks. To place the text in columns, insert spaces between the first quotation mark and the first character. A maximum of 18 text lines may exist, each up to 78 characters long.
NUMPAGES #	Sets the number of pages for the function or subfunction. NUMPAGES must always have a value of at least one and has no maximum.

Text	Description
NUMREGS #	You must define the number of registers you are placing on the page. You may place from 0 to 50 registers. Each register is defined as follows: ROW, COLUMN, BASE VALUE, OFFSET, DATA TYPE, BIT TO MODIFY, SYMBOL FLAG
NODE XXX	Use this line if the function contains subfunctions. This sets where the subfunction number is defined in the Network Editor. The three possible settings are TOP, MIDDLE, BOTTOM. For example, NODE would be set to BOTTOM for the EMTH function.
OFFSET	Offset of base value for displaying implied registers.
OFFSET #	Use this line if the function contains subfunctions. If the subfunction is defined by the contents of an implied register, the offset is set to the register's implied address. For example, if the bottom node has 40001 entered, but the actual subfunction is in the implied register 40003, then the OFFSET would be set to 3.
OPERATION-FIELD	Allow you to change the mode of operation within the Register Editor. Operationfield is formatted the same as Errorfield and Windowtable.
PAGE #	This defines the beginning of a new editor page. The number corresponds to the page number. There must be an equal number of page number lines as defined in the NUMPAGES line and they must appear in sequential order. An END PAGE must mark the end of each page.
PAGETITLE "XXX"	You may give each page a unique title. If you wish to leave the title blank, put nothing between the quotes.
REGISTERINFO	Marks the beginning of register definitions for the page. An END marks the end of the REGISTERINFO definitions.

Text	Description
ROW	Row number on screen to place the register. Use a number between 1 and 18.
SCREENINFO	Marks the beginning of user defined screen text. An END must mark the end of SCREENINFO text lines.
SUB #	Use this line if the function contains subfunctions. This defines the beginning of a set of editor pages for a new subfunction. The number corresponds to the subfunction number. There must be an equal number of SUB # lines as defined by the SUBFUNCS line and they must appear in sequential order. An END SUB must mark the end of this set of pages.
SUBFUNCS #	Certain functions, such as EMTH, may be configured to perform a variety of tasks or subfunctions. This setting refers to the total number of subfunctions this function can perform. For example, EMTH may perform any one of 38 different subfunctions. Therefore, SUBFUNCS is always set to 38 for an EMTH user configured template. If the function has no subfunctions (e.g.,. ADD), set SUBFUNCS to 0.
SYMBOL FLAG	Defines whether or not to display an address or a symbol. Set to Y to display a symbol, or N to display an address. If no symbol is available, the address is used.

Text	Description
WINDOWTABLE	Creates a scrollable window enabling you to list registers. Use this function if you have a data list that cannot be contained on one screen. Allows you to define the row, column, the nodes setting top, middle or bottom, the offset, labels you can re-use and labels you want to use. Format your line in the template like: WINDOWTABLE1 R,C, M,O,B,F,S,L,V, where: R = Row C = Column T = From which register to start. You can use T = top node (most common), M = middle node, B = bottom node. O = Offset to node. Use zero to include only one window table. Z = Maximum number of entries in the window table. N = The number of registers in the window table. S = The number of registers to be displayed. One or more than "N" to a maximum of 17. When 17 registers are used, a scroll bar appears. You can display a scroll bar for less than 17 registers by entering a number that is less than or equal to "N". L = Indicates if you are going to reuse label. V = The number of levels to follow are indicated when not reusing the label. A maximum of 50 can be used. For example: WINDOWTABLE1 2,19,T,0,Z,10,11,0,10, Source, 1 = This line defines the label.

.URF template example

```
FUNCTION "function name"
  HEIGHT 3
  SUBFUNCS 0
    NUMPAGES 2
      PAGE 1
        PAGETITLE "function name page 1 of 2"
         SCREENINFO
         NUMLINES 0
        END

      REGISTERINFO
         NUMREGS 0
         WINDOWTABLE1 2,19,T,0,Z,9,10,0,9
        Description of 1st register in decimal,1 "the bolded
          numbers are the default radix."
          Description of 2nd register in hexadecimal,2
          Description of 3rd register in binary,3
          Description of 4th register in ascii,4
          Description of 5th register in floating point,5
          Description of 6th register in 32 bit integer,6
          Description of 7th register in signed integer,7
          Description of 8th register in single bit,8
         ,0 "blank description, no radix"

       WINDOWTABLE2 11,19,M,0,B,0,8,1,1
          Source,1

       OPERATIONFIELD,1,19,T,0,3
          00001 Write Registers
          00002 Read Registers
          00003 Get Local Statistics
         ERRORFIELD,18,19,T,1,2
          04097 User initiated abort
          08193 Invalid operation type
        END
      END PAGE
      PAGE 2
        PAGETITLE "Demo Page 2 of 4"
```

```
        SCREENINFO
        NUMLINES 0
       END

       REGISTERINFO
        NUMREGS 0
        WINDOWTABLE1 2,19,T,0,Z,4,5,0,4
         MSTR Operation Code,1
         Error Status,2
         # of Registers Transferred,1
         Func Dependant Info,1
        WINDOWTABLE2 11,19,M,0,B,0,5,1,1
         Source,1

        OPERATIONFIELD,1,19,T,0,2
         00001 Write Registers
         00002 Read Registers

        ERRORFIELD,18,19,T,1,3
         04097 User initiated abort
         08193 Invalid operation type
         08194 User parameter changed
END
   END PAGE
```

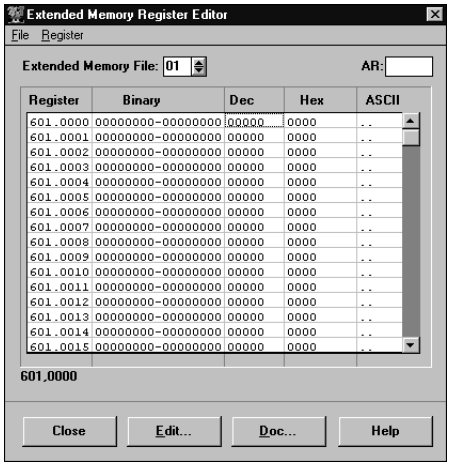
Extended Memory Register editor

The extended memory register editor lets you modify the contents of the 6xxxx registers directly. Some 984 controllers contain up to 96K of optional extended memory that can be used. These registers are accessible from the logic with the READ (XMRD) and WRITE (XMWT) blocks.

The extended memory area is divided into a maximum of 10 files each containing up to 10,000 registers. You can enter data in 5-digit decimal, hexadecimal, binary or ASCII radices.

➢ **To edit a register value using the edit window:**

1. From the Network Editor, select the instruction to edit.
2. On the **Data** menu, click **Extended Memory**. The Extended Memory Register Editor dialog box appears.



3. In the **Extended Memory File** field, select the memory file containing the registers you want to edit.
4. Select the radix value of the register to edit and click **Edit** or double-click the radix of the register to edit. The Edit window appears for the radix selected.
5. In **Register Value**, type the value to be placed into the register (using the appropriate radix), then click **OK**.

   If you are typing a binary value, you cannot type in the new value directly. Instead, set the state of individual bits by selecting one and clicking either **Set** (1), or **Reset** (0). You can also click **Select All** to set all bits to 1, or **Reset All** to set all bits to 0.

➢ **To edit a register value using the Assembly Register:**

1. From the Network Editor, on the Data menu, click **Extended Memory**. The Extended Memory Register Editor dialog box appears.
2. Click in the **AR** field.
3. Type the new register value.

You can't use the AR to type values in binary. Instead, use the edit window (described above). If you try to type an AR value into the binary field, it will be treated as a decimal value.

4. Do one of the following:
   - Select the radix field in the register where the value is to be placed, then press CTRL+ENTER.
   - Click the **AR** label (beside the entry box), and drag the cursor to the appropriate radix of the destination register.

   Be careful to drop the value in the correct radix field. For example, don't type a decimal value in the AR, then drag it to the hexadecimal field. Doing so will enter the value as hex, not decimal.

➢ **To edit documentation for extended memory registers:**

1. From the Network Editor, on the **Data** menu, click **Extended Memory**. The Extended Memory Register Editor window appears.
2. Select the register for the documentation you want to edit.
3. Click **Doc**. The Documentation Editor dialog box appears.
4. Type your documentation.
5. Click **OK**.

➢ **To display a specific register:**

1. From the Extended Memory Register dialog box, on the **Register** menu, click **Goto**. The Goto Register window appears.
2. Type the register (0000-9999) you wish to display.
3. Click **OK**. NxT displays the register in the middle row of the window.

➢ **To search for a register value:**

1. From the Extended Memory Register Editor dialog box, click **Register** then click **Search**. The Search for Data dialog box appears.
2. Type the five digit decimal value to search for.
3. Click **OK**. NxT searches down from the currently selected register for the data value.
4. To search for the next occurrence of the value, press F3.

Extended Memory utilities

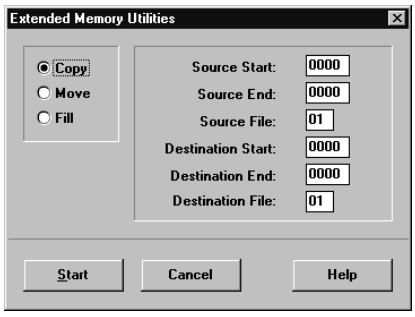
The Extended Memory utilities let you move or copy register contents. You can also fill a block of registers with a data value.

The difference between a move and a copy is that NxT clears the source registers after a move, but does not clear the source registers after a copy.

You can cancel the move, copy, or fill operation while it is in progress by clicking **Cancel**; however, the register contents that were moved before you cancelled the operation are not reset. They remain moved. You will have to go to the destination block and move the contents back to their original locations. Cancelling the move, fill, or copy operation while in progress is not recommended.

➢ **To move the contents of one block of registers to another block:**

1. From the Network Editor, on the **Data** menu, click **Extended Memory**. The Extended Memory Register Editor dialog box appears.
2. From the Extended Memory Register Editor window, on the **File** menu, click **Utilities**. The Extended Memory Utilities dialog box appears.



3. Click **Move**.

4. In the following boxes:
   - **Source Start:** Type the first register of the block to be moved.
   - **Source End:** Type the last register of the block to be moved.
   - **Source File:** Type the number of the file containing the source registers.
   - **Destination Start:** Type the first register of the destination block.
   - **Destination End:** Type the last register of the destination block.
   - **Destination File:** Type the number of the file containing the destination registers.
5. Click **Start**.
6. When finished, click **Cancel** to close the window.

➢ **To copy the contents of one block of registers to another block:**

1. From the Network Editor, on the **Data** menu, click **Extended Memory**. The Extended Memory Register Editor window appears.
2. From the Extended Memory Register Editor dialog box, click **File** then click **Utilities**. The Extended Memory Utilities dialog box appears.
3. Select **Copy**.
4. Enter the following fields:
   - **Source Start:** Type the first register of the block to be copied.
   - **Source End:** Type the last register of the block to be copied.
   - **Source File:** Type the number of the file containing the source registers.
   - **Destination Start:** Type the first register of the destination block.
   - **Destination End:** Type the last register of the destination block.
   - **Destination File:** Type the number of the file containing the destination registers.
5. Click **Start**.
6. When finished, click **Cancel** to close the dialog box.

➢ **To fill a register:**

1. From the Network Editor, on the **Data** menu, click **Extended Memory**. The Extended Memory Register Editor dialog box appears.
2. From the Extended Memory Register Editor dialog box, click **File** then click **Utilities**. The Extended Memory Utilities dialog box appears.
3. Select **Fill**.
4. In the following boxes:
   - **Range Start:** Type the first register in the block to be filled.
   - **Range End:** Type the last register in the block to be filled.
   - **File Range Start:** Type the first file of the block to be filled.
   - **File Range End:** Type the last file of the block to be filled.
   - **Fill Value:** Type the value to place in the contents of each register in the block.
5. Click **Start**.
6. When finished, click **Cancel** to close the dialog box.

Generic Register editor

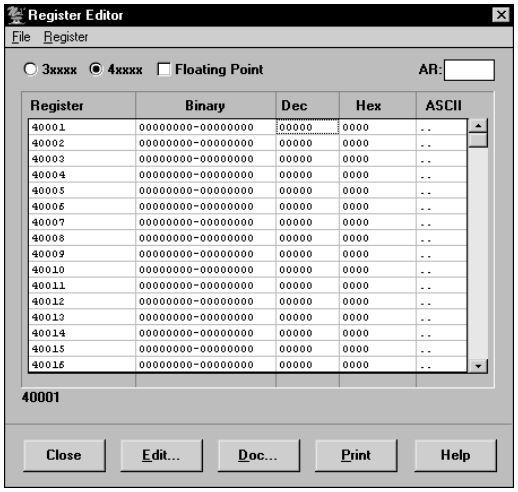
The Register Editor is used to edit register contents in a table format.

Data may be typed in binary, 5 digit decimal, hexadecimal, ASCII or IEEE floating point. The data contained in the registers is displayed in all appropriate formats.

You can edit binaries easily by just double-clicking on the bit to change it or click on it and enter a new value.

➢ **To edit a register value using the edit window:**

1. From the Network Editor, on the **Data** menu, click **Register Editor**, or click  in the toolbar. The Register Editor dialog box appears.



2. Select which register type (3xxxx, 4xxxx) to display.
3. Select or clear the floating point check box to display or not display floating point values.
4. Select the radix of the register to edit and click **Edit** or double-click the radix of the register to edit. The Edit window appears for the radix selected.
5. In **Register Value**, type the value to be placed into the register (using the appropriate radix).

   If you are typing a binary value, you cannot type in the new value directly. Instead, set the state of individual bits by selecting it and clicking either **Set** (1), or **Reset** (0). You can also click **Set All** to set all bits to 1, or **Reset All** to set all bits to 0.
6. Click **OK**.

➢ **To edit a register value using the Assembly Register:**

1. From the Network Editor, on the **Data** menu, click **Register Editor**. The Register Editor window appears.
2. Select which register type (3xxxx, 4xxxx) to display by clicking the corresponding radio button.
3. Select or clear the floating point check box to display or not display floating point values.
4. Click the **AR** box.
5. Type the new register value.

You cannot use the AR to type values in binary. Instead, use the edit window (described above). If you try to type an AR value into the binary field, it will be treated as a decimal value.

6. Do one of the following:
   - Select the radix field in the register where the value is to be placed, then press CTRL+ENTER.
   - Click the **AR** label (beside the entry box) and drag the cursor to the appropriate radix of the destination register.

   Be careful to drop the value in the correct radix field. For example, don't type a decimal value in the AR, then drag it to the hexadecimal field. Doing so will enter the value as hex, not decimal.

➢ **To edit documentation for registers:**

1. From the Network Editor, on the **Data** menu, click **Register Editor**. The Register Editor dialog box appears.
2. Select which register type (3xxxx, 4xxxx) to display.
3. Select the register for the documentation you want to edit.
4. Click **Doc**. The Documentation Editor dialog box appears.
5. Type your documentation.

➢ **To display a specific register:**

1. From the Register Editor dialog box, click **Register** then click **Goto**. The Goto Register window appears.
2. Type the register (0001-maximum) you want to display.
3. Click **OK**. NxT displays the register.

➢ **To search for a register value:**

1. From the Register Editor dialog box, click **Register** then click **Search**. The Search for Data window appears.
2. Type the five-digit decimal value to search for.
3. Click **OK**. NxT searches down from the currently selected register for the data value.
4. To search for the next occurrence of the value, press F3.

➢ **To print a screen of register contents:**

- From the Register Editor dialog box, click **Print**. The addresses, symbols and data currently displayed on the screen are sent to the default printer. Printer settings can be changed with the Printer Setup dialog box in the Lister dialog box, they cannot be changed from inside the Register Editor dialog box.

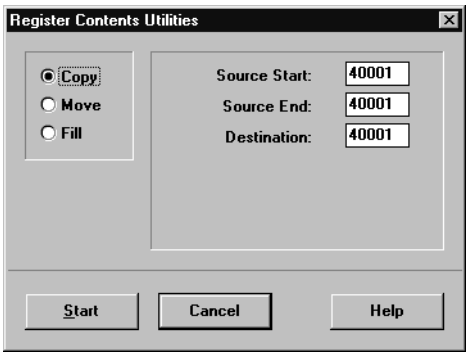
❖ For more information on printing, see "Printing selected data (Lister)" on page 263.

Register Contents utilities

The Register Contents Utilities let you move or copy register contents within a file or between files. You can also fill a block of registers with a data value.

➢ **To move the contents of one block of registers to another block:**

1. From the Network Editor, on the **Data** menu, click **Register Editor**. The Register Editor window appears.
2. From the Register Editor dialog box, on the **File** menu, click **Utilities**. The Register Contents Utilities dialog box appears.



3. Click **Move**.
4. In the following boxes:
   - **Source Start:** Type the first register of the block to be moved.
   - **Source End:** Type the last register of the block to be moved.
   - **Destination:** Type the first register of the destination block.
5. Click **Start**.
6. When finished, click **Cancel** to close the dialog box.

➢ **To copy the contents of one block of registers to another block:**

1. From the Network Editor, on the **Data** menu, click **Register Editor**. The Register Editor dialog box appears.
2. From the Register Editor dialog box, click **File** then click **Utilities**. The Register Contents Utilities dialog box appears.
3. Select **Copy**.
4. In the following boxes:
   - **Source Start:** Type the first register of the block to be copied.
   - **Source End:** Type the last register of the block to be copied.
   - **Destination:** Type the first register of the destination block.
5. Click **Start**.
6. When finished, click **Cancel** to close the window.

➢ **To fill a register:**

1. From the Network Editor, on the **Data** menu, click **Register Editor** (or **Extended Memory**). The Register Editor dialog box appears.
2. From the Register Editor window, click **File** then click **Utilities**. The Register Contents Utilities dialog box appears.
3. Select **Fill**.
4. In the following boxes:
   - **Range Start:** Type the first register in the block to be filled.
   - **Range End:** Type the last register in the block to be filled.
   - **Fill Value:** Type the value to place in the contents of each register in the block.
5. Click **Start**.
6. When finished, click **Cancel** to close the dialog box.

Other Network Editor functions

Checking for used addresses

The **Address Used** table lists currently-used register and discrete addresses and is updated continuously. Use the **Address Used** table to type an address into the assembly register (AR) or directly into an instruction.

When **Display Traffic Cop Used** is cleared, addresses are marked only as unused addresses (.), used addresses (x), or used coils (u). When **Display Traffic Cop Used** is selected, the table displays information on used or unused addresses in the Traffic Cop. Below are the marks for each address:

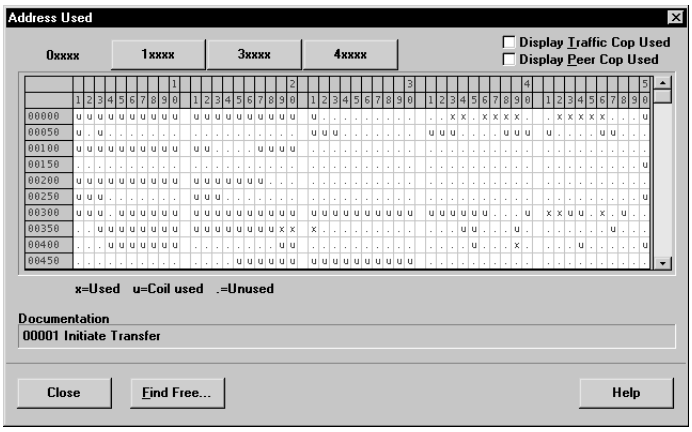
Mark	Meaning
x	Address appears in logic.
u	Address appears in logic as an output coil.
.	Address does not appear in logic.
X	Address appears in the traffic cop and in logic.
U	Address appears in the traffic cop and in logic as an output coil.
t	Address appears in the traffic cop (but not in logic).

When **Display Peer Cop Used** is selected, you can check for the currently-used and discrete addresses in the Peer Cop. Below are the marks for each address.

Mark	Meaning
p	Address appears only in the Peer Cop.
C	Address appears in the Peer Cop, in logic, and as an output coil.
P	Address appears in the Peer Cop and in logic.
M	Address appears in three or more different locations.
T	Address appears in the Traffic Cop and in Logic.

➢ **To type an address into the assembly register:**

1. From the Network Editor, on the **Display** menu, click **Used Table**. The **Address Used** table appears.



2. Select the address type (0xxxx, 1xxxx, 3xxxx, 4xxxx) to display by clicking its corresponding tab.
3. Double-click the address you want to use. You're returned to the Network Editor. The address you selected in the table is placed in the AR. You can then use the assembly register to work with the address.

➢ **To enter an address directly into an instruction:**

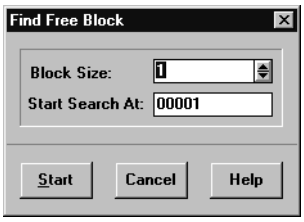
1. From the Network Editor, do one of the following:
   - Select the instruction you want to edit, then on the **Edit** menu, click **Edit Instruction**.
   - Double-click the instruction you want to edit. The Edit Instruction dialog box appears.
2. Select the instruction node where you want to enter the address by clicking it.
3. Click **Used**. The Address Used Table appears.
4. Double-click the address you want to add to your instruction. The address is placed in the node field you selected in the Edit Instruction dialog box.

   If the Address Used Table is not current, a message asks you whether you want the table rebuilt. Click **OK**.

Finding free addresses

➢ **To find a free address:**

1. From the Address Used dialog box, click the tab of the address type (0xxxx, 1xxxx, 3xxxx, 4xxxx) to search for.
2. Click **Find Free**. The Find Free Block dialog box appears.



3. Select or type the size of the contiguous block of addresses you want to find.
4. Type the address you want to start searching from.

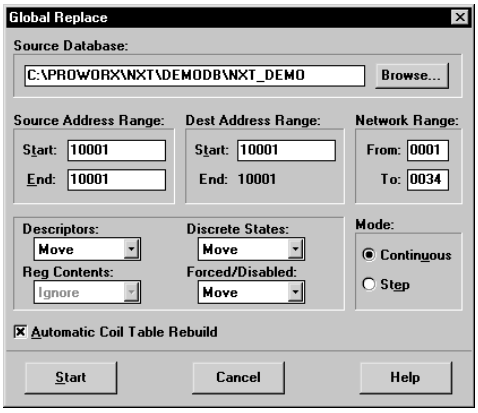
   NxT allows you to start a search from any address. However, I/O functions typically require a word boundary, so you will have to manually adjust the **Start Search At** value to be on a 16 + 1 boundary.
5. Click **Start**. NxT marks the free addresses it finds with an asterisk (*).

Global register replace (offline only)

The Global Replace function lets you move or copy register descriptors and/or register contents from a source—not necessarily an active—database to the active database.

➢ **To perform a Global Replace:**

1. From the Offline Network Editor, on the **Search** menu, click **Global Replace** or  . The Global Replace dialog box appears.



2. Use the following information to set the parameters.

Source database

Type the path and file name of the database from which you want to move or copy descriptors and/or register contents or click Browse to navigate to it.

Source address range

Set the block address range:

- In **Start**, type the starting address of the block to copy or move.
- In **End**, type the final address of the block to copy or move.

The following registers can be used as source addresses:

- 0xxxx, 1xxxx, 3xxxx and 4xxxx registers can be used when copying or moving addresses.

- 0xxxx, 1xxxx, 3xxxx, or 4xxxx registers can be used when copying or moving descriptors.
- Only 4xxxx registers can be used when copying or moving register contents.

Dest address range

Type the starting address of the block (in the active database) to be overwritten by the copy/move operation in Start.

NxT calculates the ending address of the block based upon the size of the block you specified in the **Source Address Range** area.

Network range

Set the block network range:

- Type the starting network of the block to be copied/moved in **From**.
- Type the final network of the block to be moved in **To**.

Descriptors

Select whether the descriptor contents are to be moved, copied, or ignored:

- **Move:** Register contents are transferred into the destination block in the active database. If this is an internal move (moving only within the active database) the source contents are deleted.
- **Copy:** Register contents are transferred into the destination block in the active database.
- **Ignore:** Descriptors are not transferred to the active database.

Reg contents

Select whether the register contents are to be moved, copied, or ignored. This option is unavailable if you have selected a block of discretes.

- **Move:** Register contents are transferred into the destination block in the active database. If this is an internal move (moving only within the active database) the source contents are deleted.
- **Copy:** Register contents are transferred into the destination block in the active database.
- **Ignore:** Register contents are not transferred to the active database.

Discrete states

Select whether to move, copy, or ignore the discrete states:

- **Move:** Relocates the state of each discrete source address to the new destination address.
- **Copy:** Duplicates the state of each discrete source address to the new destination address.
- **Ignore:** Leaves all discrete states as they are.

Forced disabled

Select whether to move, copy, or ignore discrete forced or disabled state information:

- **Move:** Relocates the disabled state of each discrete source address to the new destination address.
- **Copy:** Duplicates the disabled state of each discrete source to the new destination address.
- **Ignore:** Leaves all discrete addresses that are forced or disabled as they are.

Mode

Select a mode of replacement:

- **Continuous:** Performs all changes without individual confirmation.
- **Step:** Confirms every change.

Automatic coil table rebuild

- When selected, the coils are updated in the Address Used Table after the global replace is complete and a check for duplicate coils is performed.
- When cleared, the Address Used Table is not updated and no search for duplicate coils is performed.

Symbolic addressing

Symbolic addressing equates a numeric address with text. This lets you use more meaningful symbols (e.g., push_btn) in place of numerical addresses.

Before working with symbolic addressing, be sure that the **Symbols** check box in the Preferences window is selected.

➢ **To display the Symbol Summary panel:**

- In the Network Editor, on the **View** menu, click **Symbol List** or click **Symb** in the toolbar.

➢ **To add a symbol to the Symbol Summary panel:**

1. In the Network Editor, double-click the Symbol Summary panel or On the **Display** menu, click **Documentation Editor**. The Documentation Editor appears.
2. In the **Navigate By** area, select **Reference**, then type the address to be associated with this symbol.

   You can either type the address in manually, or use the arrow keys to scroll through the address list.
3. In **Symbol**, type the new symbol text.
4. Click **OK**. The symbol and its associated address are added to the Symbol summary panel, sorted alphabetically.

➢ **To add a symbol using the Instruction Edit window:**

1. In the Network Editor, double-click an instruction with the address to which you want to assign a symbol. The Instruction Edit dialog box appears.
2. In the address field, type the new symbol text.
3. Click **OK**. The Add Symbol dialog box appears.
4. Type the address to associate with this symbol.
5. Click **Create**. The symbol, and its associated address are added to the Symbol summary panel and sorted alphabetically.

➢ **To place an address or symbol in the network logic:**

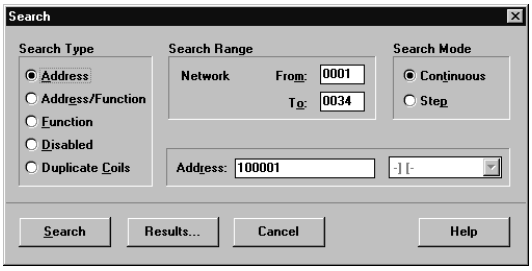
- Drag the address or symbol from the Symbol Summary panel to its destination in logic.

Searching logic

You can search networks in a database for a specific address, instruction, or address/instruction combination. You can also search for disabled addresses or duplicate coils (Offline only).

➢ **To search for logic elements:**

1. In the Network Editor, on the **Search** menu, click **Find** or click  in the toolbar. The Search dialog box appears.



2. Select the search type and the value(s) for that type:
   - **Address:** Select to search for the address you specify in **Address** the address field.
   - **Address / Function:** Select to search for the address you specify in the **Address** field and function you specify in the **Function** field.
   - **Function:** Select to search for the instruction block you specify in the **Function** field.
   - **Disabled:** Select to search for disabled contact or coil.
   - **Duplicate Coils:** (Offline only) Select to search for coils with duplicate addresses.
3. If you are searching for an address, function, or address/function combination, enter the following:
   - **Search Range:** Type the starting network for the search in the **From** field and type the ending network for the search in the **To** field.
   - **Search Mode:** Select **Continuous** to search the entire range of networks, displaying all matches in the Search Results Table or select **Step** to search only for the next match.
4. Click **Search**.

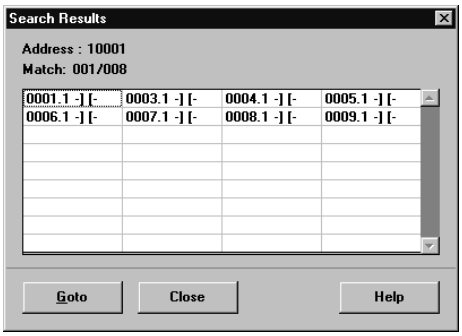
Viewing the search results

The search results table consists of all the search matches found by the search function. Before the Search Results Table can be displayed, you must first perform a search.

➢ **To display the search results table:**

If you selected Continuous search mode, the Search Results dialog box is displayed automatically when the search is completed.

1. Perform a search.
2. Click **Results**. The Search Results Table is displayed.



Each match from the search is displayed in a cell of the table with the format **NNNN.R YYYY**, where:

NNN is the network number;

R is the row within the network; and

YYYY is the function name.

➢ **To go to a search result:**

1. From the Search Results Table, select the result to whose location you want to go.
2. Click **Goto**. NxT displays the network and segment with the matching cell selected.
3. To return to the search results table, click **Results**.

Retracing searches

The Search panel appears in the top right corner of the Network Editor after you **Goto** a location in the Search Results table. The Search panel can be dragged by the title bar to a different location. Once positioned, the panel will remain in place until you exit ProWORX NxT.

This panel allows you to navigate through logic from search match to search match.

➢ **To view locations of search matches using the search panel:**

Do any of the following:

- **Prev:** Click to move to the logic location of the previous match.
- **Next:** Click to move the logic to the next search match.
- **Mark:** Click to add the logic location of the current search match to the mark table.
- **Stay:** Click to stay at the current logic location and cancel display of the search panel.
- **Cancel:** Click to quit using the search panel. You are returned to the Network Editor in the logic location you were in before the search.

Setting bookmarks in logic

You can set bookmarks in your network logic so you can quickly return to a cell or series of cells.

The Set Mark, Unmark, Goto Marks, and Retrace functions allow quick viewing of non-consecutive areas of logic. By marking multiple cell locations on different networks, (up to 42 marks are allowed) you can use the mark table or the Retrace Mark panel to quickly jump between the marked locations. Marks may also be set after a search.

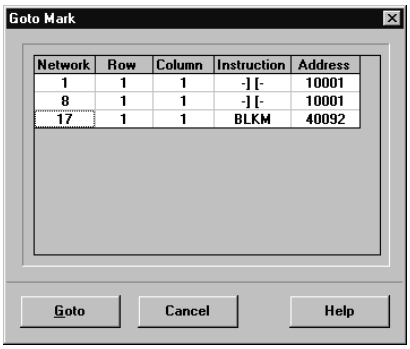
➢ **To set a mark:**

1. From the Network Editor, select the address or instruction you want to set the mark for.
2. From the **Search** menu, click **Set Mark**.

Going to marks

➢ **To go to a mark:**

1. From the Network Editor, on the Search menu, click **Goto Mark**. The Goto Mark dialog box appears, showing a list of current marks.



2. Click a mark to go to, then click **Goto** or double-click the mark.

Retracing marks

You can use the Retrace Mark panel to quickly jump from mark to mark.

This panel allows you to navigate through logic from mark to mark.

➢ **To retrace your marks:**

1. From the Network Editor, on the **Search** menu, click **Retrace Marks**.

   The Retrace panel appears in the top right corner of the Network Editor. You can drag the Retrace panel by the title bar to a different location by the title bar. Once positioned, the panel will remain in place until you exit ProWORX NxT.

2. Do any of the following:

   - **Prev:** Click to move to the previous mark. The network window is repositioned to this mark.
   - **Next:** Click to move to the next mark. The network window is repositioned to this mark.
   - **Goto Mark:** Click to return to the Goto Mark dialog box to select a different mark.
   - **Stay:** Click to close the Retrace Mark panel and disregard the remembered logic position.
   - **Clear:** Click to clear all marks from the list.
   - **Cancel:** Click to return to the network to the location prior to the start of the Goto Mark function. The Retrace Mark panel is removed.

Inserting and deleting network items

Inserting network items

You can insert columns, rows and networks.

➢ **To insert a column, row or network:**

1. From the Network Editor, click the location in logic where you want to insert the new item.
2. On the **Edit** menu, click **Insert**, then do one of the following:
   - **Column:** Click to insert a new column to the right of the cursor.
   - **Row:** Click to insert a new row above your cursor.
   - **Previous Network:** Click to insert a new network above the current network.
   - **Next Network:** Click to insert a new network below the current network.

Deleting network items

You can delete an element, column, row or network. You cannot delete a row or column while it contains an element (instruction). You must first clear the row or column, then delete it.

➢ **To delete an element, column, row, or network:**

1. From the Network Editor, click the cell in logic where you want to delete an item.
2. On the **Edit** menu, click **Delete**, then do one of the following:
   - **Element:** Click to delete the element in the currently selected cell.
   - **Column:** Click to delete the column containing the currently selected cell. Columns to the right of the deleted column are shifted left.
   - **Row:** Click to delete the row containing the currently selected cell. Rows beneath the deleted row are shifted up.
   - **Network:** Click to delete the current network. NxT prompts you to confirm the deletion of a network. Click **Yes** to proceed.

Transferring logic blocks to and from disk (offline only)

Saving blocks of logic to disk (offline only)

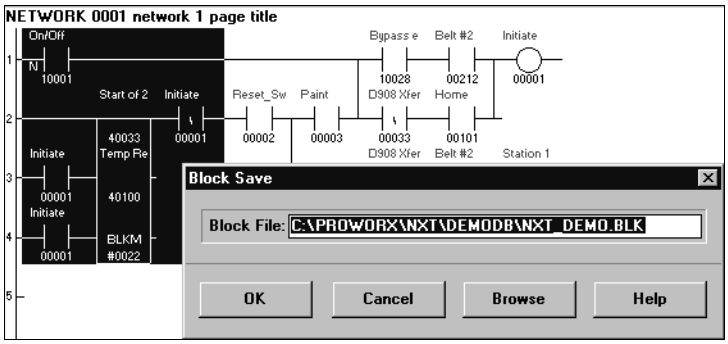
You can save a block of cells into a separate file.

➢ **To save a block of logic:**

1. Select the block to save.

   To select a block, click to select the cell where you want the block to start, then drag the cursor to the final cell of the block. To select an entire network or series of networks, on the **Edit** menu, click **Blocking** then click **Network Range**.

2. On the Edit menu, click **Blocking** then click **Save**. The Block Save dialog box appears.



3. Type the path and file name of the file to contain the block of cells or click **Browse** to navigate to the file.

   A default file name is created based on the active database. The file must have a .BLK extension.

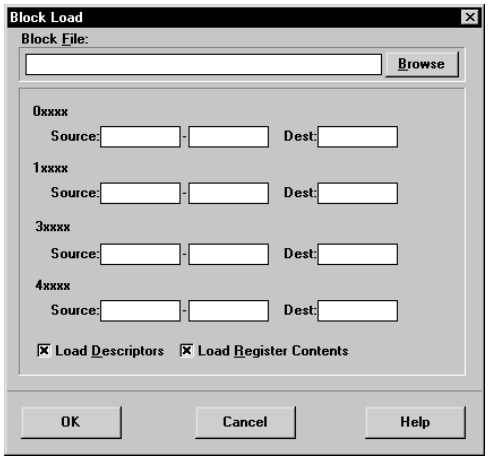
4. Click **OK**. If the .BLK file exists, it's replaced. If the file does not exist, it's created.

Loading blocks of logic from disk (offline only)

You can load a block of cells from a .BLK file into the active database.

➢ **To load a block of cells into the active database:**

1. Click the starting cell where the block is to be inserted.
2. On the **Edit** menu, click **Blocking** then click **Load**. The Block Load window appears.



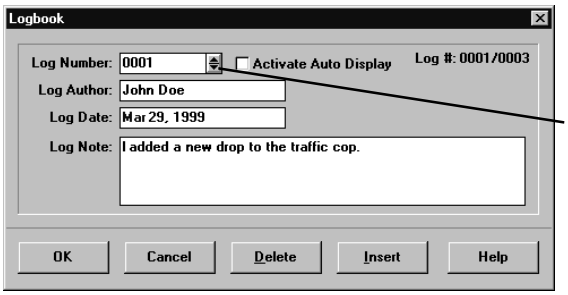
3. Type the path and file name (with a .BLK extension) of the block file to load or click **Browse** to navigate to it. If the block file exists, address range are set to the ranges for the block database. If the block file does not exist, the ranges are blank.
4. For each address type (0xxxx, 1xxxx, 3xxxx, 4xxxx), type the first address in the destination block.
5. To load descriptors associated with the register addresses, select **Descriptors**.
6. To load register contents of the addresses, select **Register Contents**.
7. Click **OK**. The block is loaded into the database of the network being displayed if all checks for address ranges and valid instructions pass.

Making logbook entries

The Logbook is a general purpose note holder that is attached to a database name, but not linked to any database record. It can be used as a scratch pad to remember information, as a daily journal, or a reminder pad to pass information between different shifts. You can set the Logbook to automatically display the next time the Network Editor is started. This forces the next user (for example, the following shift) to review the logbook.

➢ **To add a logbook entry:**

1. From the Network Editor window, on the **Display** menu, **Logbook**. The Logbook window appears.



2. (Optional) In **Log Number**, type the identification number for this log entry. The Log Number defaults to the first unused log number (in increments of one).
3. In **Log Author**, type your name or employee number.
4. In **Log Date**, type the date that this log is entered. The Log Date can be 20 characters, so you can type any information in any format you want (the time of day, shift number and so on). The default is the system date.
5. In **Log Note**, type a log of up to 200 characters in length, then click **OK**.

➢ **To delete a logbook entry:**

1. Select an entry from the **Log Number** list.
2. Click **Delete**. NxT prompts you to confirm the deletion.
3. Click **Yes**.

➢ **To display the logbook automatically at startup:**

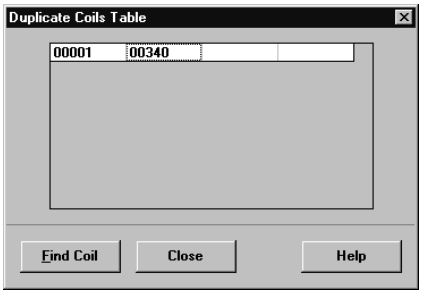
- From the Logbook dialog box, select the **Auto Display Activate**.

Searching for duplicate coils (offline only)

You can search for coils which have been assigned to a duplicate address. If you find any, you can look up the offending coils using a search function.

➢ **To search for duplicate coils:**

1. On the **Search** menu, click **Find**.
2. From the Search dialog box, select **Duplicate Coil Search**.
3. Click **Search**. If duplicate coils are found, the duplicate coils table appears.



4. Select the address you want to go to by clicking it.
5. Click **Find Coil**. A search for the coil address is performed and a Results Table appears. All locations in logic with the found addresses are displayed.

Displaying disabled addresses

You can search for disabled discrete addresses. If any are found, the Disabled Address table dialog box is displayed.

➢ **To display the Disabled Address table:**

1. From the Search dialog box, click **Disabled Table**.
2. Click **Search**.
3. If disabled addresses are found, NxT displays the Disabled Table.
4. Click the address you want to go to.
5. Click **Find Addr**. A search is performed for the disabled address and the Results Table is displayed.

Locating coils from contacts

The Locate Coil function allows you to find contact and coil relationships. To locate a coil in this case means to search for the output coil associated with a selected contact.

➢ **To locate a coil:**

1. From the network window, select a contact with a coil address.
2. On the **Search** menu, click **Locate Coil**.

Rebuilding a database

The Rebuild Database function reconstructs the descriptor pointer file (.DPF) from the existing descriptor data file (.DDF). This may be necessary if the .DPF file is ever corrupted or accidentally erased.

➢ **To rebuild a database:**

1. From the Network Editor, on the File menu, click **Utilities**, then click **Rebuild Database**. You are prompted for confirmation.
2. Click **Yes**.

Performing a sweep (online only)

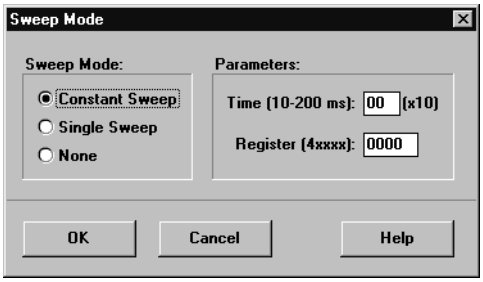
The Sweep function is a powerful diagnostic tool that lets you solve logic for a set number of scans or solve logic continuously with a constant time between scans.

Constant sweep mode

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

➢ **To perform a Constant Sweep:**

1. From the Online Network Editor, on the Configuration menu, click **Sweep**. The Sweep Mode dialog box appears.



2. In **Sweep Mode**, click **Constant Sweep**.
3. In **Time**, type the target time (in tens of milliseconds) for each scan.
4. In **Register (4xxxx)**, type 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 here.
5. Click **OK**.

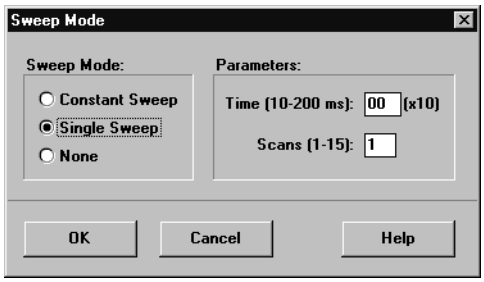
Single sweep mode

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

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

➢ **To perform a Single Sweep:**

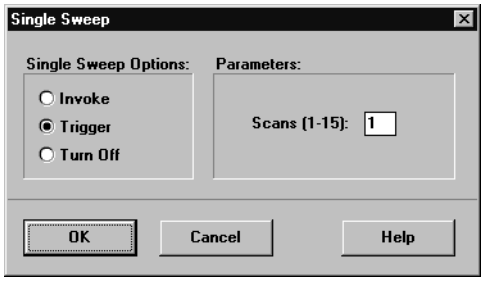
1. From the Online Network Editor, on the **Configuration** menu, click **Sweep**. The Sweep Mode dialog box appears.



2. In **Sweep Mode**, select **Single Sweep**.
3. In **Time**, type the target time (in tens of milliseconds) for each scan.

If the actual scan time is less than the target scan time, the controller waits for the target scan time to elapse before performing the next scan. If the actual scan time is more than the target scan time, the controller continues on with the next scan. This lets you slow the scan time when debugging logic so that the controller doesn't solve logic too quickly for you to catch errors.

4. In **Scans**, type the number of scans (from 1 through 15) to be performed during the sweep then click **OK**.
5. When you are ready to perform the sweep, on the **Configuration** menu, click **Sweep**. The Single Sweep dialog box appears.



6. Select one of the single sweep options:
   - **Invoke:** Select to start the sweep.
   - **Trigger:** Select to set a trigger for the sweep.
   - **Turn Off:** Select to shut off the sweep.
7. Click **OK**. The controller performs the scans (unless you selected Turn Off), then stops solving logic with all outputs frozen in their last state.

   You can then browse register contents and perform other diagnostics using this "snapshot" of the solving process.

7 Using the Traffic Cop

In this chapter

Traffic Cop overview

The Traffic Cop is used to configure the I/O drops, racks, and slots. Often, more than one Traffic Cop series can be configured in your database.

For example, you can have a 800 Series drop, a DCP Series drop, and a 900 Series drop configured in the same database. A120 and Micro Series devices are exceptions.

Drops, racks, and slots

Your Modicon control system involves a certain amount of Discrete and possibly Analog I/O (Input/Output). Each I/O point is physically wired to a terminal of an I/O card in a rack somewhere on your plant floor.

Modicon I/O can be set up either locally (attached directly to the backplane of the main controller rack) or as Remote I/O (through the use of a Remote I/O processor in the main controller rack.) Remote I/O, though not supported by all controller types, allows the greatest flexibility and capacity for your system.

I/O is serviced by the controller in groups called drops (or channels). A single drop of I/O can consist of multiple racks of I/O and must be scheduled to be scanned (in the Segment Scheduler) during the controllers' scan of the logic. For controllers with local I/O, it is always drop #1.

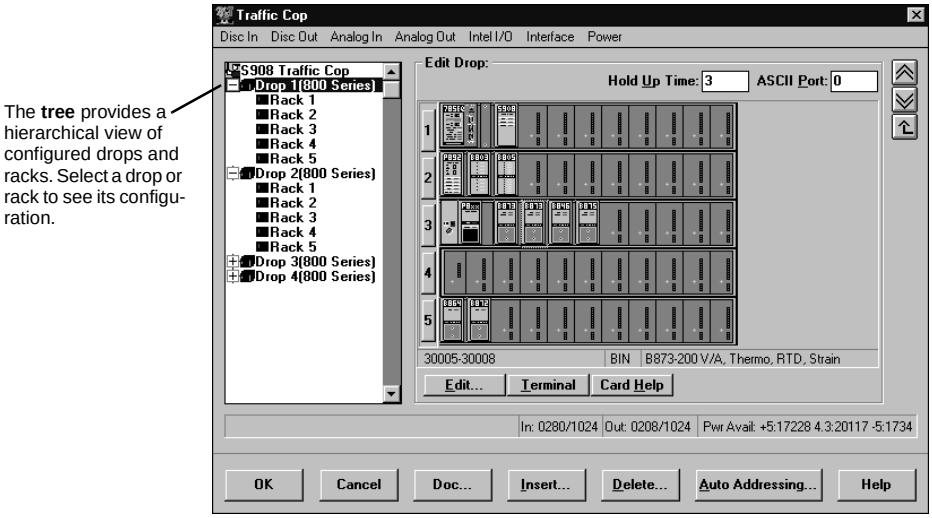
Remote drops of I/O communicate with the main controller through a Remote I/O processor in the main controller's rack. Several I/O families exist for Modicon 984/584 controllers.

Using the Traffic Cop display

The tree control area of the Traffic Cop window lets you select different drops (or racks within drops) in the Traffic Cop tree.

➢ **To display the Traffic Cop:**

- From the Network Editor, on the **Configuration** menu, click **Traffic Cop** or click  on the toolbar.



➢ **To navigate through a tree:**

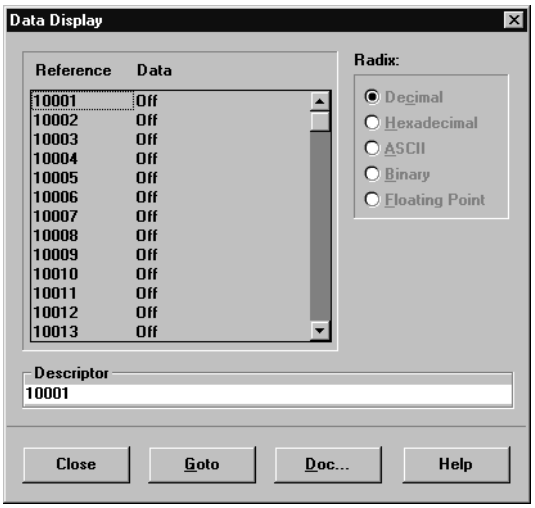
- Click  to move up one visible row in the tree.
- Click  to move down one visible row in the tree.
- Click  to move up one level in the tree (for example, from a rack up to its parent drop.
- To expand the racks in a drop, click ⊞ to the left of the drop.
- To collapse the racks in the drop, click ⊟ to the left of the drop.
- To select a drop Drop or rack Rack, click on it.

Using the Traffic Cop data display

The Data Display window is available only in the 200, 900, and DCP series Traffic Cop. It shows a list of all programmed references and data.

➢ **To display the programmed references and data:**

- From the Traffic Cop window, click **Data**. The Data Display window appears.



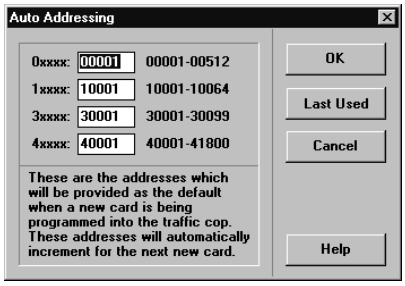
Discretes are displayed as ON or OFF (DON, DOFF if disabled) and registers are displayed in the selected Radix.

Auto addressing in the Traffic Cop

The Auto Address function lets you set default addresses to be entered when programming a new card into Traffic Cop. The addresses are automatically incremented for each new card added.

➢ **To set the default addresses for new cards:**

1. From the Traffic Cop window, click **Auto Addressing**. The Auto Addressing window appears.



2. For each reference type (0xxxx, 1xxxx, 3xxxx, 4xxxx), type the default starting address.
3. Click **Last Used** to recalculate the next available address for a Traffic Cop card. This prevents duplicate addresses from being used.
4. Click **OK**.

Displaying the terminal block (800, Quantum, A120)

The Terminal Block dialog box displays the card currently selected, with programmed references, data values, symbols (if selected) and their descriptors. If Symbols are turned on in Preferences, then an additional column containing all the symbols is displayed.

If you're working Online, I/O points are monitored and updated.

➢ **To display the terminal block for a programmed card:**

1. In the Traffic Cop, click the card you want to display.
2. Click **Terminal**. The Terminal Block window appears with the location (drop, rack, slot) of the selected card displayed in the title bar.
   - **Next:** Click to display the terminal block of the next card in the currently selected rack.

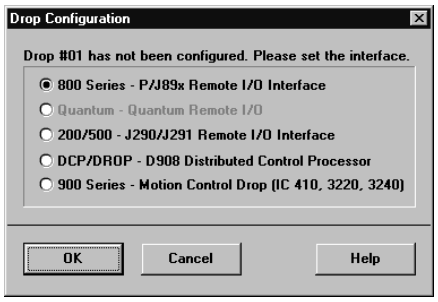
- **Prev:** Click to display the terminal block of the previous card in the currently selected rack.
- **Doc:** Click to edit the documentation for the currently selected address in the Doc Editor.
- **Goto:** Click to search for an address in logic that corresponds with the I/O point. If a match is found, you can exit the Traffic Cop and go directly to the Network Editor, where a complete address search of the logic is performed.

Configuring a drop

If a drop has not been configured yet, **Configure** is displayed in the drop overview area. The Traffic Cop tree control cannot be expanded until the drop type has been chosen.

➢ **To configure a drop:**

1. Click the drop in the tree control.
2. Click **Configure**. The Drop Configuration dialog box appears with the previous default selections.



3. Select the interface corresponding to your topology.
4. Click **OK**.

800 Series Traffic Cop

This Traffic Cop is used to configure an 800-series drop.

Racks associated with the drop (and the cards configured in the racks) are also displayed to the right of the tree control. The racks can be displayed in two views and both allow you to edit slots:

- **Drop Edit:** Displays all racks in the drop.
- **Rack Edit:** Zooms in to display only the currently selected rack. This view also lets you configure the rack type and size.

➢ **To configure an 800 Series drop:**

1. From the Traffic Cop tree control, select the 800 Series drop to edit.

   NxT displays the Edit Drop view in the right side of the window.
2. In **Hold Up Time**, type the number of seconds for this I/O drop to hold its I/O values if communication from the 984 is lost.
3. In **ASCII Port**, type the ASCII Port used for ASCII messaging on this drop.

If the racks haven't been configured for the drop yet, click **Configure** and select an interface, then click **OK** to continue.

➢ **To insert a slot, rack, or drop:**

1. From the Traffic Cop window, click **Insert**. NxT displays the Insert Traffic Cop Item window.
2. Select the item to insert.
3. Click where it should be placed:
   - **Insert before:** The currently-selected item is shifted right if it is a slot or down if it is a rack or a drop.
   - **Insert after:** Items after or below the currently selected item are shifted right or down.

You can press the INSERT and DELETE keys to insert or delete heads, drops, racks, or slots.

➢ **To clear or delete a slot, rack, or drop:**

1. From the Traffic Cop window, select the item to delete.
2. Click **Delete**. NxT displays the Delete Traffic Cop Item window.
3. Select whether you are deleting a slot, rack, drop, or all drops in the Traffic Cop.
4. Select an action, then click **OK**.
   - **Delete:** Removes the item, shifting the remaining items up (rack or drop) or left.
   - **Clear:** Clears the item and leaves it empty, without shifting neighboring items.

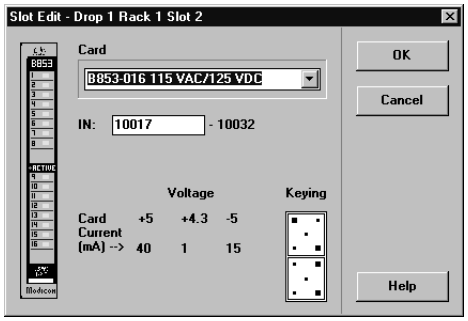
You can press the INSERT and DELETE keys to insert or delete heads, drops, racks, or slots.

➢ **To move a card from one slot to another:**

- Drag the card from its current slot to the destination slot.

➢ **To edit a slot:**

1. From the Traffic Cop display, select a slot and click **Edit** or double-click the slot. The Slot Edit window appear.



Selecting a card displays the power supply loading and mechanical keying for the card. Select a card from the drop-down list, then click **OK**.

2. Select the card to insert in the slot (selected in the Traffic Cop window) from the drop-down list. Selecting a card displays the power supply loading and mechanical keying for the card.
3. In the address field (**In** or **Out**), type the starting address for the address range assigned to this card, then click **OK**.

For example, suppose you are configuring a B828 card with 16 outputs. The address field will be entitled **Out** and you must type the initial address of a 16 address table (0xxxxx) for this card. The final address in the table is automatically displayed.

The table must begin on a word boundary. If you type a starting address that is not on a word boundary (16+1), NxT automatically adjusts the address down to the nearest boundary. The address table is automatically provided if you have selected Auto Addressing.

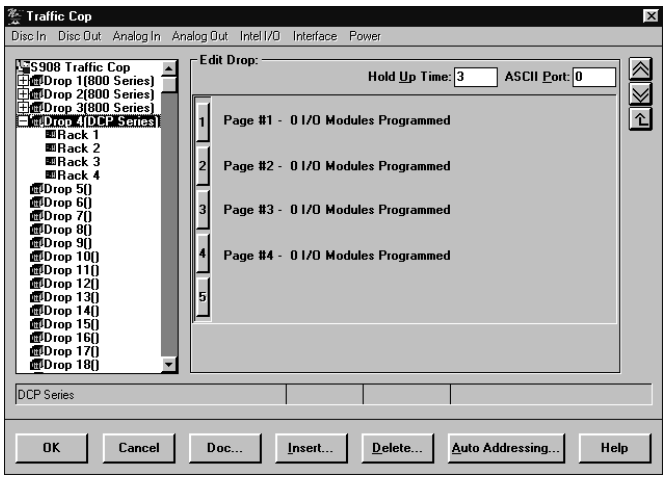
Some cards have other values which are configured at this level. Selecting a B863-001 (4 Channel In). For example, lets you toggle between BIN and BCD.

DCP Series Traffic Cop

The DCP Series Traffic Cop is a four-page display showing the addresses used to transfer data to and from a D908 tied to an S908 system. The D908 is a distributed control processor available for 680/685/780/785 systems. The controllers use a D908 for a remote drop to the master S908 system.

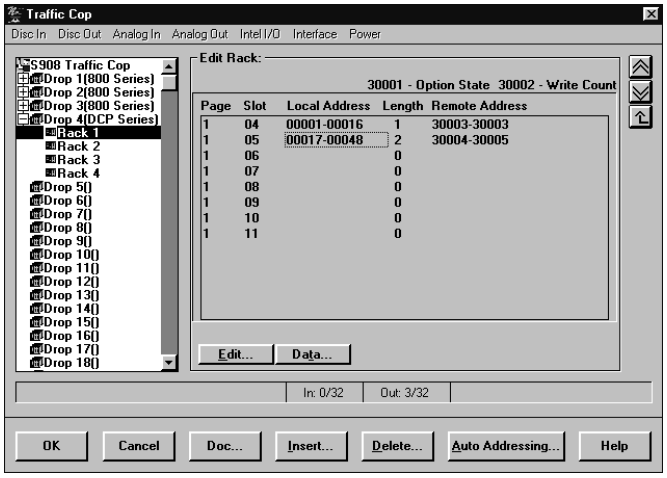
➢ **To edit DCP drops:**

1. From the Network Editor, on the **Configuration** menu, click **Traffic Cop** or click  in the Toolbar.



The four pages of the drop are displayed as racks in the tree control as racks. Selecting a rack from the tree control displays the corresponding page, where you can edit individual slots.

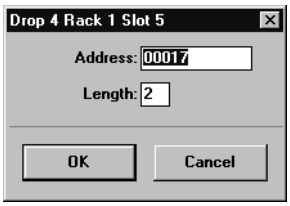
2. Click the corresponding button of the Page you want to configure (for example, click 3 to configure Page #3). The Traffic Cop display switches to Edit Rack mode, showing the slots for a single page.



- The **HB** field displays the health status for each slot: **OK** appears if the card is fine or **??** appears if the card is unhealthy.
- To view data for a local address table, select the table and click **Data**.
- To type or edit documentation for a slot, select the slot and click **Doc**.

3. Double-click the slot to configure or select the slot and click **Edit**.

4. Double-click **Local Address**, or select it and click **Edit**. The slot edit dialog box is displayed. The location of the currently selected slot is displayed in the Title Bar in the format Drop/Rack/Slot.



5. In **Address**, type the starting address for the Local Address table.

   In a DCP system, registers are automatically exchanged between the supervisory PLC and the distributed control drop. The supervisory PLC writes 0xxxx or 4xxxx information to the distributed drop and reads 1xxxx or 3xxxx information from the distributed drop. This step sets the registers to be used for the exchange.

6. In **Length**, type the length (in words) of the Local Address table.

   ProWORX NxT automatically sets the remote address to the length corresponding to the word length entered for the Local Address.

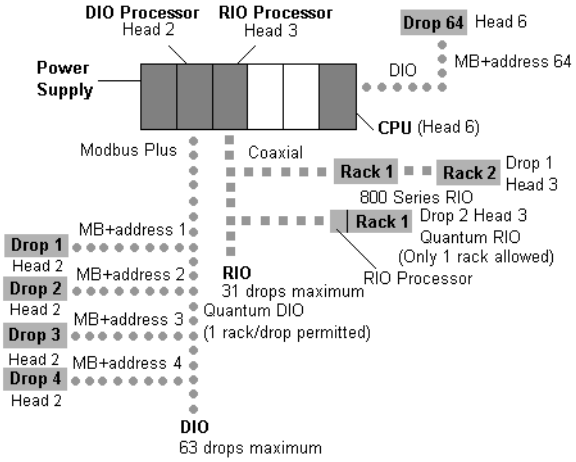
   Addresses 300001 and 300002 are reserved for the Option State and Write Count, respectively.

7. Click **OK**.

Quantum Traffic Cop

Quantum I/O can be set up for Local I/O or Remote I/O (RIO). In addition, Distributed I/O (DIO) is controlled via the Modicon Modbus Plus network.

Like other Modicon I/O, Quantum I/O is organized based on drops and racks. However, in addition to drop number and rack number, Quantum I/O devices also have a head number. Since Quantum controllers can have up to four I/O systems (one RIO and three DIO), each I/O system is given a head number. The head number is the slot where the card is located on the local rack where the I/O system is connected.



DIO drops connected to a DIO processor occupying Head 2 (slot 2) of the local Quantum backplane. All of those drops belong to Head 2.

The DIO drop connected to the CPU, which is in the sixth slot of the 6 slot backplane is designated as Drop 64, Head 6.

➢ **To configure the Quantum Series Traffic Cop:**

1. In the Traffic Cop tree control, select the Quantum Series drop to edit. NxT displays the Edit Drop display in the right side of the window.
2. In **Hold Up Time**, type the amount of time (in seconds) for this I/O drop to scan its I/O if communication from the 984 is lost.
3. In **ASCII Port**, type the ASCII Port used for ASCII messaging on this drop.

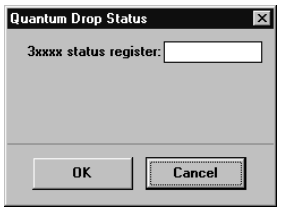
If the racks haven't yet been configured for the drop, click **Configure** and select an interface, then click **OK** to continue.

3xxxx Status Register

When using the Quantum Series Traffic Cop, you can set a 3xxxx Status Register for your drop.

➢ **To set the 3xxxx Status Register:**

1. In the **Status** area of the Traffic Cop window, click **Edit**. The Quantum Drop Status dialog box appears.

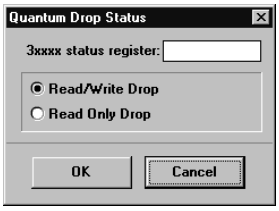


2. Type the register to store the controller status bits, then click **OK**.

If you are using the Quantum Series Traffic Cop and you are using Distributed I/O (DIO), you can set the directions in which 3xxxx status register information travels. To activate the DIO Read/Write Status, on the tree control, click the appropriate distributed drop.

➢ **To set the read/write status:**

1. In the **Status** area of the Traffic Cop window, click **Edit**. The Quantum Drop Status dialog box appears.



2. Select one of the following, then click **OK**:
   - **Read/Write Drop:** Data is passes both to and from the drop and the DIO processor.
   - **Read Only Drop:** Data is passed only from the drop to the DIO processor.

➢ **To insert a slot, rack, or drop:**

1. In the Traffic Cop dialog box, click **Insert**. NxT displays the Insert Traffic Cop Item dialog box.
2. Select the item to insert and where it should be placed:
   - **Insert before:** Currently selected item is shifted right (slot) or down (rack or drop).
   - **Insert after:** Items after (below) the currently selected item are shifted.

You can press the INSERT and DELETE keys to insert or delete heads, drops, racks, or slots.

➢ **To clear or delete a slot, rack, or drop:**

1. In the Traffic Cop dialog box, select the item to delete.
2. Click **Delete**. NxT displays the Delete Traffic Cop Item dialog box.
3. Select whether you're deleting a slot, rack, drop, or all drops in the Traffic Cop.
4. Select an action, then click **OK**:
   - **Delete:** Removes the item, shifting the remaining items up (rack or drop) or left.
   - **Clear:** Clears the item and leaves it empty, without shifting neighboring items.

➢ **To edit a slot:**

1. Select the slot to edit, then click **Edit** or double-click the slot to edit. The Slot Edit window appears with a list of available cards.
2. Select the card to insert in the slot (selected in the Traffic Cop window) from the drop-down list. Selecting a card displays the power supply loading and mechanical keying for the card.
3. In the address field (**In** or **Out**), type the starting address for the address range assigned to this card, then click **OK**.

   For example, if you are configuring a DAI340-00 card with 16 inputs. In the **IN** address field, type the initial address of a 16 address table (1xxxxx) for this card. The last address in the table is displayed.

For some cards, the table must begin on a word boundary. If you type a starting address that is not on a word boundary (16+1), NxT automatically adjusts the address down to the nearest boundary. The address table is automatically provided if you have selected **Auto Addressing**.

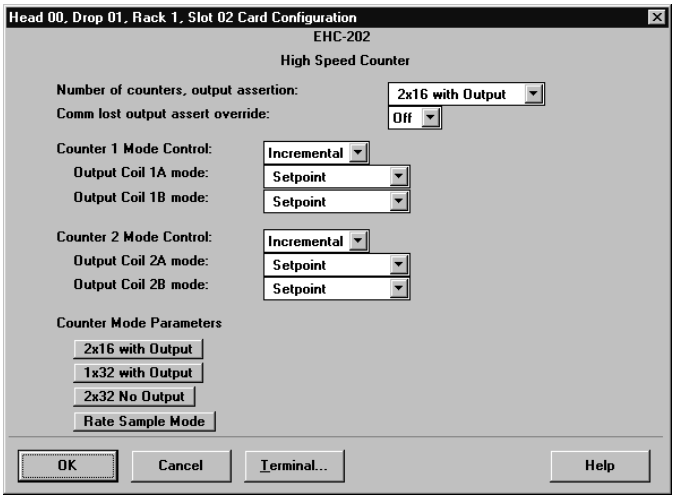
Some cards have other values which are configured at this level. Selecting a MSB101-00 (Motion Inc Enc). For example, to toggle between BIN and BCD.

Configuring Quantum cards

Most Quantum cards require additional parameters to configure.

➢ **To configure card-specific options:**

1. From the Quantum Traffic Cop, select the card to configure.
2. Click **Card Config**. The Card Configuration dialog box appears.



3. Type or select the card-specific parameters, then click **OK**. Consult the card's manual for details. For example, Setting up an Interbus-S NOA611-00 Card in the Quantum Traffic Cop

ProWORX NxT supports Interbus-S I/O devices through a Quantum NOA611-00 Card. NxT communicates with a Quantum controller, which relays information to and from the NOA611-00. The card then receives data from and transmits instructions to the Interbus-S I/O devices. Set up the NOA611-00 card through the Quantum Traffic Cop.

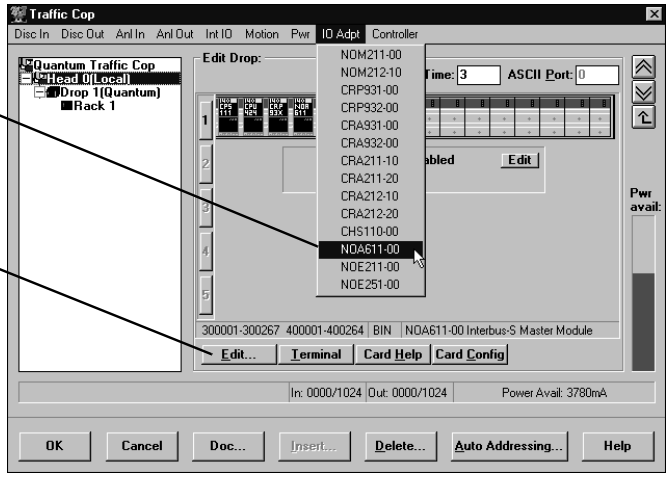
➢ **To set up an NOA611-00 card in the Quantum Traffic Cop:**

Before continuing, you must have configured your database for a Quantum controller (see Controller configuration - Controller tab on page 64).

1. From the Network Editor, on the **Configuration** menu, click **Traffic Cop** or click  in the toolbar. The Quantum Traffic Cop appears.

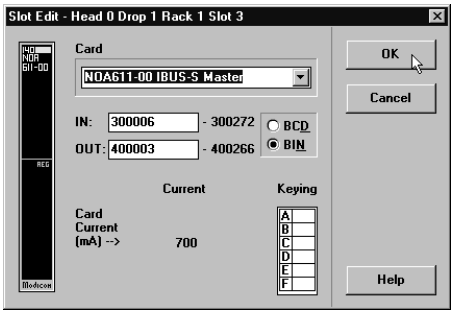
Example: To place an NOA611-00 card, select the local drop and the slot where it will be placed, then click **NOA611 on the IO Adpt menu**.

You can also select a slot, click Edit, then choose the NOA611-00 from the drop-down list.



2. In the Traffic Cop window, click the Quantum Series local drop to select it. The NOA611-00 must be placed in a local drop. Note that the drop must be configured before you can place items into it.
   - ❖ For instructions on configuring a drop, see Configuring a drop on page 184.
3. Click the slot where the NOA611-00 will be placed to select it.
4. Click **IO ADAPT** then click **NOA611-00**. The NOA611-00 icon appears in the slot.

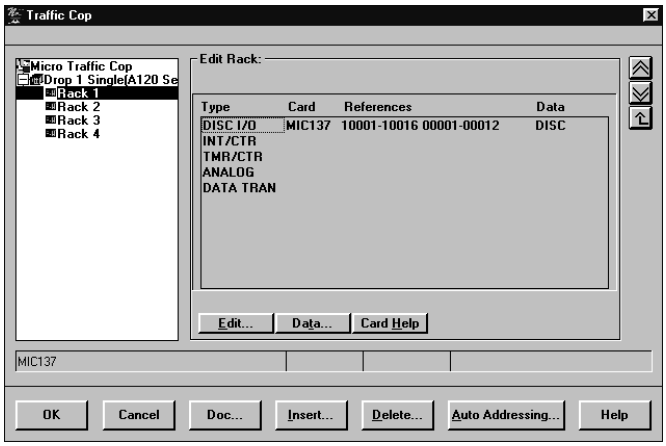
5. Double-click the NOA611-00 icon or with the NOA611-00 icon selected, click the lower **Edit**. The Slot Edit dialog box appears.



6. Edit the NOA611-00 settings as necessary, then click **OK**.
   - For both **In** and **Out**, type an initial address for the range assigned to the card. NxT provides an address table automatically.
   - Click either **BIN** (Binary) or **BCD** (Binary-Coded Decimal). See your NOA611-00 user's manual for more information.
7. Click **Card Config**.
8. Configure the **Output Timeout State** according to the NOA611-00 user's manual, then click **OK**. The Card Configuration window closes.
9. To close the Traffic Cop, click **OK**.

Micro 300 Series Traffic Cop

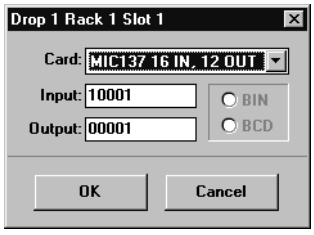
The Micro Drop Summary displays a summary of currently configured I/O modules. Each drop in the Micro Traffic Cop is described as single, parent, or child.



Micro 512 and 612 Series controllers can have A120 Series I/O cards programmed in racks 2 to 4.

➢ **To edit a slot:**

1. From the Micro Traffic Cop, select the slot to edit and click **Edit** or double-click the slot. The Edit window appears.



2. In the **Card** field, select the card to insert in the slot. Selecting a card displays the power supply loading and mechanical keying for it.
3. In the address (**In** or **Out**), type the starting address for the address range assigned to this card, then click **OK**.

   For example, if you configure a B828 card with 16 outputs, the address field is entitled **Out**. You must type the initial address of a 16 address table (0xxxxx) for this card. The final address in the table is displayed.

For some cards, the table must begin on a word boundary. If starting address us used that isn't on a word boundary (16+1), the address is adjusted to the nearest boundary. The address table is provided when **Auto Addressing** is selected.

Some cards have other values which are configured at this level. Selecting a MIC141 (4 Channel In/2 Channel Out). For example, lets you toggle between BIN and BCD.

200/500 Series Traffic Cop

The 200/500 Series I/O screen is an S908 representation of the connection to a J290/J291 interface device. The 200 Series drop contains racks 2 to 5. For each slot in the rack, NxT displays the slot number, type (input or output), reference address range (the associated addresses in logic), data type (discrete or analog), and the health status (**OK** or **??**) of the card. The health status is only available if the controller is running and channels are not explicitly displayed.

➢ **To configure a slot:**

1. Select the drop and rack containing the slot you want to edit from the tree control. The rack appears in the **Edit Rack** area of the window.
2. Select the slot to edit and click **Edit** or double-click the slot.
3. Type the first address of the table associated with this input or output point, then click **OK**.

   For example, suppose you are entering an address table for a 16 IN slot on a J290. You must associate this slot with a 16-bit table of discretes, or one 16-bit register.

   If you are entering a register, select the input type (binary or BCD).

Other functions

- **Data:** Click to view the address contents (the register value or the state of each discrete in the table).
- **Doc:** Click to edit documentation for each slot.
- **Insert:** Click to delete an item (slot, rack, or drop) from the Traffic Cop.
- **Auto Addressing:** Click to set the default addresses for new cards configured into the Traffic Cop. NxT automatically increments the addresses for each new card configured.

200/500 Series slot edit

➢ **To configure a slot:**

1. Select the drop and rack containing the slot you wish to edit from the tree control. The rack is displayed in the **Edit Rack** area of the window.
2. Select the slot to edit and click **Edit**, or double-click the slot.
3. Type the first address of the table associated with this input or output point.

   For example, suppose you are entering an address table for a 16 IN slot on a J290. You must associate this slot with a 16-bit table of discretes, or one 16-bit register.

   If you are entering a register, enable the input (binary or BCD).
4. Click **OK**.

900 Series Traffic Cop

The 900 Series I/O displays the Traffic Cop screen for a motion control I/O drop. The Traffic Cop allows a bi-directional 8 register slot for data transfer. A 900 Series drop is always a remote drop and only found in conjunction with an S908 remote I/O processor. If the controller is running, NxT Online displays the controller health status (**OK** or **??**) in the HB field.

➢ **To edit a slot:**

1. In the tree control, select the drop to edit. NxT displays the single slot for the drop, the card entered (if any), as well as the input and output reference numbers, data type, and description of the card.
2. Select the slot and click **Edit**, or double-click the slot. NxT displays the Edit dialog box, with the drop, rack, and slot shown in the title bar.
3. In **Input**, type the starting register reference number.
4. In **Output**, type the starting register reference number.
5. Click the proper **Data Type** (binary or BCD).
6. Click **OK**.

A120 Series Traffic Cop

This Traffic Cop Series is used with A series compact and new Micro series controller.

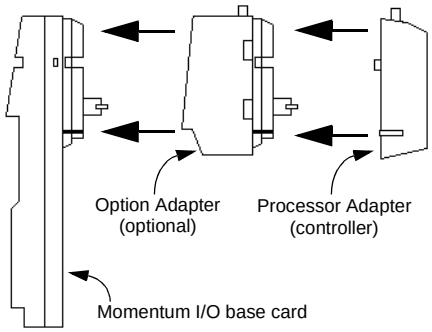
The Slot Edit function for the A120 Series Traffic Cop allows you to edit a configured card or type a new card into a slot.

➢ **To edit the card:**

1. Click the ▼ to the right of the card entry box. A list of valid cards for the drop type you are using appears.
2. Select a card from the drop down list.
3. In **Input** (or **Output**), type the starting address of the address table associated with the I/O points on this card.

Momentum M1 I/O systems

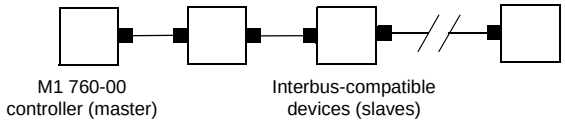
Momentum I/O systems differ from those of other Modicon controllers. A Momentum I/O system grows from a single Momentum I/O base unit. An M1 Processor Adapter (for example, a controller) is mounted on a Momentum I/O base. If a Momentum Option Adapter is used, it is mounted between the Processor Adapter and the I/O base.



Option Adapters add a time of day clock and one or two additional Modbus ports, depending on the Adapter model. Features of an Option Adapter are configured along with the Processor Adapter; as far as controller configuration is concerned, the division between the two is transparent.

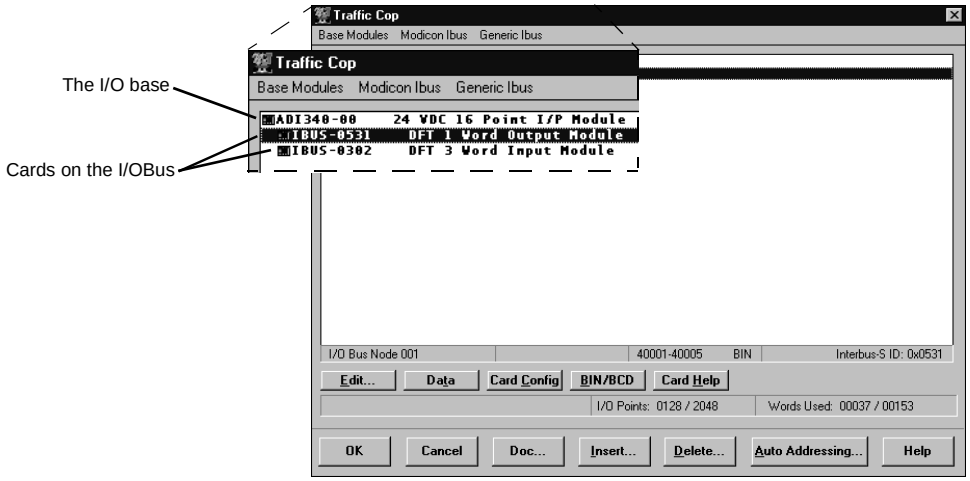
I/OBus

The M1 760-00 Processor Adapter also provides a way to control a network of Interbus-S cards over an I/OBus. The M1 760-00 becomes a master on the Interbus network. Slave devices on a network of this type can be standard Interbus cards (including Modicon cards configured for Interbus communications) or Momentum I/O bases with Interbus Communication Adapters mounted on them.



In an I/OBus, each Interbus-S card is connected to its neighbor in a string. Signals are passed from one card to the next card in line. Node addresses are based on a card's virtual position in the I/OBus network. The first card connected to the I/OBus master (the M1 760-00) has an address of 1. Subsequent cards are numbered 2, 3, and so on. A maximum of 128 cards can be on your I/OBus network.

M1 Traffic Cop



The main window of the M1 Traffic Cop lists all modules currently inserted into the Momentum network. For M1 7x0-x0 controllers, there is only a single entry, the LCL or LoCaL node. This is the I/O base onto which the controller is mounted.

With M1 760-00 controllers, you can also add Interbus-S cards in a string of nodes (that is, slots) called the I/OBus. These can be Modicon cards configured for Interbus communications, other Momentum I/O bases with an Interbus adapter, or third-party Interbus-S cards.

➢ **To view the configuration of a particular slot:**

- From the Momentum Traffic Cop, either double-click the slot or select the slot and click Edit. The Slot Edit dialog box appears.

  The LCL, or LoCaL node, is the I/O base onto which the M1 controller is mounted. When using M1 7x0-x0 controllers, this is the only node you can configure.

  When selecting a node on an I/O Bus connected to an M1 760-00 controller, you can only select slots greater than one if a card exists for all previous slots in the string. For example, you can only add a card into slot 3 if cards have already been added for slots 1 and 2.

➢ **To add a card to the I/OBus:**

1. From the Traffic Cop, select the card in the position following the one where the new card will be inserted. To add a card to the end of the I/O Bus, select the blank line following the last card on the list.
2. Click **Insert**. The **Slot Edit** dialog box appears.
3. Configure the slot card as described in the following instructions.

➢ **To configure a slot card in the Slot Edit dialog box:**

1. If necessary, in the **Card** box, select the card for this slot.

   If you are configuring cards in slots other than the LCL (LoCaL) node, this list will include supported Interbus-S cards. Otherwise, you will only be able to insert Momentum I/O bases.
2. In the address boxes (**IN** and **OUT**), type the starting address for the address range assigned to this card. If Auto Addressing is turned on, a set of address ranges are selected for you automatically.

For example, if you configure an ADI540-00, a Discrete Input card with 16 inputs. In the IN field, type the initial address of a 16-address table (1xxxxx) for this card. The final address is calculated.

On some cards, the initial address for a table of I/O points must begin on a word boundary. That is, it must be one more than a multiple of 16, like 300001 or 100017. If you type a starting address that is not on a word boundary, NxT will adjust the address down to the nearest boundary.

3. If necessary, click **BIN** or **BCD**, depending on how the integer value is stored.

   BIN indicates straight binary representation and **BCD** indicates Binary-Coded Decimal.

4. Click **OK**.

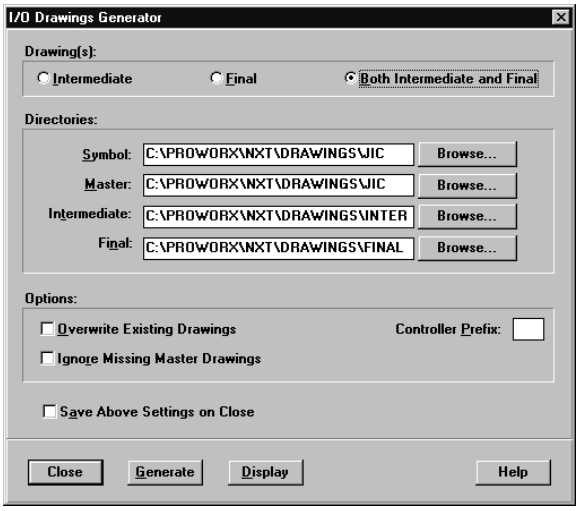
To replace the card within a particular slot, use the Traffic Cop card menus. Click the slot you want to replace, then select a card from the **Base Modules**, **Modicon Ibus** and **Generic Ibus** menus at the top of the **Traffic Cop** dialog box.

Using the I/O Drawing Generator

The I/O Drawing Generator is used to create CAD drawings of 800, Micro, Quantum and A120 I/O.

➢ **To activate the I/O Drawing Generator:**

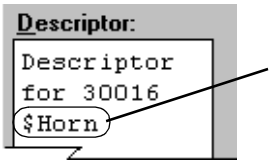
- From the Network Editor, on the **Display** menu, **I/O Drawing Generator**. The I/O Drawings Generator dialog box appears.



The Traffic Cop default setting for the drawings is Intermediate and the default directories are those directories previously used.

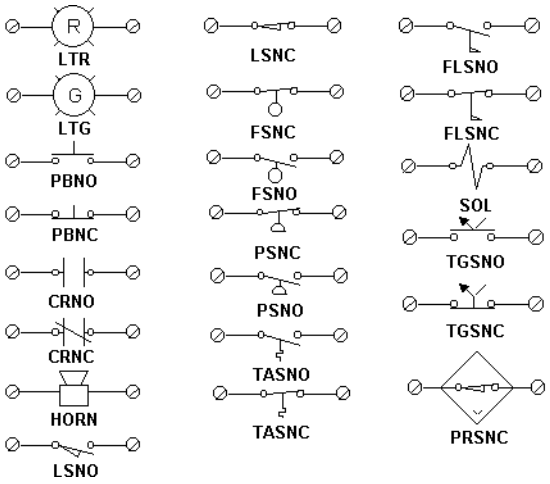
- Click **Browse** to change the directories. The **File Open** dialog box appears.
- Click **Generate** to generate the drawing.

There are different symbols you can use to represent real world devices in your I/O drawings. Type these symbols into the descriptor, starting with a dollar sign ($).



This is the descriptor field in the Documentation Editor. Type symbols by preceding the symbol text with a **$**. See below for a list of symbols and their corresponding text. The symbol can be in any descriptor field.

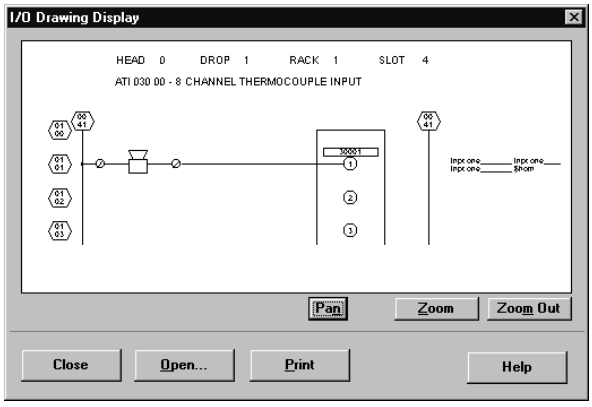
The following is a list of all symbols you can use:



Displaying I/O drawings

➢ **To display I/O drawings:**

1. From the Network Editor, on the **Display** menu, **I/O Drawing Generator**. The I/O Drawing Generator dialog box appears.
2. Click **Display**. The I/O Drawing Display dialog box appears.



Once the final .DXF drawings are created, they can be imported using your CAD program.

➢ **To pan across the drawing:**

1. Click **Pan**.
2. Click at the location you want to be begin your pan view.
3. 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.

➢ **To zoom into the display:**

1. Click **Zoom**.
2. Click at the start location where you want to begin your zoom.
3. Drag your cursor to mark the area. A rectangle appears to define the section of drawing you want to zoom in on.
4. Release the mouse button.

➢ **To zoom out of the display:**

- Click **Zoom Out**.

➢ **To select a different .DXF drawing:**

1. From the I/O Drawing Display window, click **Open**. The File Open dialog box appears.
2. Select the .DXF to display, then click **OK**.

➢ **To print a drawing:**

- From the I/O Draw Display window, click **Print**. The drawing is printed to your default printer.

8 Documenting your PLC

In this chapter

Documenting your PLC

Symbolic Addressing, Address and Bit Descriptors, Short and Long Comments, Network Comments and Page Titles are available for comprehensive database documentation.

You can attach text descriptions to logic element addresses, register bits, segments, networks, labels, and subroutines as well as all of your hardware including I/O points, racks, power supplies, drops, and more. These descriptions can be viewed while programming logic or configuring I/O, and are also included in printed output of the various parts of your control system.

There are four components to documentation in ProWORX NxT:

- **Documentation Window:** Used to edit short comments, long comments, and descriptors from within the Network Editor.
- **Documentation Summary:** Used to review symbols and descriptors, as well as search for a specific documentation record.
- **Documentation Editor:** Used to edit all documentation components, including page titles and long comment placement on printouts.
- **Documentation Utilities:** Used to move, copy and delete some or all documentation for a selected range of references, as well as clean up unused documentation records.

The types of documentation available are:

- **Symbols:** A maximum of 32 characters long. They are text representations of numerical addresses. Symbols are displayed in upper case and can begin with any character other than a number between 0 and 9.
- **Descriptors:** Short descriptions of a reference. You can have five to nine rows of 9, 12, or 15 characters each.
- **Short Comments:** More detailed descriptions of the reference. A Short Comment is four lines long and each line contains up to 48 characters.
- **Page Titles:** A single 64 character line. Only specific types of references support Page Title documentation. Page titles are used to label sections of logic.
- **Long Comments:** Are up to 32,000 characters in length. The maximum number of Long Comments in a database is 5000. Long Comments can also be printed in network listings.

Each reference type supports different kinds of documentation. The Documentation Table (below) shows the kinds of documentation that can be entered for different types of references:

Type of Reference	Format	Descriptors	Short Comments	Page Titles	Long Comments	Symbols
Coil	0xxxx	•	•	•	•	•
Discrete Input	1xxxx	•	•			•
Register Input	3xxxx	•	•			•
Holding Register	4xxxx	•	•			•
Bit Descriptor	4xxxx bits	•	•			
Network	Nxxxx	•	•	•	•	
Labels	Lxxxx	•	•	•	•	
Segments	Sxxxx	•	•			
Program	P1	•	•			
Drop	Dhhdd	•	•			
Rack	Rhhdd	•	•			
Slot	Thhddrss	•	•			
Extended Memory	6ff,xxxx	•	•			
Constants	#					•
S901 Channel	Ccc	•	•			
S901 Input Slot	Tccls	•	•			
S901 Output Slot	Tcc0s	•	•			

Using the Documentation window

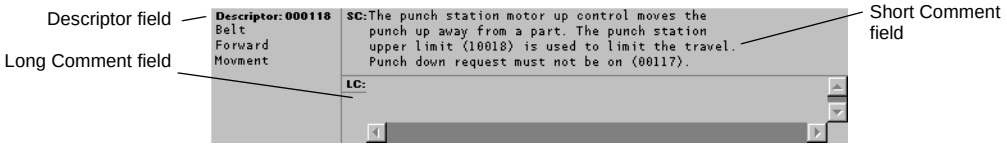
The Documentation Window lets you enter descriptors, short comments, and long comments for cells or networks without leaving the Network Editor. If Symbols is selected in system Preferences, the window also displays the Symbol associated with a selected address in logic.

You can add documentation for 0xxxx, 1xxxx, 3xxxx, and 4xxxx references, as well as the network itself (Nxxxx).

➢ **To edit documentation in the Documentation Window:**

1. If the documentation window does not appear in the Network Editor, on the **View** menu, **Documentation Window**. The Documentation Window is displayed, and a checkmark appears beside the Documentation Window option in the View menu.

If the Documentation Window in the View menu is grayed out, you do not have an active database selected. Open or create a database before continuing.



2. Select the instruction in logic to document. If you select a blank cell in logic, the documentation you type applies to the network itself. Any existing documentation for the selected is displayed.
3. Click the box containing the documentation (descriptor, short comment, or long comment) you want to edit.
4. Type the new text.

You can use the **Cut** (CTRL+X), **Copy** (CTRL+C), and **Paste** (CTRL+V) between fields. For example, select text from a short comment, copy it, then paste it into the long comment

Do not use the cut, copy, and paste buttons on the toolbar, these functions only operate on the instructions themselves.

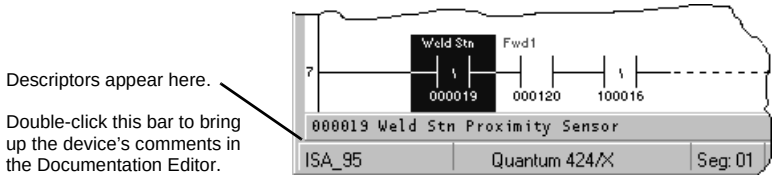
5. When finished, click outside of the field to save the changes. If you don't want to save your edits, press ESC to exit the field.

Using the One-Line Documentation window

The One-Line Documentation window shows your descriptors of logic elements but takes up very little space on your screen, leaving you room to view complex networks.

➢ **To use the One-Line Documentation window:**

1. On the **File** menu, click **Preferences**. The Preferences window appears.
2. Select the **One-Line Doc Window Enabled** check box.
3. Click **OK**.
4. If the Documentation Window is not visible in the Network Editor, on the **View** menu, click **Documentation Window**. The One-Line Documentation Window replaces the On-Screen Documentation Window in the Network Editor.



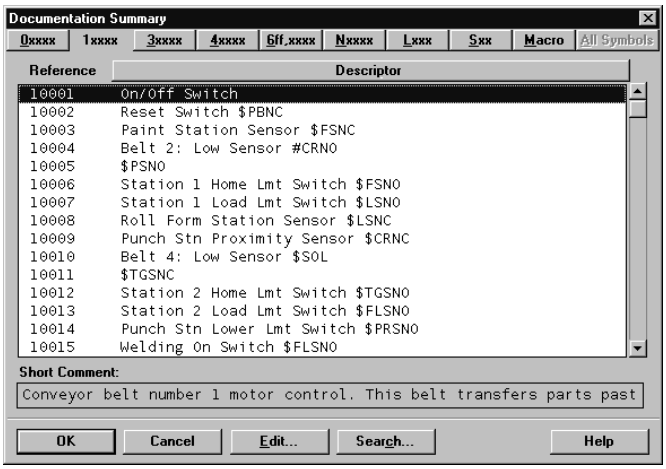
Documentation summary

The Documentation Summary provides a view-only display of descriptors, short comments and symbols (if the Symbols option is selected in **Preferences**) for all available references.

The Documentation Summary also shows whether a symbol associated with a reference is made visible to Process Window. Process Window is an MMI application that is available from Total Control Products (Canada) Inc.

➢ **To display the Documentation Summary window:**

1. From the Network Editor, on the Display menu, click **Documentation Summary** or from the Documentation Editor, Instruction Editor, Equation Network Editor, or Add Symbol window, click **Summary**.



2. Select the reference type you want to view from the horizontal tab list.
   - **Reference:** Click to view all references of one type (regardless of whether the reference has any documentation).
   - **Symbol:** Click to view only references which are associated with a symbol.

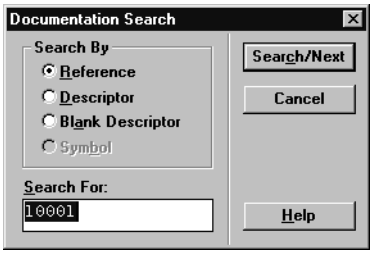
     If Symbols are turned off in System Preferences, the Symbol and MMI columns don't appear.

Searching for specific documentation

The Documentation Search function allows you to search for references, descriptors, blank descriptors and symbols.

➢ **To activate the search from the Documentation Editor:**

1. On the Display menu, click **Documentation Editor**. You can also click **Edit** from the Documentation Summary dialog box. The Documentation Editor window appears.
2. Click **Search**. The Documentation Search dialog box appears.



➢ **To search by reference:**

1. In **Search By**, click **Reference**.
2. If you have performed a search before, the address for the previous search appears in the **Search For**. If necessary, type a new address or reference.
3. Click **Search/Next**. After the search is performed, the search results are displayed in the documentation fields in the Documentation Editor or selected in the Documentation Summary list. If the search is successful, the previous dialog box (either the Documentation Summary or the Documentation Editor) is repositioned to the matching record.

➢ **To search by descriptor:**

1. From the Documentation Search dialog box, click **Descriptor**.
2. Type the descriptor text in **Search For**. Unlike **Search By Symbol**, the descriptor does not have to begin with the specified text in order for a match to be found.
3. Click **Search/Next**. If the search is successful, the previous dialog box (Documentation Summary or the Documentation Editor) is repositioned to the matching record.

➢ **To search by blank descriptor:**

1. From the Documentation Search dialog box, click **Blank Descriptor**.
2. Click **Search/Next**.

   If the search is successful, the previous dialog box (either the Summary or Editor) is repositioned to the next record that does not have any documentation associated with it.

➢ **To search for a symbol:**

1. From the Documentation Search dialog box, click **Symbol**.
2. Type the symbol in **Search For**.
3. Click **Search/Next**.

   The symbol must **begin** with the specified text for a match to be found. Documentation Summary or Documentation Editor is repositioned to the matching record.

   Because a search continues from the last matched record, it's possible you won't find a match between the current position and end of the database. In this situation, you're given the option to continue the search from the beginning.

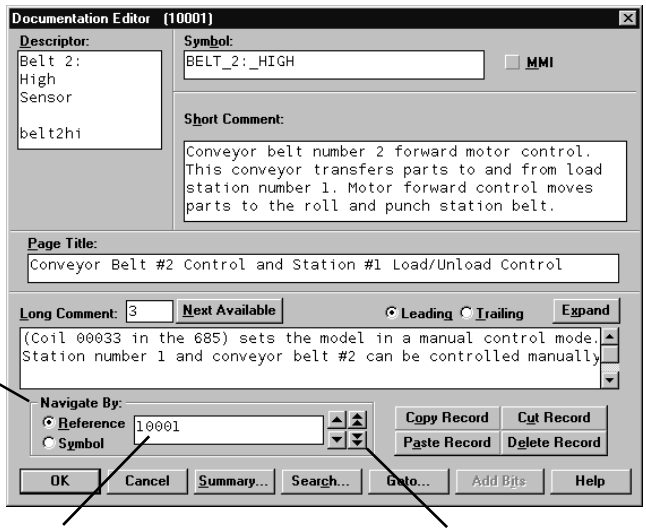
Using the Documentation editor

The Documentation Editor lets you describe in detail your logic addresses, Traffic Cop Configuration and other references. You can document addresses, networks, segments, labels, drops, racks and slots.

This documentation can be displayed automatically whenever the reference is used in programming logic, configuring I/O, and generating printer listings.

➢ **To display the Doc Editor:**

- From the Network Editor, on the **Display** menu, click **Documentation Editor**, or click  from the tool bar. The Documentation Editor window appears.



Navigate By lets you toggle between navigating by **Reference** in sequential order or by **Symbol** in alphabetical order.

The Entry field control lets you type a reference or symbol. NxT automatically takes you to the selected record.

These buttons display records relative to the current record.

When you click  or type a reference or symbol to move to a new record, changes made in the previous record are automatically saved.

➢ **To go to logic at the currently-displayed reference:**

- Click **Goto** to return to the Network Editor and search for the address or symbol displayed in the Navigate By area. From there, you can select any occurrence of that address in logic.

➢ **To enter Descriptors, Short Comments, Page Titles, and Symbols:**

1. Click the respective field to place the cursor there.
2. Type your text. You can **cut** (CTRL+X), **copy** (CTRL+C), and **paste** (CTRL+V) selected text within a field, or among fields. For example, you can select text from **Short Comment**, copy it, then paste it into **Long Comment**.

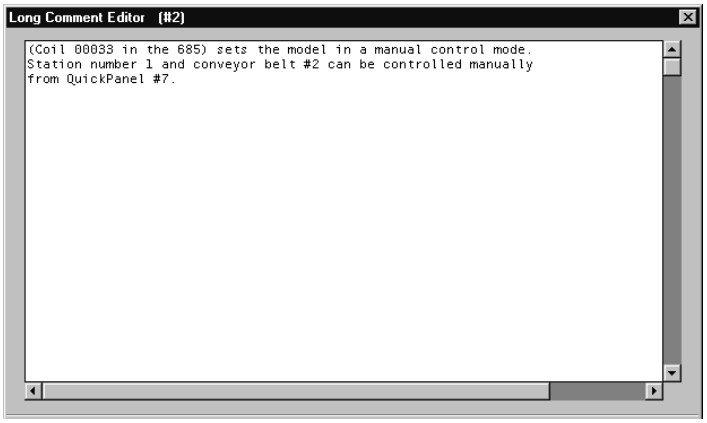
   If the text you have typed does not fit in the first line of the field, text in the **Descriptor** and **Short Comment** boxes wraps onto several lines.
3. Click anywhere outside the field to record your changes.

➢ **To enter long comments:**

1. From the Doc Editor, type the reference type associated with the comment. When you type the reference type in **Navigate By**, the documentation accompanying the reference is displayed.

   Comments can be associated with multiple references. Only one long comment can be associated with a reference; however, a single long comment can be associated with any number of references within the database. Long comments can be as many as 32,000 characters long and can be printed in network listings.

   - If the Long Comment number is greater than 0, you can expand its display. Click **Expand** to show the Long Comment dialog box.
   - To find the next unused Long Comment number, click **Next Available**.



2. Enter your changes.

If you are deleting a Long Comment, be aware that there may be other references associated with this Long Comment. Deleting the text of the comment may also affect other references. As an alternative, you can set the Long Comment number to zero. This breaks the association of the current reference with the Long Comment while leaving the text of the comment intact.

3. Click **OK**. The edit box is updated to the next blank Long Comment and the text in the Long Comment dialog box is cleared.
4. Select where in the Lister printout the Long Comments are to appear:
   - **Leading:** The comment printed before the network;
   - **Trailing:** The comment printed after the network.

Moving, copying, and deleting multiple records

All documentation for a single reference is stored in a database record. There are four operations you can perform on a record:

- **Copy Record:** Copies all documentation, except the **Symbol** and **MMI** fields.
- **Cut Record:** Copies all documentation, except the **Symbol** and **MMI** fields, and deletes the record.
- **Paste Record:** Pastes all documentation fields from the most recent Copy Record or Cut Record operation. Paste overwrites only the enabled fields of the currently selected reference with the exception of the **Symbol** and **MMI** fields. You can paste the same record into multiple references.
- **Delete Record:** Deletes all the documentation for the current record.

➢ **To insert text from one reference into another reference:**

1. Type the reference to copy in the **Navigate By** entry field.
2. Select the text to copy and press CTRL+C.
3. Type the reference where you want to paste the text.
4. Select the documentation field you want to paste the text into and press CTRL+V. You can paste text into multiple references, by selecting one reference at a time and repeating Step 4.

➢ **To copy a long comment number into multiple records:**

1. Type the reference where the Long Comment is located. Remember the number of the Long Comment you want to tie to the different references. The number is located in the entry field beside **Next Available**.

   Click  to find the reference where you want to associate the Long Comment to.
2. In **Long Comment**, type the Long Comment number.
3. Press TAB or click out of the entry field. As soon as you select another reference number, the Long Comment is automatically tied to the previously selected reference.

➢ **To copy a long comment:**

1. From the **Long Comment** box, select the text to copy.
2. Press CTRL+C.
3. Type the destination reference in **Navigate By**.
4. Click **Next Available**.
5. Click in the **Long Comment** box.
6. Press CTRL+V. The Long Comment is duplicated each time you paste.

Adding 4xxxx Bit descriptors

The Add Bits functions is only enabled if the current reference is a 4xxxx address.

➢ **To add bit descriptors for a specific 4xxxx address:**

1. Type a 4xxxx address in the **Navigate By** entry field.
2. Click **Add Bits**. The button is replaced with **Remove Bits**.

Documentation utilities

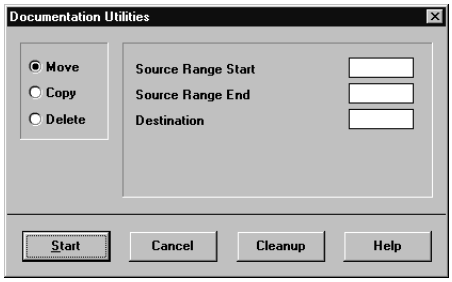
Normal database editing functions may require you to move, copy, or delete documentation.

Moving documentation

Move lets you select a range of documentation records to a new location.

➢ **To move documentation records:**

1. On the Display menu, click **Documentation Utilities**. The Documentation Utilities dialog box appears.



2. Select **Move**, if it's not the selected function.
3. Type the starting address of the source range in **Source Range Start**. A **Source Range End** is automatically entered. To move more than one record, change the **Source Range End**.
4. Click **Start**. Documentation records within the entered range are deleted from their old locations and placed in the new ones. Existing documentation records in the destination range, they are overwritten.

   For example, you can select records associated with addresses 40125 through 40150 and move them to 40250. When complete, new records are created containing the documentation from the source range of records for 40250 through 40275. The records associated with 40125 through 40150 are deleted. If records exist for any of the destination range records, they are overwritten with the new documentation data.

   You can also move documentation from one type of database record to another (for example, N0001 to 00001).

If you move, delete, or add new records to the database, click **Cleanup** when you've finished to eliminate empty records in the database structure.

Copy documentation

Copy Records works the same as Move, except the source records are not deleted. They retain their original contents; only copies of the documentation text are placed into the new range of records.

➢ **To copy documentation records:**

1. On the **Display** menu, click **Documentation Utilities**.
2. If Copy is not the selected function, click **Copy**.
3. Type the starting address of the source range in **Source Range Start**. The **Source Range End** is automatically entered. To move more than one record, change the Source Range End.
4. Click **Start**. The Copy operation makes an identical copy of the source records without changing the source records in the new location.

Delete documentation

Delete Documentation lets you remove documentation records within a specified range.

➢ **To delete documentation:**

1. On the **Display** menu, click **Documentation Utilities**.
2. From the Documentation Utilities dialog box, click **Delete**.
3. Type the starting address of the range of records you want to delete. An ending address is automatically added. The start and end range descriptor record types must be the same.
4. Click **OK**. Documentation records within the range are marked as deleted. To free up disk space, use the Cleanup function.

➢ **To clean up moved or deleted records:**

- Click **Cleanup** to remove all data from records marked as deleted and decreasing the DDF file size.

Importing/exporting databases

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

Importing database documentation into ProWORX NxT

You can import descriptors and comments from files and other databases into your current database.

This function does not import controller logic.

❖ For information about importing logic, see “Opening an existing database” on page 17 or see “Loading blocks of logic from disk (offline only)” on page 172.

NxT can import documentation from these types of files:

- **ProWORX ASCII (.FIL):** files containing descriptors, short comments, and page titles exported from databases.

  When importing an .FIL file, you can add the new information to your database without overwriting any existing data. Overlay the new information onto your existing data, overwriting it where necessary or replace all existing data with the new information.

- **ProWORX Symbol (.FIS):** ProWORX products generate this type of file when exporting symbol and controller address information.

- **Updoc ASCII:** NxT requires both the .ASN and .ASR files from the Updoc database to import the documentation successfully.

  Updoc descriptors overwrite all information in the first six descriptor fields of your NxT database. If your database has fewer than six descriptor fields, an error message appears during the import process. To change the number of fields in your database, on the **File** menu, click **Utilities** then click **Database Setup**.

❖ For more information, see “Editing the setup of a database” on page 19.

- **Graysoft:** NxT requires both the .LAB and .HDR files from the Graysoft database to import the documentation successfully. Graysoft descriptors overwrite all information in the first three descriptor fields of your NxT database.

- **Ladder Doctor:** NxT requires the .TXT file from the Ladder Doctor database to import the documentation successfully.

  Ladder Doctor descriptors overwrite all information in the first four descriptor fields of your NxT database. The five-character Ladder Doctor names are imported into the first descriptor field of the NxT database and the eight-character descriptions fill the remaining three fields.

- **Spreadsheet Data Interchange Format (.DIF):** You can import .DIF files created by spreadsheets as your database documentation. However, you must take special care when importing databases from Microsoft Excel.

❖ For more information, see "Appendix E - .DIF Files and Excel".

Spreadsheet descriptors overwrite all information in the first nine descriptor fields of your NxT database. If your database has fewer than nine descriptor fields, an error message appears during the import process. To change the number of fields in your database, on the **File** menu, click **Utilities**, then click **Database Setup**.

❖ For more information, see Editing the setup of a database on page 19.

- **dBaseIV Database (.DBF):** You can import .DBF files created by dBaseIV or other data management and spreadsheet programs (including Microsoft Excel).

  For best results, configure the **.DBF file** for **nine** descriptor fields before you import it into NxT, regardless of how many descriptor fields your database uses. Although, you will not receive an error message during the import if the .DBF has fewer fields, its short comments may become garbled.

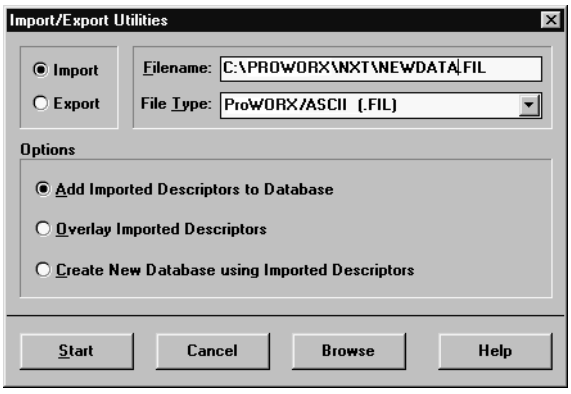
  When you import a .DBF file, you can choose to add the new information to your database without overwriting any existing data; overlay the new information onto your existing data, overwriting it where necessary; or replace all existing data with the new information.

- **Traffic Cop (.TEF):** Importing a .TEF file overwrites the existing Traffic Cop data. Exporting creates a .TEF file of the current Traffic Cop data. NxT requires both the .TEF and .DEF files to successfully import the documentation.

  If a mismatch occurs between the database and the import file, a message box appears displaying the mismatch in yellow.

➢ **To import database documentation:**

1. From the Network Editor, on the **File** menu, click **Utilities** then click **Import/Export**. The Import/Export Utilities dialog box appears.



2. Click **Import**.
3. Type the path and file name of the database to import or click **Browse** to navigate to it.
4. Select the **File Type** of the database to import from the drop-down list.
5. If you're importing a ProWORX .FIL or dBaseIV .DBF file, choose how the new data will enter your database.
   - To add the imported descriptors to the database without changing any of its existing descriptors, click **Add Imported Descriptor to Database**.
   - To overwrite the database's existing descriptors with new ones from the imported file, click **Overlay Imported Descriptors**. Empty fields in the imported file will not erase descriptors in the open database.
   - To erase all descriptors from the open database except those from the imported file, click **Create New Database Using Imported Descriptors**.
6. Click **Start**. The documentation is imported into your database.

Exporting database documentation from ProWORX NxT

You can export descriptors and comments from your database to an ASCII file. You can then edit your documentation in the word processor or spreadsheet program you use.

This function does not export controller logic.

❖ For information about exporting logic, see "Saving blocks of logic to disk (offline only)" on page 171.

ProWORX NxT exports documentation in a database to these formats:

- **ProWORX ASCII (.FIL):** files for exchanging data easily. By default, NxT creates this type of file for documentation.

  When exporting information to a ProWORX ASCII file, you can choose whether you want the data written to the file **sequentially** (slower to create, but generally less confusing to edit because the information is in order) or **randomly** (faster to create, but sometimes more confusing to edit because the information in whatever order NxT finds it).

- **ProWORX Symbol (.FIS):** files for exchanging symbol and controller address information.

- **Spreadsheet Data Interchange Format (.DIF):** NxT creates standard .DIF files. Most spreadsheet programs can this format without difficulty. However, you must take special care when transferring data to and from Microsoft Excel in .DIF files.

❖ For more information, see ""Appendix E - .DIF Files and Excel" on page 369".

- **dBaseIV Database (.DBF):** NxT 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.

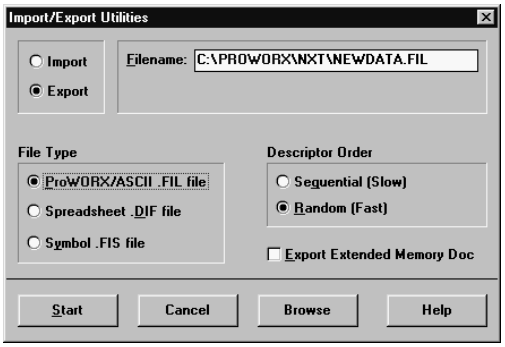
  When exporting a database to a .DBF file, each descriptor field and short comment becomes its own record. NxT generates nine records for your descriptor fields regardless of how many you have configured in your database.

- **Traffic Cop (.TEF):** Importing a .TEF file overwrites the existing Traffic Cop data. Exporting creates a .TEF file of the current Traffic Cop data. NxT requires both the .TEF and .DEF files to successfully import the documentation.

  If a mismatch occurs between the database and the import file, a message box appears displaying the mismatch in yellow.

➢ To export database documentation:

1. From the Network Editor, on the **File** menu, click **Utilities** then click **Import/Export**. The Import/Export dialog box appears.



2. Select **Export**.
3. Type the path and file name of the file to export your database to or click **Browse**.
4. Click the **File Type** to create.
5. If you are exporting to a ProWORX ASCII file, choose how the file data will be written.
   - **Sequential** writes are slower, but the file may be less confusing to edit as NxT sorts the information before exporting it.
   - **Random** writes are considerably faster, but may be confusing to edit as the information is exported in whatever order NxT finds it.
6. Click **Start**. NxT tells you the status of the export.

9 Using Equation Networks

In this chapter

Introduction to Equation Networks

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 **Insert** menu won't be available.

➢ To create a new Equation Network:

1. In the main Network Editor, move to the logic network where you want the new Equation Network. Each Equation Network takes up an entire network's worth of logic.
2. Click **Edit**, then from the **Insert** menu, click **Equation Network**. The Equation Network Editor display appears and a blank Equation Network is inserted into your logic.

➢ To edit an existing Equation Network:

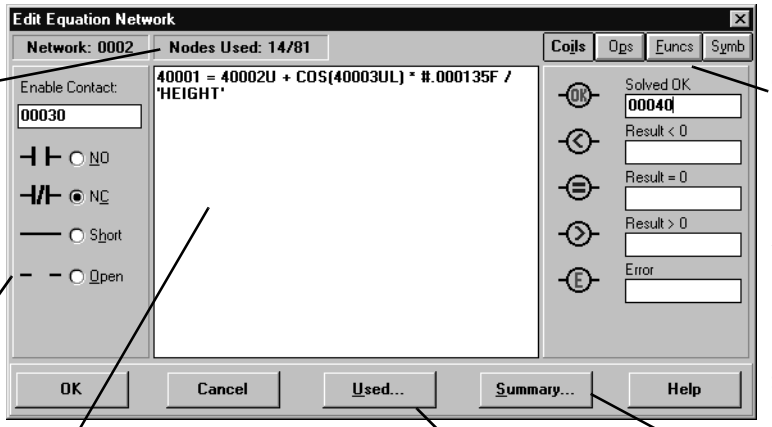
1. In the main Network Editor, move the cursor to the top row of the Equation Network you want to edit.
2. From the **Edit** menu, click **Edit Equation Network**. (When the cursor is on an Equation Network, this option replaces **Edit Instruction** in the **Edit** menu.)

   - Or -

   Double-click anywhere in the Equation Network.

The Equation Network Editor display

The Equation Network Editor display looks like this:



Each element of an equation takes up a certain amount of space, measured in "nodes". This text tells you how much space you have left.

You select an enable contact and its register address in this panel.

These buttons switch between four different panels in the Equation Network Editor: Coils (shown), Operators, Functions, and Symbols.

The equation appears in this editor. You can type the equation in directly, if you wish.

Click for a list of previously-used addresses.

Click to view the Descriptor Summary.

The register addresses for the Equation Network's output coils are set in the Coils panel. While you can type in the equation from the keyboard, three list panels. For example, the Operators, Functions and Symbols panels—let you insert items directly into your equation.

➢ **To add an item from a list panel to your Equation Network:**

1. Select the list panel from which you want to add an item.
2. Move the equation cursor to where you want to add the item.
3. In the list box, double-click the item you want to add. If any text within the equation is selected, the new item will replace it.

   - Or -

   Drag the item from the panel onto the equation or address box.

Coils panel

You set addresses for the output coils in the Coils panel. There are five possible output coils for an Equation Network:

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

➢ **To change an address for one of the output coils:**

- From the Equation Network Editor, click the appropriate text box in the output coils panel and type the register address for that coil. You can enter either the direct address (in X:Y numeric format) or a symbolic address. You can also insert addresses from the Symbols list panel, Used Register Address table and the Descriptor Summary.

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.

Operators list panel

The Operators list panel contains a list of mathematical operators recognized by the Equation Network Editor. This includes operators for addition, multiplication, exponentiation, boolean, and comparison operations. You can insert an item from the Operators panel directly into your equation.

❖ For a complete list of operators and their meanings, see "Mathematical operations in equation networks" on page 233.

Functions list panel

The Functions list panel contains a list of standard 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. You can insert a function from the Functions panel directly into your equation.

- ❖ For a complete list of functions, see "Mathematical functions in equation networks" on page 237.

Symbols list panel

The Symbols list panel contains a list of all previously-defined symbols for use in an Equation Network. You can insert an item from the Symbols panel directly into your equation, an output coil address box or the enable contact address box.

- ❖ For more information on symbols, see "Symbolic addressing" on page 164.

Equation format

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

Equation values and data types

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

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

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

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

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

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

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

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

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

Exponential notation

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

```
+1.35E-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

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

Assignment operator The assignment operator = is used to assign a storage place for the results of the equation. All equations will use the assignment operator. The format is: `ADDRESS = EXPRESSION` Where ADDRESS is a valid register address and EXPRESSION is a valid value or expression assigned to the address.	=	Assignment.

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

Bitwise operators Bitwise operators work on binary (base 2) representations of values. • In the case of AND, OR and XOR, the computer applies the operator to each digit in the two values: `010 XOR 011` (2 XOR 3 in decimal numbers) results in `001` (1 in decimal). • In the case of shifting operators, the computer shifts all digits in the binary representation of the number the given number of places to the left or right. Digits on one side of the number are lost, and zeros fill in the blanks on the other side. For example, for 8-bit numbers, `77 << 2` means 01001101 shifted left two digits. The binary result is 00110100, or 52 decimal	&	AND. The single bit result of an AND operation is only true (**`1`**) if both bits are set to 1.
	|	OR. The single bit result of an OR operation is true (**`1`**) if either bit is set to 1. The result is false (**`0`**) only if both bits are set to 0.
	^	XOR, short for "exclusive or". The single bit result of an XOR operation is false (**`0`**) if both bits are the same, true (**`1`**) otherwise.
	<<	Left shift. The result of `40001<<#2` is the binary representation of the number stored at 40001 shifted left two (#2) places. Zeros are added on the right to fill in the gap.
	>>	Right shift. The result of `40001>>#2` is the binary representation of the number stored at 40001 shifted right two (#2) places. Zeros are added on the left to fill in the gap.
Relational operators These operators describe a comparison between two values or expressions. The result is always true (`1`) or false (`0`). For example, `#35 <= #42` evaluates to `1` (true). Relational operators are used in Conditional expressions.	<	Less than.
	<=	Less than or equal to.
	=	Equal to.
	<>	Not equal to.
	=>	Greater than or equal to.
	>	Greater than.

Conditional operators See page 236 for details.	? :	Used in a conditional expression.
Parentheses Used to set precedence in solving equations. To make sure certain operations are solved before others, enclose those operations in parentheses.	( )	

Conditional expressions

In Equation Networks, conditional expressions take the following form:

EXPR1 RELOP (EXPR2) ? (EXPR3) : EXPR4

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

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

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

Mathematical functions in equation networks

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)").

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

Using register address lists

Click the **Used** to bring up a list of previously-used addresses—register addresses that have been used elsewhere in your logic database.

Click the **Summary** to bring up the Descriptor Summary display for the address currently selected. This includes addresses for output coils and the enable contact. If the cursor does not highlight a register address, the Descriptor Summary will jump to address 00001.

Addresses from both tables can be inserted directly into the equation.

➢ **To insert an address from the Previously-Used Address table or Descriptor Summary:**

1. Move the cursor to the spot in the equation (or to a coil address box) where you want to insert the address.
2. Click **Used** or **Summary**. The appropriate table appears.
3. Navigate through the table until you find the address you want to add to the equation.
4. Double-click that address. The address is inserted at the current cursor position. If any text was selected, it will be overwritten.

Setting up an enable contact

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

➢ **To select a type for the enable contact:**

- Select the symbol of the enable contact that corresponds with your chosen type. An enable contact can be a normally-open contact(⊣ ⊢), normally-closed contact (⊣/⊢), horizontal short (——), or a horizontal open (– –).

➢ **To select a register address for the enable contact:**

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

  - Or -

  Insert an address into the **Enable Contact** address field from the Symbols list panel, Used-Register Address table, or the Descriptor Summary.

Equations displayed within the Network Editor

When you scroll to an Equation Network from the main Network Editor, the display will show the text of the equation you created, along with any input or output coils. There are several things to keep in mind when viewing Equation Networks from the main Network Editor:

- **Blocking:** Blocking operations on Equation Networks are limited to single cells or full network blocks. The only blocking operation not allowed is a block save—saved blocks cannot have Equation Networks.
- **Cursor movement:** You can only move the cursor onto the input contact or output coils of an Equation Network.
- **Cut and Paste:** You can Copy part of the Equation Network into the clipboard, but you cannot Paste into it. Similarly, the Cut operation will copy material into the clipboard, but will not delete anything. The Equation Network Editor must be used for modifying Equation Networks.
- **Display menu:** Tables and lists created using commands from the Display menu will include items used in Equation Networks.
- **Find, Locate Coil and Global searches:** All search operations will find (and replace) searched-for items within Equation Networks. The search result tables will show "Eqn" for any addresses that are part of the actual equation of an Equation Network.
- **Instruction Speed buttons:** These have no effect when viewing Equation Networks.
- **Online mode:** Power flow is shown using settings from the Network Display setup dialog box. Any contact or coil receiving power will show power flow. If the enable contact passes power, the equation box will also change to show power flow.

Forcing an Equation Network output coil on or off affects how power is passed through that coil; however, the power flow of the output coil itself is still displayed based on the status of the Equation Network. For example, "Result>0" will still show power if an Equation Network's Result is greater than 0. This may make for some strange visual effects, such as an output coil that seems to be passing flow but doesn't affect anything that follows.

The following Network Editor features are disabled when you move the cursor onto an Equation Network:

- Assembly Register (AR) operations that modify parts of an Equation Network. Functions that force discrete variables will work as usual.
- Insert Row/Column
- Delete Element/Row/Column
- Drag and drop operations from side panels.

10 Using the PCFL Editor

In this chapter

Introduction to the PCFL editor

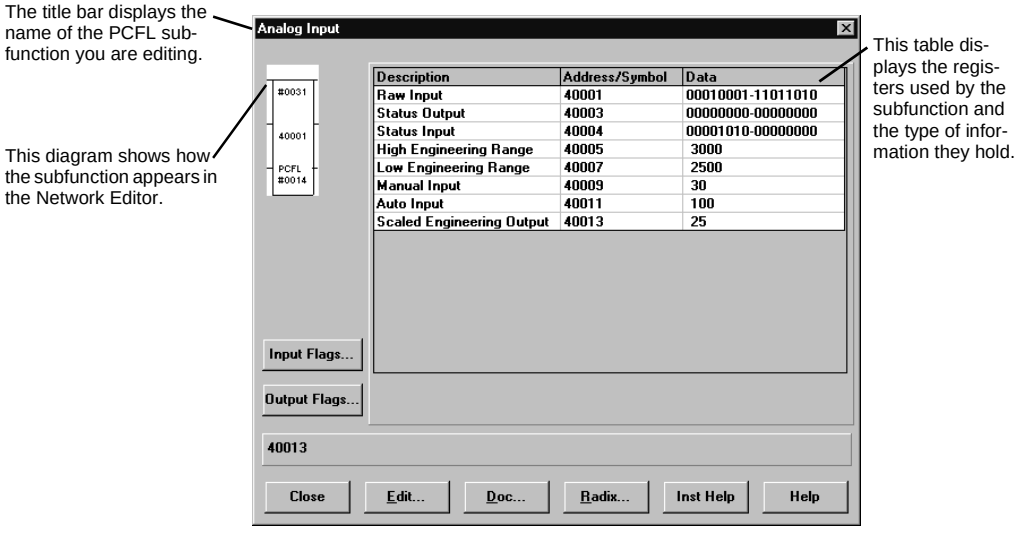
The PCFL Editor simplifies the entry of PCFL instruction block data. It replaces the Register Editor for PCFL blocks.

The PCFL instruction block is a multi-function block. There are many different PCFL subfunctions that use the same basic instruction block. While each PCFL instruction block uses a similar arrangement of registers and status flags, the registers and flags for each subfunction have different meanings. The PCFL Editor provides a way to configure a PCFL block without concern for which register to set.

The PCFL Editor also simplifies editing of the PCFL Equation subfunction. The PCFL Equation block stores the equation as a series of registers, in a format that may not be intuitive to a database developer.

➢ **To open the PCFL Editor:**

1. Move the network cursor onto the PCFL block you want to edit.
2. Do one of the following:
   - On the **Data** menu, click **Register Editor**.
   - Press CTRL+R.
   - Right-click the PCFL block, then select **Register Editor**. The PCFL Editor dialog box appears.



Editing PCFL registers

The **PCFL Editor** dialog box contains a table showing a PCFL function's register addresses, along with their labels and current values. A register's current value is displayed in an appropriate *radix* (the base of a number system used by ProWORX NxT to refer to a value's data type). The radix of each data item can be changed to allow display in a variety of number formats.

Depending on the specific PCFL instruction, up to three buttons might also appear to the left of the register table:

- **Input Flags:** Click to view and edit a PCFL instruction block's input flags.
- **Output Flags:** Click to view a PCFL instruction block's output flags.
- **Eqn Edit:** Click to edit the equation in a PCFL Equation instruction block.

These functions are covered further later in this chapter.

➢ To change the displayed data type of a PCFL register:

1. In the table, click the Description, Address/Symbol or Data of the register you want to reformat. The selected register's Address/ Symbol and the first line of its Descriptor (if any) appear at the bottom of the register table.
2. Click **Radix**.
3. Select the desired radix from the **Radix Options** box and click **OK**.

➢ To edit the value of a register:

1. In the table, click the Description, Address/Symbol, or Data of the register you want to change. The selected register's Address/Symbol and the first line of its descriptor (if any) appear at the bottom of the register table.
2. Click **Edit**. An **Edit** dialog box appears based on the radix of the register you want to edit. The Edit dialog box for binary values is especially different from that of other radixes.

❖ For information on editing binary values, see page 246.

3. Do one of the following, then click **OK**:
   - Type the new input value for the register.
   - Type binary values bit-by-bit in the Edit Binary dialog box.

- Type values in other radixes in the supplied text box.

To get help on a specific PCFL instruction, click **Inst Help** for help on the currently-displayed PCFL instruction block function.

➢ **To edit a binary value:**

1. In the **Binary** box, click the bit you want to change.
2. Do one of the following, then click **OK**:
   - **Set:** Click to change the bit to 1.
   - **Reset:** Click to change the bit to 0.

   You can also change all the bits at the same time:
   - **Set All:** Click to change all bits to 1.
   - **Reset All:** Click to change all bits to 0.

Editing PCFL input/output flags

The Input and Output flags of many different PCFL subfunctions are stored in the same register. However, each subfunction interprets the flags differently. When editing Input/Output flags, the PCFL Editor automatically determines the meaning of each flag for the PCFL subfunction being edited.

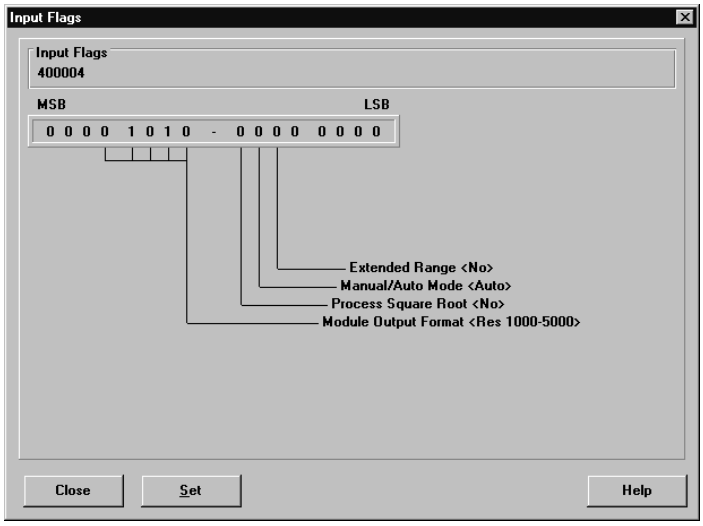
Most PCFL flags use one bit of information and can be set to only two values (usually "on" and "off").

Input flags with more than two settings use multiple bits. The PCFL Editor determines how to change each bit automatically. For example, within the input flags for the PCFL Analog Input instruction block is the Module Output Format, which takes up five bits of information. When setting the Module Output Format, you don't have to change the five bits individually. Instead, you select a Module Output Format from a list and the PCFL Editor changes the appropriate bits.

❖ To customize the display and flag list for a subfunction's input and output flags, see Customizing the PCFL Configuration File on page 255.

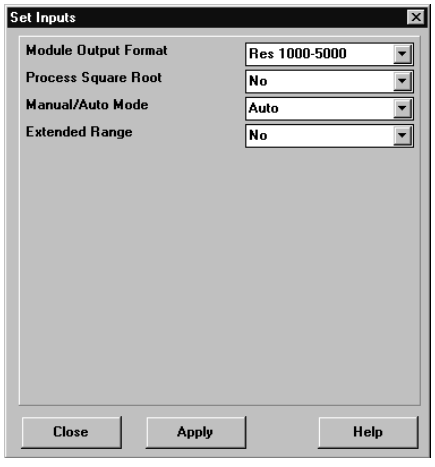
➢ **To view a PCFL block's input flags:**

- From the PCFL Editor, click **Input Flags**. The Input Flags dialog box appears.



➢ **To edit a PCFL block's input flags:**

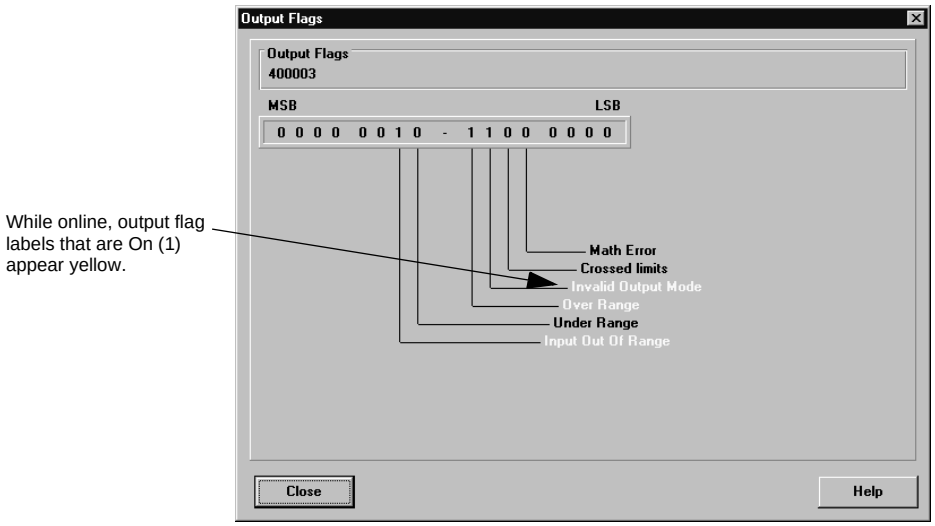
1. From the **Input Flags** dialog box, click **Set**. The **Set Inputs** dialog box appears.



2. The **Set Inputs** dialog box displays every input flag used by the instruction, along with a list box for each flag. To change a particular flag, select the new setting from its box.
3. Click **Apply** to confirm your changes.
4. When you're done, click **Close**. You are returned to the Input Flags dialog box. Your new settings should be reflected in the Input Flags display.

➢ **To view a PCFL block's output flags:**

- From the PCFL Editor, click **Output Flags**. The **Output Flags** dialog box appears.



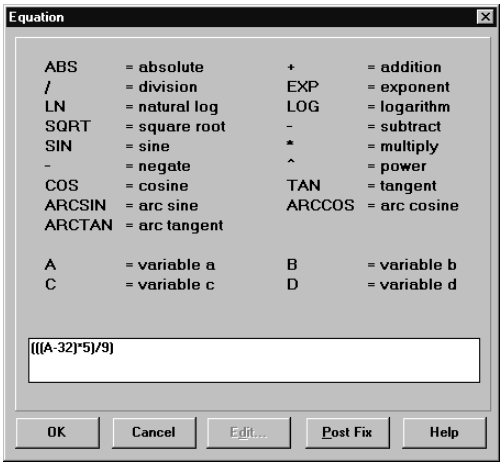
Editing the PCFL equation block

The PCFL Editor provides two different methods of editing equations in the PCFL Equation block: as a series of registers and as a line of text.

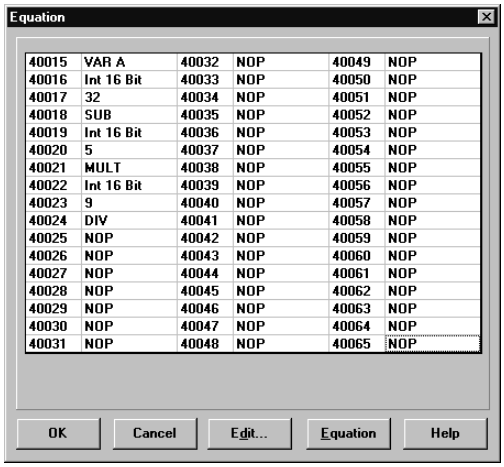
➢ **To edit a PCFL equation:**

1. Move the cursor onto a PCFL Equation instruction block.
2. To open the **PCFL Equation Editor** dialog box, do one of the following:
   - On the **Data** menu, click **Register Editor**.
   - Press CTRL+R.
   - Right-click the PCFL block, then select **Register Editor**.

   The **PCFL Editor** dialog box appears.
3. Click **Eqn Edit**. You can edit the PCFL equation in either infix (left-to-right) or postfix notation. A toggle button at the bottom lets you change between the two formats.
   - Click **Equation** to switch to regular, left-to-right infix notation. This is the easiest way to edit PCFL equations. This is the default mode.



- Click **Postfix Entry** to edit the equation registers directly.



Editing the PCFL equation as text

With the PCFL Equation Editor, you can enter an arithmetic formula in a regular, left-to-right format, technically known as "infix notation". The PCFL Editor converts the equation to the format expected by the PCFL block, storing it in the equation registers.

➢ **To enter a PCFL equation as a string of text:**

1. From the PCFL Editor, click **Eqn Edit**.

   If the PCFL Equation Editor dialog box shows a table of registers, click Equation. The Equation Entry dialog box switches to Equation mode.

2. Type your equation in the text box.
3. Click **OK**.

If the PCFL Editor locates errors in the equation, you're returned to the Equation dialog box.

PCFL editor equation text format

An equation is an expression, composed of operands and operators.

- **Operators** are the mathematical operations that you perform on values. For example, an asterisk (`*`) is an operator representing multiplication.
- **Operands** are the values that an operator works on. Operands can be any valid expression. Most operators require two operands; the exception is negation (the "`-`" operator) which requires one.
- In a PCFL equation, **functions** are predefined calculations performed on single expressions. For example, `ARCTAN(B*3)` calculates the arc tangent of three times the value stored in variable B.
- **Expressions** normally refer to an operator together with its required operands. It can also be a constant value, a variable, or a function. For example, `3 + SIN(A*2)` is a valid expression, as are `SIN(A*2)`, `A*2` and `A`.

  To ensure expressions are calculated in the correct order, enclose all relevant expressions in parentheses. For example, `3 * (4 + 2)` is calculated as 3 times 6, or 18; while `(3 * 4) + 2` is calculated as 12 plus 2, or 14.

  The PCFL Equation block supplies four variables: `A`, `B`, `C` and `D`.

Equation Operators

You can use the following operators in your equation:

Operator	Meaning	Example	Result
-	negation	-3	negative 3
-	subtraction	3 - 2	1
/	division	3 / 2	1.5
+	addition	3 + 2	5
*	multiplication	3 * 2	6
^	power (exponentiation)	3 ^ 2	9 (that is, 3 * 3)

Functions are applied to a single expression enclosed in parentheses after the function name. You can use the following functions in your equation:

Function	Meaning
ABS	absolute value
LN	natural log
SQRT	square root
SIN	sine
COS	cosine
ARCSIN	arc sine
ARCTAN	arc tangent
EXP	exponent
LOG	logarithm
TAN	tangent
ARCCOS	arc cosine

Editing PCFL equation registers

PCFL instruction block's middle node holds the address of a series of 64 consecutive registers, a 4x register referred to as 4yyyy. In a PCFL Equation block, the first 14 registers hold status information and equation inputs, while the equation itself is stored in registers 4yyyy+14 through 4yyyy+64. The Postfix Entry mode of the PCFL Equation dialog box lets you edit those registers directly.

The PCFL equation is stored in postfix notation, sometimes called "reverse polish notation". This is different from infix notation, the left-to-right equation format you're probably used to.

❖ For more information on postfix notation, see "About Postfix notation" on page 254.

➢ **To edit the PCFL equation registers directly:**

1. From the PCFL Editor, click **Eqn Edit**.
2. If the **PCFL Equation Editor** dialog box displays a list of functions and operators, (ABS, division and so on), click **Postfix Entry**.

➢ **To change a specific equation register:**

1. Click the address of the register you want to change.
2. Click **Edit**.
3. Click the Postfix Code that you want to place in the selected register.
4. Click **OK**.

Postfix codes

The Postfix Codes have the following meanings:

Code	Meaning	Number of operands
NOP	nothing (no operation)	n/a
ABS	absolute value function	1
ADD	addition operator	2
DIV	division operator	2
EXP	exponent function (to the power of e)	1
LN	natural log function (base e)	1
LOG	logarithm function (base 10)	1
MULT	multiplication operator	2
NEG	negation operator	1
POW	power operator	2
SQRT	square root function	1
SUB	subtraction operator	2
SIN	sine function	1

Code	Meaning	Number of operands
COS	cosine function	1
TAN	tangent function	1
ARCSIN	arc sine function	1
ARCCOS	arc cosine function	1
ARCTAN	arc tangent function	1
Float	Indicates that the following two registers contain a floating point number. To change that number, click the first of those two registers on the table, then click **Edit**.	n/a
Integer	Indicates that the following register contains an integer number. To change that number, click that register on the table, then click **Edit**.	n/a
VAR A	variable A	n/a
VAR B	variable B	n/a
VAR C	variable C	n/a
VAR D	variable D	n/a

About Postfix notation

Postfix notation differs from regular infix notation in that the operator is placed after the operands. The operator is a symbol indicating a specific mathematical operation—multiplication, division and so on. The operands are the elements that the operator acts on—the actual values to be added or multiplied.

The equations you're probably familiar with are written in infix notation. When using infix notation, the operator is placed between the two operands on which it works.

For example, suppose you want to multiply the numbers 24 and 11. In the two notations, this would look like:

`24 * 11` in infix notation

`24 11 *` in postfix notation.

Postfix equations are evaluated using a stack. The computer reads the equation from left to right (in the PCFL instruction block, from lower-numbered registers to higher-numbered registers). When it reaches a value, it adds the value to the top of the stack. When it reaches an operator, it removes the top one or two items from the stack, applies the operator to those items, and adds the result to the top of the stack.

In the following example, the underlined portion in the "Equation" column indicates the section of the equation being evaluated.

Equation	Stack	Comments
4 21 * 33 +		Stack is empty.
4 21 * 33 +	4	Add 4 to the stack.
4 **21** * 33 +	4, 21	Add 21 to the stack.
4 21 ***** 33 +	84	Apply * operator (multiplication) to 4 and 21, adding the result to the stack.
4 21 * **33** +	84, 33	Add 33 to the stack.
4 21 * 33 **+**	117	Apply + operator (addition) to 84 and 33, adding the result to the stack. This is the final result of the equation.

This equation would be written as `(4 * 21) + 33` in infix notation.

Customizing the PCFL configuration file

Customizing the PCFL Editor configuration file lets you change register names, input/output flag names and the input/output flag diagrams.

Changing the PCFL configuration file is an advanced operation. Before you make any changes, make a backup of the original file.

The PCFL configuration file is called PCFL.DAT and is stored in the ProWORX NxT installation directory. You can edit it with any text editor, such as Windows Notepad.

The PCFL.DAT file contains a section for each subfunction of the PCFL instruction block. In the following format description, a field enclosed in angled brackets (< and >) should be replaced by the appropriate value without the brackets. A carriage return at the end of a line is indicated by <\n>.

The format for each subfunction is:

```
<Function name><\n>
<Function title><\n>
<Number of registers in the main PCFL Editor dialog box><\n>
<Register description>,<Register radix>,<Register offset><\n>
...
Input Flags,<Input Flag Register offset>;<\n>
<Input Flag diagram format><\n>
Option "<Flag description>",<First bit>,<Last bit>;<\n>
<Bit field>,<Bit field description><\n>
...
End Input Flags<\n>

Output Flags,<Output Flag Register offset>;<\n>
<Output Flag diagram format><\n>
Option "<Flag description>",<First bit>,<Last bit>;<\n>
<Bit field>,<Bit field description><\n>
...
End Output Flags<\n>
```

PCFL field descriptions

The following table describes each field in the PCFL configuration file.

Field	Description
Function name	A unique identifier for each PCFL subfunction. The PCFL Editor uses this identifier to find the entry for a particular subfunction. **NOTE:** Don't make any changes to this PCFL subfunction name. If you do, the PCFL Editor won't be able to find the proper subfunction entry.

Field	Description
Function title	The subfunction name which appears in the title bar of the PCFL Editor dialog box. For example, the Function title for the PCFL Analog Input instruction block is Analog Input. You can use this field to find the entry for a desired subfunction.
Number of registers in the main PCFL Editor dialog box	The number of registers that appear in the table of registers on the PCFL Editor dialog box. Statistics for each table entry appear in following lines, one for each register.
Register description	The label for a single entry in the PCFL subfunction register table. These register descriptions appear in the Description column of the table on the PCFL Editor window. Each entry in the PCFL subfunction register table has a single line with a Register description, Register radix and a Register offset.
Register Radix	A number indicating the data type for a register used by the PCFL subfunction. This value indicates the format used to display and edit values in the Data column of the register table on the PCFL Editor window. The data type is indicated by number: 1 = Decimal (integer) 2 = Hexadecimal 3 = Binary 4 = ASCII 5 = Floating point 6 = 32-bit integer
Register offset	The offset for the register, calculated from the beginning of the register table. This value is used to calculate the address that appears in the Address/Symbol column in the table on the PCFL Editor dialog box. For the actual offset values, see the online instruction help for the specific PCFL subfunction.
Input Flag register offset	The offset of the register where the PCFL subfunction's input flags are stored.

Field	Description
Input Flag diagram format	This section describes how the PCFL Editor draws the lines that connect bits to the flag descriptions in the Input Flags and Output Flags dialog boxes. ❖ For more information on this field, see the section following this table.
Flag description	This section of the configuration file contains entries for each flag in the Input Flags/Output Flags dialog boxes. Each entry is one line. This part of the flag entry contains the name or description of the flag. This description appears in the Input Flags or Output Flags dialog box and (for Input Flags) as the option label in the Set Inputs dialog box.
First bit	The bit offset for the first bit in the series of bits that make up the input/output flag described by this line. For example, if the setting for this flag was stored in bits 2 and 3, the first bit would be `2`.
Last bit	The bit offset for the last bit in the series of bits that make up the input/output flag described by this line. For example, if the setting for this flag was stored in bits 2 and 3, the last bit would be `3`. If the flag is composed of only one bit, don't include the last bit and its preceding comma for this entry.
Bit field	The values of individual bits within an input flag often indicate different things. These lines of the configuration file indicate the possible settings for each flag and the bits that must be set to indicate that setting. The Bit field contains a series of `0`s and `1`s that indicate the bit pattern for this value. For example, in the PCFL On/Off Control instruction block, bits 6 and 7 of the input status register comprise the "Manual Forcing" flag. If bit 6 is on (1) and bit 7 is off (0), this sets the Manual Forcing mode to "Manual, forced OFF". The Bit field for this setting would be `10`.

Field	Description
Bit field description	The values of individual bits within an input flag often indicate different things for different subfunctions. These lines of the configuration file indicate the possible settings for each flag and the bits that must be set to indicate that setting. The Bit field description contains a description of what the setting indicated in the preceding Bit field means. Values in the Bit field description appear in the list box in the Set Inputs dialog box for the appropriate Input flag.
Output flag register offset	The offset of the register where the PCFL subfunction's output flags are stored.
Output flag diagram format	This section describes how the PCFL Editor draws the lines that connect bits to the flag descriptions in the Input Flags and Output Flags dialog boxes. ❖ For more information on this field, see the section following this table.

Input/output flag diagram formats

This section describes how the PCFL Editor draws the lines that connect bits to the flag descriptions in the Input Flags and Output Flags dialog boxes.

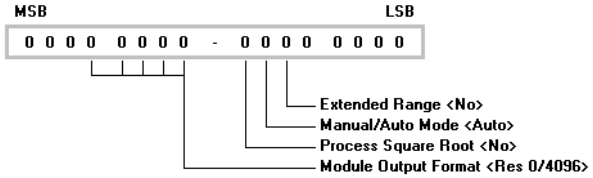
The "Input/Output flag diagram format" line in the PCFL.DAT file consists of a string of 16 digits. Each digit indicates how a line should be drawn for the bit in that position. The possibilities are:

2 Draw a line from this bit to its label.

3 Draw a line from this bit to the line coming from the following bit.

4 Leave this spot blank.

For example, the Input Flags diagram format line for the PCFL Analog Input block is `4443333222244444`. The Input Flags diagram looks like this:



11 Printing

In this chapter

Printing

In general, NxT has three methods of sending information about your database or controller to a printer:

- **Online, with no active database:** Prints the currently displayed network only.
- **Online, with an active database:** Prints the currently displayed network and documentation from the database.
- **Offline:** Prints the currently selected network or a configurable list of networks, documentation, configuration data, mismatch tables, and formatting (cross-references, indices, page titles, and page numbering). In previous versions of NxT and ProWORX*PLUS*, this was referred to as the Lister option.

You can also print data from the User Configurable and Generic Register editors. Printouts from a Register editor are sent to the default printer, as specified in the Print Setup dialog box (page 274).

❖ For more information, see "User Configurable Register editor" on page 137 and "Generic Register editor" on page 152.

Printing a network

You can print a single network in Online or Offline. The printout displays a line drawing of the network elements, with or without descriptors and other documentation.

➢ **To print a single network:**

1. From the Network Editor, on the **File** menu, click **Print Network**. The Print dialog box is displayed.
2. Select any printer-specific options you may have. Consult your printer's documentation for details.
3. Click **OK**.

Printing selected data (Lister)

NxT Offline can print any part or all of the database information.

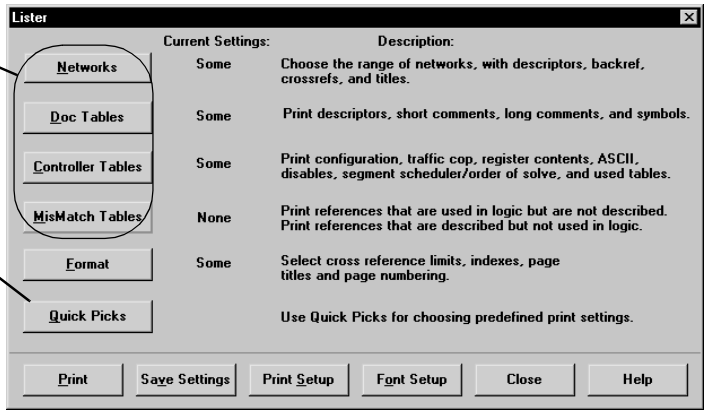
➢ **To select data to print:**

1. From the Network Editor, on the **File** menu, click **Print Setup**. The Lister dialog box appears.

Each button takes you to a section of data. For each section, select the data to print.

The **Current Settings** column provides a summary of your print choices.

Click to save or load back custom print settings.



2. For each section, select items to print:
   - **Networks** (see page 264).
   - **Doc Tables** (see page 265).
   - **Controller Tables** (see page 267).
   - **MisMatch Tables** (see page 268).
3. Click **Format** to adjust page titles and numbering, and select cross reference limits and indexes (see page 269).
4. Click **Print Setup** to choose a printer or adjust printer settings.
5. Click **Font Setup** to change or adjust the output font.
6. Click **Print**.

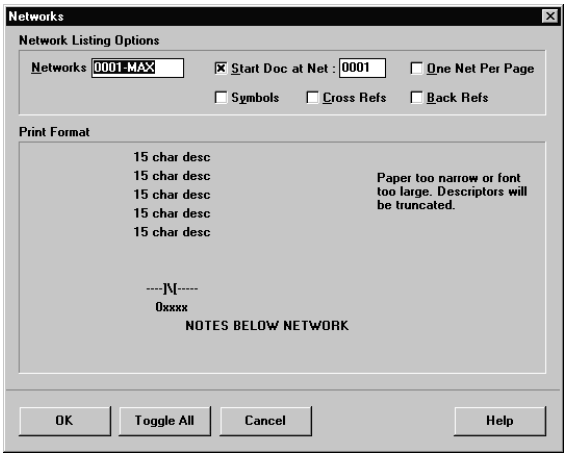
You can also click the settings in the Current Settings column to change them.

Network printing options

Use this option to set how networks of ladder logic are printed.

➢ **To select the networks to print:**

1. From the Network Editor, on the **File** menu, click **Print Setup**. The Lister dialog box appears.
2. Click **Networks**. The Networks dialog box appears.



3. Click an option to select or clear it. As you select different parameters, the print format area changes to show your new formatting.

Click **Toggle All** to select or clear all options.

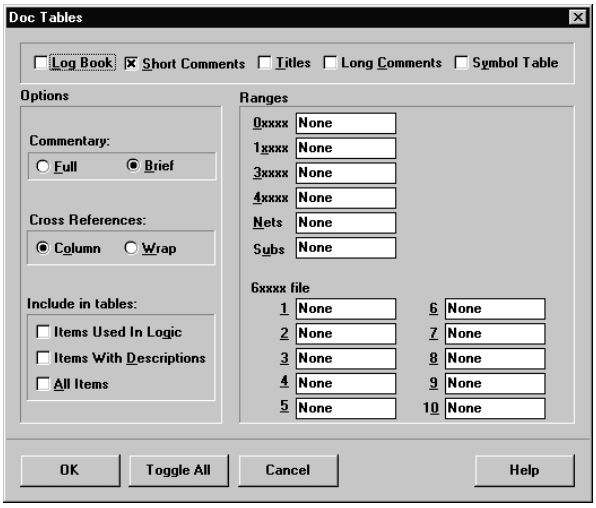
- Type a range of networks to print. The maximum range is the number of networks that have been programmed. If you enter a value higher than that or that is nonsensical (such as 1,123), the entry appears as **1 - Max**. Any entry that contains spaces or is empty is set to "None."
- Select the network number where you want to start printing documentation.
- Print **Symbols**, Cross-References (**Cross Refs**) and/or Back References (**Back Refs**) for your logic.

Documentation tables

The Documentation Tables consist of all the documentation from the Logbook, Short Comments, Page Titles, Long Comments, Symbol and Descriptor Tables.

➢ **To activate the Doc Tables:**

1. On the **File** menu, click **Print Setup**. The Lister dialog box appears.
2. Click **Doc Tables**.



3. Click an option to select or clear it:

Click **Toggle All** to select or clear all options.

- Types of documentation (**Log Book**, **Short Comments**, and so on) to print.
- Under **Commentary**, **Full**, or **Brief** documentation.
- Under **Cross References**, **Column**, or **Wrap** format.

Cross-references provide a way of relating references in ladder logic. Any coil with an associated contact is cross-referenced to the contact location. References used in function blocks and elsewhere in the logic are cross-referenced to their locations.

A new cross-reference is performed if logic or PLC configuration has changed or cross-reference files do not already exist. You can select these items to include in your printout.

NNNN.R	-] [-	Normally Open Contact
NNNN.R	-]\[-	Normally Closed Contact
(NNNN.R)		Coil
NNNN.R	**S(XXXX)**	function block, Source (name)
NNNN.R	**D(XXXX)**	function block, Destination (name)
NNNN.R	**P(XXXX)**	function block, Pointer (name)

You can select ranges for address types 0xxxx, 1xxxx, 3xxxx and 4xxxx as well as ranges for networks and subroutines. The maximum range value you can enter for 0xxxx, 1xxxx, 3xxxx and 4xxxx is the maximum value currently set in your controller configuration. The maximum range for networks is the number of networks that have been programmed, and the maximum range for subroutines depends on the controller type.

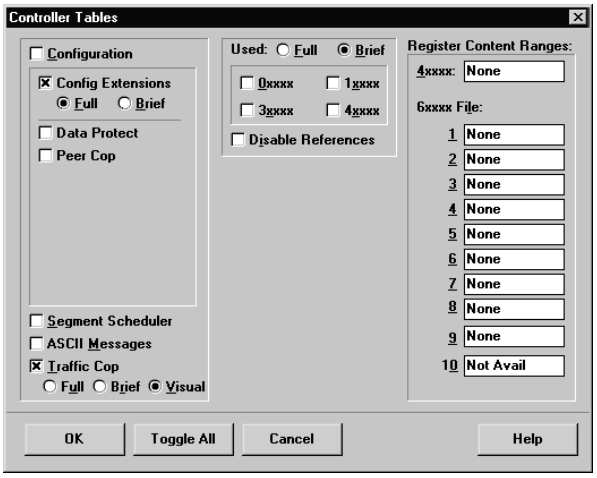
If the controller you are using supports extended memory, you have the choice of selecting a range for 6xxxx. There are up to 10 extended memory files available for 6xxxx. Use the files your controller has configured for you.

Controller tables

The Controller Tables consist of controller configuration information, such as the configuration extensions you have installed as well as the Address Used Tables and Register Contents for 4xxxx address types.

➢ **To activate the Controller Tables:**

1. On the **File** menu, click **Print Setup**. The Lister dialog box appears.
2. Click **Controller Tables**. The Controller Tables dialog box appears.



3. Click an option to select or clear it. You can set these parameters:

Click **Toggle All** to select or clear all options.

- **Configuration Extensions:** Select the configuration extensions to print and whether you want a full or brief printout of the documentation. When Full is selected, you can also select:
  - **Data Protect** to print the Data Protect Extension information.
  - **Peer Cop** to print Peer Cop Extension information.
- **Segment Scheduler:** Select to print the Segment Scheduler information.
- **ASCII Messages:** Select to print the ASCII Message information.

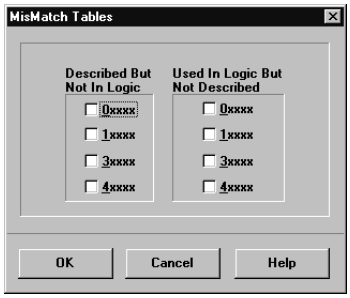
- **Traffic Cop:** Select to print the Traffic Cop information and further select:
  - **Full** to print the entire Traffic Cop and any attached documentation.
  - **Brief** to print the Traffic Cop and a summary of the documentation.
  - **Visual** to print a graphical representation of the brief option.
- **Address Used Tables:** Select 0xxxx, 1xxxx, 3xxxx, or 4xxxx address types and select **Full** to print the addresses used in Logic, Peer Cop, and Traffic Cop or **Brief** to print only addresses in Logic.
- **Register Contents:** Select the range for the 4xxxx Register Contents you want to print. The maximum range value you can enter for 4xxxx is the value currently set in the controller configuration. If you enter a value higher than that or that is invalid (such as 1,123), the entry appears as **1 - Max**. Any entry that contains spaces or is empty is set to "None."

Mismatch tables

A Mismatch Table is a table of reference points used but not documented or references documented and not used.

➢ **To select mismatch tables for printing:**

1. From the Network Editor, on the **File** menu, click **Print Setup**. The Lister dialog box appears.
2. Click **MisMatch Tables**. The MisMatch Tables dialog box appears.



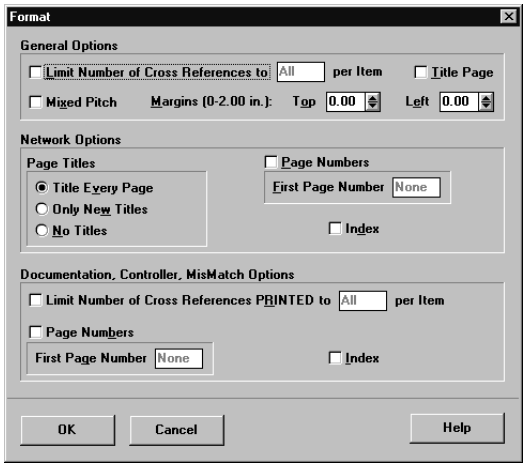
3. For each address type, select to print **Descriptors** without corresponding element in logic and/or **Elements** in logic without descriptors, then click **OK**.

Formatting a printout

After selecting data to print, use this feature to determine how the printout will look. You can adjust page titles and numbering, and select cross reference limits and indexes.

➢ **To format a printout:**

1. From the Network Editor, on the **File** menu, click **Print Setup**. The Lister dialog box appears.
2. Click **Format**. The Format dialog box appears.



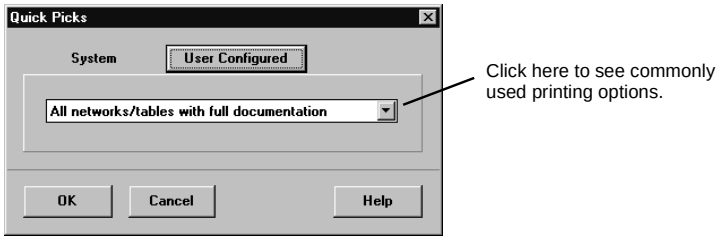
3. The following formatting options are available:
   - **Mixed Pitch:** For cleaner and clearer looking printouts.
   - **Page Titles:** Prints a page title associated with the current network.
   - **Title Page:** Prints a summary of all listing options and the database configuration.
   - **Page Numbering:** Prints the page numbers.
   - **Network Index:** An index of networks by their titles.
   - **Table Index:** An index of all tables.

Quick picks

Quick Picks let you select from a list of commonly-configured print options.

➢ **To print using Quick Picks:**

1. From the Lister dialog box, click **Quick Picks**. The Quick Picks window appears.



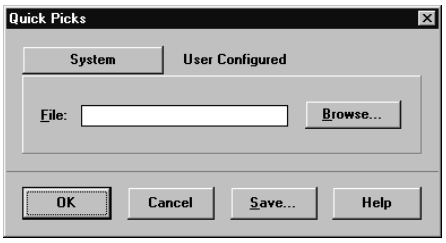
2. Select a pre-configured option or a user-configured file (see below), then click **OK**.

Using custom quick picks

You can save your custom print settings to a file, then select the file from the Quick Picks window.

➢ **To save custom print settings to a file:**

1. From the Network Editor, on the **File** menu, click **Print Setup**.
2. Configure your print settings.
3. Click **User Configured**. The Quick Picks dialog box appears.



4. Click **User Configured**.
5. Click **Save**. The Save to User Configured OPT File window appears.
6. Type the path and file name (with the .OPT extension) of the file to save, then click **OK**. If the file does not exist, it is created. If the file already exists, you're prompted to overwrite it.

➢ **To open a custom print settings file:**

1. From the Network Editor, on the **File** menu, click **Print Setup**.
2. Click **Quick Picks**. The Quick Picks dialog box appears.
3. Click **User Configured**.
4. Select a settings file to load from the drop-down list or type its path and file name (with the .OPT extension), then click **OK**.

➢ **To modify a custom Lister settings file:**

1. Open the .OPT file you want to modify (see above for steps on opening the file).
2. In the Quick Picks window, click **OK**. You're returned to Lister.
3. Make the modifications to the Lister settings. See above for information on changing the Lister settings.
4. In the Lister window, click **Save Settings**.

Print preview

Print preview lets you see your data looks before you send it to the printer.

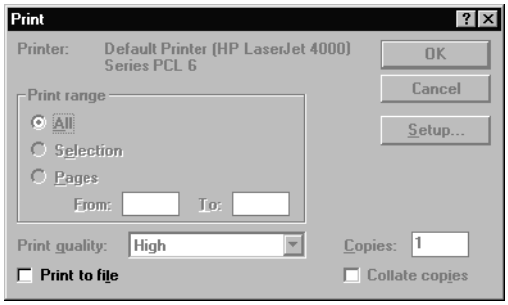
➢ **To display a document in Print Preview:**

1. While Offline, select **Print Preview** on the **File** menu. The Print setup dialog box appears.
2. Select the printer settings you want, then click **OK**. A status dialog box appears while the NxT sets up the preview with your settings.
3. You can do the following from Print Preview:

   - Click  to select whether to print the entire document, the current page, or a specific range of pages.
   - Click  to fit a full page of information within the viewable area.
   - Click  or select **Full Screen** on the **View** menu to maximize Print Preview by removing it's toolbar, menu bar, and borders.
   - Select **Goto** on the **View** menu to display a specific page of data.
   - In the Zoom list on the toolbar, select or type a magnification between 10 through 500 percent.

Print to file

You have the option to print your data to a file. This feature allows you to print your data to a DOS based text (.TXT) file to be viewed in a text editor such as Microsoft's Notepad.



➢ **To print data to file:**

1. While Offline, select Print on the File menu. The Print setup dialog box appears.
2. Select the print settings you want.
3. Select **Print to file,** then click OK. The Select Print File dialog box appears.
4. Navigate to the folder where you want to store the text file.
5. Type a file name or choose the default file name, then click OK. The current data is saved to the file.

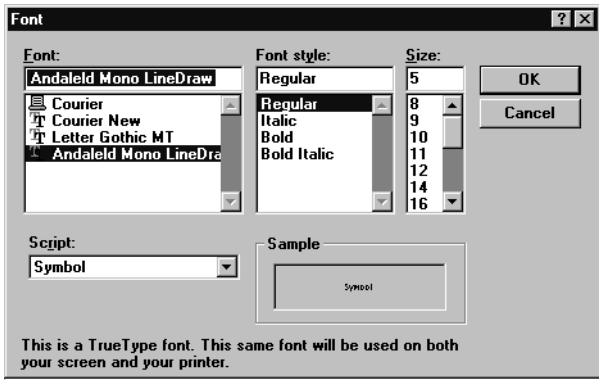
By default, NxT chooses the name of the current database as the text file name.

Changing the printout font

Changing the printout font alters the look of your printout as well as the amount of information you can fit on one page.

➢ **To change the font:**

1. From the Network Editor, on the **File** menu, click **Print Setup**. The Lister dialog box appears.
2. Click **Print Setup**. The Print Setup dialog box appears.
3. Adjust the settings as necessary, then click **OK**. The Font dialog box appears.



4. Select the font and font size.

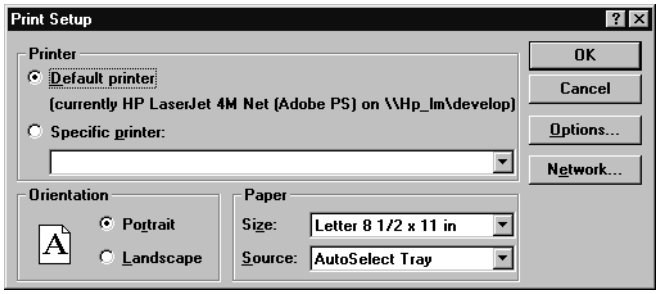
Only True Type fixed spaced fonts can be used in the Lister. ProWORX NxT installs the font Andaleld Mono LineDraw, which is the recommended True Type font. Font style does not affect the look of the printout.

Changing the print setup

You can select a printer and choose a paper type and orientation in the Print Setup dialog box.

➢ **To change the Print Setup:**

1. On the **File** menu, click **Print Setup**. The Lister dialog box appears.
2. Click **Print Setup**. The Print Setup dialog box appears.



3. Select the **Printer**, **Paper** type and paper **Orientation** you want, then click **OK**.

12 Using the Data Watch Window

In this chapter

Using the Data Watch Window

The Data Watch Window lets you examine register contents and discrete values as they change over time. This powerful analysis tool provides four different views of your data and lets you record the displayed data to a file for future reference.

You can adjust the sample rate, set triggers, and condense data by clamping the sample within or outside a value range. Together, these features help you zero in and isolate sporadic problems in your process or step back and see the whole picture. You can display up to ten "child" windows simultaneously inside the Data Watch window.

ProWORX*PLUS* users will find the Data Watch Window quite familiar, as NxT uses the same 20 row x 3 column display, provides address fill operations, and imports Full Page (.TFP) files.

The Data Watch window includes the following views:

- **Data Watch view:** Used for full-page data display, tracking, and data watch operations. The Data Watch window is also used to define the addresses to view or log.
- **Data Logger view:** Used to record (but not edit) data values to file and view them.
- **Trend view:** Used to show a graphical representation of data points.
- **Spreadsheet view:** Used to show multiple data points over time in a spreadsheet form.
- **Graphical view:** Used to create a graphical representation of register contents and discrete values.

The Data Watch panel

Many of the functions present in the Data Watch View can be used in the Data Watch Panel, accessible from the Network Editor. The Data Watch Panel provides a convenient place to keep track of data without cluttering the screen with lots of separate windows.

❖ For more information on the Data Watch panel, see page 122.

About the Address/Contents table

The Address/Contents table displays the addresses (or symbols, if Symbolic Addressing has been turned on in the NxT Preferences window).

In the Trend view, each address/content pair in the table is assigned a unique color, which corresponds with the pen color used to plot the data point on the trend. The pair is also underlined with the pen style used to plot the data value.

You can set up the addresses to be viewed in the Data Watch View, or you can select one of the tracking functions available from the Data menu in the Network Editor window.

➢ **To enter an address into the Address/Contents table:**

1. From the Network Editor, on the **Data** menu, double-click **Data Watch Window**. The Data Watch window appears, showing the Data Watch view. You have the option of selecting a different view.
2. Type the address that you want to track.

You can't enter a symbol, Data Watch Window allows reference numbers only.

3. Click the cell in the Address/Contents table where you want the address displayed.
4. Press ENTER.

About the Assembly Register in the Data Watch Window

The Assembly Register (AR) in the Data Watch dialog box is used to enter addresses into the Data Watch dialog box.

This is separate from the Assembly Register in the Network Editor. You're not entering addresses directly into the Network Editor.

Displaying the Data Watch Window

There are several methods of displaying the Data Watch Window from the Network Editor **Data** menu:

- Clicking **Data Watch Window** opens the Data Watch Window, and lets you enter the addresses to be tracked by the Data Watch Window application. You cannot select addresses from the Network Editor.
- Clicking **Add Watch** opens the Data Watch Window, then places the address of the currently-selected network into the Address/Contents table.
- Clicking **Track** then clicking **Instruction** opens the Data Watch Window, then enters all addresses associated with the instruction in the currently selected cell in logic (in the Network Editor) into the Address/Contents table. You can then go to the Network Editor and select different instructions to track by clicking them.
- Clicking **Track** then clicking **Address** opens the Data Watch Window, then enters the address associated with the cell currently selected in logic into the Address/Contents table. You can then go to the Network Editor and select different addresses to track.
- Clicking **Track** then clicking **Network** opens the Data Watch Window and places all addresses in the currently selected network into the Address/Contents table.
- Clicking **Track** then clicking **Discretes** opens the Data Watch Window, and places the addresses of all discretes in the currently selected network into the Address/Contents table.

General procedures

There are several procedures which are common to some or all Data Watch Window views:

- Setting the sample rate;
- Filling cells in the Address/Contents table with addresses;
- Deleting addresses from the Address/Contents table;
- Setting the font size;
- Changing the radix of data in the Address/Contents table;
- Creating, opening, importing, and exporting Data Watch Window files;
- Exporting a .DWW file to a .DIF file;
- Setting triggers;
- Clamping data;
- Disabling/forcing discretes;
- Editing register contents.

Setting the sample rate

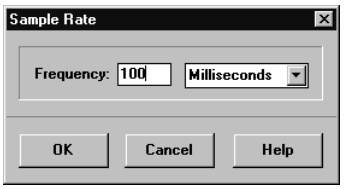
The Sample Rate function lets you set how often the Data Watch Window will sample data provided by the separate NxT application. Note that this does not directly set the rate at which NxT samples data from the controller. The frequency can be set in either milliseconds or seconds.

Note that the sample rate is a target value only. Depending upon how busy the system is, the actual sample rate may be slower. Factors which commonly slow up the sample rate are:

- The number of addresses tracked by the Data Watch Window;
- The refresh rate set in the Network Editor;
- Other concurrent processes (applications, operating system tasks, etc.).

➢ **To set the sample rate:**

1. From any view of the Data Watch Window, click **Settings** then click **Sample Rate**. The Sample Rate dialog box appears.



2. In **Frequency**, type the target sample rate (in seconds or milliseconds).
3. From the units drop down box, select whether the sample rate is in milliseconds or seconds, then click **OK**.

Adding addresses to the Address/Contents table

You can fill the next cell, previous cell, or an entire column (20 rows) in the Data Watch view with consecutive addresses.

➢ **To fill the next or previous cell with a value:**

1. Select the cell to use as a base for filling.
2. Do one of the following:
   - Click **Fill** then click **Next** to type the next consecutive address below the currently selected address.
   - Click **Fill** then click **Previous** to type the previous consecutive address above the currently selected address.

Filled values don't carry over to the next column in the table. Instead, the overflow values are shifted up when **Next** selected on the **Fill** menu at the bottom row of the table or down if **Previous** on the **Fill** menu is selected at the top row of the table.

➢ **To fill a column of cells with values:**

1. Type the starting address into the AR field, select the cell where you want it displayed, then press ENTER.
2. Click **Fill** then click **Column**. NxT fills the rest of the column (down) with consecutive addresses.

Deleting addresses from the Address/Contents table

Data Watch and Trend views only

You can delete a single cell or a group of cells (by row or column) from the Data Watch Window.

➢ **To delete a single address:**

1. Select the address in the Data Watch window to delete.
2. Click **Edit**, then either click **Delete** or press DELETE.

➢ **To delete multiple addresses:**

1. Select an address in the Data Watch window within the range of addresses you want to delete.
2. From the Data Watch Window, click **Edit** then click **Delete Multiple**.
3. Do one of the following:
   - **Column:** Click to delete the entire column.
   - **Row:** Click to delete the entire row.
   - **Down:** Click to delete all addresses beneath the cell (down the column).
   - **Up:** Click to delete all addresses above the selected cell (up the column).
   - **Page:** Click to delete the entire page of 60 addresses.

Setting the font size

You can change the font size for the cell display. The default display uses the maximum font size (6.75 pt) available. You can reduce this size to 6 or 5 points to use a smaller portion of your screen for the display.

➢ **To set the font size:**

1. From the Data Watch window, click **Font Size** on the **Settings** menu.
2. Select either 5, 6, or 6.75 point.

Changing the radix

You can set the radix in which data values will be displayed for individual registers in the Data Watch window.

➢ **To change the radix of an individual cell:**

- From the Data Watch Window, click **Edit** then click **Radix**, then select the radix to display.

Creating and using Data Watch Window files

Each time you open the Data Watch Window from the Network Editor, NxT creates a new, untitled window. You can create new windows, then save them as a file. Later, you can record a stream of data to this file and save the Data Watch Window configuration (addresses entered, clamp settings, etc.).

The window called **Track** is updated automatically by NxT. Avoid defining data in the Track window because NxT will overwrite your edits as soon as the cursor is placed on a new cell in logic.

➢ **To create a new Data Watch Window file:**

1. From the Data Watch Window, click **File** then click **New**.
2. Type a path and file name (with a .DWW extension), then click **OK**.

➢ **To open an existing Data Watch Window file:**

1. From the Data Watch Window, click **File** then click **Open**.
2. Select a file to open, then click **OK**.

➢ **To save a Data Watch Window file:**

1. From the Data Watch Window (any view), click **File** then click **Save**.
2. Type a path and file name (with a .DWW extension), then click **OK**.

➢ **To save a file to a different path or with a new name:**

1. From the Data Watch Window (any view), click **File** then click **Save As**.
2. Type a path and file name (with a .DWW extension), then click **OK**.

➢ **To close a "child" window:**

- Select the window to close, then click **File** then click **Close**.

➢ **To exit the Data Watch Window application:**

- From the Data Watch window (any view), **File** then click **Exit**.

Exporting a .DWW file to a .DIF file

You can convert a Data Watch Window log file (.DWW) into a Data Interchange Format (.DIF) file for importing into a third-party spreadsheet or database application.

➢ **To export a recorded .DWW file to a .DIF file:**

1. From the Data Watch window, click **File** then click **DIF Export**. The DIF export window appears.
2. In **Data File**, type the path and file name of the .DWW file you want to convert.
3. In **DIF File**, type the path and file name (with a .DIF extension) of the .DIF file to open or create.

If you select an existing .DIF file, the previous data in the file will be overwritten.

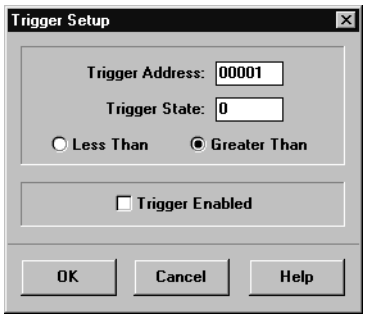
4. Click **Start**.

Setting triggers

The Trigger Setup window lets you configure an address in logic to act as a trigger for recording data in the Data Watch window (Data Logger, Trend, and Spreadsheet views).

➢ **To set a trigger:**

1. From the Data Watch Window, click **Settings** then click **Trigger**. The Trigger Setup dialog box is displayed.



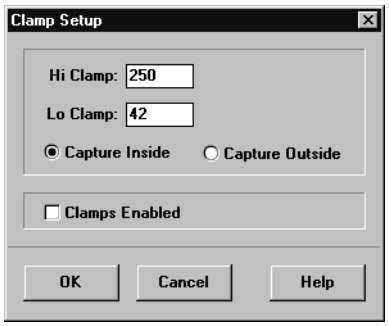
2. In **Trigger Address**, type the 0xxxx, 1xxxx, 3xxxx, or 4xxxx address to use as a trigger.
3. In **Trigger State**:
   - For **discretes**, type the state of the discrete (0 or 1) which will activate data display/capture in the Data Watch window.
   - For **registers**, type the register data value threshold which will activate data display/capture in the Data Watch window. Then select whether the trigger will spring when the register value is greater than or less than the threshold.
4. Select the **Trigger Enabled** check box.
5. Click **OK**.

Clamping data

Clamps let you specify a range of analog data values to capture and display. You can specify whether analog data values inside or outside the range will be captured.

➢ **To set up a clamp:**

1. From the Data Watch Window, on the **Settings** menu, click **Clamps**. The Clamp Setup dialog box is displayed.



2. In **Hi Clamp**, type the maximum analog data value in the range.
3. In **Lo Clamp**, type the minimum analog data value in the range.
4. Do one of the following:
   - **Capture Inside:** Click to capture data values within the entered range.
   - **Capture Outside:** Click to capture data values outside the entered range.
5. Select **Clamps Enabled**. Clamps will be shown as blue horizontal lines on the trend.
6. Click **OK**.

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 FORCE ON or FORCE OFF, placing control of the discrete back in logic.

If you force an address either on or off, then overwrite the address with a new one, the original address remains FORCED. However, if an address is forced, deleting it removes the force unless the address is referred to elsewhere.

➢ **To force a discrete ON:**

1. From the Data Watch view, select the discrete you wish to force ON.
2. Click **Data**, then click **Force ON**.

➢ **To force a discrete OFF:**

1. From the Data Watch view, select the discrete you want to force OFF.
2. Click **Data**, then click **Force OFF**.

➢ **To return control of a discrete's state back to logic:**

1. From the Data Watch view, select the discrete that you want to enable.
2. Click **Data**, then click **Enable**.

Editing register contents

You can edit the contents of a register from the Data Watch view.

➢ **To edit the register contents:**

1. From the Data Watch view, select the register to edit.
2. Click **Data**, then click **Register Contents**. The Edit Data dialog box appears.
3. Type the new register value. This value must be in the same radix as the previous value. The radix is displayed beside the value in the Data Watch window.
4. Click **OK**.

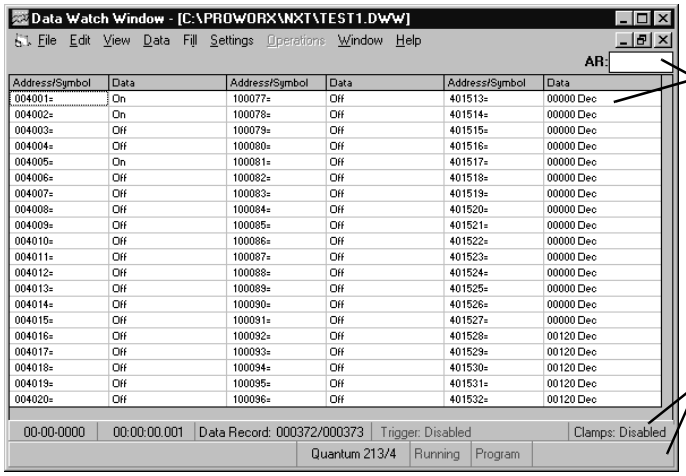
Working with the views

Data Watch view

The Data Watch view is used for full-page data display, tracking, and data watch operations.

You can change the radix for individual addresses by selecting **Radix** on the **Edit** menu.

NxT begins tracking the data for this address. In this view, only the current value for each address is displayed. Use the Trend, Data Logger, or Spreadsheet view to see historical data.



You can fill a single cell or an entire column with incrementing addresses from the Fill menu.

Using the Data Logger view

The Data Logger view is used to record data values to file and view them. The addresses that are logged are defined in the Data Watch view. Log Files from the Data Logger have an extension of .DWW.

Setting up the log file

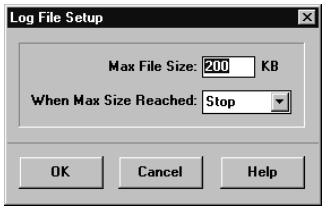
The Log File Setup window lets you configure the maximum size of your log file and determine what NxT should do when the maximum file size is reached. The log file size determines the number of records (tracked addresses changes) that can be stored. Generally, the file has 40 records of overhead, plus three records per address tracked. Each record requires 21 bytes, so to track 10 addresses (for example), would require a maximum file size no less than:

(40 + 10 * 3) * 21	**Overhead bytes**
+	
(number of data records) * 21	**Data bytes**

A data record is written to the file each time the data changes for an address. It doesn't write based on sample rate. You can find the above equation useful in estimating how many records (data changes) a given file size can hold.

➢ **To set up the log file:**

1. From the Data Watch Window, on the **Settings** menu, click **Log File**. The Log File Setup dialog box appears.



2. In **Max File Size**, type the maximum size (in KB) of the log file. Ensure the maximum file size doesn't exceed available storage space (although this typically won't be a problem).
3. In **When Max Size Reached**, select **Stop** to halt the recording process or **Reset** to initialize the log file, empty all contents, then restart recording.

Recording data to the log file

Although the Data Logger view is provided specifically for recording data to a file, you can also record data from the Trend and Spreadsheet views.

You record data to the currently open .DWW file. To set the maximum size of this file, click **Settings** then click **Log File Setup**.

You cannot append a recorded file. You can only overwrite the file. If you are writing data to a file which already contains records, you will be prompted to confirm the overwrite.

➢ **To record data to the log file:**

- From the Data Watch Window (Data Logger, Trend, or Spreadsheet views), click **Record to File** on the **Operations** menu. You can also click the **Rec** button.

➢ **To pause the recording:**

- From the Data Watch Window (Data Logger, Trend, or Spreadsheet views), click **Pause** on the **Operations** menu or  .

➢ **To stop recording:**

- From the Data Watch Window (Data Logger, Trend, or Spreadsheet views), click **Record to File** on the **Operations** menu or click the **Rec** button.

➢ **To move through the records:**

- To set the recording to the first data record, click **First** on the **Operations** menu or click  .
- To set the recording to the previous record, click **Previous** on the **Operations** menu or click  .
- To set the recording to the last data record, click **Last** on the **Operations** menu or click  .
- To set the recording to the next data record, click **Next** on the **Operations** menu or click  .

Using the Trend view

The Trend view is used to show a graphical representation of data points. You can view both discrete states and register values, create setpoints and alarm values (as references), and record data from this view. You can adjust the x- and y-axis values to "zoom" the trend display in or out.

➢ **To display the Trend View:**

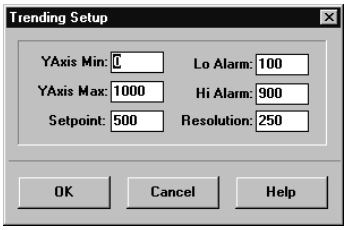
- From the Data Watch Window, click **Trend** on the **View** menu.

Setting up the Trend display

The Trending Setup window lets you configure how data points are to be displayed in the Trend View window. Note that this affects the display only - not the data values.

➢ **To set up the Trend View:**

1. From the Data Watch window (any view), click **Trending** on the **Settings** menu. The Trend Setup dialog box is displayed.



2. In **Y-Axis Min**, specify the base value for the Y axis. This is the bottom range of the values displayed.
3. In **Y-Axis Max**, type the top range of the values to be displayed.
4. In **Setpoint**, type the Y-Axis value of a setpoint. The setpoint is for reference only, and is drawn in the trend with a green line.
5. In **LoAlarm**, type the Y-Axis value for the LoAlarm. This value is for reference only, and is drawn in the trend with a red line.
6. In **HiAlarm**, type the Y-Axis value for the HiAlarm. This value is for reference only, and is drawn in the trend with a red line.

7. In **Resolution**, type the time (in ms) range to display across the X axis.

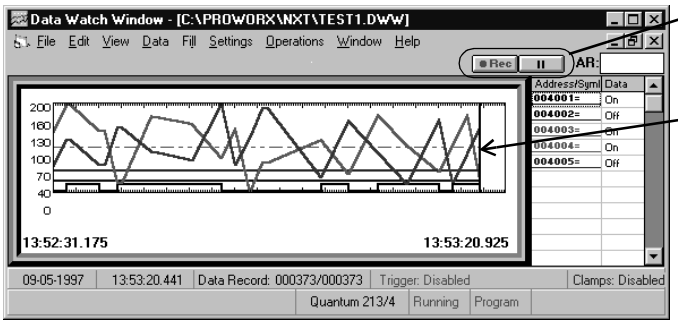
The X axis (and therefore this time range) is subdivided into 200 samples. Decreasing the Resolution value is equivalent to "zooming in", and increasing the value is equivalent to "zooming out" the display. For example, a 100 ms resolution * 200 samples gives you an X-axis range of 20 000 ms (20 seconds) in "width." You could "zoom out" the view by setting the resolution higher (e.g. 1000 ms * 200 samples = 200 000 ms "wide").

Reading the trend

When you enter the Trend view, all addresses in the Address/Contents table are plotted. You can also add or delete addresses "on the fly".

Create setpoints and alarms from the **Settings** menu in the Trend Settings window.

Addresses are shown in the color they are plotted. The line style (e.g., dots, dashes) is shown under each address.



You can record logged data to file directly from the Trend view.

The vertical cursor is shown at the leading edge of the trend. You can go backwards through the trend by pressing ←. Doing so moves the trace bar back through the trend, and the sample time/data values are shown in the status bar.

You can plot up to 60 values at a time. For up to 9 discretes, square waves are set to 1/9 the height of the trend display. For more than nine discretes, the square waves are resized as necessary to fit.

Each plotted line has a unique color which corresponds to the address being plotted.

Discretes are plotted as on or off, producing the expected square wave. Note that discretes are spread out vertically across the trend. If you plot nine or fewer discretes, each discrete is shown at one-ninths the height of the display. If you plot more than nine discretes, the trend sizes the square waves evenly.

There are time values at the bottom left and bottom right corners of the trend. These values show the range of time over which the trend is plotted. You can adjust the time range shown on the trend in the **Settings** menu.

You can zoom in the view to see the trend over a shorter length of time by adjusting the value in the **Resolution** field in the Trending Settings window.

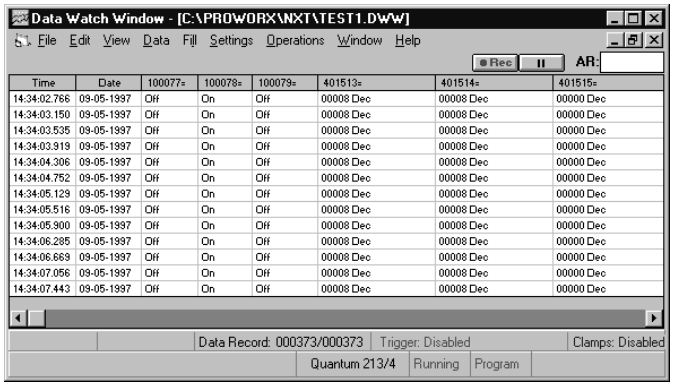
You can adjust the minimum and maximum values displayed in the y axis by adjusting the values in the **YAxisMin** and **YAxisMax** fields in the Trending Settings window.

Using the Spreadsheet view

Use the Spreadsheet to show data similar to the Data Logger view, but in the form of a spreadsheet (for example, more than one data sample is shown at a time). This lets you view timestamped historical data for several addresses at a time.

➢ **To display the Spreadsheet View:**

- From the Data Watch Window, click **View** then click **Spreadsheet**. The Spreadsheet view appears.



You can record data to file in the Spreadsheet view. See *Using the Data Logger view* on page 288.

Using the Graphical view

Use the Graphical viewer to create graphical representations of register contents and discrete values.

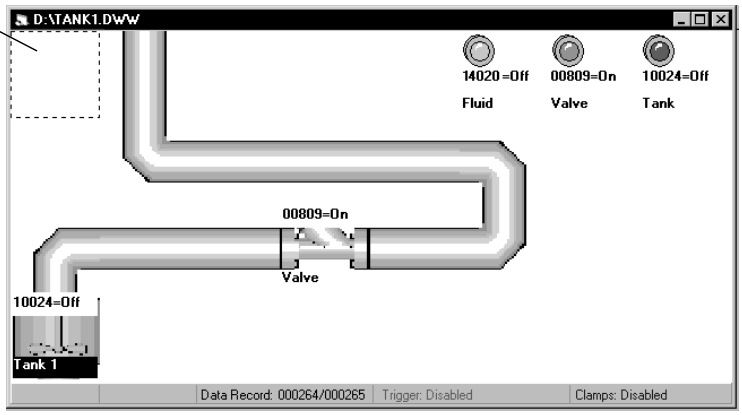
You can add your own bitmaps or choose from the library of bitmaps that are included with the Graphical viewer.

➢ **To access the Graphical viewer:**

1. From the Network Editor, select **Data Watch Window** on the **Data** menu.
2. On the **View** menu, select **Graphical**. A blank window appears with a bitmap cell in the right uppermost corner.

Click anywhere to place the bitmap cell.

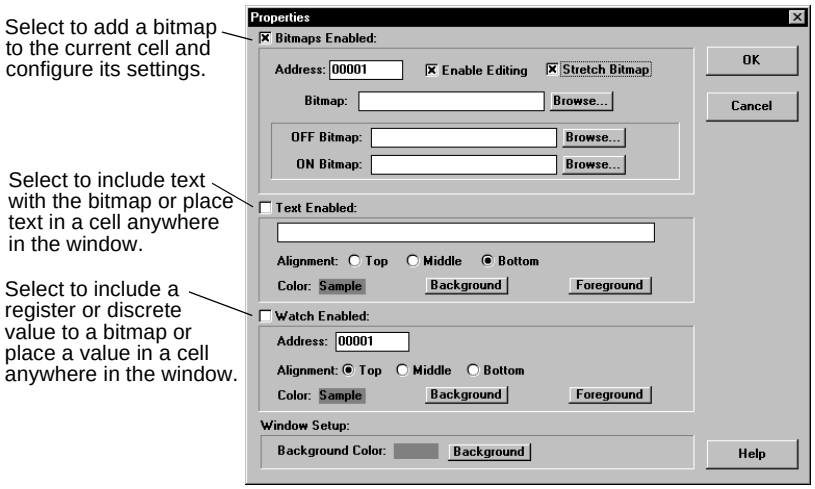
The bitmap cell is where your bitmap will appear.



Like the other viewers, the Graphical viewer also includes Settings and Operations menus to allow you to set triggers, trending, logging, etc.

➢ **To insert a bitmap:**

1. Click anywhere in the Graphical viewer to place the bitmap cell where you want your bitmap.
2. Right-click on the cell and select **Properties**. The Properties dialog box appears.



3. Configure the properties using the following information.

Bitmaps enabled

Below are descriptions of the bitmap properties:

- **Address**: Type a Modicon discrete or analog address.

If you use a discrete address, you can select bitmaps to represent the off and on states. If you use an analog address, you can specify a range of data values, a linear scaled value, and a range of bitmaps to represent different data values.

- **Enable Editing:** Select to allow changes in the address data state.
- **Stretch Bitmap:** Select to fill the cell with the bitmap or clear to add the bitmap at it's original size.
- **Bitmap:** Type the path and file name of the bitmap you want to add to the cell or click **Browse** to navigate to it.
- **OFF Bitmap:** Type the path and file name of the bitmap you want to represent the off state or click **Browse** to navigate to it.
- **ON Bitmap:** Type the path and file name of the bitmap you want to represent the on state or click **Browse** to navigate to it.
- **Range:** Type a range specifying the low to high data values for the analog address. For example, 1 - 100.

- **Scale Range:** Type a range specifying the low to high values of the linear scaled value.

  For example, with the range set to 0 - 100 and the scale set to 0 - 4096, the scaled range will be 50% (2048 as a value) when the analog value is 50.

- **# of Bmps:** Type a number of bitmaps to represent data values in the range you specified.

  For example, when the following conditions are applied:

  - The bitmap "meter.bmp" is selected;
  - The range is set to 1 - 5; and
  - The # of Bmps is set to 5.

  The Graphical viewer displays the bitmap "meter1.bmp" when the data value is 1, then displays meter2.bmp when the data value is 2, and so on.

Text enabled

Below are descriptions of the text properties:

- **Text box:** Type the text you want to appear.
- **Alignment:** Select where you want the text to appear in the cell.
- **Background:** Click to select the background color of the text.
- **Foreground:** Click to select the color of the text.

Watch enabled

Below are descriptions of the data value properties:

- **Address:** Type the Modicon address of the value you want to monitor.
- **Alignment:** Select where you want the value to appear in the cell.
- **Background:** Click to select the background color of the text.
- **Foreground:** Click to select the color of the text.

Window setup

Click **Background** to change the color of the entire window background.

13 Working with PID/PID2 blocks

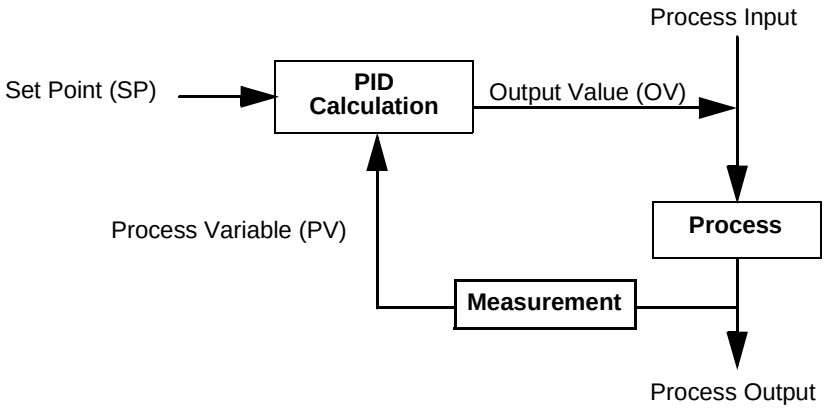
In this chapter

PID and PID2 blocks: an 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.

Unless indicated, operations given in this chapter that can be performed on a PID can also be performed on a PID2.

- For more information on the differences between PID and PID2 blocks, see the ProWORX NxT online help.



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 blocks are highly complex pieces of logic. While they can be very useful, they can also be quite difficult to work with. ProWORX NxT includes a PID display with the following functions that make online programming of PID/ PID2 blocks easier:

- The PID Tuner/Face Plate display.
- The PID Summary display.
- The PID View Networks display.
- Quick access to the Data Watch Trend Window.
- Quick access to the Documentation and Register editors.

Not all controllers support PID blocks, and even fewer support the more advanced PID2. If your controller doesn't support PIDs, you won't be able to add them into your logic database or access the PID display.

➢ **To view the PID monitoring displays:**

- From the online Network Editor, on the **Data** menu, click **PID Summary**.

  You can switch between the Summary, Tuner/Face Plate and View Networks displays by clicking the appropriate buttons along the top row.

  To return to the Network Editor, click **Close**.

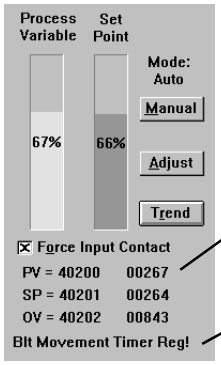
PID display shortcuts

- To open the Register Editor for a PID block, select the PID and click **Tune**.
- To open the Documentation Editor for a PID's process variable, select the PID and click **Doc**.

The PID tuner/face plate display

Sometimes it can be difficult to predict exactly how a PID's parameters will affect its behavior. "Tuning" a PID refers to the process of adjusting a PID's parameters until it operates the way you want. Often, the easiest way to determine the best PID settings is by observing changes in the PID's operation as they happen.

The PID Tuner display provides PID faceplates for up to three PID/PID2 blocks at a time. This provides fast access to features necessary to monitor, control and tune each block. Each PID face plate display looks like this:



The bar graphs indicate where the Process Variable and Set Point are between the low engineering range and the high engineering range. The higher the percentage, the closer it is to the high engineering range. The Process Variable is likely to change over time. You can change the Set Point using the Adjust button.

This area lists the register address (left) and current value (right) of the PID's **P**rocess **V**ariable, **S**et **P**oint, and **O**utput **V**ariable.

The PID's descriptor, as entered in the Documentation Editor, see Chapter "8 Documenting your PLC" on page 207.

From the PID face plate you can:

- Click **Manual** to toggle the PID's operating mode between Auto and Manual.
- Click **Adjust** to modify the PID's Set Point (in Auto mode) or Output Value (in Manual mode).
- Click **Trend** to open up a Trend window for this PID.
- Select **Force Input Contact** to force on the PID's input contact.

Switching to Manual mode temporarily halts the self-correcting operation of the PID block. This lets you manually change the register settings to get a better idea of how your PID works. Switching back to Auto mode returns the PID to regular programming.

➢ **To access the PID Tuner/Face Plate display:**

1. If you aren't looking at the PID Summary or PID View Networks displays, on the **Data** menu, click **PID Summary**. The PID monitor dialog box appears.

2. The PID Tuner is one of three displays that can be shown in this window. If the PID Tuner display isn't the one that appears, click the Face Plate button. The PID Tuner display appears.
3. If your logic database has more than three PID/PID2 blocks, use the vertical scroll bar on the right to move to the one you want.

Adjusting a PID's set point

The Adjust Set Point dialog box (which appears when you click the **Adjust** button in the PID Tuner/Face Plate display) functions differently depending on whether the PID is in Auto and Manual mode. In Auto mode, it changes a PID's set point; in Manual mode, its output value.

Mode	Adjustment value	Value restrictions
Auto	Set Point (SP)	Between the High and Low Engineering Ranges
Manual	Output Value (OV)	PID blocks: 0-4096, PID2 blocks: between the high and low clamp values, normally set to 0 and 4095 respectively.

Before adjusting the Set Point, check the High Engineering Range and the Low Engineering Range. The Set Point bar graph appearing in the PID's Face Plate is based on where the set point value falls within the Engineering Range.

For example, if the Low Engineering Range is 100 and the High Engineering Range is 300 and you change the set point to 200, the Set Point bar graph would read "50%".

To close the Adjust Set Point dialog box and confirm your changes, click **Apply**. To close the dialog box without making any changes, click **Close**.

Tracking PID values in the Data Watch Window

Clicking a PID Face Plate's **Trend** button from within the PID Tuner display brings up a Data Watch trend window for that PID. The trend window tracks the PID's register values—including its process variable, set point, and output variable—over time, plotting them on a graph. You can have Trend windows for multiple PIDs open at the same time.

❖ For more information on Trend windows, see page 290.

PID Summary display

The PID Summary window displays a table with the following information on each PID and PID2 block in the logic database:

- The location of the PID in the network;
- The register address for the PID's process variable, set point and output variable; and
- A description of the PID, as entered from the documentation editor (see page 214)

➢ **To view the PID Summary display:**

1. If you aren't looking at the PID Tuner or PID View Networks displays, on the **Data** menu, click **PID Summary**. The PID monitor dialog box appears.
2. The PID Summary is one of three displays that can be shown in this window. If the PID Summary display isn't the one that appears, click **Summary**. The PID Summary display appears.

PID View Networks display

The PID View Networks display provides a quick look at where PID/PID2 blocks are located in your logic networks. You can't edit any logic from here, but it does let you jump from one PID to another very quickly.

➢ **To view the PID View Networks display:**

1. If you aren't looking at the PID Tuner or PID Summary displays, on the **Data** menu, click **PID Summary**.
2. The PID View Networks is one of three displays that can be shown in this window. If the PID View Networks display isn't the one that appears, click **View Net**. The PID View Networks display appears.

➢ **To move the network view to a different PID:**

- Click **Previous** or **Next** to cycle through the PID/PID2 instruction blocks located in your database.

14 Working with Macros

In this chapter

Introduction to macros

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

Macros are generic pieces of logic networks you create with parameters instead of actual addresses. Macros are programmed offline in the Network Editor. When you insert a macro in your main logic database, 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 logic database retains its link to the inserted macros. This means ProWORX NxT notices if you make changes to a macro and informs you when you view it in the Network Editor.

Creating a new macro

Macros can only be created while offline and working in the Network Editor or from the ProWORX NxT startup screen. Macro creation is similar to database creation, except you select **New Macro** instead of **New** on the **File** menu.

A macro's controller (selected from the Select Controller Type dialog box) should have the same logic instruction set as the controller used by the main logic database. It isn't' necessary for the controller type to be identical, as long as the instruction sets matches.

❖ For information on creating a new logic database, see "Creating a new database" on page 13.

Opening an existing macro

You must be offline and working in the Network Editor or be at the ProWORX NxT startup screen to open an existing macro database.

➢ **To open a previously-created Macro:**

1. From the **File** menu, select **Open Macro**.
2. Navigate to and select the file name of the macro database you want to open. You are taken directly to the Network Editor.

Saving a macro

Normally, changes made to the macro database are saved as you make them, so you don't have to explicitly save your work. You can make a backup of your macro database the same way you would a regular logic database.

❖ For more information, see "Backing up and restoring a database (offline only)" on page 22.

Editing a macro

In general, you edit a macro with the same tools you use in the Network Editor. However, several Network Editor functions are disabled when editing a macro database. Among them are:

- The Traffic Cop
- Config Extensions
- ASCII functions
- Extended memory
- Segment Summary
- I/O Drawing Generator
- Goto Segment
- Loader functions from the Controller menu

Using macro parameters

While in the Macro Editor, 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 logic database.

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.

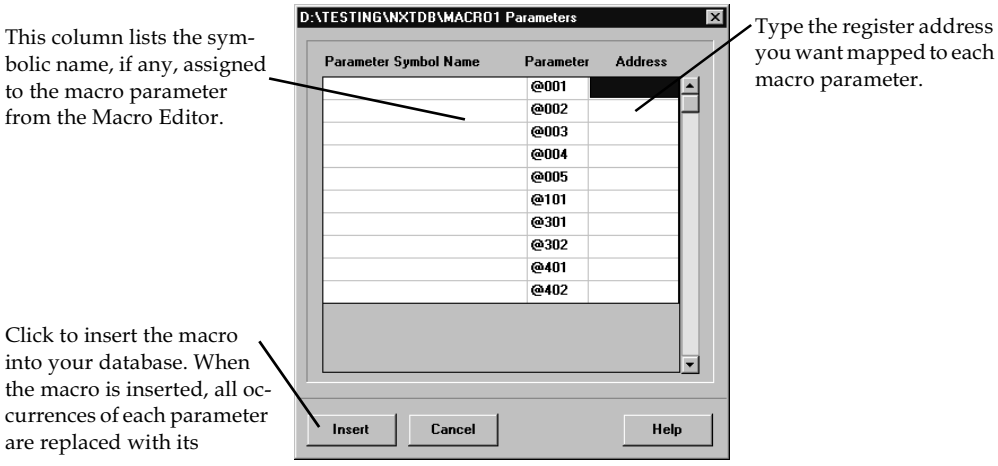
You can have a total of 200 parameters in your macro database—50 for each address type.

Adding and removing macros from your logic database

You insert macros into your logic network while working in the Network Editor. You can only insert macros while working offline.

➢ **To insert a macro into a database:**

1. On the **Edit** menu, click **Insert** then click **Macro**.
2. Select the name of the macro you want to insert. The Macro Parameters dialog box appears.



3. For each macro parameter in the **Parameter Symbol Name** column, type a Modicon address in the **Address** column. You can enter the same address for more than one parameter if needed.
4. When all the parameters have been mapped to Modicon addresses, click **Insert**. ProWORX NxT 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 logic database and you are taken to the Macro Overview screen.

You can automate macro insertions with CODEGEN, a batch file utility included with ProWORX NxT.

❖ For more information, see "Automating macro insertions with Codegen" on page 313.

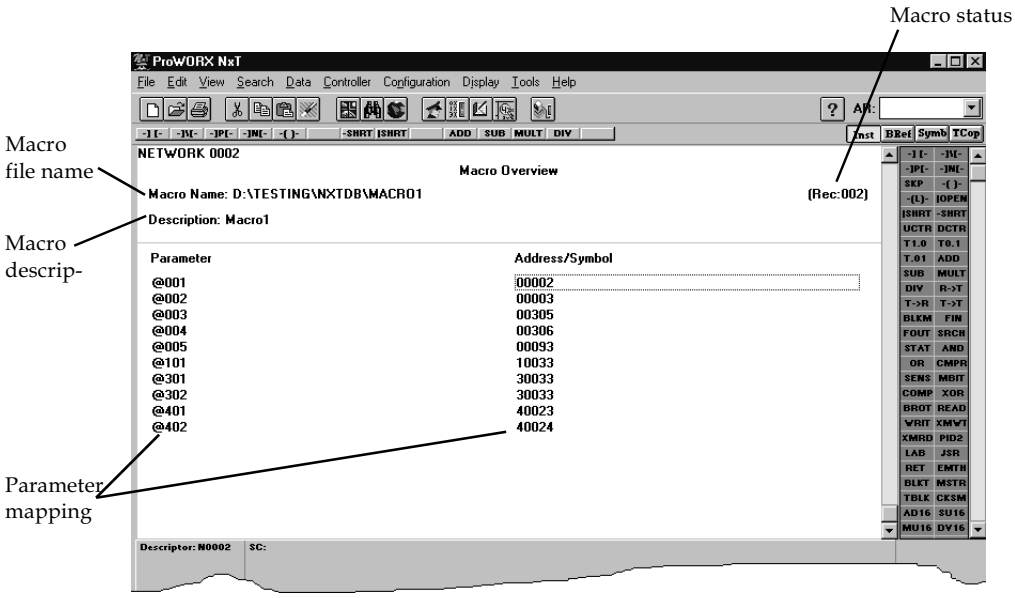
➢ **To remove a macro from a database:**

1. While in the Network Editor, move the cursor onto the macro you wish to delete. The Macro Overview screen appears.
2. On the **Edit** menu, click **Delete** then click **Macro**. A confirmation dialog box will appear.
3. Click **Yes** and the macro will be deleted from the logic database.

Deleting a macro from a database doesn't erase the macro file from your hard drive—it just removes an inserted macro's logic from your main logic database. To remove a macro completely from your hard drive, first remove it from the database as described above, then delete its associated files with Windows Explorer or some other file manager.

The Network Editor's macro overview display

The Macro Overview display appears in the main Network Editor when you move the cursor onto an inserted macro. It also appears just after inserting a macro into a database. This display gives the macro's file name, description (a "very long description" as entered from the documentation editor), 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 three things:

- **Rec: xxx**: The macro hasn't been changed since it was inserted into the main logic network.
- **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 database it is linked to. See the next section, "Making changes in macros".
- **Macro not found**: The macro database file either no longer exists or has been moved to a different directory.

Don't worry about the exact meaning of the numbers in "Rec: xxx". They are just to only to assist customer support with any troubleshooting you might need.

Making changes in macros

If you make changes to a macro database 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 database. In this case, you'll have to unlink that macro insertion. Unlinking a macro removes its connection to the original macro database; the logic in that macro insertion becomes part of the regular main database logic.

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

➢ **To update a macro in a database:**

1. While in the Network Editor, move the cursor onto a macro that needs to be updated. The Macro Overview screen appears, with a status that reads "Macro Has Changed." (If the macro status reads "Rec: xxx", where "xxx" is a series of numbers, then you don't need to update it.)
2. From the **Edit** menu, select **Update Macro**. The macro's logic is reinserted into the logic network and the status changes to "Rec: xxx".

➢ **To unlink a macro from a database:**

Once you've unlinked a macro(s), you can't relink it.

1. While in the Network Editor, move the cursor onto the macro you want to unlink. The Macro Overview screen appears.
2. From the **Edit** menu, select **Unlink Macro**. A confirmation dialog box will appear.
3. Click **Yes**. The macro is unlinked. The Macro Overview display disappears and you are returned to the Network Editor.

Unlinking a macro removes all connections between it and your main logic database, leaving the macro's logic behind as regular network logic. This affects a single macro insertion only — if the same macro appears elsewhere in the same logic network, its bond remains.

➢ **To unlink all the macros from a database:**

- From the Offline Network Editor, select **Unlink All Macros** on the **Edit** menu.

Automating macro insertions with Codegen

Codegen is a separate batch utility that automates the process of appending macros to your logic. To use Codegen, first create a special .CGF batch file that specifies which macros to insert into the database. Codegen takes this batch file and appends the macros to the end of your main logic database.

Codegen can be used with a program consisting entirely of macros. Write several macros at once, create a .CGF script, then use Codegen to insert the macros into your main database. When you build up a large enough macro library, most of your programming is done.

When Codegen runs a script file, it just appends new macros to the end of the main logic database. It does not check to see if those macros already exist elsewhere within the main logic database. Thus, if you run Codegen twice on the same logic database, two sets of macros are inserted at the end of your logic.

Appending a macro and database

Start Codegen from either the ProWORX NxT program group or using the Windows Run command.

If an error occurs while inserting a macro, Codegen skips that macro and jumps to the next macro entry. The information about what it did is saved to the file codegen.log and can be viewed with the Log File Viewer a text editor like Microsoft's Notepad.

➢ **To create a .CGF file for Codegen:**

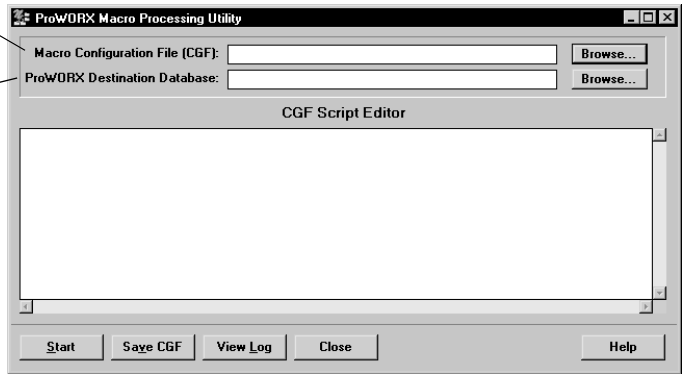
1. Click **Start**, point to **Programs**, then select **ProWORX** and click **Codegen**. Codegen appears.

Select an existing .CGF file or create a new one.

Select a destination database.

Click **Start** to process the selected .CGF file and database.

Click **Save .CGF** to save the current .CGF data to



2. In the **Macro Configuration File (CFG)** field, type the path and the name of the macro or click **Browse** to navigate to it.
3. In the **ProWORX Destination Database**, type the path and file name of the database or click Browse to navigate to it.
4. In the **CGF Script Editor**, type your macro using the following format:

```
<Mode>
# MacroName PathToMacro
ParameterName Address
ParameterName Address
...
#MacroName PathToMacro
ParameterName Address
ParameterName Address
...
```

5. Click **Start**. The .CGF file and database are processed.

➢ **To compile a macro and database without opening Codegen:**

1. From the Windows **Run** feature, click **Browse** to navigate to the Codegen executable. Codegen.exe should now appear in the Open field of the Run dialog box.
2. Using the default format below, type the path and file names of the macro configuration (.CFG) and the database (.DCF) files.

```
Codegen /cgf:c:\proworx\nxt\<Filename>.cgf /
db:c:\proworx\nxt\databasename.dcf
```

   - **<Filename>** contains the name of your .CGF file.
   - **<ProWORX NxT database name>** contains the full path and file name of your database.

3. Click **OK**. Codegen appends the .CGF and .DCF files as a background task.

➢ **To display a macro's log file:**

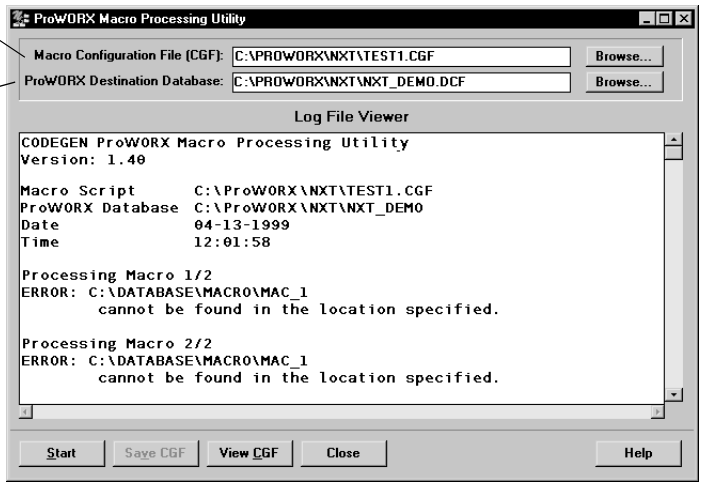
1. Create a .CGF file and compile it.

2. Click **Log View**. The Log File Viewer appears with information about the compiled .CGF file.

Select an existing .CGF file.

Select a destination database,

Click **Start** to process the selected .CGF file and database.



The Log File Viewer displays logged information about a compiled .CFG file. This information includes:

- The macro script path and file name;
- The ProWORX database path and file name;
- The date and time the macro and database were processed; and
- Whether the processing was successful or the location of any errors;

.CGF batch file descriptions

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

- **Mode** can be one of three things:
  - **<Create New>:** Clears the source database of all documentation and logic and inserts macros at the beginning of the logic.
  - **<Overlay>:** 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 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.

15 Monitoring your Hardware

In this chapter

Monitoring the health of your hardware

With ProWORX NxT, you can easily monitor the health of your controllers and I/O systems. You can continuously monitor one device, schedule routine checks of your entire network, log health data to a file, and see the status bits of a controller's memory. Together, these features alert you to changes in controller health and help you track down intermittent faults.

Monitoring the health of one device

Use this feature to monitor a controller's health from your PC instead of manually checking status words or hardware indicators. In this mode, the Monitor polls the controller's health continuously until you stop it. The Monitor displays any changes in a controller's health on the screen and records them to a log.

The Monitor only shows *changes* in a controller's health status as the Monitor runs, not what the status is when monitoring begins. For example, suppose you begin monitoring an unhealthy controller. When you start the Monitor, it does not notify you that the controller is unhealthy, but does let you know if the controller changes from unhealthy to healthy.

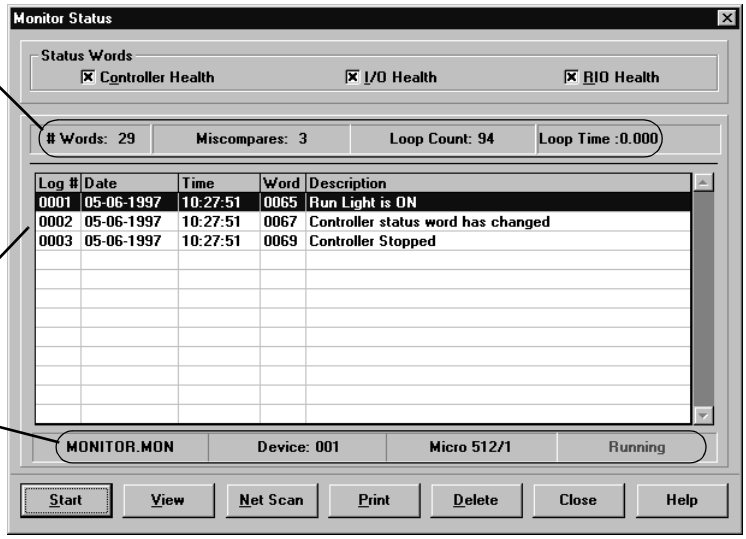
➢ **To continuously monitor the status of one controller:**

1. On the **Tools** menu, click **Monitor** then click **Monitor Device**.
   - If you have selected a controller in the Main Screen with the **Controller** menu's **Select Device** command, the Monitor analyzes that controller.
   - If you have selected a controller in the Network Editor with the **Controller** menu's **Change Device** command, the Monitor analyzes that controller.
   - If you haven't selected a controller, the Select Device dialog box appears. Type the address of the controller to analyze or click **Net Scan** to select one from a graphical display.

The Net Scan window has a separate Monitor function to check that its graphical depiction of status lights matches the controllers.

❖ For more information, see Performing a network scan on page 50.

The Monitor Status window appears.



The Monitor Bar shows the number of words you are monitoring, the number of state changes in those words, the number of times they have been checked, and the amount of time in seconds it takes to complete one check.

Changes in controller health status are reported, date and time stamped, then logged to a file.

The Status Bar displays the name of the log file and the controller's address, type, and state.

2. Select the status words to monitor:
   - **Controller Health:** Monitors words such as 984 status, 911 states, stop codes, EOL pointers, R I/O timeouts, ASCII message status, and run status.
   - **I/O Health:** Monitors the Module Health Table.
   - **R I/O Health:** Monitors the Drop or Channel Status Table.
3. Click **Start**. The Monitor begins continuously checking the health of your controller. The Start button changes to Stop.

If a status change occurs, the Monitor displays it on your screen and logs it to a file. This file usually has the same name as the current database with the extension .MON. If you're working from the Startup Screen or Online Editor with no open database, the file is called MONITOR.MON. If the Monitor finds a .MON file for your database (or a MONITOR.MON file if you don't have a database), it prompts you to add to the existing file or create a new one.

4. To stop monitoring the controller, click **Stop**.

➢ **To select another controller to monitor:**

Changing to a new controller clears your log file.

1. Click **Net Scan**. The Select Device dialog box appears.
2. Type the address of the controller to analyze or click **Net Scan** to select a controller from a graphical display.

   The Net Scan window has a separate Monitor function to check that its graphical depiction of status lights matches the controllers.

❖ For more information, Performing a network scan on page 50.

➢ **To print the current log:**

- Click **Print**. The log prints to your default printer.

➢ **To delete the current log:**

This command deletes the entire log, not just a selected entry in it. A deleted log file is unrecoverable.

- Click **Delete**.

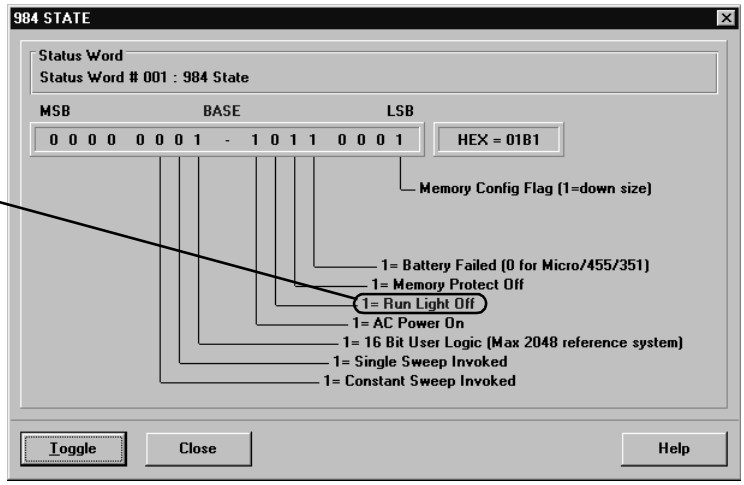
Viewing status words in detail

When the health of a controller changes, the Monitor records the event in the controller's log. The View Status Word window lets you see the changes in bits of the status word. The function of each used bit is described, and the changed bit is selected.

➢ **To view a status word in detail:**

1. From the Monitor Status window, click the status word to select it.
2. Click **View**. The View Status Words window appears.

When a bit changes, its description is selected. The word's unused bits are not labelled.



3. To see how the bits changed over time, click **Toggle**. The status word bits are displayed in three states:
   - **Previous:** two scan cycles before the change occurred;
   - **Base:** one scan cycle before the change occurred;
   - **Next:** immediately after the change occurred.

   When the View Status Bits window opens, the Monitor shows the bits as they appeared before the change took place (the BASE condition).
4. Click **Close** when you have the information you require.

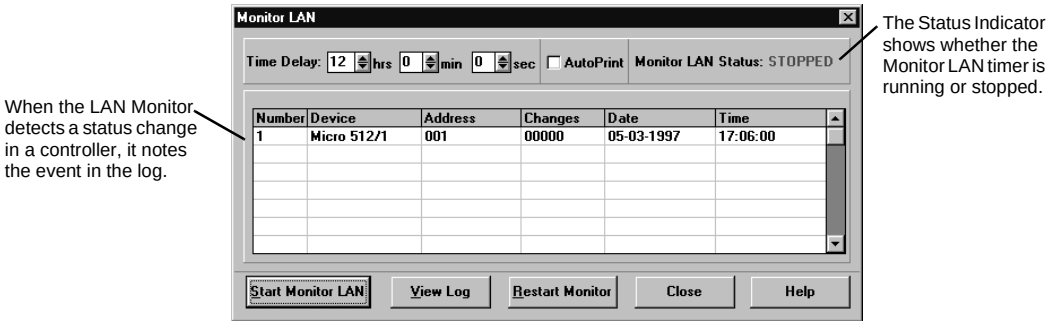
Checking the health of all controllers on a network

This feature checks the health status of all the controllers on your network, then displays any changes on the screen and records them to a log. You can set the LAN Monitor to repeat its scan at regular intervals.

The LAN Monitor only shows changes in your controllers' health status from the last time the Monitor ran, not the current status of the controllers. For example, if you set the LAN Monitor to scan at one-hour intervals, when you start the Monitor, it won't tell a controller is unhealthy or one hour later if the controller is still unhealthy. The LAN monitor will tell you the controller has changed from unhealthy to healthy in that hour.

➢ **To scan the health of a network of controllers at regular intervals:**

- On the **Tools** menu, click **Monitor** then click **Monitor LAN**. The Monitor LAN window appears.



The LAN Monitor immediately scans your entire network for controllers. For each controller located, the LAN Monitor creates a log file containing baseline controller, I/O, and RI/O health information. This scan may take several minutes, then displays the result in the Monitor LAN window.

You can do the following from the Monitor LAN dialog box:

- **Start Monitor LAN:** Click to start the timer counting down.

When the timer reaches zero, the LAN Monitor analyzes the health of all controllers on your network. It records any changes in a controller's health to the controller's log file, then resets the timer and starts it counting down for the next cycle. The LAN Monitor continues cycling until you stop it.

- **Stop Monitor LAN:** Click to stop the timer.

- **Time Delay:** Set the time delay between network scans with the Hours/Minutes/Seconds fields.
- **AutoPrint:** Select to print changes in controller health as they occur.
- **Restart Monitor:** Click to reset the LAN Monitor's logs and timer. The LAN Monitor deletes the old controller logs, then immediately begins scanning your network for controllers, just as it does when the LAN Monitor first opens.
- **View Log:** Click to see the changes in the controller's health status bits.

Viewing a controller's health log

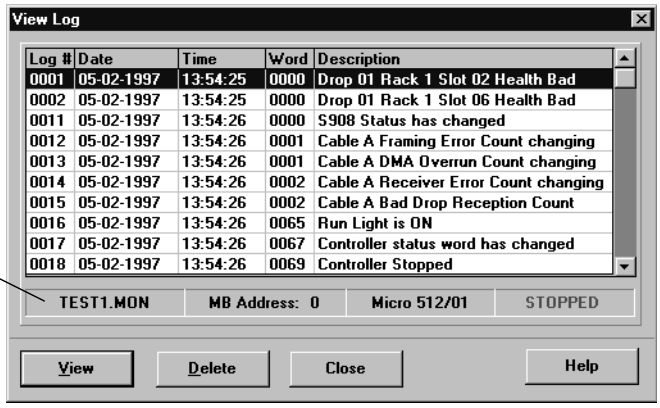
The LAN Monitor records changes in health status words for each controller and its I/O and R I/O. The changes are listed in the View Log window. In it, you can select changes in health status words to see in detail or delete the log.

➢ **To view a controller's health log:**

1. Do one of the following:
   - From the ProWORX NxT Title Screen or the Network Editor, on the Tools menu, click **Monitor** then click **View Status**. The Open Monitor File dialog box appears. Type the path and file name of the file to view or navigate to it. Click **OK**.
   - From the Monitor LAN window, select a controller's log, then click **View Log**. The View Log dialog box appears.

Each entry in the log is date and time stamped, and the change described.

The Status Bar displays the current LAN Monitor log and the controller's address, type, and state. If you are viewing a previously- saved log, the Status Bar shows only the log name and controller address.



You can do the following from the View Log dialog box:

- Click **Close** to return to the Monitor LAN window.

When you delete a log file, it can't be recovered.

- Click **Delete** to delete the entire log.
- Select an event to see in detail, then click **View**. The View Status Words window opens.

16 Using the Compare Function

In this chapter

Using the compare function

ProWORX NxT's Compare function finds differences in logic and configuration between a database and a controller or between two databases. This powerful tool lets you be sure that your controllers are using the right logic and are configured properly, and that a local database is the same as your operation's master database. You can compare elements manually or schedule routine checks.

The Compare function examines any or all of these elements:

• Networks of logic	• Coils used
• Controller configuration	• Coil state
• Present user loadables	• Input state
• Traffic Cop I/O settings	• 3xxxx registers
• Segment Scheduler settings	• 4xxxx registers
• ASCII port parameters	• Coils disabled
• ASCII messages	• Inputs disabled

Using the on-demand compare function

This Compare function finds and highlights differences between a database and a controller's memory or between two databases. When the comparison is complete, NxT displays the findings on-screen and records them to a log, and can send them to a printer.

To use the compare function, select the database and controller or the two databases to compare, start the comparison, then view its results.

➢ **To select a master database for a Comparison:**

1. On the **Tools** menu, click **Compare** then click **Compare** again.
2. If you have a database open, the Compare function automatically selects it as your master database; otherwise, you are prompted for a database. The **Open** dialog box appears.

3. Type the path and file name of the database to use or navigate to it, then click **OK**. The Compare dialog box appears.

➢ **To change the database from the default database:**

1. Click **Browse**. The **Open** dialog box appears.
2. Type the path and file name of the database to use or click **Browse** to navigate to it, then click **OK**. The name appears in **Master Database**.

➢ **To compare your master database to another database:**

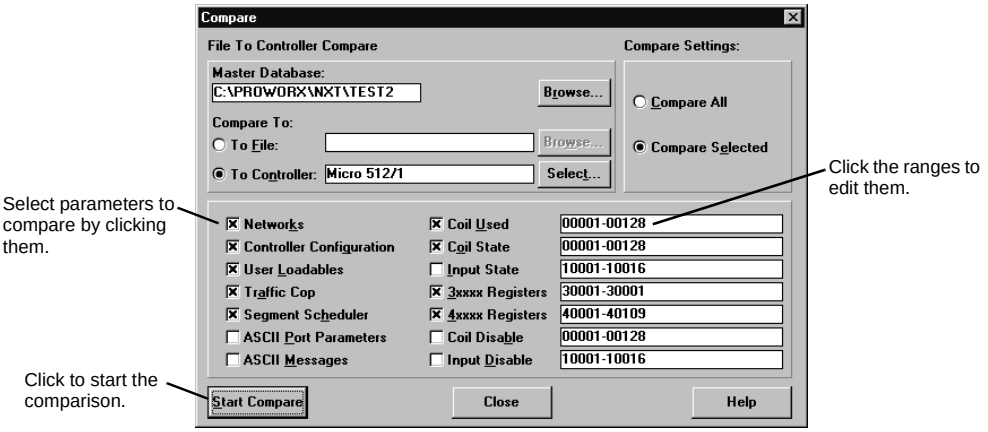
1. Click **To File**.
2. To choose your second database, click **Browse**. The **Open** dialog box appears.
3. Type the path and file name of the database to use or navigate to it, then click **OK**. The name appears in **To File**.

➢ **To compare your master database to the memory of a controller:**

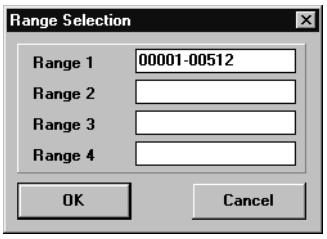
1. Select **To Controller**.
2. To choose a controller, click **Select**. The Select Device dialog box appears.
3. Type the address of the controller or click **Net Scan** to select a controller from a graphical display.
   - ❖ For more instructions on using Net Scan, see "Performing a network scan" on page 50.
4. Click **OK**. The type of the controller appears in **To Controller**.

➢ **To choose parameters to compare:**

1. To compare all parameters, select **Compare All**.
2. To choose parameters to compare, select **Compare Selected**. The Compare dialog box expands.

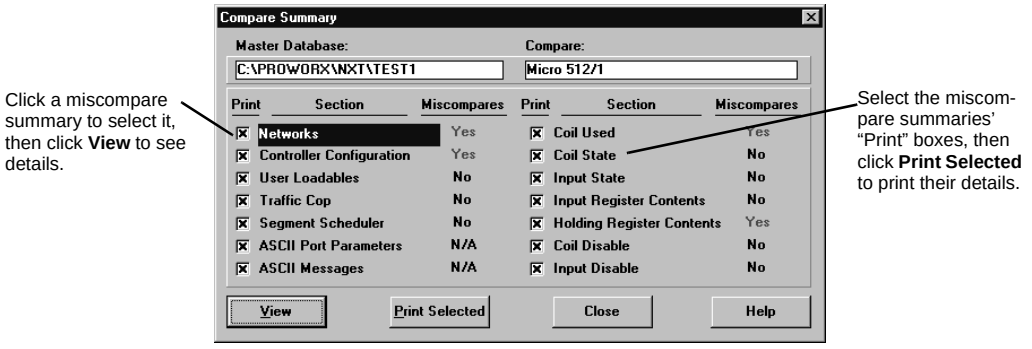


3. Select the parameters you want to compare. The column of parameters on the right require address ranges to be set.
4. Click the text box of a range to edit it. The **Range Selection** dialog box appears.



5. Click **Start Compare**. NxT reads the controller's memory or the second database and compares it to the Master database.

When the comparison is complete, the Compare Summary window appears.



Press TAB, then the arrow keys to move the selection bar to the miscompare to view. Press ENTER to view it. Press SPACEBAR to select or clear its Print box.

- For more detailed instructions about this window, see "Using the Compare Summary window" on page 333.

Scheduling comparisons to repeat automatically

Like the On-Demand Compare function, the Timed Compare finds and highlights differences between a database and a controller's memory. However, the Timed Compare does not compare two databases.

Once configured, the Timed Compare repeats the comparison automatically at the interval you set. When the comparison is complete, NxT displays the findings, records them to a log, and, if you want, sends them to a printer.

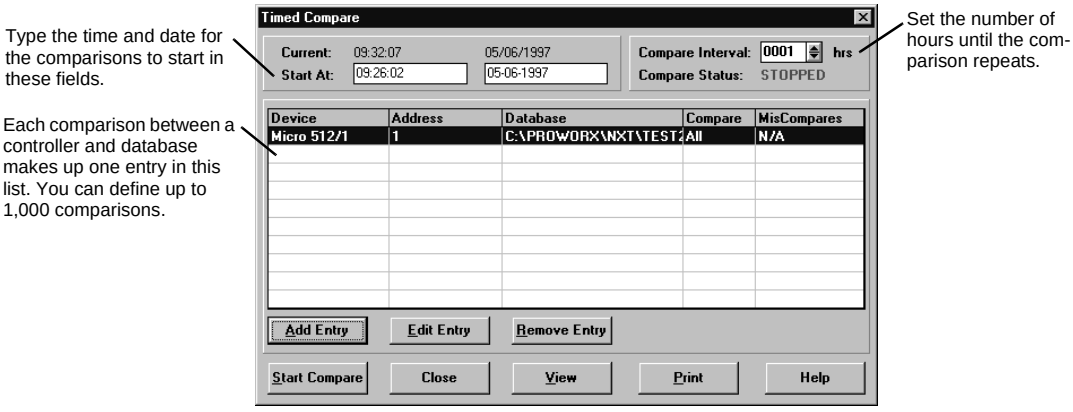
Follow these three steps to perform a Timed Compare:

1. Create comparison entries.
2. Set and start the interval timer.
3. View the results of the comparison.

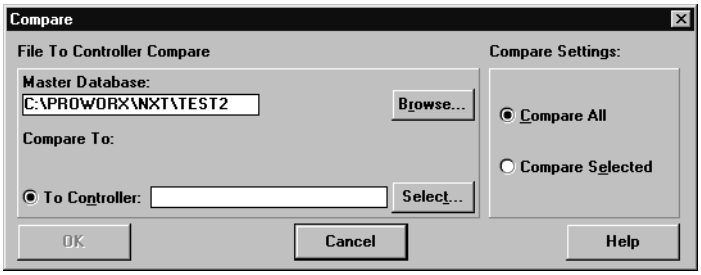
Up to 1,000 database/controller comparisons can be defined.

➢ **To create a new entry in the comparison list:**

1. On the **Tools** menu, click **Compare** then click **Timed Compare**. The Timed Compare dialog box appears.

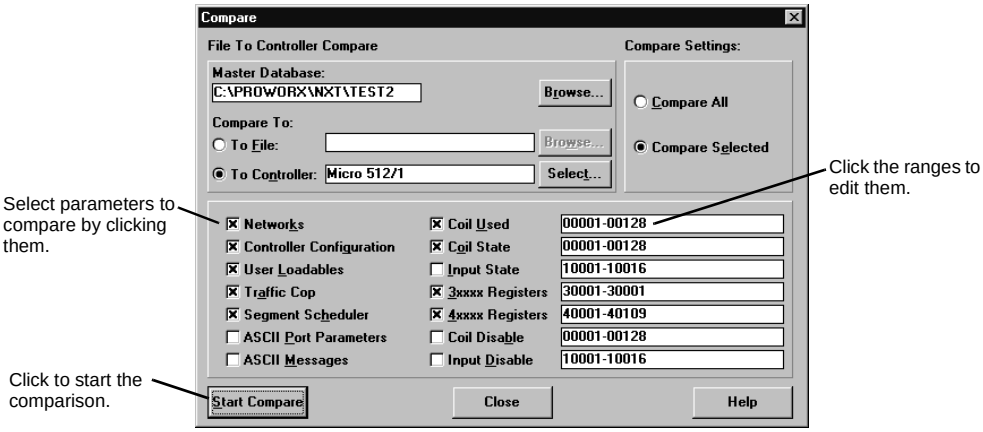


2. Click **Add Entry** or double-click an empty slot in the list. The Open window appears.
3. Type the path and file name of the database to use or navigate to it, then click **OK**. The Compare window appears with the name in **Master Database**.

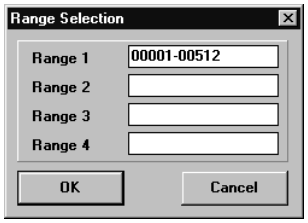


4. Click **Select** to choose a controller. The Select Device dialog box appears.
5. Type the address of the controller or click **Net Scan** to select a controller from a graphical display, then click **OK**.
   - ❖ For more instructions on using Net Scan, see "Performing a network scan" on page 50.

6. Click **Compare All** to compare all parameters or click **Compare Selected** to choose parameters to compare. The Compare window expands.



7. Select the parameters you want to compare. The column of parameters on the right require address ranges to be set.
8. Click the text box of a range to edit it. The **Range Selection** dialog box appears.



9. Click **OK**. You are returned to the Timed Compare dialog box.

➢ **To edit an entry in the Timed Compare list:**

1. In the Timed Compare dialog box, select entry to edit, then click **Edit Entry** or double-click the entry to edit. The Compare window appears.
2. Change the entry.
3. Click **OK**. You're returned to the Timed Compare window with the edited entry in the list.

➢ **To delete an entry from the Timed Compare list:**

Deleted entries cannot be recovered.

1. In the Timed Compare dialog box, click the entry to remove.
2. Click **Remove Entry**.

➢ **To set the start time and interval for a Timed Compare:**

1. In the Timed Compare dialog box, type the time and date for the comparisons to begin in the Start At fields.
   - In the left field, type hours/minutes/seconds.
   - In the right field, type month/day/year.
2. Click  to set the interval between comparisons (in hours). The interval cannot be less than one hour or more than 9999 hours.

➢ **To start or stop a Timed Compare:**

1. In the Timed Compare dialog box, click **Start Compare**. There must be at least one entry in the Comparison list before the timer starts.

   When the **Start At** time and date match the actual time and date, NxT performs the comparisons in the **Entries** list. The results are recorded to log files.

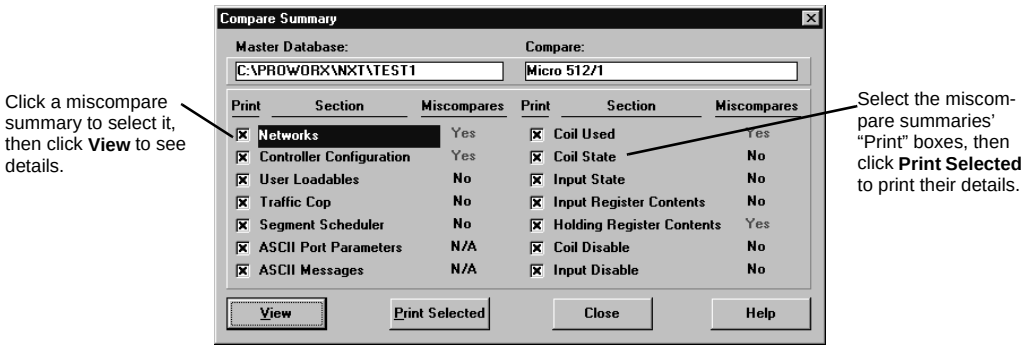
   NxT then starts a timer and waits the specified interval time. When the time expires, NxT performs the comparison again, then resets the timer.
2. To stop the Compare function, click **Stop Compare**.

➢ **To view a compare log for an entry in the Timed Compare list:**

1. In the Timed Compare window, select the entry to view.
2. Click **View**. The Compare Summary dialog box appears.

Using the Compare Summary window

When a comparison is complete, the Compare Summary window appears.



Press TAB, then the arrow keys to move the selection bar to the miscompare to view. Press ENTER to view it. Press SPACEBAR to select or clear its Print box.

➢ **To print the results of the comparison:**

1. In the Compare Summary dialog box, click the miscompares to print.
   - For all miscompares except Networks, this option prints the same information that is displayed by the **View** button.
   - For Networks, this option prints a brief list of miscompares. To print the details of Network miscompares (including networks of logic), click **Print** in the Network Compare window.

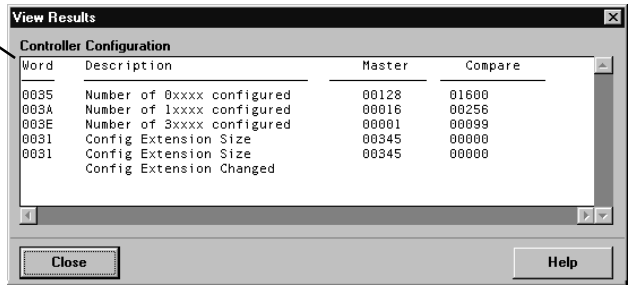
   ❖ For more information, see page 336.
2. Click **Print Selected**. The summaries print to your default printer.

➢ **To view the details of any miscompare except Networks:**

- In the Compare Summary window, select a miscompare and click **View**, or double-click the miscompare. The View Results window appears.

The contents of this window change depending on the parameter you select to view in the Compare Summary window.

NxT provides descriptions of the miscompares to help you either correct them or locate additional information in your controller's manual.

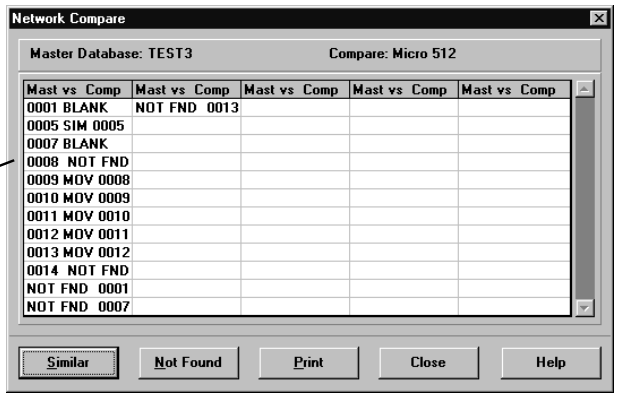


➢ **To view the details of Network miscompares:**

- In the Compare Summary window, select **Networks** and click **View** or double-click **Networks**. The Network Compare window appears.

Information about the master database is in the left of the column; the second database or controller appears on the right.

Column entries list the number of a network in one database and its condition in the other. Entry 4, for example, says that Network 8 in the master database does not exist in the controller.



Network Compare reports the following errors:

- **Blank:** One database has logic in a network while the other has nothing. The Compare function lists the number of the mismatching network.
- **Moved:** Identical logic appears in both databases, but in different networks. The Compare function lists both network numbers.

- **Similar:** Closely matching (but not identical) logic appears in the same network in both databases. The Compare function lists the network number.
- **Not found:** Logic in one database doesn't appear in the other. The Compare function lists the number of the network containing the logic.

These errors often appear in pairs. For example, if two databases each contain different logic in Network 12, the Compare function reports that one network of logic in the first database does not exist in the second, and one network of logic in the second doesn't exist in the first.In the table, you see this result:

MAST	VS	COMP
0012	NOT	FND
NOT	FND	0012

Not Found errors also frequently appear when networks of logic have been moved in one database but not another. Suppose a master database is used to program a controller, then the logic originally in Networks 3 and 4 of the master database is moved to Networks 4 and 5. If the database is now compared to the controller, these results appear in the table:

MAST	VS	COMP
NOT	FND	0003
0003	MOV	0004
0004	MOV	0005
0005	NOT	FND

The third network in the controller no longer appears in the master database (because, in the database, that logic has been moved to the fourth network). Similarly, the fifth network in the master database does not appear in the controller (because, in the controller, that logic is still in the fourth network).

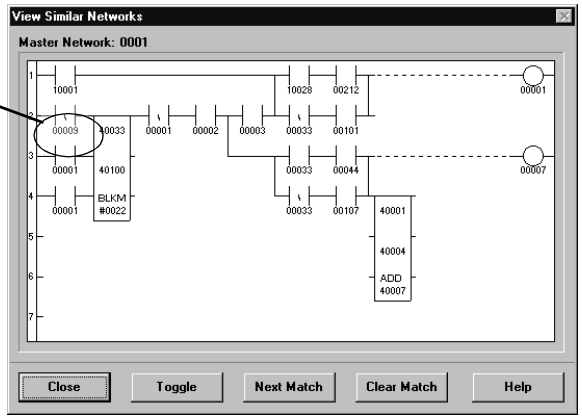
➢ **To print Network miscompares:**

1. In the Network Compare window, click **Print**. The Network Print dialog appears.
2. Do one of the following:
   - **Summary:** Click to print a concise list of all network miscompares.
   - **Similar:** Click to print the logic of networks similar to each other.
   - **Moved:** Click to print the network logic that only differs in location.
   - **Not Found:** Click to print the logic of all networks found in one database, but not the other.

➢ **To see networks of logic resembling each other but not identical:**

1. In the Network Compare window, click **Similar**. The View Similar screen appears.

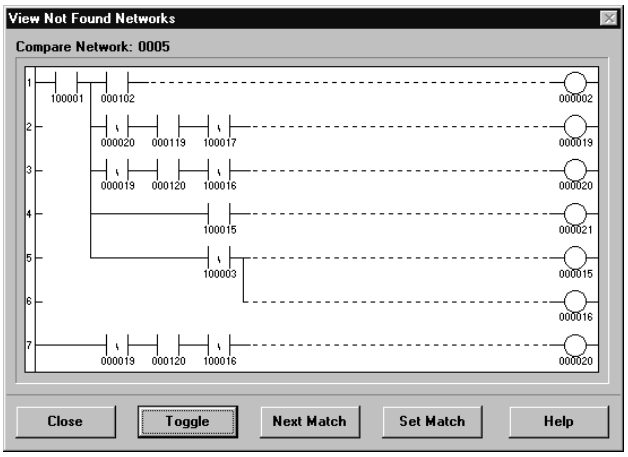
Differences between the two databases (or the database and your controller) appear in red.



2. Do one of the following:
   - **Toggle:** Click to switch views between the master database and the second database or controller. Switching between the networks of logic makes it easier to spot any differences.
   - **Next Match:** Click to move to the next pair of similar networks. At the end of the list of matches, click Next Match again to go to the start of the list.
   - **Clear Match:** Click to remove the current pair of networks from the Similar list. This doesn't delete the networks of logic themselves, only their entry in the Network Compare window.

➢ **To see networks appearing in one database but not the other:**

1. In the Network Compare window, click **Not Found**. The View Not Found Networks dialog box appears.



2. Do one of the following:

   - **Toggle:** Click to switch views between the master database and the second database or controller.

The Compare function generates two independent Not Found lists: one for networks present in the master database but not the second database or controller, and another for networks present in the second database or controller but not the master database. Click **Toggle** to switch between these lists.

   - **Next Match:** Click to move to the next Not Found network of the current view. Clicking Next Match only affects the current view: each of the two Not Found lists operates independently of the other.
   - **Set Match:** Click to remove the current network from the Not Found list.

17 Configuring a BM85

In this chapter

Configuring a BM85 Bridge multiplexer

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

You can use ProWORX NxT to configure a BM85's Modbus ports (either manually or from files you create and load) and edit the BM85's Address Routing Map.

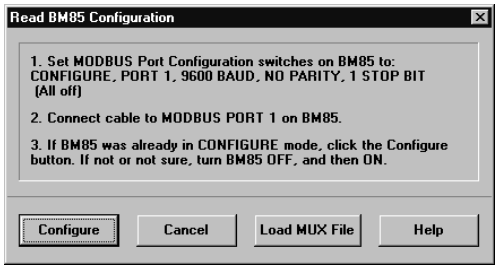
Reading or loading a BM85 configuration

Before configuring the Modbus ports of a BM85, NxT must read the current configuration of the BM85 or load a previously-saved MUX file from disk.

You can also load a MUX file after reading the current configuration, but loading one directly can save you time.

➢ **To read a Modbus port configuration from a BM85:**

1. From the ProWORX NxT Title Screen or the Network Editor, on the **Tools** menu, click **BM85 MUX Setup**. The Read BM85 Configuration dialog box appears.



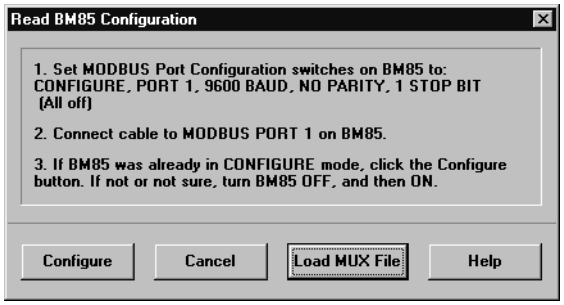
2. Follow the instructions as they appear to connect your computer to the BM85.
3. Click **Configure**. NxT looks for a BM85 until it finds one. If your PC is not connected to a BM85 or is connected incorrectly, press ESC to return to the Network Editor.

   NxT reads the current configuration of your BM85, then displays it in the BM85 Port Parameters window.

❖ For more information, see "Configuring the Modbus ports of a BM85" on page 342.

➢ **To load a MUX file for editing:**

1. From the ProWORX NxT Title Screen or the Network Editor, click **Tools** then click **BM85 MUX Setup**. The Read BM85 Configuration dialog box appears.

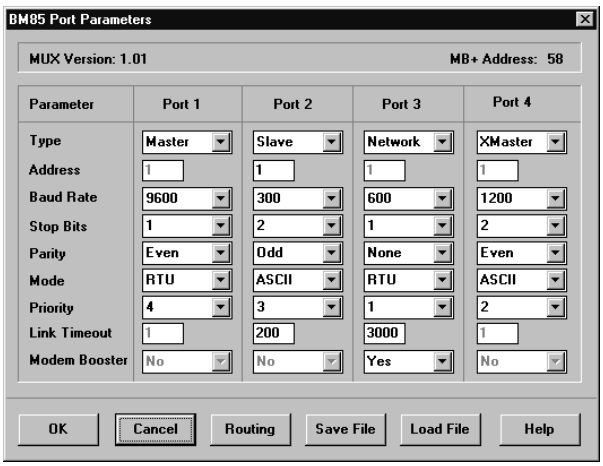


2. Follow the instructions as they appear to connect your PC to the BM85.
3. Click **Load MUX File**. The Select MUX Setup File window appears.
4. Type the path and file name of the MUX file or navigate to it, then click **OK**. NxT loads the MUX file, then displays it in the BM85 Port Parameters window.

Configuring the Modbus ports of a BM85

With ProWORX NxT, you can configure each of a BM85's four ports, edit the ports' Address Routing Maps and save your settings to disk as a MUX file which can be loaded later.

After reading the configuration from a BM85 or loading a saved MUX file from disk, the BM85 Port Parameters dialog box appears with the configuration information.



Below are the descriptions for each port parameter in the BM85 Port Parameters dialog box:

- **Type:** Selects the Modbus device that attaches to the port.
  - **Master:** Select for a master device, such as a PC.
  - **XMaster:** Select for devices in Silent Master mode.
  - **Slave:** Select for a slave device, such as a PLC.
- **Network:** For a network of slave devices connected through a modem.
- **Address:** Sets the address of a slave device from 1 to 247. This option is not available unless the port type is set to 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. The default is 1.

- **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.
- **Mode:** Selects a communications mode for the port, RTU or ASCII. The default is RTU.
- **Priority:** Determines the order in which the BM85 checks the ports, with 1 the highest priority and 4 the lowest. All ports must have different priorities.
- **Link Timeout:** 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.

➢ **To configure the Modbus Ports of a BM85:**

1. For each port, select or type the parameter values using the parameter descriptions above.
2. Click **Load File** to load a MUX file from your disk. The Select MUX Setup File window appears.
3. Type the path and file name of the MUX file or navigate to it, then click **OK**. NxT loads the MUX file.
4. Click **Save File** to save the current port settings into a MUX file. The Save MUX File window appears.
5. Do the following:
   - Type the path and file name of the MUX file, then click **OK**. NxT saves the MUX file to your disk for a network of slave devices connected through a modem.OK. NxT saves the MUX file to your disk.
   - Click **Routing** to edit the BM85's address routing map.
6. To write your changes, click **OK** to the BM85 for a network of slave devices connected through a modem. It may take a few moments to configure the BM85's ports according to your settings.

Editing a BM85's address routing map

Each of the four Modbus ports on a BM85 has its own *Address Routing Map.* When the BM85 receives a message at a Modbus port, it compares the address of the message to the appropriate address routing map. The BM85 then redirects the message to a Modbus Plus network or device according to the routing information it finds. Use NxT to view and edit the BM85's address routing maps.

You must set a port's Port Type to **Master** or **XMaster** in the BM85 Port Parameters window before the BM85 will use its address routing map.

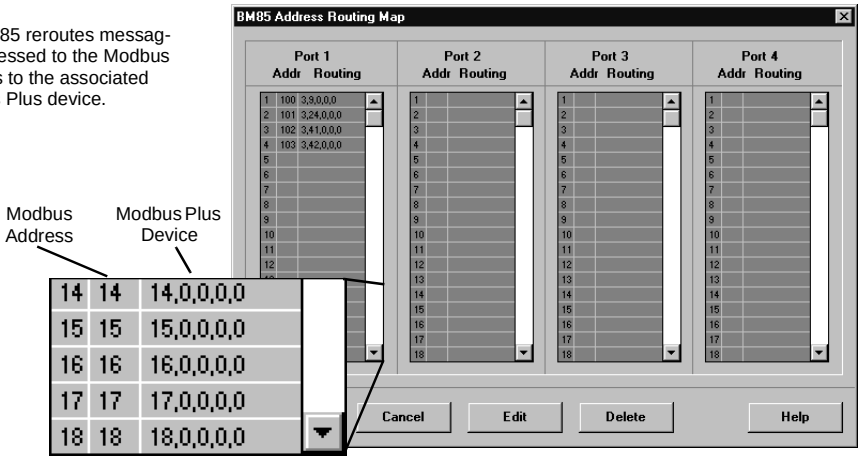
➢ **To edit the Address Routing Map of a BM85:**

1. From the ProWORX NxT Title Screen or the Network Editor, click **Tools** or click **BM85 MUX Setup**. The Read BM85 Configuration dialog box appears.
2. Follow the instructions on your screen to connect your computer to the BM85.
3. Click **Configure**. NxT reads the current configuration of your BM85, then displays it in the BM85 Port Parameters window.

If your PC is not connected to a BM85 or is connected incorrectly, press ESC to return to the Network Editor.

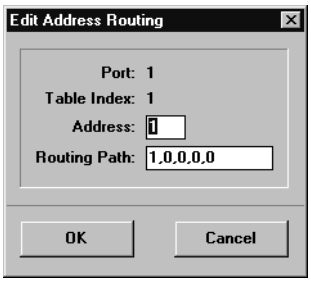
4. Click **Routing**. The BM85 Address Routing Map window appears.

The BM85 reroutes messages addressed to the Modbus Address to the associated Modbus Plus device.



You can see the first 18 routing paths of the 64 available for each Modbus port.

5. The Edit Address Routing dialog box appears when you do one of the following:
   - Select a routing path to delete, then click **Delete**.
   - Select a routing path to edit, then click **Edit**.
   - Double-click a routing path to edit.



6. In the **Address** field, type the reference Modbus address.
7. In the **Routing Path** field, type the Modbus Plus address to which the message will be rerouted, then click **OK**. The Edit Address Routing dialog box closes.
8. Select another address to edit, then click **OK**. You're returned to the BM85 Port Parameters dialog box.
9. When you are satisfied with your changes, click **OK**. It may take ProWORX NxT a few moments to configure the BM85's ports according to your settings.

Appendix A - Mnemonics

Configurable mnemonics

Use mnemonics to enter ladder logic instructions in the Network Editor. To edit a mnemonic, on the **File** menu, click **Utilities**, then click **Mnemonics.**

No.	Mnemonic	Description	
01	NO	-] [-	Normally Open
02	NC	-]\[-	Normally Closed
03	PTC	-]P[-	Off to On
04	NTC	-]N[-	On to Off
05	VTO	| OPEN	Vertical Open
06	VTS	| SHRT	Vertical Shunt
07	HSH	-SHRT	Horizontal Shunt
08	CNR	-( )-	Normal Coil
09	CR	-(L)-	Latched Coil
10	SKP	SKP	Skip Function
11	UCT	UCTR	Up Counter
12	DCT	DCTR	Down Counter
13	T1	T1.0	Timer (seconds)
14	T0	T0.1	Timer (tenths)
15	T.	T.01	Timer (hundredths)
16	ADD	ADD	Addition
17	SUB	SUB	Subtraction
18	MUL	MULT	Multiplication
19	DIV	DIV	Division
20	RT	R->T	Register to Table
21	TR	T->R	Table to Register

No.	Mnemonic	Description	
22	TT	T->T	Table to Table
23	BLK	BLKM	Block Move
24	FIN	FIN	First-In
25	FOU	FOUT	First-Out
26	SRC	SRCH	Table Search
27	STA	STAT	System Status
28	AND	AND	Logical And
29	OR	OR	Inclusive Or
30	CMP	CMPR	Logical Compare
31	SEN	SENS	Logical Bit Sense
32	MBI	MBIT	Logical Bit Modify
33	COM	COMP	Logical Complement
34	XOR	XOR	Exclusive Or
35	BRO	BROT	Logical Bit Rotate

Appendix B - File Extensions

File extensions

NxT requires many different types of files to operate. You can determine the purpose of files in the NxT directory by their extensions.

The files marked with an asterisk(*) make up a database.

Database files

Extension	Type of File
.CML*	Comment (long) data file
.CPF*	Comment (long) pointer and length file
.DCF*	Database configuration file
.DDF*	Descriptor data file
.DPF*	Descriptor pointer file
.LGF*	Log book note file
.NDF*	Short comment file
.TDF*	Title data file
.TSF*	ProWORX symbol file

Controller memory files

Extension	Type of File
.LDF*	Logic data file
.LPF*	Logic pointer file
.MDF*	Memory data file
.XDF*	Extended memory data file

Report files

Extension	Type of File
.LOG	Text log file from utilities like CODEGEN
.TXT	Print-to-file output

Loadables

Extension	Type of File
.MSL	MSL loadables
.USL	USL loadables

Additional files

Extension	Type of File
.BLK	Block data file
.CDT	Temporary long comment data file
.CGF	Codegen batch file for automating macro insertions
.DDB	Descriptor data file used with blocking
.DIF	Data interchange file
.DPB	Descriptor pointer file used with blocking
.DSF	Data setup file
.DSU	Data setup file for entry to network display
.FIL	ProWORX format export file
.HLP	Help file
.LPB	Logic pointer file used with blocking
.MDB	Memory data file used with blocking

Extension	Type of File
.NDB	Short comment file used with blocking
.OPT	List module option file
.RDF	Cross-reference data file
.RUF	Address Used Tables reference file
.RPF	Cross-reference pointer file for database listing
.SRC	Search data file
.TDB	Title data file used with blocking
.TFP	ProWORX full page data file
.URF	User Configurable Register editor file

Appendix C - Modbus Cable Kit

The Modbus cable kit

The Modbus Cable Kit contains the materials you need to connect an IBM or compatible computer to a Modbus device. The kit consists of:

- A 9-Pin Adaptor for use with 9-pin serial ports (used on IBM AT and compatible computers). This cable has one 9-pin female DE9S connector and one 25-pin male DB25P connector. The 9-Pin Adaptor may be used to adapt any PC/XT compatible serial cable for use with an AT-style serial port.
- Modbus Cable for use with 25-pin serial ports (used on IBM PC, PC/XT, PS/2, and compatible computers). This cable has one male 25-pin DB25P connector and one female 25-pin DB25S connector.
- 584 Adaptor Module for use with Modicon 584 controller and W190 cable. This adaptor has two female 25-pin DB25S connectors enclosed in a plastic housing.
- 680 Adaptor Cable for use with Modicon 984 x80 and x85 models. This cable has a female 25-pin DB25S connector and a male 9-pin DE9P connector.

IBM AT or PS/2 to Modicon 984A, 984B, or 984X

The Modbus Cable and 9-Pin Adaptor combination are used to connect an AT computer with a male, 9-pin DE9P serial port to a 984A, 984B or 984X controller. Plug the 9-pin female connector of the 9-Pin Adaptor into your computer's serial port and the 25-pin male connector into the Modbus Cable's female connector. Plug the Modbus Cable's male connector into the controller's Modbus port. Modbus port 1 is normally used.

IBM AT to Modicon 984 x80 or x85, Quantum, or Compact Series

The Modbus Cable, 9-Pin Adaptor and 680 Adaptor Cable are used to connect an AT computer with a male, 9-pin DE9P serial port to a 984 Model x80 or x85 controller. Plug the 9-pin female connector of the 9-Pin Adaptor into your computer's serial port and the 25-pin male connector into the Modbus Cable's female connector. Plug the Modbus Cable's male connector into the 680 Adaptor Cable's female connector. Plug the 680 Adaptor Cable's male connector into the controller's 9-pin Modbus port.

IBM AT to Modicon 584

The Modbus Cable, 9-Pin Adaptor and 584 Adaptor Module are used to connect an AT computer with a male, 9-pin DE9P serial port to a 584 processor. A Modicon W190 Cable (the cable used to connect a 584 to a P190 Programming Terminal) is also required.

Plug the 9-pin female connector of the 9-Pin Adaptor into your computer's serial port and the 25-pin male connector into the Modbus Cable's female connector. Plug the Modbus Cable's male connector into either end of the 584 Adaptor Module. Plug the other end of the 584 Adaptor Module into the W190 Cable. Plug the W190 Cable's circular connector into the 584 controller's Modbus port.

IBM PC/XT or PS/2 to Modicon 984A, 984B, or 984X

The Modbus Cable is used to connect a PC/XT or PS/2 computer with a 25-pin male DB25P serial port to a 984 processor. Plug the Modbus Cable's female connector into your computer's serial port, and the male connector into the 25-pin Modbus port on the 984. Modbus port 1 is normally used.

IBM PC/XT or PS/2 to Modicon 984 x80 or x85, Quantum, or Compact Series

The Modbus Cable and 680 Adaptor Cable are used to connect a PC/XT or PS/2 computer with a 25-pin male DB25P serial port to a 984 Model x80 or x85 series controller. Plug the Modbus Cable's female connector into your computer's serial port. Plug the Modbus Cable's male connector into the 680 Adaptor Cable's female connector. Plug the 680 Adaptor Cable's male connector into the controller's 9-pin Modbus port.

IBM PC/XT or PS/2 to Modicon 584

The Modbus Cable and 584 Adaptor Module are used to connect a PC/XT or PS/2 computer with a 25-pin male DB25P serial port to a 584 processor. A Modicon W190 Cable (the cable used to connect a 584 to a P190 Programming Terminal) is also required.

Plug the Modbus Cable's female connector into your computer's serial port, and the male connector to either end of the 584 Adaptor Module. Plug the other end of the 584 Adaptor Module into the W190 Cable. Plug the W190 Cable's circular connector into the 584 controller's Modbus port.

Using other computers

Follow the directions on the preceding pages if your computer has a serial port that is compatible with an IBM AT, PC/XT, or PS/2 computer. If not, your computer dealer may be able to supply an adaptor cable that terminates in a PC-compatible connector. Connect the cable to your computer, then follow the instructions on the preceding pages.

Always verify the connector location, type and pinout before connecting anything to your computer.

Both serial and parallel ports may be terminated in 25-pin connectors, and both serial and video ports may be terminated in 9-pin connectors. If you are in doubt about which port to use, consult the documentation included with your computer or your computer dealer.

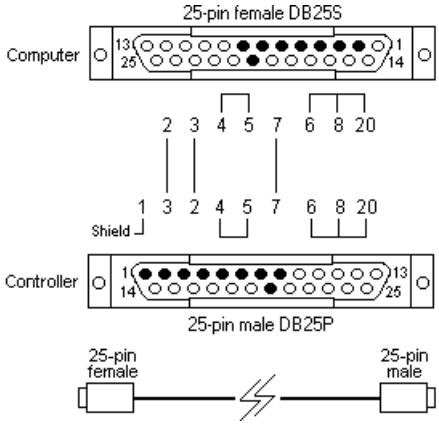
Some computers may be configured as Data Communications Equipment (DCE) rather than the Data Terminal Equipment (DTE) configuration used by IBM. Contact Customer Support about obtaining a DCE to DTE adaptor if you have such a computer.

Appendix D - Cable Wire Diagrams

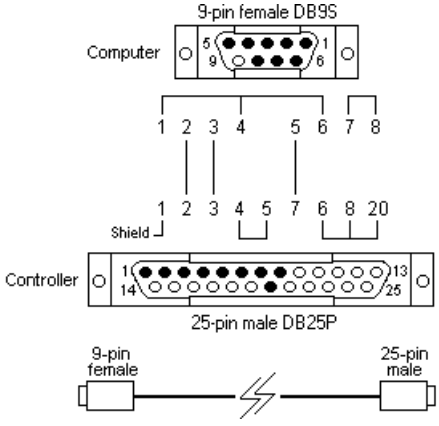
Cable wire diagrams

These drawings illustrate needed cable connections for connecting a PC-compatible computer to a Modicon controller or associated device.

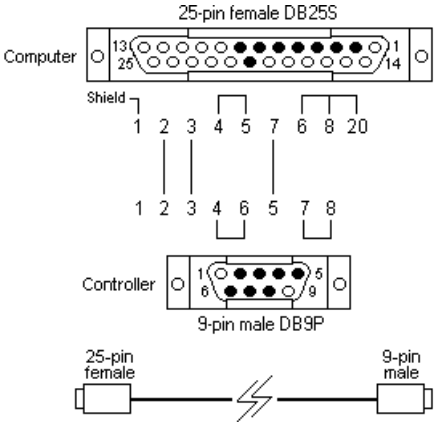
25-Pin Serial Port to Modicon 984A, 984B, or 984X



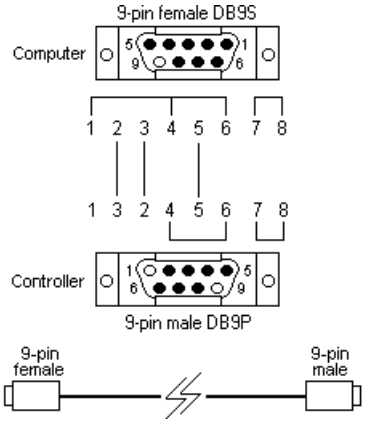
9-Pin Serial Port to Modicon 984A, 984B, or 984X



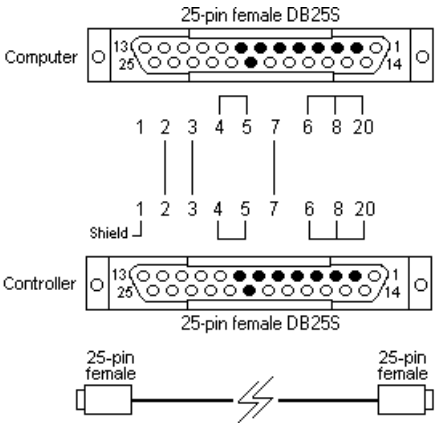
25-Pin Serial to Modicon 984 x80 and x85



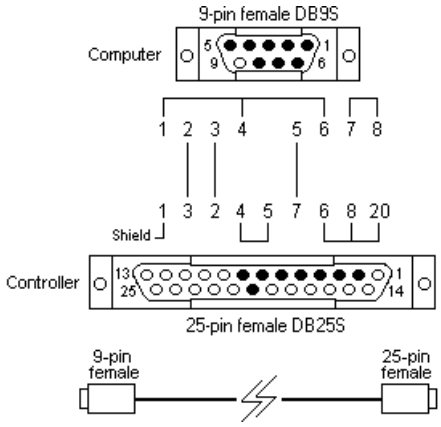
9-Pin Serial to Modicon 984 x80 and x85



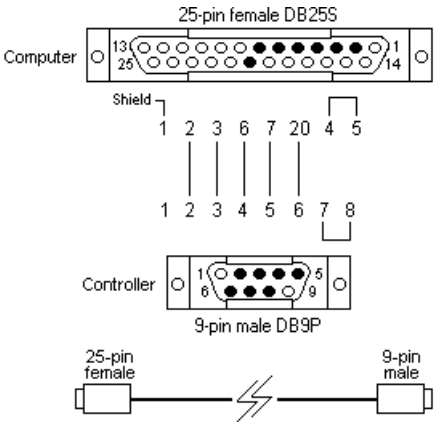
25-Pin Serial to Modicon 584 with W190 cable



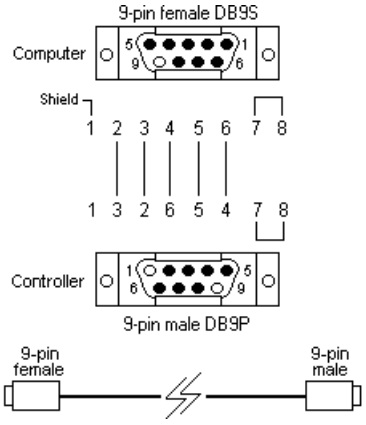
9-Pin Serial to Modicon 584 with W190 Cable



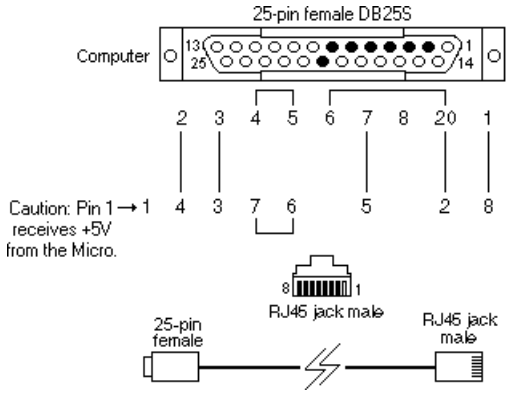
25-Pin Serial to Modicon E Series, Quantum, or Compact



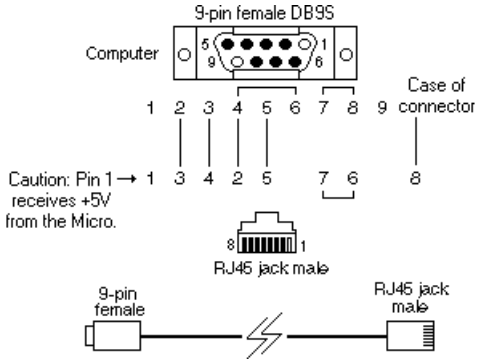
9-Pin Serial to Modicon E Series, Quantum, or Compact



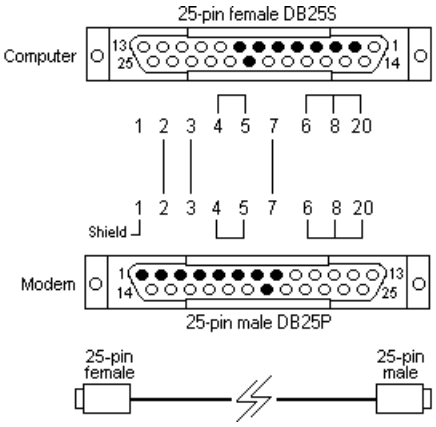
25-Pin Serial to Modicon Micro 311 or 411



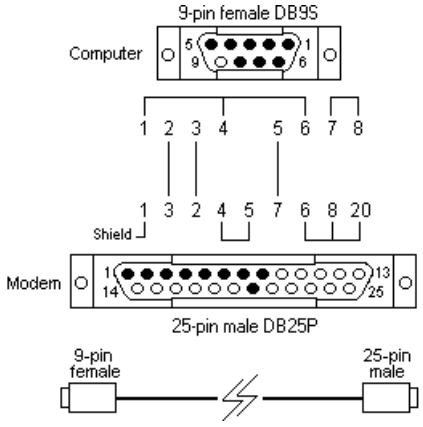
9-Pin Serial to Modicon Micro 311 or 411



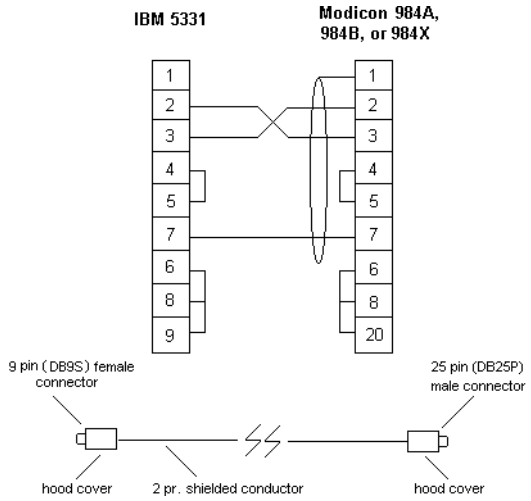
25-Pin Serial to Modicon J478 modem



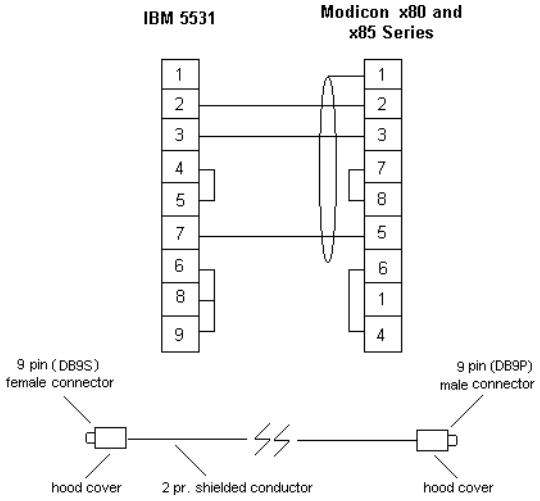
9-Pin Serial to Modicon J478 modem



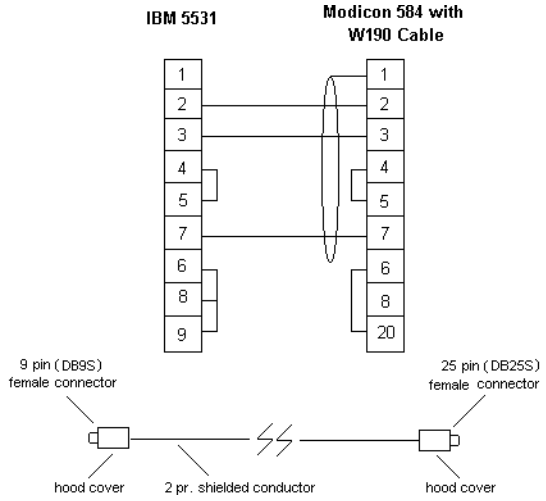
IBM 5531 to Modicon 984A, 984B or 984X



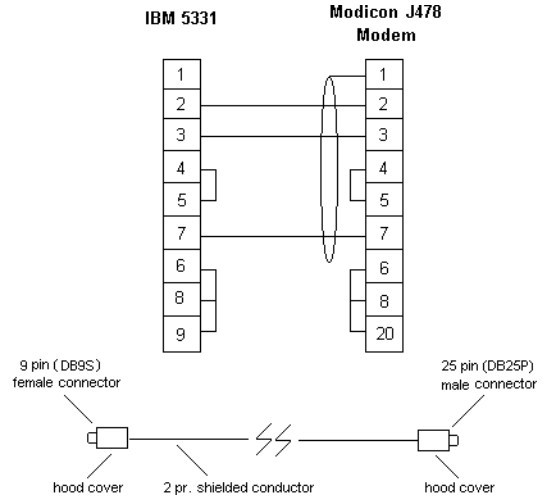
IBM 5531 to Modicon x80 and x85



IBM 5531 to Modicon 584 with W190 cable

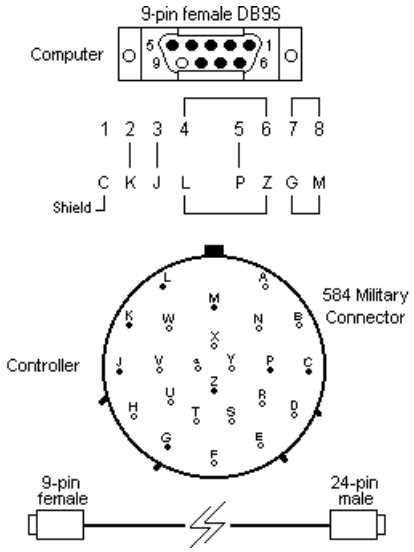


IBM 5531 to Modicon J478 modem



Loopback connectors

584 Military connector



Appendix E - .DIF Files and Excel

Editing .DIF files with Microsoft Excel

NxT exports database documentation in two formats which Microsoft Excel can read:

- **dBase4 (.DBF):** Use this database format if possible as Excel reads and writes it correctly. When you export a database to a .DBF file, each descriptor field and short comment becomes its own record.
- **Data Interchange Format (.DIF):** When Excel imports a .DIF file, it converts the controller addresses in the first column of the database into numerical values which NxT 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 NxT after you have changed it in Excel.

If you prefer to use .DIF files instead of .DBF files and want to use Excel to edit documentation, follow these seven steps:

➢ Step 1: Set the size of your descriptor fields for Microsoft Excel.

1. Open your database in ProWORX NxT.
   - ❖ For more information, see "Opening an existing database" on page 17.
2. From the Network Editor, on the File menu, click **Utilities** then click **Database Setup**.
3. Change the **Descriptor Field Width** to 15.
4. Change the number of **Descriptor Fields** to 9.
5. Click **OK**. A dialog box prompting you to expand your database may appear. Click **OK**.

➢ Step 2: Export your NxT database as a .DIF file.

1. From the Network Editor, on the **File** menu, click **Utilities** then click **Import/Export**.
2. Select **Export**.
3. Type the path and file name of the file to export your database to or click **Browse** to navigate to it.
4. Select **.DIF** as the File Type to create.
5. Click **Start**.

➢ **Step 3: Open and edit your database in Microsoft Excel.**

1. Open the .DIF file in Microsoft Excel. The spreadsheet looks like this:

	A	B	C	D	E	F	...	K
1	Address 1	D	Desc. 1	Desc. 2	Desc. 3	Desc. 4	...	Desc. 9
2	Address 1	S	Comment 1	Comment 2	Comment 3	Comment 4		
3	Address 1	L	Lookup 1					
4	Address 1	T	Page Title					
5	Address 2	D	Desc. 1	Desc. 2	Desc. 3	Desc. 4	...	Desc. 9

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.

If the letter in Column B is...	**The following cells in the row contain...**
D (for **D**escriptors)	descriptors 1 through 9 in columns C through K.
S (for **S**hort Comments)	short comments 1 through 4 in columns C through F.
L (for **L**ong Comments)	a long comment lookup number in column C.
T (for Page **T**itle)	the page title in column C.

2. Make your changes to the documentation.

➢ **Step 4: Convert the controller addresses from numbers to text.**

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 NxT can read. When you press ENTER, the text value appears in the cell where you entered the formula.
3. Select the cell.
4. On the **Edit** menu, click **Copy**.

5. Select the temporary column by clicking its header.

   For example, if you entered the TEXT formula into the first cell of Column M, now select all of Column M.

6. On the **Edit** menu, click **Paste**. This operation pastes the TEXT formula copied from the first cell of the temporary column into all the other cells in the column.

   Click **Yes** if a warning message appears telling you that the selection is too large for **Undo**.

   The temporary column now contains the same values as Column A, but formatted as text instead of numbers.

7. Select the entire temporary column again.
8. On the **Edit** menu, click **Copy**.
9. Select **Column A**.
10. On the **Edit** menu, click **Paste Special**, then click **Values**. The text values from your temporary column replace the numerical values in column A.

    Click **Yes** if a warning message appears telling you that the selection is too large for **Undo**.

11. Select the entire temporary column.
12. On the Edit menu, click **Clear** then click **All**. The values in your temporary column disappear.

    Click **Yes** if a warning message appears telling you that the selection is too large for Undo.

➢ **Step 5: Export the Microsoft Excel spreadsheet as a .DIF file.**

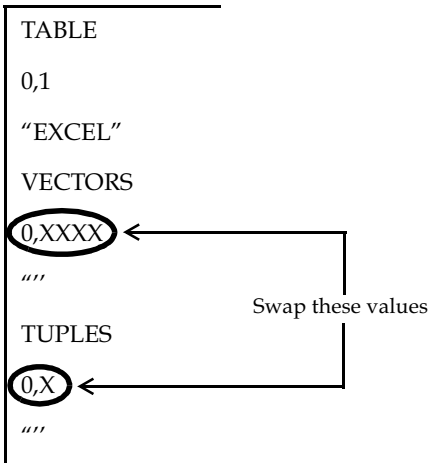
- Save the edited database as a .DIF file.

➢ **Step 6: Correct the rows and columns in the .DIF header.**

1. Open the .DIF file with a text editor.

   Microsoft's WordPad in Windows '95 or Write in Windows 3.1 open .DIF files.

2. Switch the "VECTORS" and "TUPLES" values in the header of the .DIF file.



"XXXX" and "X" will be numbers.

3. Save the edited database as an ASCII .DIF file.

➢ **Step 7: Import your database back into ProWORX NxT.**

1. From the Network Editor, on the **File** menu, click **Utilities** then click **Import/Export**.
2. Click **Import**.
3. Type the path and file name of the Excel database.
4. Select **.DIF** from the **File Type** box.
5. Click **Start**. The open database is overwritten by the Excel database.

Appendix F - I/O Cards Supported

I/O cards supported (in alphabetical order)

A120 cards

Card	Description	Card	Description
ADU 204	4 Channel Register Input (+/-0.5V)	DEO 216	24 VDC 16 Point Input Module
ADU 205	4 Channel Register Input (+/-10V)	DEP 208	230 VAC 8 Point Input Module
ADU 206	4 Channel Register Input	DEP 209	120 VAC 8 Point Input Module
ADU 211	8 Channel Analog Input Module	DEP 210	115 VAC 8 Point Input Module
ADU 212	8 Channel Analog Input Module	DEP 211	115 VAC 8 Point Input Module
ADU 214	4 Channel Multi Range A/D Input	DEP 214	12-60 VDC 16 Point Input Module
ADU 216	8 Channel Thermocouple	DEP 215	5 VDC TTL 16 Point Input Module
CM9 00	Auto Interface	DEP 216	24 VDC 16 Point Input Module
DAO 216	24 VDC 16 Point Output Module	DEP 217	24 VDC 16 Point Input Module
DAP 204	24 VDC 4 Point Relay (NO) Module	DEP 218	115 VAC 16 Point Input Module
DAP 208	24 VDC 8 Point Relay (NO) Module	DEP 220	Fast 24 VDC 16 Point Input Module
DAP 209	120 VAC 8 Point Output Module	DEP 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	M72 51	Programmable Limit Switch
DAP 216	24 VDC 16 Point Output Module	M73 50	Resolver Decoder Function Module
DAP 217	5-24 VDC 16 Point Output Module	MOT 201	1 Slot 1 Axis Motion Control Module Encoder
DAP 218	24-240 VAC 16 Point Output Module	MOT 202	2 Slot 1 Axis Motion Control Module Resolver & Encoder
DAP 220	24 VDC 8 Point Input/Output Module	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
DAU 202	2 Channel Register Output (+/-10V)	ZAE 201	High speed Counter/Positioner (2 Relay)
DAU 204	4 Channel Analog Output, Opto-Isolation	ZAE 204	4 Channel High speed Counter/ Positioner
DAU 208	8 Channel Register Output (+/-10V)		

B800 cards

Card	Description	Card	Description
B802-008	115 VAC 8 Point Output Module	B863-032	4 Channel Register Input (TTL Level)
B803-008	115 VAC 8 Point Input Module	B864-001	8 Channel Register Output (TTL Level)
B804-016	115 VAC 16 Point Output Module	B865-001	8 Channel Register Input (TTL Level)
B804-116	115 VAC 16 Point Output Module	B868-001	8 Channel Register Output (TTL Level)
B805-016	115 VAC 16 Point Input Module	B869-001	8 Channel Register Input (TTL Level)
B806-032	115 VAC 32 Point Output Module	B872-002	4-20 mA,1-5V 4 Channel Analog Output
B806-124	24 VAC 32 Point Output Module	B872-011	Selectable 4 Channel Voltage Output
B807-032	115 VAC 32 Point Input Module	B872-100	4-20mA 4 Channel Current Output Module
B807-132	115 VAC 32 Point Input Module	B872-200	Selectable 4 Channel Voltage Output
B808-016	230 VAC 16 Point Output Module	B873-001	4-20mA,1-5V 4 Channel Analog Input
B809-016	230 VAC 16 Point Input Module	B873-002	4-20mA,1-5V 4 Channel Analog Input
B810-008	115 VAC 8 Isolated Output Module	B873-011	-10 V to 10 V 4 Channel Analog Input
B814-001	NO Power Relay 8 Point Output Module	B873-012	-10 V to 10 V 4 Channel Analog Input
B814-002	NC Power Relay 8 Point Output Module	B873-200	V/A, Thermo, RTD, Strain Gauge Input
B814-108	NO/NC Power Relay 8 Point Output Module	B875-001	4-20mA, 1-5V 8 Channel Analog Input
B817-116	115 VAC 16 Point Isolated Input Module	B875-002	4-20mA, 1-5V 8 Channel Analog Input
B817-216	230 VAC 16 Point Isolated Input Module	B875-011	-10 V to 10 V 8 Channel Analog Input
B818-032	24 VDC 32 Point Output (True High)	B875-012	-10 V to 10 V 8 Channel Analog Input
B819-232	230 VAC 32 Point Input Module	B875-101	Fast selectable 8 Channel Analog Input
B820-008	10-60 VDC 8 Point Output (True High)	B875-102	Fast selectable 8 Channel Analog Input
B821-008	10-60 VDC 8 Point Input (True High)	B875-111	Select. 8 channel Differential Input
B821-108	10-60 VDC 8 Point Input (True High)	B875-200	V/A, Thermo, RTD, Strain Gauge Input
B824-016	24 VDC 16 Point Output (True High)	B877-111	Select. 16 channel Single Ended Input
B825-016	24 VDC 16 Point Input (True High)	B881-001	24 VDC 16 Point Latched Input (True High)
B826-032	24 VDC 32 Point Output (True High)	B881-108	115 VAC 8 Point Protected Output Module
B827-032	24 VDC 32 Point Input (True High)	B881-508	125 VDC 8 Point True High Output Module
B828-016	5V TTL 16 Point Output	B882-032	24 VDC Diagnostic Output Module

B800 cards

Card	Description	Card	Description
B829-116	5V TTL 16 Input (Fast Response)	B882-239	0-30 kHz 2 High Speed Up-Counter Module
B832-016	24 VDC 16 Point Output (True Low)	B883-001	0-50 kHz 2 High Speed UP/Down Counter
B833-016	24 VDC 16 Point Input (True Low)	B883-101	4 kHz CAM ABS Encoder Input,8 Disc Out
B836-016	12-250 VDC 16 Point Output Module	B883-111	1 kHz CAM with Velocity compensation
B837-016	24 VAC/DC 16 Point Input (True High)	B883-200	10 Thermocouple Input Module
B838-032	24 VDC 32 Point Output (True High)	B883-201	8 RTD Input Module
B840-108	NO/NC Reed Relay 8 Point Output Module	B884-002	2 Loop, PID Control Module
B842-008	NO/NC Reed Relay 8 Point Output Module	B885-002	ASCII/BASIC Module
B846-001	Analog MUX (16 voltage to one output)	B885-100	Motion Module
B846-002	Analog MUX (16 current to one output)	B885-110	Motion Module
B849-016	48 VAC/DC 16 Point Input Module	B886-000	High Speed Logic Solver
B853-016	115 VAC/125 VDC 16 Input (True High)	B887-000	12 Register Bidirectional
B855-016	12 VDC 16 Point Input (Intr. Safe)	B888-100	Datalogic CM1000 AutoID interface
B862-001	4 Channel Register Output (TTL Level)	B984-100	High Speed Logic Solver
B863-001	4 Channel Register Input (TTL Level)	B984-102	High Speed Logic Solver

Quantum cards

Card	Description	Card	Description
ACI030-00	Analog 8 Channel Unipolar Input	DAO840-10	24-115 VAC 16 Output
ACO020-00	4-20 mA Analog Output Module	DAO842-10	100-230 AC 16 Output Module
AMM090-00	Analog In/Out 4Ch/2Ch	DAO842-20	24-48 VAC 16 Output
ARI030-10	8 Channel RTD	DDI153-10	5 VDC 4x8 Input Module
ATI030-00	8 Channel Thermocouple	DDI353-00	24 VDC 32 Input Module
AVI030-00	8 Channel Bipolar, Analog Input	DDI353-10	24 VDC True Low 32 Input Module
AVO020-00	Analog Voltage Output Module	DDI673-00	125 VDC 24 Point I/P Module
CHS110-00	Hot Standby	DDI841-00	10-60 VDC 16 Input Module
CPS-111	115/230V AC Power Supply 3A	DDI853-00	10-60 VDC 32 Input Module

Quantum cards

Card	Description	Card	Description
CPS-114	115/230V AC Power Supply 8A	DDM390-00	16/8 Bidirectional 24 VDC
CPS-124	115/230V AC Power Supply RED 8A	DDM690-00	125 VDC 4 Input/4 Output HPO Module
CPS-211	24 V DC Power Supply 3A	DDO153-10	5 VDC 4x8 Output Module
CPS-214	24 V DC Power Supply 8A	DDO353-00	24 VDC 32 Output Module
CPS-224	24 V DC Power Supply RED 8A	DDO353-10	24 VDC True Low 32 Output Module
CPS-511	125V DC Power Supply 3A	DDO843-00	10-60 VDC 16 Output
CPS-524	125V DC Power Supply 8A	DDO885-00	125 VDC 12 Point O/P Module
CPU-113-2	Controller	DRA840-00	16 Output Relay
CPU-113-3	Controller	DRC830-00	8 Output ISO Relay
CPU-213-4	Controller	EHC105-00	High Speed Counter 5 Channel
CPU-424-X	Controller	EHC202-00	High Speed Counter
CPU-534	Controller	ESI062-10	2 Channel ASCII Interface
CRA211-10	DIO Drop MB+	GPS100-00	IRIG-B Time Sync Interface
CRA211-20	DIO Drop MB+	HLI340-00	Hi-Speed/Latch/Interrupt
CRA212-10	DIO Drop MB+	MMB102-00	Two axis motion with incremental
CRA212-20	DIO Drop MB+	MMB104-00	Four axis motion with incremental
CRA931-00	RIO Drop S908	MMC120-0X	2-Axis Motion Control
CRA932-00	RIO Drop S908	MMD102-00	Two axis absolute motion
CRP811-00	Profibus DP Interface Module	MMD104-00	Four axis absolute motion
CRP931-00	RIO Head S908	MSB101-00	Motion Inc Enc
CRP932-00	RIO Head S908	MSC101-00	Motion Enc/Res
DAI340-00	24 VAC ISO 16 Input Module	NOA611-00	Interbus-S Master Module
DAI353-00	24/48 VAC 32 Input Module	NOA611-10	Interbus-S Master with PCP
DAI440-00	48 VAC 2x8 Input Module	NOE211-00	Ethernet TCP/IP Twisted Pair
DAI453-00	48 VAC 32 Input Module	NOE251-00	Ethernet TCP/IP Fiber Optic
DAI540-00	115 VAC 16 Input Module Isolated	NOE311-00	Ethernet SY/MAX Twisted Pair
DAI543-00	2x8 115 VAC Input Module	NOE351-00	Ethernet SY/MAX Fiber Optic
DAI553-00	115 VAC 32 Input Module	NOE511-00	Ethernet MMS Twisted Pair
DAI740-00	230 VAC 16 Input Module	NOE551-00	Ethernet MMS Fiber Optic
DAM390-00	16/8 Bidirectional 24 VAC	NOM212-10	MB+ Drop Interface Card
DAM490-00	16/8 Bidirectional 48 VAC	NOM2XX-00	MB+ Drop Interface Card

Quantum cards

Card	Description	Card	Description
DAM590-00	16/8 Bidirectional 120 VAC	NOP911-00	Profibus FMS Interface Module
DAO840-00	24-230 VAC 16 Output	SERX53-00	Sequence Of Events Recorder

Micro cards

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

Momentum M1 and Interbus cards

Card	Description	Card	Description
AAI030-00	8 Channel Differential Input	BDO356-00	24 VDC 32 Point O/P Module
AAI140-00	16 Channel single ended Input	BDO946-50	115 to 230 VAC 16 Point O/P
AAI520-40	4 Channel RTD/Thermocouple	IBUS-0101	DFT 1 Word Output Module
AAO120-00	4 Analog Output 0-20mA	IBUS-0102	DFT 1 Word Input Module
AAO921-00	4 Analog Output 4-10mA	IBUS-0103	DFT 1 Word Bidirectional Module
ADI340-00	24 VDC 16 Point I/P Module	IBUS-0201	DFT 2 Word Output Module
ADI350-00	24 VDC 32 Point I/P Module	IBUS-0202	DFT 2 Word Input Module
ADI540-50	120 VAC 16 Point I/P Module	IBUS-0203	DFT 2 Word Bidirectional Module
ADI740-50	230 VAC 16 Point I/P Module	IBUS-0231	DFT 2 Word Output Module
ADM350-1X	24 VDC 16 In / 16 Out	IBUS-0232	DFT 2 Word Input Module
ADM370-10	24 VDC 16 In / 8 Out	IBUS-0233	DFT 2 Word Bidirectional Module
ADM390-10	24 VDC 16 In / 16 Out	IBUS-0301	DFT 3 Word Output Module
ADM390-30	24 VDC 10 In / 8 Out Relay	IBUS-0302	DFT 3 Word Input Module
ADM690-50	115 VAC 10 In / 8 Out	IBUS-0303	DFT 3 Word Bidirectional Module
ADO340-00	24 VDC 16 Point O/P Module	IBUS-0331	DFT 3 Word Output Module
ADO350-00	24 VDC 32 Point O/P Module	IBUS-0332	DFT 3 Word Input Module
ADO530-50	115 VAC 8 Point O/P Module	IBUS-0333	DFT 3 Word Bidirectional Module
ADO540-50	115 VAC 16 Point O/P Module	IBUS-0401	DFT 4 Word Output Module
ADO730-50	24 VAC 8 Point O/P Module	IBUS-0402	DFT 4 Word Input Module
ADO740-50	230 VAC 16 Point O/P Module	IBUS-0403	DFT 4 Word Bidirectional Module
AEC920-00	High Speed Counter 50khz	IBUS-0431	DFT 4 Word Output Module
AMM090-00	24 VDC 4 In / 2 Out Bidirectional	IBUS-0432	DFT 4 Word Input Module
BAI036-00	8 Channel Analog I/P Module	IBUS-0433	DFT 4 Word Bidirectional Module
BAM096-00	4 I/P / 2 O/P Analog Module	IBUS-0501	DFT 5 Word Output Module
BAO126-00	4 Channel Analog O/P Module	IBUS-0502	DFT 5 Word Input Module
BDI346-00	24 VDC 16 Point I/P Module	IBUS-0503	DFT 5 Word Bidirectional Module
BDI356-00	24 VDC 32 Point I/P Module	IBUS-0531	DFT 1 Word Output Module
BDI546-50	120 VAC 16 Point I/P Module	IBUS-0532	DFT 1 Word Input Module
BDI746-50	230 VAC 16 Point I/P Module	IBUS-0533	DFT 1 Word Bidirectional Module
BDM346-00	24 VDC 16 In / 16 Out	IBUS-0633	DFT 8 Word Bidirectional Module
BDM346-30	8 In / 8 Out Relay	IBUS-1233	DFT 16 Word Bidirectional Module
BDO346-00	24 VDC 16 Point O/P Module		

SY/MAX cards

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

Appendix G - NxT and fxManager

How NxT works with fxManager

If you've used SecurWORX Local Station for NxT from Total Control Products (Canada) Inc. before, you'll have no problem getting to know fxManager. fxManager is SecurWORX re-engineered to give you version control, security, audit trailing, and scheduling for your entire database development system.

fxManager allows you to:

- Track changes made to projects and settings in fxManager;
- Monitor and record actions performed by users;
- Control access to projects and settings in fxManager; and
- Manage and execute scheduled events.

When fxManager is installed, you can add ProWORX NxT *projects* to the fxManager Server to handle and control. To work on these projects, an administrator adds a group(s) to the project, then assigns users and access permissions to the group(s).

❖ For more information on security, see "Access Control" on page 386.

ProWORX NxT databases are referred to as *projects* in fxManager.

Users can then access projects from **fxManager** or the **Project Manager**. The Project Manager can be opened from the Title Screen, Online Editor, or Offline Editor.

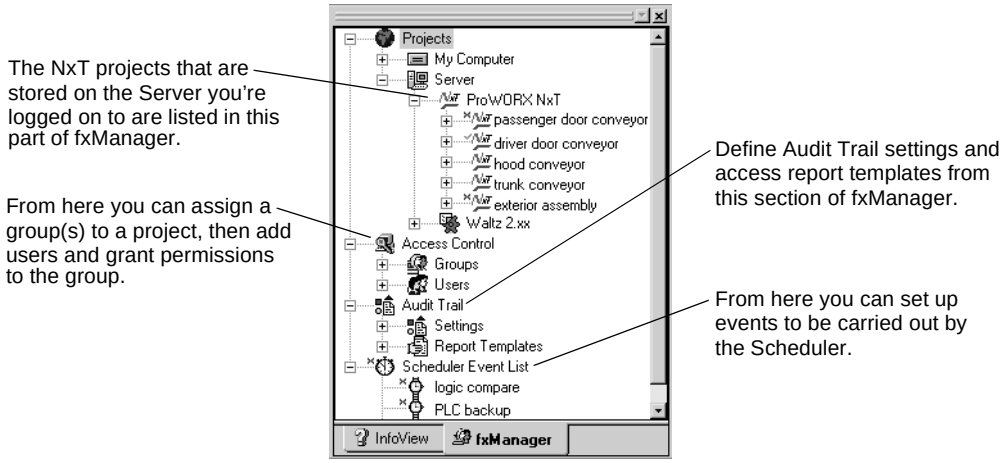
To work on a project that's stored on the fxManager Server, you first need to log on to the Server, then check out the project and open it. The project can be opened either in the Online or Offline Editor, depending on the current mode you're working in.

❖ For more information on working with the Project Manager, see "About the Project Manager" on page 393.

About fxManager

fxManager is organized into the following sections:

- The **Projects** section organizes the NxT projects stored on your local computer and on the fxManager Server. This is also where you assign who has access to each project.
- The **Access Control** is where you define the security access for the fxManager Server, operations performed in fxManager, and to all NxT projects stored on the Server.
- The **Audit Trail** section organizes all the Audit Trail settings and report templates stored on the fxManager Server.
- The **Scheduler** is an optional add-on to fxManager that manages and executes scheduled events. These scheduled events are stored and controlled by the fxManager Server.



❖ For more information on any of these features, see fxManager's main help.

Access Control

Using fxManager, a Server administrator(s) can:

- Create and manage groups;
- Add users to groups, and;
- Assign permissions to groups to allow or prevent access to NxT projects or fxManager operations.

Users can belong to one or more groups, and in turn, inherit the permissions assigned to the groups to which they are a member.

You configure Access Control through fxManager. For more information on groups, users, and permissions, see fxManager's main help.

ProWORX NxT permissions

Below are the ProWORX NxT permissions you can assign to groups. Set to **True** to allow users access. When set to False, the operations are denied.

Property	Description
ReadfromController	Allows a controller to be read from.
WritetoController	Allows a controller to be written to.
StartStopController	Allows the controller to be started or stopped.
EditController	Allows Ladder Logic, Controller Configuration, Traffic Cop, and associated Documentation to be modified.

fxManager permissions

Below are the fxManager permissions you can assign to groups. Set to **True** to allow users access. When set to False, the operations are denied.

Property	Description
CheckInOut	Allows projects to be checked in and out of the Server.
Get	Allows read-only copies of project files to be accessed from the Server.
OverrideCheckOut	Allows a user to undo another user's check out.
ChangePassword	Allows a user to change their own password.
ChangeAllPasswords	Allows a user to change other user's passwords.
EditAuditTrail	Allows: • **Audit Trail** to be checked in or out; • **Settings** to be configured or edited; • **Report Templates** to be added, edited, or deleted; • **Reports** to be generated or deleted.
EditAccessControl	Allows: • **Access Control** to be checked in or out; • **Users** to be created, added to or removed from a group, deleted, renamed, and user properties to be edited; • **Groups** to be created, added to or removed from a project, deleted, renamed, and group properties to be edited; • **Permissions** to be edited and set.

Property	Description
EditProjectList	Allows: • **Projects** to be added or destroyed; • **Groups** to be added to or removed from a project; • **Controller addresses** to be added or removed from the Controller Address Selection dialog box.
Label	Allows labels to be added to a project.
EditEventList	Allows: • **Scheduler Event List** to be checked in or out; • **Events** to be created, added, or edited; • **Scheduler** properties to be edited; • **Scheduler** to be started or stopped.

Audit Trail

From fxManager, you can set up the Audit Trail feature to record user operations triggered in ProWORX NxT and in fxManager. When logged on to a Server, Audit Trail tracks and records your actions then saves the information to an Audit Trail database file. You can later view this information by generating reports.

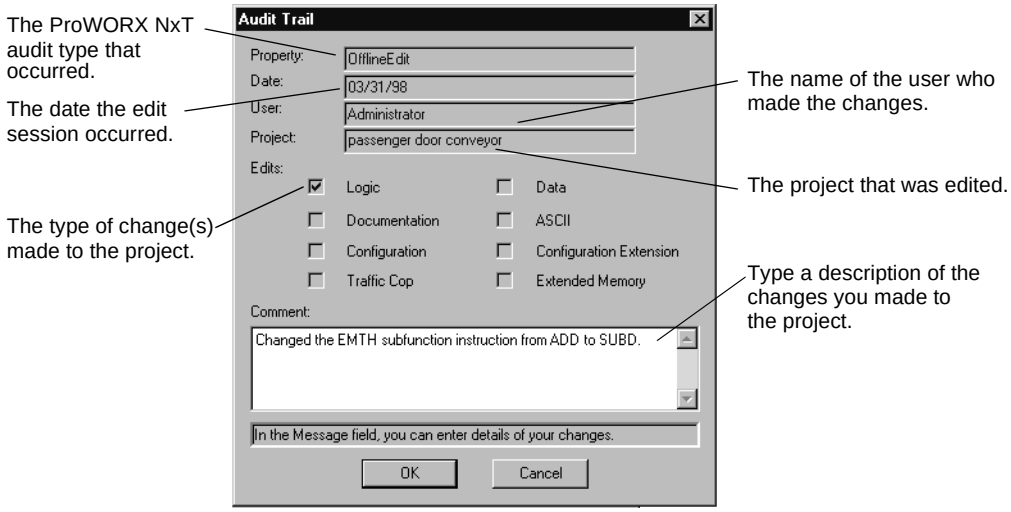
You can log such actions as editing a project in Online mode, logging on to a Server, or creating a project.

In addition, ProWORX NxT allows you to add comments about the changes made to a project in an edit session. These comments are also included in the Audit Trail database records.

You configure Audit Trail settings and generate reports from fxManager.

❖ For more information, see fxManager's main help.

The Audit Trail dialog box automatically appears when you go Offline, Online, or shut down NxT. It displays the audit information that occurred during the last edit session in a specific project.



The information you add in the comments section is logged to the Audit Trail database file and can be used later in a generated report.

ProWORX NxT Audit Trail settings

Below are the ProWORX NxT actions you can record in an Audit Trail. Set conditions to True to log a record.

Property	Description
OfflineEdit	Logs a record when changes are made to a project during an **Offline** session and specifies the type of change made in the Event Description field. The possible event types are: • **Logic:** the logic was edited. • **Doc:** the documentation was edited. • **Config:** the configuration was edited. • **TCop:** the Traffic Cop was edited. • **Data:** the data memory was edited. • **ASCII:** the ASCII data was edited. • **Config_Ext:** the configuration extension was edited. • **Ext_Mem:** the extended memory was edited.
OnlineEdit	Logs a record when changes are made to a controller during an **Online** session and specifies the type of change made in the Event Description field. The possible edit types are: • **Logic:** the logic was edited. • **Doc:** the documentation was edited. • **Config:** the configuration was edited. • **TCop:** the Traffic Cop was edited. • **Data:** the data memory was edited. • **ASCII:** the ASCII data was edited. • **Config_Ext:** the configuration extension was edited. • **Ext_Mem:** the extended memory was edited.

fxManager Audit Trail settings

Below are the fxManager actions you can record in an Audit Trail. Set conditions to True to log a record.

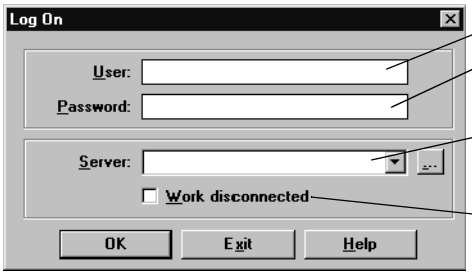
Property	Description
CreateProject	Logs a record each time a project is added to the Server.
GetFile	Logs a record each time a read-only copy of a project is retrieved (get) from the Server.
CheckInOut	Logs a record each time a file is checked in, checked out, or an undo check out is performed.
LogOnOff	Logs a record each time a user logs on to or off the Server.
SetupChanges	Logs a record each time any of the following configuration settings change: • Adding, editing, or removing users or groups; • Editing permissions; • Editing groups assigned to projects; and • Editing Audit Trail settings.
PasswordChange	Logs a record each time a password is changed.

Connecting to a server

Like Local Station for NxT, fxManager requires you to log on. This gives you access to the NxT projects that are stored on the server.

➢ **To open fxManager:**

- Click the **Start** button, point to **Programs**, then click **fxManager**. The Log On dialog box appears.



When logging on, you may be prompted to rename a project you've created while disconnected that has the same name as one already on the Server.

Working Disconnected from an fxManager Server

You can work on projects while disconnected from a Server. For example, you may want to do this when working remotely.

While disconnected, the Project Manager lists projects that were listed when you were last connected to the Server. You can only open the projects you checked out prior to logging on in disconnected mode. Projects can't be checked in while disconnected.

Changes you make to an NxT project are stored on your local computer until the next time you connect to the Server and check in the project.

Audit Trail records project changes to an Audit Trail database file while working disconnected. The next time you connect to the Server, these records are transferred to the Server and you are able to check in your project changes.

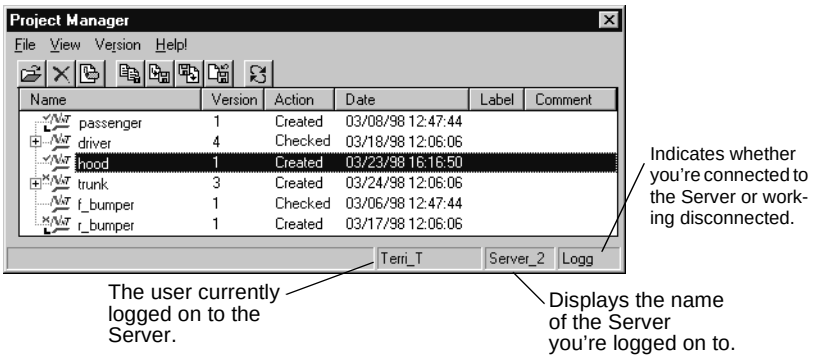
Connect to the Server periodically to get the latest fxManager settings and to update the Audit Trail database with any records that were logged while working disconnected. If you plan on working disconnected for an extended period, ensure your user property **MaxTimeDisconnected** is set accordingly.

About the Project Manager

You can work on projects stored on the Server from either the Project Manager or fxManager. You can access the Project Manager from NxT's Title Screen or while Online or Offline.

➢ **To open the Project Manager:**

- From the **File** menu, select **Project Manager**. The Project Manager dialog box appears.



When fxManager isn't running, you're required to log on to the Server when opening the Project Manager.

❖ For more information, see "Connecting to a server" on page 392.

The Project Manager is organized by rows and columns. Each row contains information on a project. The columns are described below:

Column	Description
Name	Name of the project that is stored on the Server, created while disconnected, or stored on your computer.
Version	The number of previous versions that exist. Click the expansion icon ⊞ next to the project name to list the previous versions.
Action	Displays the last action (created, checked in, checked out) that was performed on the project.
Date	The date and time the project was last edited and saved.

Column	Description
Label	The label associated with the project.
Comment	Displays part of a project's comment. View an entire comment, by generating a project history report. ❖ For more information, see fxManager's main help.

Toolbar

You can perform the following commands from the Project Manager's toolbar.

Button	Description
	Click to **open** a selected project you checked out from the Server or a project you have on your computer.
	Click to **delete** a selected project on your computer.
	Click to add a **label** to a selected project.
	Click to **get** a read-only version of a selected project stored on the Server.
	Click to **check out** a selected project stored on the Server.
	Click to **check in** a selected project you made changes to.
	Click to **undo a check out** of a selected project.
	Click to **update** the project list with the latest information on the Server.

Project icons

The following icons are displayed next to a project's name both in the Project Manager and fxManager to indicate the status of the project.

Icon	Description
	Indicates the project is presently checked out by you on this computer.
	Indicates the project is checked out by another user or by you on another computer.
	Indicates the project is a local project that was created by you while disconnected from the Server on this computer. You are the only user who can edit the project.
	Indicates the project is a local project that was created by another user while disconnected from the Server on this computer. Only the user who created this project can edit it.

Working with the Project Manager

In this section, you'll learn to work with the Project Manager. This includes:

- Checking out a project;
- Opening a project;
- Creating a project;
- Adding a project to an fxManager Server;
- Checking in a project.
- Getting a read-only copy of a project;
- Labelling a project;
- Undoing a check out; and
- Deleting a project.

Checking out a project

Before you can work on any project stored on the fxManager Server, you'll need to check it out. When you check out a project, a copy is transferred from the Server to your local computer. This process allows you to open and make changes to the project.

While you have a project checked out, other users can only get a read-only copy of the project. Only the latest version of a project can be checked out, but if you need to, you can get a read-only copy of previous versions.

To perform a Check Out, the group you belong to must have the fxManager Permission **CheckInOut** and it must be assigned to the project. For more information, see fxManager's main help.

➢ **To check out a project:**

1. From the Project Manager, select the NxT project you want to check out.

2. Click  or from the **Version** menu, select **Check Out**. Now you can open the project you've checked out.

If the project is already checked out by another user, use **Get Latest Version** to retrieve a read-only copy of the project. For more information, see "Getting a read-only copy of a project" on page 403.

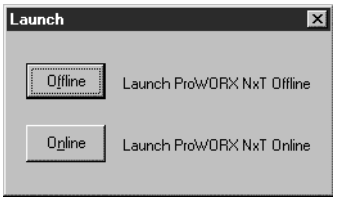
Opening an NxT project

Once you've checked out a project, you can open it from either the Project Manager or fxManager.

➢ **To open an NxT project:**

1. Check out the NxT project you want.
2. Do one of the following:

   - From the Project Manager, click  or from the **File** menu, select **Open**. The project is opened either in Online or Offline, depending on the mode you're currently working in.
   - From fxManager, right-click on the project you have checked out and select **Open**. The Launch dialog box appears.



Select the mode you want to launch NxT in.

3. If you're working with ProWORX NxT Online, the **Controller Address Selection** dialog box appears.

   - Click the type of connection you want to establish, then select the address.

If you're not starting ProWORX NxT from the fxManager **Launch** dialog box, only one type of connection is available. The exact type depends on the controller address used by ProWORX NxT Online the last time it was used. The others are disabled.

❖ For information on changing the choices available in the Controller Address Selection dialog box, see page 399.

4. When you're finished editing the project, check it in so the latest version is stored on the Server.

❖ For more information, see "Checking In a project" on page 402.

Creating a project

In earlier versions of NxT, databases (projects) were created from the ProWORX NxT Title Screen or Network Editor. With fxManager, you can only create projects from fxManager.

When you create a new project, an NxT database (i.e. 984 B S908) is created without logic. Once the project is created, you'll need to edit it to set the correct PLC type for the project.

Projects created while disconnected are called local projects. The local projects are only added to your local hard drive, not to the Server. To add a project to the Server, you must reconnect to the Server then check in the project.

Audit Trail doesn't log actions that occur in a local project. To log actions, check project in to the Server the next time you log on in connected mode.

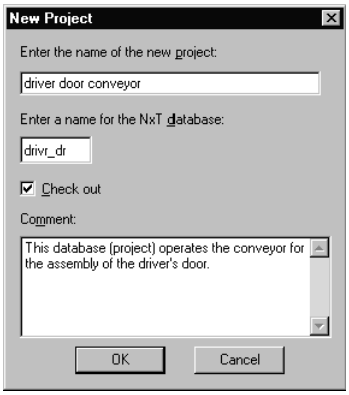
- ❖ For more information on local projects, see fxManager's main help.

➢ **To create a project:**

1. In the **fxManager** tab of the **Navigator**, right-click on the ProWORX NxT folder.

To create a project, the fxManager permission **EditProjectList** for your group must be set to True. See your administrator if this permission is set to False.

2. Select **New**. The New Project dialog box appears.



3. Type the name of your new project (32-character maximum).
4. Type the name of the NxT database (8-character maximum).

5. Do one of the following:
   - Select the **Check out** check box (default) to edit the project or add groups to the project once it's created on the Server.
   - Clear the **Check out** check box to add the new project to the Server without editing it further.
6. Type a comment or description for the new project (256-character maximum).
7. Click **OK**. The project is created on the Server computer and the Administrators group is assigned to the new project. This allows an administrator to set up groups, users, and permissions for the project.
8. Configure the controller addresses from which a user can launch the NxT project online.

❖ For more information on configuring these properties, see below.

Once you create a new project on a Server, it's a good idea to also add groups to the project to allow users access to it.

Configuring the controller address selection lists

The Controller Address Selection dialog box contains lists of possible controller addresses to which ProWORX NxT Online can connect. If you have the EditProjectList permission, you can edit the selections in fxManager.

The **ModbusAddress**, **ModbusPlusRouting** and **TCPIPAddress** properties of an NxT project managed by a Server hold the controller addresses for that project. Each choice is composed of an address, a slash character (/), and a description of that address. If more than one address is configured, the addresses are separated by a semicolon (;).

Example 1:

Editing selections for the **Modbus** list.

If the property **ModbusAddress** of an NxT project is set to:

```
1/Modbus Port #1;3/Modbus Port #2
```

This lets the user select "Modbus Port #1", which connects to Modbus address 1, or "Modbus Port #2", which connects to Modbus address 3.

Example 2:

Configuring selections for the **Modbus Plus** list.

If the property **ModbusPlusRouting** of an NxT project is set to:

```
1/MB+ Routing #1;10,1/MB+ Routing #2
```

This lets the user select "MB+ Routing #1", which connects to Modbus Plus routing address "1", or "MB+ Routing #2", which connects to Modbus Plus routing address "10, 1".

Example 3:

Configuring selections for the **TCP/IP** list.

If the property **TCPIPAddress** of an NxT project is set to:

```
10.10.10.10/IP Address
```

This lets the user select only "IP Address", which connects to TCP/IP address "10.10.10.10".

Adding a project to an fxManager Server

Projects can only be added to a Server from fxManager. This is also useful when transferring or importing a project between Servers.

When you add a project to a Server, an Administrators group is automatically assigned to it. This allows an administrator to set up groups, users, and permissions for the project.

Projects added while disconnected are called local projects. Local projects are only added to your local hard drive, not to the Server. To add a project to the Server, you must reconnect to the Server then check in the project.

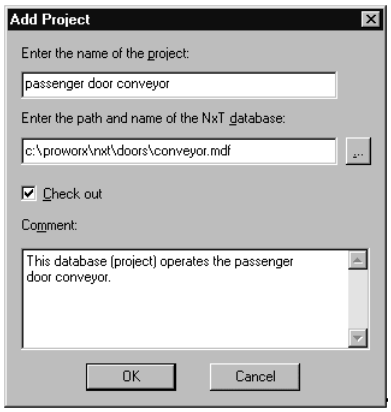
Audit Trail doesn't log actions that occur in a local project. To log actions, check project in to the Server the next time you log on in connected mode.

❖ For more information on local projects, see fxManager's online help.

To add a project, the fxManager permission **EditProjectList** for your group must be set to True. See your administrator if this permission is set to False.

➢ **To add a project to a Server:**

1. In the **fxManager** tab of the **Navigator**, right-click on the ProWORX NxT folder.
2. Select **Add**. The Add Project dialog box appears.



3. Type a project name for the NxT database (32-character maximum).
4. Type the path and NxT database file name or click ... to browse.
5. Do one of the following:
   - Select the **Check Out** check box to edit the project or add groups to the project once it's added to the Server.
   - Clear the **Check Out** check box to add the project to the Server without editing it further.
6. Type a comment (256-character maximum) for the new project.
7. Click **OK**. The project is copied to the Server computer and the Administrators group is assigned to the new project. This allows an administrator to set up groups, users, and permissions for the project.

8. Configure the controller addresses from which a user can launch the NxT project online.
   - ❖ For more information, see Configuring the Controller Address Selection Lists on page 399.

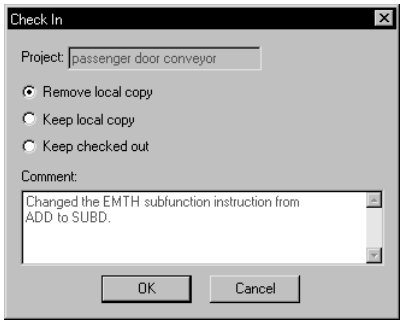
Once you add a project to a Server, it's a good idea to also add groups to the project to allow users access to it.

Checking In a project

After saving the changes you make to a project, it's a good idea to check it in to the fxManager Server it came from. This updates the Server with the latest project and increments the project's versions number within the project list.

➢ **To check in a project:**

1. From the Project Manager, select the NxT project you want to check in.
2. Click  or from the **Version** menu, select **Check In**. The Check In dialog box appears.



3. Choose the option you want:
   - **Remove local copy:** (default) Removes the copy of the project on your local computer after the check in is complete.
   - **Keep local copy:** Updates the Server with your changes, then leaves a read-only copy of the project on your computer.
   - **Keep checked out:** Updates the Server with your changes, then keeps the project checked out so you can continue working on it.

4. Type a comment (256-character maximum) about the changes made while the project was checked out.
5. Click **OK**. The Server is updated with your latest changes and the version number is incremented within the project list.

Getting a read-only copy of a project

Use **Get Latest Version** to retrieve a read-only copy of a project and place that copy on your computer. Use this command if you only need to perform a build operation on a project or to view a project without making any changes.

➢ **To get a read-only copy of a project:**

1. From the Project Manager, select the NxT project you want to get.
2. Click  , or on the **Version** menu, click **Get Latest Version**. fxManager copies the read-only version of the project to your local computer.
3. Click  to view the project.

Labelling a project

Normally, different versions of projects are only identified by the version number. Adding a label to a project gives it a more descriptive name.

➢ **To add a label to a project:**

1. From the Project Manager, select the project you want to label.
2. Click  or from the **File** menu, select **Label**. The Label dialog box appears.

3. Type a brief note in the **Label** box (15-character maximum).
4. Click **OK**. The label is attached to the project.

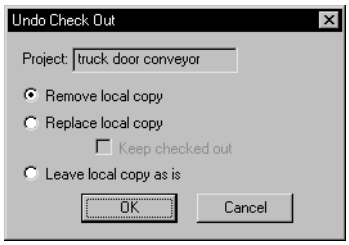
Undoing a check out

If you don't want to keep the changes you made to the project since you last checked it out or to cancel the check out, fxManager provides an Undo Check Out command.

You must be connected to the Server to undo a check out.

➢ **To undo a checkout:**

1. From the Project Manager, select the project you checked out that you want to cancel.
2. Click  or from the **Version** menu, select **Undo Check Out**. The Undo Check Out dialog box appears.



3. Select the option(s) you want for this undo:
   - **Remove local copy:** (default) Deletes the copy of the project on your local computer.
   - **Replace local copy:** Replaces the local copy with a read-only copy of the latest version on the Server.
   - **Keep checked out:** Keeps the project checked out so you can continue working on it after canceling the changes you made since you last checked it out. This option is only available with the Replace local copy option.
   - **Leave local copy as is:** Keeps a read-only copy of the project with the changes you made while it was checked out.
4. Click **OK**. The project is returned to the Server unchanged.

Deleting a project

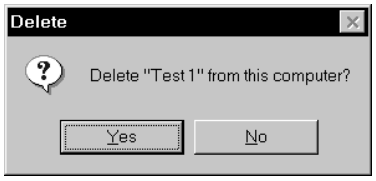
You can only delete project files from your computer using the Project Manager. This can be performed while checking in a project or canceling a check out.

To delete a project from a Server, use the **Destroy Project** feature in fxManager.

- For more information, see fxManager's main help.

➢ **To delete a project from your local hard drive:**

1. From the Project Manager, select the project you want to delete.
2. Click  or from the **File** menu, select **Delete**.



3. Click **Yes**. The project is removed from your computer.

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 to *discrete*.

ASCII

American Standard Code for Information Interchange.

1) A way of encoding the standard text (the letters, numbers, etc. on your keyboard) your computer generates.
2) A data transmission mode for Modbus communications which sends and receives standard text. ASCII mode uses 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 NxT 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

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 Network Editor. This block can be copied, deleted, saved, moved, and loaded.

BM85

A Bridge Multiplexer.

BPS

Bits per second.

BP85

A 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

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 an 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 database.

Controller

An industrial control computer, also called a programmable logic controller or PLC.

CPI

Characters per inch.

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 Network Editor's cursor is always on the current element.

Current Network

The network being edited. The network displayed in the Network 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.

Database

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.

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 8 data bits per package. ASCII mode sends 7 data bits per package.

Data Contents

A printout showing the data values in a ladder logic program.

Data Register

A 4xxxx holding/output register.

DCP-908

A distributed control processor providing intelligent bidirectional communication between a supervisory 984 controller and distributed 984 controllers.

DCP Drop ID#

A distributed control processor drop address. It is equivalent to the drop number used by the DCP.

Decimal

The base 10 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.

Descriptors

A short description of an address within a ladder logic program. A number of descriptor fields.

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.

Device

Any programmable unit (such as a PLC, numeric controller, or robot) or I/O card.

Dim Awareness

The state of a PLC that contains no logic, configuration, or traffic cop information.

Directory

A group of files and/or subdirectories. A directory called the root directory is placed on each disk when it is formatted. Subdirectories can be created within the root directory and within other subdirectories. Files can be stored in a subdirectory or the root directory. In Windows, directories are often called “folders”.

Disable

To stop the programmable controller’s logic-solving mechanism from updating the state of a coil or updating the state of a discrete input. Also see *force*.

Discrete

Inputs (such as switches) or outputs (such as coils) that can only be on or off. Discrete inputs are usually held in 1xxxx registers. Compare to *analog*.

Display

A visual output device such as a monitor.

Distributed I/O (DIO)

One of four major architectures for input/output systems (also see *Local I/O*, *Remote I/O*, and *Peer-to-peer Communications*). I/O that is installed away from the PLC over a wide area and communicates with it through a Modbus Plus network. One Quantum controller can support up to three distributed I/O networks, each with up to 64 drops. The local rack houses a DIO processor for each network, which sets the network's head number.

Documentation

A description of a controller's memory, logic, and configuration. The descriptors, short comments, long comments, and page titles within a database.

Documentation Editor

The editor in which descriptors, short comments, long comments, and page titles can be entered and modified.

Double Precision

A 32-bit format which uses two registers to store numerical values.

Drop

A group of I/O cards physically connected together as an I/O network. A controller reads information from the drop, solves logic, then writes results to the drop in one segment of ladder logic. The Segment Scheduler controls the order in which drops are serviced.

Duplicate Coil

An output coil address which has been assigned to more than one coil.

EEPROM

Electrically Eraseable Programmable Read-Only Memory.

Element

A ladder logic instruction such as a coil, timer, or short.

Enable

To allow a PLC, based on the logic programmed into it, to update the state of a coil or input.

Equation Network

A special section of logic that lets the programmer solve regular mathematical equations within the network. Not supported by every controller.

Exponential Notation

A format for numbers based on powers of 10. For example, +1.35E-4 indicates 1.35 multiplied by 10 to the power of -4 (*i.e.* with an exponent of -4), which works out to 0.000135.

Extended Memory

Extra register memory available for some models of 984/584 controllers. It is accessed through the XMRD and XMWT functions.

Extension

The three letters after the period in a DOS file name, often used to indicate the file's purpose.

File

A collection of information stored on a disk. It can contain either a program or data.

File Name

The name of a file. NxT 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 command or operation.

Global Address Change

An operation in the Network 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.

Instruction

One of the programmable controller's instruction set.

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.

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.

Lister

The Lister prints ladder logic as well as various documentation and controller reports.

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.

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 (ni-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 Editor

The editor in which you edit ladder logic.

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.

Not in Logic Mismatch Table

A printout of those descriptor records in a database whose corresponding address is not used in the ladder logic program.

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.

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.

PLC

Programmable Logic Controller, also known simply as a controller.

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 PLCs, a set of ladder logic instructions contained in a set of NxT files (a *database*).

Programmable Logic Controller

An industrial control computer.

ProWORX Function

A ProWORX command or operation.

Quick Print

A function that allows you to print a network to a printer, with or without documentation.

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 NxT, the term "radix" sometimes refers to a value's data type: binary, integer, floating point and so on.

RAM

Random Access Memory.

Random Access Memory

Memory that holds programs while they are being executed.

Read Only Memory

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

A data transmission mode used for Modbus communications. RTU uses 8 data bits.

Register

A location in a PLC's memory. It is identified by an *address*.

Reports Listing

A group of printouts which consist of hardware allocation, data usage, and data contents for a ladder logic program.

ROM

Read Only Memory.

Routing Path

The sequence of devices through which a message passes to reach its final destination.

RTU

Remote Terminal Unit communications mode.

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.

Save

To store information on a disk.

Search

To locate a specified network element (or elements) in the ladder logic.

Segment

A group of I/O networks solved as a unit by the programmable controller. The Segment Scheduler controls the frequency of segment execution and order of I/O operations. Each segment controls two I/O channels in a 584 or 984/S901 configuration, or one drop in a 984/S908 configuration.

Serial Port

A 9- or 25- pin port used for serial communications (for example, Modbus).

Short Comment 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.

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.

Slave

A networked device controlled by another device. Slave devices to not initiate data transactions. Compare to *master*.

Slot

The position of an I/O module in a rack.

State Flow

In logic, an instruction is highlighted if it solves true instead of only when it passes power (compare to *Power Flow*).

Stop Bits

Bits used to indicate the end of transmission of a data item or frame.

Subdirectory

A directory within a directory.

Sweep

For a PLC, one cycle of scanning inputs, solving logic, and writing outputs.

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.

Traffic Cop Table

A table used by the Traffic Cop that contains the configuration of the programmable controller I/O cards and their corresponding network element addresses.

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.

Vertical Form Control Unit

A device, usually programmed by a paper tape loop, that controls pagination on line printers. It is also called a Vertical Form Unit.

Word

16 bits of data (two bytes). Also called a *machine word*.

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