Getting Started

Logic Developer - PLC

PLC Programming Software

Version 4.00

May 2003

GFK-1918D

CIMplicity Machine Edition

GE FANUC

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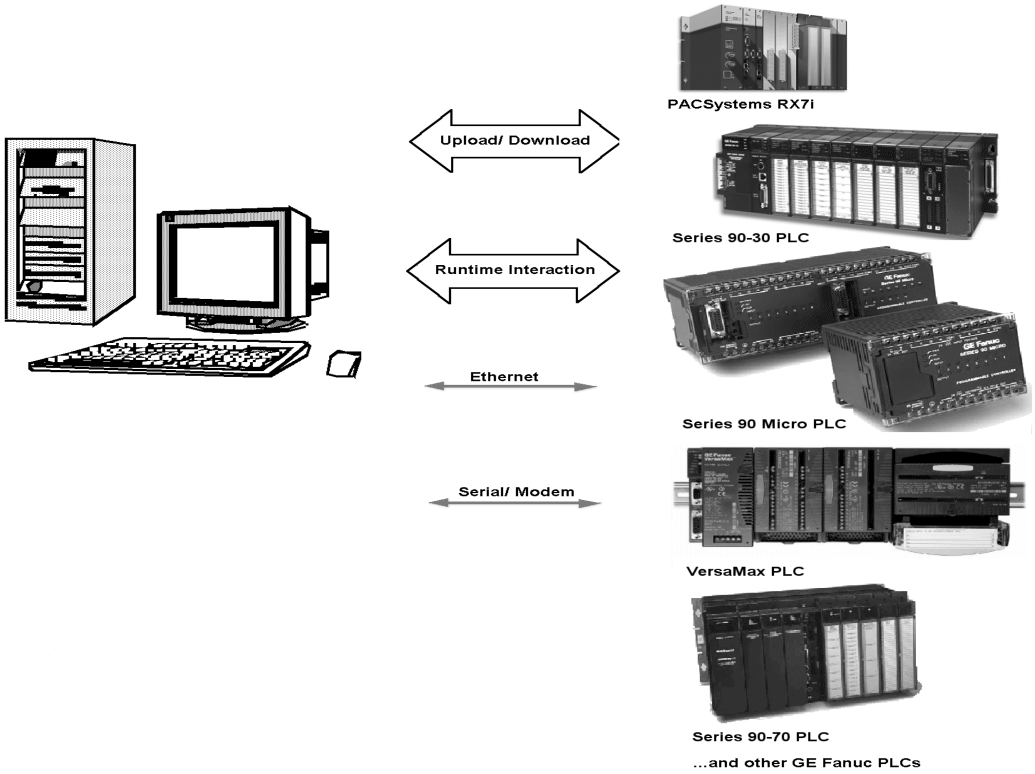
1 Welcome

Congratulations on your purchase of Logic Developer - PLC, the GE Fanuc PLC programming component of Machine Edition automation software. This software package provides all the tools necessary to create powerful control applications.

Logic Developer - PLC provides a way to configure your PLC hardware or remote I/O, create and edit PLC logic, upload and download projects, and monitor and debug the execution of control programs. Projects can be imported from Logicmaster, VersaPro, and CimplicityControl folders.

CIMPLICITY Logic Developer - PLC Environment



Logic Developer - PLC makes it possible to develop control applications on a personal computer and download them to a PLC via Ethernet or serial/modem connection.

Hosted in the Machine Edition environment, Logic Developer - PLC takes advantage of a powerful set of common programming tools (see page 14). The same tools can be applied to Logic Developer - PC (PC Control), Logic Developer - State, CIMPLICITY View and CIMPLICITY Motion components, providing a single programming environment. The Machine Edition environment unites and organizes components, providing data sharing and networked operation.

The following features are included in this version of Logic Developer - PLC:

- Hardware Configuration (HWC): a comprehensive tool for configuring and customizing GE Fanuc PLCs or racks of Remote I/O for your specific operating needs. For more information on Hardware Configuration, see page 43.
- LD Editor: an intelligent, cell-based, graphical editor for developing LD (Ladder Diagram) logic. You can customize the look and feel of the LD Editor. For more information on the LD Editor, see page 63.
- IL Editor: an easy-to-use, free-form text editor for creating Instruction List logic. Configurable formatting rules and color coding make your scripts easy to read. For more information on the IL editor, see page 79.
- C Blocks and C Programs: independent sections of executable code, written in C language, that are developed outside of Logic Developer - PLC. Precompiled C blocks and C programs are imported into your project. For more information on C blocks, see page 86. For more information on C programs, see page 88.
- PLC Motion Editor: a free-form text editor that enables you to enter the program in your preferred style. The PLC Motion editor is specifically designed for support of the IC693DSM314 motion module. For more information on the Motion editor, see page 91.
- Local Logic Editor: a text-based editor used for developing logic that executes locally on a IC693DSM314 motion module. Local Logic runs synchronously with the PLC Motion program, but is independent of the PLC's CPU. For more information on the Local Logic editor, see page 95.
- CAM Editor: an accessory for the Logic Developer - PLC Motion editor specifically designed for support of the IC693DSM314 motion module. It provides a graphical means to create, edit, and manage electronic CAM profiles. For more information on the CAM editor, see page 100.

SYSTEM REQUIREMENTS

To use Logic Developer - PLC and its tools, you require the following:

- Windows® NT version 4.0 with service pack 6.0 or later

  OR

  Windows 2000 Professional

  OR

  Windows XP Professional

  OR

  Windows ME

  OR

  Windows 98 SE.
- Internet Explorer™ version 5.5 with Service Pack 2 or later. (You must install IE5.5 SP2 before installing Machine Edition.)
- 500 MHz Pentium-based computer. (1 GHz recommended.)
- 128 MB RAM (256 MB recommended).
- TCP/IP Network protocol-based computer.
- 150-750 MB free hard disk space depending on the selected products.
- 200 MB hard disk space for sample projects (optional).
- Additional hard disk space for projects and temporary files.

INSTALLATION

For last-minute information, release notes, and supported hardware lists for Machine Edition products, see the Important Product Information (IPI) document on the CD. There are several ways to view this document

- When installing Machine Edition, select **Important Product Information** on the initial Launcher screen.
- From the Machine Edition Help menu, choose **Important Product Information**.
- When running Machine Edition, click the InfoView tab in the Navigator, then double-click the Important Product Information page under Getting Started in the Table of Contents.
- When running Machine Edition, click the Home button on the InfoViewer toolbar, then click the What's New link under Get Started on the left hand side.

If you have a previous version of Machine Edition installed on your workstation, you must uninstall it before installing the latest version. You can do so by selecting the "Uninstall CIMPLICITY Machine Edition" option from the CIMPLICITY Machine Edition Start menu group. All projects, settings, and authorizations will remain intact during an uninstall operation.

To install Logic Developer - PLC

1. Insert the CIMPLICITY Machine Edition CD into your CD-ROM drive.

   By default, the setup program will automatically start. If the setup program does not automatically start, run *Setup*.exe in the root directory of the CD.
2. Click **Install** to start the install process.
3. Follow the instructions as they appear on the screen.

PRODUCT AUTHORIZATION

Before you can start developing projects with Logic Developer - PLC, you must authorize the software with a program called Product Authorization. If you don’t authorize the software, you can use it for only a four-day trial period. This procedure takes only a few minutes and enables you to take advantage of any product support for which you qualify. You will need to contact us by telephone, fax, or e-mail as part of the authorization process.

To authorize a copy of Machine Edition

1. Have your serial numbers ready.

   The serial numbers can be found on the License Key sheet that came with your product.

2. Run the Product Authorization program from the **Start** menu > **Programs** > **Product Authorization**.

   The Product Authorization dialog box appears.

3. Click **Add**.

4. Select the medium with which you are authorizing: Internet, Phone/Fax/E-mail, or Floppy Disk Transfer. Click Next.

   If you choose the Internet option, proceed to step 5.

   If you choose the Phone/ Fax/E-mail option, proceed to step 5.

   If you choose the Floppy Disk Transfer option, ensure you have an authorization disk before proceeding.

5. Fill in the fields in the dialog box.

   Fields that are identified with an asterisk (*) must be filled in.

6. If authorizing by:

   - **Internet**, click **Submit Authorization**. We will reply by e-mail with your new key code(s).
   - **Phone**, click **Phone/Fax** and call the number on the screen to receive a new key code(s).
   - **Fax**, click **Phone/Fax.** In the dialog box that appears, click **Print FAX**. Fax the Product Authorization Request to us, using our fax number on the printout. We will reply by fax with your new key code(s).
   - **E-mail**, click **Send E-mail**. In the dialog box that appears, click **Authorize** to e-mail us. We will reply by e-mail with your new key code(s).

   Product Authorization is complete after you enter the new key code and it has been accepted. Depending on the product you have purchased, you may need to run the Product Authorization program a number of times.

To move the authorization to another computer

You can run the software on only the computer that the Product Authorization was run on. If you want to develop your projects on a different computer, you need to complete the following steps to move the authorization from one computer to another.

1. Install Logic Developer - PLC on the computer that the authorization will be moved to. Run the Product Authorization program from the **Start menu** > **Programs** > **CIMPLICITY Machine Edition** > **Product Authorization**.

   The Product Authorization dialog box appears.

2. Click **Software**.

   There is a Target Site Code on the top right-hand side of the screen. Write down this site code carefully. It must be accurate for the move to work. You will need the Target Site Code when you move the authorized software from the source computer.

3. Click **Add**.

   The Product Authorization wizard appears.

4. Click **Authorize by disk**.

   At this point, you need to go to the source computer that has the authorized software, and move the authorization to a disk.

5. From the source computer, run the Product Authorization program and click **Software**.

6. Click **Move**, and then click **OK**. Enter the Target Site Code that you wrote down from Step 3 and click **Next**. Verify that the site code is correct and click **OK**.

7. Insert a blank formatted floppy disk into the floppy drive and click **Next**.

   The authorization code will be moved to the disk and a dialog box should appear telling you it was successful.

8. Click **OK**.

9. Go back to the computer to which you are moving the authorization and insert the floppy disk.

   The screen that is asking for an authorization disk should be displayed.

10. Click **Next**.

11. Click **Finish**.

    A screen should appear telling you the move was successful.

12. Click **OK**.

The authorization has now been moved to the new computer.

TECHNICAL SUPPORT

Support is available to registered users at no charge for 90 days after purchase. A support agreement can be purchased from your local GE Fanuc distributor if extended support is required.

If problems arise that can't be solved using the information in your product manual, online Help system, or the GE Fanuc Technical Advisor knowledge base, contact us by telephone, fax, or mail.

When contacting us, call from a telephone near your computer and have your CIMPLICITY Machine Edition software running. Have the following information handy to help us assist you as quickly as possible:

- The serial number from your installation CD case, and the Product name and version number from the **Help**>**About** dialog box.
- The brand and model of any hardware in your system.
- Operating system and version number.
- The steps you performed prior to the problem occurring.

North America

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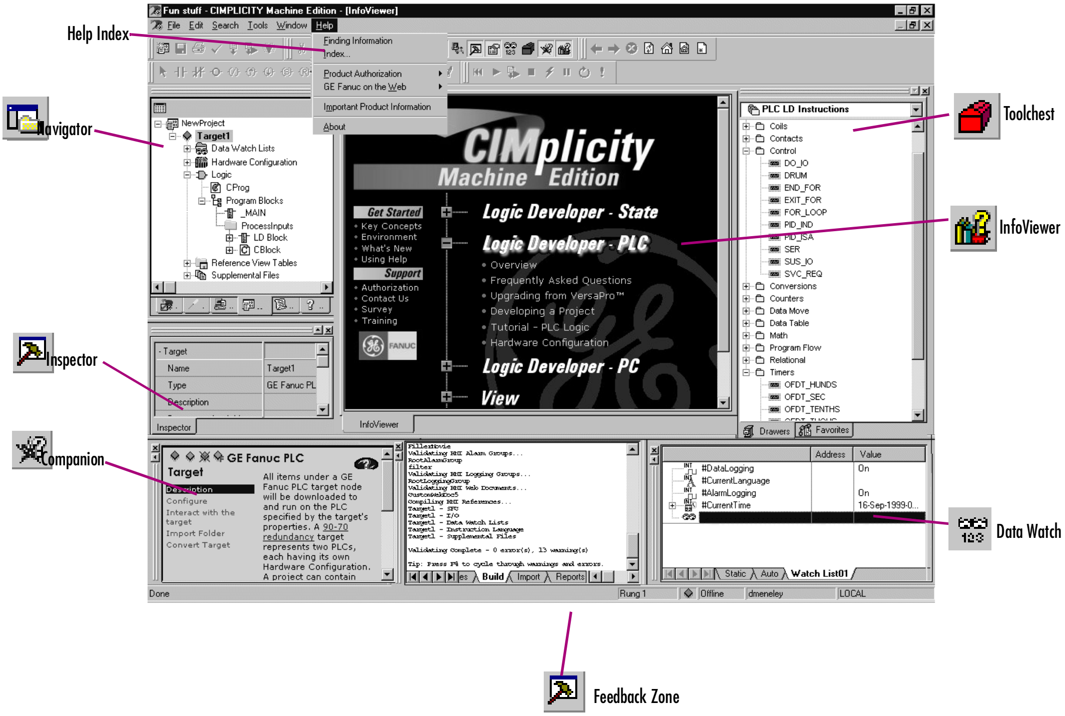
E-mail: plc_europe@gefanuceur.ge.com

2 CIMPLICITY Machine Edition

Machine Edition offers you a complete solution for the development of automation applications in one package. Machine Edition features an integrated development environment and tools that enable you to spend more time building applications and less time learning the software. All Machine Edition products are fully integrated into the environment and interact with each other.

- They share the same set of tools providing a consistent interface throughout the development process.
- They feature full drag-and-drop capabilities between tools and editors.
- They feature a true scalable solution. You have the choice of what type of machine your projects run on.
- They automatically display Help in the Companion for what you click on.

The following illustrates a Machine Edition project:



All items under a GE Fanuc PLC target node will be downloaded to and run on the PLC specified by the target's properties. A 90-70 redundancy target represents two PLCs, each having its own Hardware Configuration. A project can contain

```
FillerMovie
Validating HMI Alarm Groups...
RootAlarmGroup
filter
Validating HMI Logging Groups...
RootLoggingGroup
Validating HMI Web Documents...
CustomWebDoc5
Compiling HMI References...
Target1 - SFC
Target1 - I/O
Target1 - Data Watch Lists
Target1 - Instruction Language
Target1 - Supplemental Files

Validating Complete - 0 error(s), 13 warning(s)

Tip: Press F4 to cycle through warnings and errors.
```

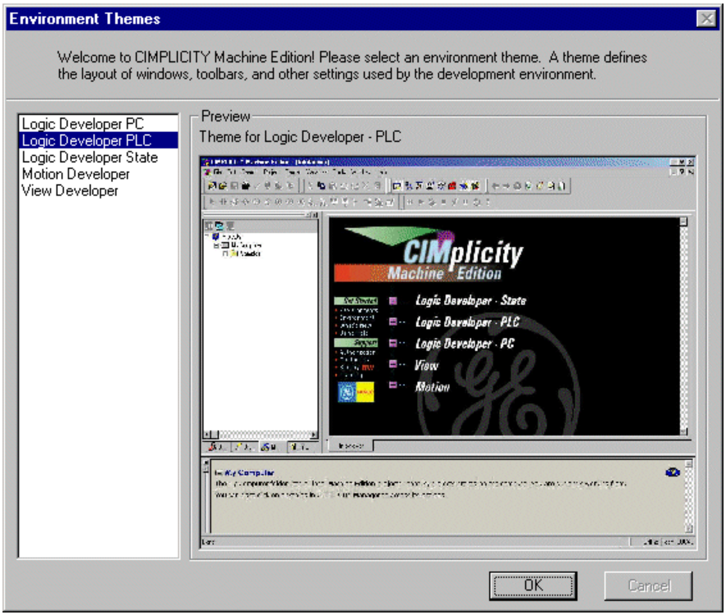
QUICK START

Machine Edition makes it easy to get started developing a project.

To start Machine Edition

1. Click Start **Start**, point to **Programs**, point to **CIMPLICITY Machine Edition** and then choose **CIMPLICITY Machine Edition**.

   After Machine Edition initializes, the Environment Themes dialog box appears.



Environment Themes

Welcome to CIMPLICITY Machine Edition! Please select an environment theme. A theme defines the layout of windows, toolbars, and other settings used by the development environment.

- Logic Developer PC
- Logic Developer PLC
- Logic Developer State
- Motion Developer
- View Developer

Preview

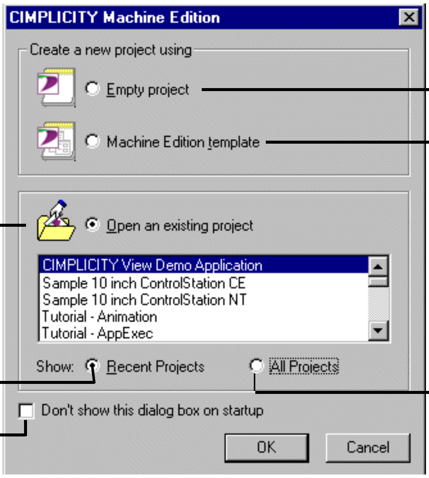
Theme for Logic Developer - PLC

Note: The Environment Themes dialog box appears automatically the first time you start Machine Edition. To change the theme later, choose **Apply Theme** from the **Windows** menu.

2. Choose the Logic Developer - PLC theme.
3. Click **OK**.

   When you open a project, the appearance of your Machine Edition screen will match the preview in the Environment Themes dialog box.

The CIMPLICITY Machine Edition dialog box appears.



CIMPLICITY Machine Edition

Create a new project using

○ Empty project

○ Machine Edition template

● Open an existing project

CIMPLICITY View Demo Application
Sample 10 inch ControlStation CE
Sample 10 inch ControlStation NT
Tutorial - Animation
Tutorial - AppExec

Show: ● Recent Projects ○ All Projects

□ Don't show this dialog box on startup

Select this option if you want to create a new project from scratch.

Select this option if you want to use a Machine Edition template to create your project.

Select this option if you want to select an existing project.

Select this option to display only the projects that have been used recently.

Select this option to display all existing projects.

Select this check box if you do not want to see this dialog box again.

4. Select the appropriate option to open a project. The **Open an existing project** option is selected by default.

   Notes:

   - If you select either the **Empty project** option or the **Machine Edition template** option, the New Project dialog box appears and you can continue creating a new project (see page 12).
   - If you select the **Open an existing project** option, you can also select either the **Recent Projects** option or the **All Projects** option. The **Recent Projects** option is selected by default.

5. If you selected the **Open an existing project** option, select from the list the project that you want to open.

   The existing projects include samples and tutorials that you can open and use to familiarize yourself with Machine Edition.

6. If you want, select the **Don't show this dialog box on startup** option.
7. Click **OK**.

   Your project opens in the Machine Edition environment that you specified in the Environment Themes dialog box.

PROJECTS

You can create and edit Machine Edition projects using products such as CIMPLICITY View, Logic Developer - PC, CIMPLICITY Motion, Logic Developer - State, and Logic Developer - PLC. These products share Machine Edition tools to provide a high level of integration between the various parts of your project.

You can import folders created with Logicmaster, CimplicityControl, or VersaPro.

Using Logic Developer - PLC, you can build multiple projects to suit your specific requirements.

To create a new project using a template

Before creating a project, there are some things you should know:

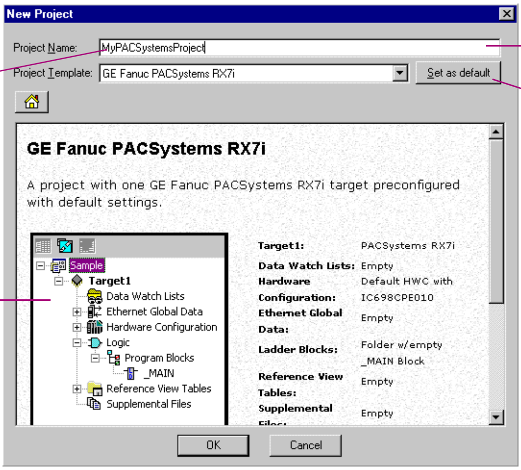
- The primary components your project will contain.
- The PLC you project will run on.

1. From the **File** menu, choose **New Project**, or click on the File toolbar.

The New Project dialog box appears.

Choose your project template from the Project Template list.

A sample description of the project appears on the screen.



Enter the name of your project in the Project Name box.

You can set the selected project template as the default template by clicking the Set as default button.

New Project

Project Name: MyPACSystemsProject

Project Template: GE Fanuc PACSystems RX7i

GE Fanuc PACSystems RX7i

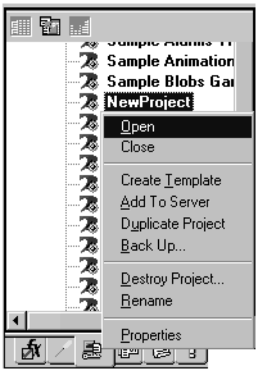
A project with one GE Fanuc PACSystems RX7i target preconfigured with default settings.

Target1: PACSystems RX7i
Data Watch Lists: Empty
Hardware Configuration: Default HWC with IC698CPE010
Ethernet Global Data: Empty
Ladder Blocks: Folder w/empty _MAIN Block
Reference View Tables: Empty
Supplemental Files: Empty

2. Choose a Project Template that suits your needs.
3. Enter a descriptive Project Name.
4. Click **OK**.

Your project opens in the Machine Edition environment.

To open an existing project for editing



Navigator: Manager tab

1. Open the Navigator and choose the Manager tab.

   A list of projects is displayed.

2. Right-click a project and choose **Open**.

   Your project loads and is ready for editing.

Want to know more? In the Help Index, look up “Projects”.

To import a folder

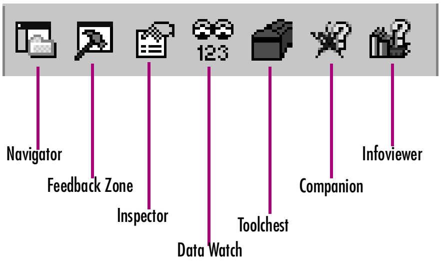
1. Open the Navigator and choose the Project tab.
2. Select the target that you want to import the folder into.
3. Right-click the target, point to **Import**, and choose the folder type.
4. In the dialog box that appears, navigate to and double-click the folder you want to import.

Want to know more? In the Help Index, look up “import a CimplicityControl folder”, “import a Logicmaster folder”, or “import a VersaPro folder”.

TOOLS

Project development is supported by the Machine Edition tools. Each tool is opened and closed by means of a button on the Tools toolbar.

A description of each tool's function is provided below.



Navigator

The Navigator is a docking tool window containing a set of tabs. Each tab displays information about your development system in a hierarchical tree structure similar to Windows Explorer. The available tabs depend on which Machine Edition products you have installed and what kind of work you are developing or managing. The Project tab shows the overall organization of your application.

Feedback Zone

The Feedback Zone window is a docking window used to display several types of output information generated by Machine Edition components. This interactive window uses category tabs to organize the output generated from the Machine Edition products you have installed.

Inspector

The Inspector lists the properties and current settings for a selected object or element. You can edit these properties directly in the Inspector. When you select several objects, the Inspector window lists the properties commom to all of them. The Inspector window provides a simple method of viewing and setting properties for all objects.

Data Watch

The Data Watch tool is a runtime debugging tool that enables you to monitor and edit the values of variables. This tool is useful while working online to a target. With the Data Watch tool, you can monitor individual variables or user-defined lists of variables. Data Watch lists can be imported, exported, or saved with a project.

Toolchest

The Toolchest is a powerful storehouse of objects you can add to your project. You can drag most items directly from the Toolchest into Machine Edition editors. You can choose from predefined objects or create your own reusable fxClasses. The Toolchest adds true object-oriented capability to Machine Edition.

Companion

The Companion provides useful tips and information while you work. While the Companion is open, it tracks your moves and displays help on whatever item is currently selected in the Machine Edition environment. It is context-sensitive and displays a description of whatever you click on the Machine Edition screen.

InfoViewer

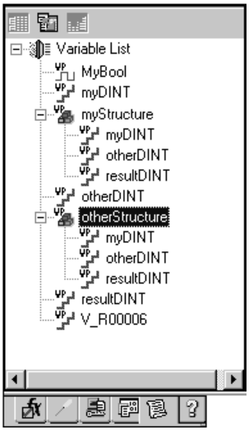
The InfoViewer is an embedded Web browser used mainly to display

- Machine Edition help.
- Machine Edition reports.
- The documentation associated with a project or target.

If you are familiar with Internet Explorer or Netscape Navigator, then you are already familiar with the basic InfoViewer interface. Like the Companion, the InfoViewer is context-sensitive. Press F1 to get help on any item you select in the Machine Edition environment. A table of contents is found in the InfoView tab of the Navigator.

Want to know more? In the Help Index, look up "Tools: an Overview".

VARIABLES



- Variable List
  - MyBool
  - myDINT
  - myStructure
    - myDINT
    - otherDINT
    - resultDINT
  - otherDINT
  - otherStructure
    - myDINT
    - otherDINT
    - resultDINT
  - resultDINT
  - V_R00006

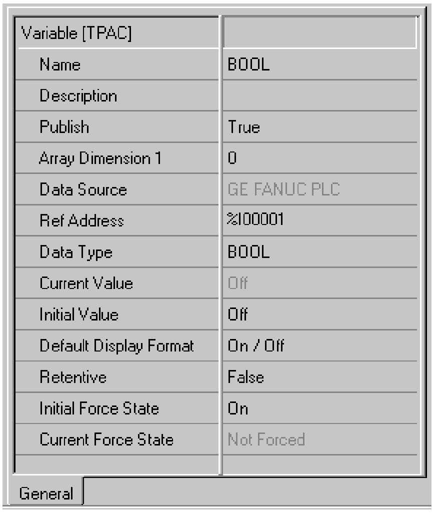
Navigator: Variables tab

A variable (sometimes called a tag) is a named storage space for data values.

All variables in a project are displayed in the Variables tab of the Navigator. A variable represents a memory location in the target PLC. Each variable must be mapped to a reference address (for example, %R00001) for all PLC families except PACSystems™ RX7i. On a PACSystems™ RX7i, if you don't map to a specific reference address, it is considered a symbolic variable. Machine Edition handles all the mapping for you in a special portion of PACSystems™ user space memory.

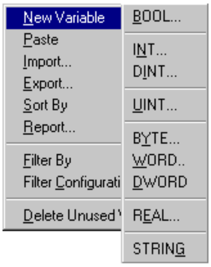
The reference address and other properties of a variable, such as data type, are configured in the Inspector.

Arrays and compound structure variables are supported by Machine Edition. Variable definitions can be imported from and exported to a variety of file types. You can edit your variables in a spreadsheet and then import them. Logic Developer - PLC variables, that is, variables used on GE Fanuc PLC and PACSystems™ targets, can be viewed in CIMPLICITY View. The following diagram shows the Inspector displaying a typical set of variable properties.



Variable [TPAC]	
Name	BOOL
Description	
Publish	True
Array Dimension 1	0
Data Source	GE FANUC PLC
Ref Address	%I00001
Data Type	BOOL
Current Value	Off
Initial Value	Off
Default Display Format	On / Off
Retentive	False
Initial Force State	On
Current Force State	Not Forced

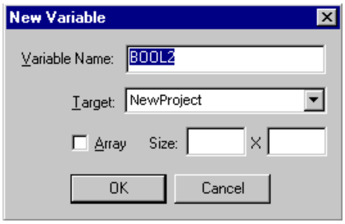
To create a variable



New Variable menu

1. In the Variables tab of the Navigator, right-click **Variable List**, point to **New Variable** and then choose the data type of the variable.

   The New Variable dialog box appears.



New Variable

Variable Name: BOOL2

Target: NewProject

□ Array Size: ☐ × ☐

OK

2. Type a name for the variable and press **ENTER**.

   Variable names can range from 1 to 32 characters, begin with a letter, contain upper or lower case letters, use numbers between zero and nine, and use the underscore character ("_").

3. Select the target the variable will be used in.
4. If the new variable is an array, select the Array check box and enter the size(s).
5. Click **OK**.

   A new variable with a default name appears in the list.

To map a variable to PLC memory

In order to successfully download a project to the PLC, variables must be properly mapped to the PLC's memory, unless they are symbolic variables, which a PACSystems™ RX7i will automatically map for you. There are two ways to map a non-symbolic variable.

First method:

1. In the Variables tab of the Navigator, right-click a variable and choose **Properties**.

   The Inspector displays the properties of the variable.

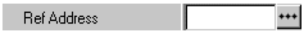
2. In the **Ref Address** field, enter an address. You can:
   - Spell out the exact address, for example, %R00123 or 123R. In either case this maps the variable to %R00123.
   - Enter only the memory area, for example %R. This maps the variable to the next highest available address. For example, if %R00122 was the last address used, entering %R maps the variable to %R00123.

Second method:

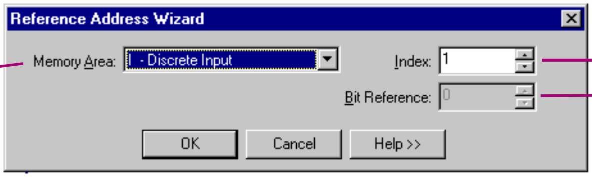
1. In the Variables tab of the Navigator, right-click a variable and choose **Properties**.

   The Inspector displays the properties of the variable.

2. Click the Ref Address field and then click the ••• button.



   The Reference Address Wizard appears.



Memory Area: I - Discrete Input

Index: 1

Bit Reference: 0

Select a region of

Select an index

Select a bit reference for a BOOL variable in 16-bit memory.

3. From the **Memory Area** list, choose a region of PLC memory.
4. In the Index box, enter an index from the beginning of the region.
5. Select a bit reference.

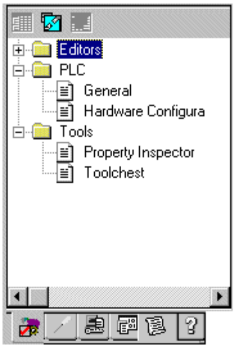
   The **Bit Reference** box is available only if you're mapping a BOOL variable to 16-bit memory area on a PACSystems™ PLC.

6. Click **OK**.

   Your variable is mapped to the Reference Address.

Want to know more? In the Help Index, look up “Variables”, “Importing variables from a file”, “Symbolic Variable”, and “Bit addressing in 16-bit memory”.

OPTIONS



Navigator: Options tab

The Options tab of the Navigator contains option and preference settings. Options are organized into folders and pages. Click ⊞ or ⊟ to expand or collapse folders. Examples:

Editors > Ladder > View >Coil Justification: The leftmost column in which coils can be placed; also the column where the right power rail resides. The default is 10.

PLC> General > Duplicate Addresses: Indicates whether to prevent, warn about, or ignore mapping two variables of the same data size (1, 8, 16, 32, or 64 bits) and length (array size) to the same reference address.

PLC > Hardware Configuration >New Reference Assignment: The way in which default reference addresses will be assigned when modules are added to the Hardware Configuration.

To set options and preferences

1. In the Options tab of the Navigator, expand an options folder and right-click a page within the folder to display the option's properties in the Inspector.
2. In the Inspector, edit the option's settings as needed..

Want to know more? In the Help Index, look up "Options", "Confirmations", "PLC Options", and "General Options".

MACHINE EDITION HELP

CIMPLICITY Machine Edition includes a comprehensive online help system that enables you to access specific help topics while working with Machine Edition.

Use the InfoViewer or Companion to access help.

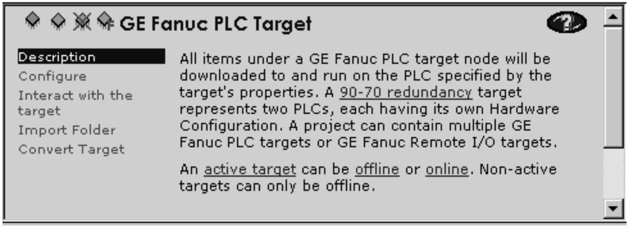
Companion Help

The Companion is a Machine Edition help system that provides useful tips and information while you work. While the Companion is open, it displays help on whatever item is currently selected in the Machine Edition environment, tracking your movements while you work.

To use Companion help

1. Ensure the Companion window is open. To open it, press Shift+F11.
2. Click on any item on the screen.

A description of the item you clicked appears in the Companion.



GE Fanuc PLC Target

All items under a GE Fanuc PLC target node will be downloaded to and run on the PLC specified by the target's properties. A 90-70 redundancy target represents two PLCs, each having its own Hardware Configuration. A project can contain multiple GE Fanuc PLC targets or GE Fanuc Remote I/O targets.

An active target can be offline or online. Non-active targets can only be offline.

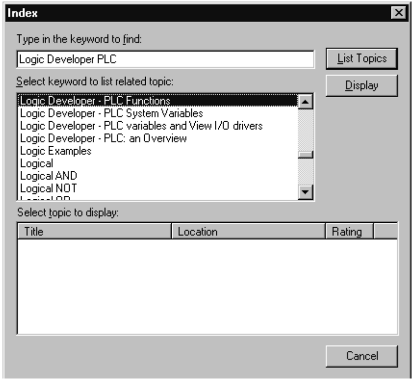
InfoViewer Help

The InfoViewer, another Machine Edition help system, provides detailed information. The InfoViewer has its own toolbar for navigating the help system, a Table of Contents (in the InfoView tab of the Navigator), and a searchable index. As with the Companion, InfoViewer help is context-sensitive. Click an item on the screen and press F1 to display the appropriate topic in the InfoViewer.

To use the Help index

1. From the Help menu, choose Index.

   The Index dialog box appears.



Index

Type in the keyword to find: Logic Developer PLC

Select keyword to list related topic:

Logic Developer - PLC Functions
Logic Developer - PLC System Variables
Logic Developer - PLC variables and View I/O drivers
Logic Developer - PLC: an Overview
Logic Examples
Logical
Logical AND
Logical NOT

Select topic to display:

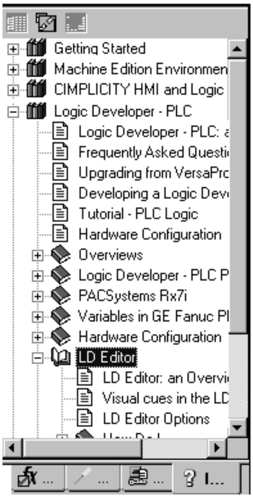
Title	Location	Rating

2. Enter a keyword in the top text box or select one in the middle text box.
3. Click **List Topics**.

   A list of topics appears in the bottom text box. The topics are sorted by their rating or likelihood of containing the correct information.
4. In the bottom text box, select a topic to display.
5. Click **Display**.

   The selected Help topic is displayed in the InfoViewer.

To look up topics in the Help Table of Contents



Navigator: InfoView Tab

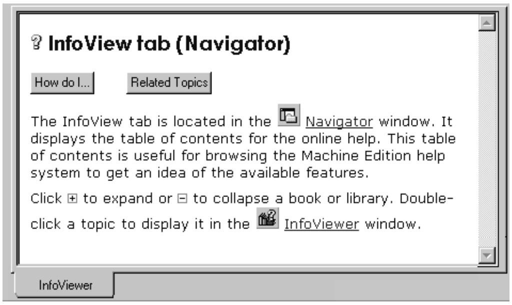
1. Open the ? InfoView tab of the Navigator.

   A table of contents for the entire help system appears.

2. Expand Libraries and Books to locate a topic of interest

3. Double-click a topic.

   The topic is displayed in the InfoViewer.



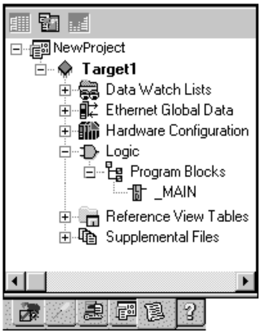
? InfoView tab (Navigator)

The InfoView tab is located in the Navigator window. It displays the table of contents for the online help. This table of contents is useful for browsing the Machine Edition help system to get an idea of the available features.

Click ⊞ to expand or ⊟ to collapse a book or library. Double-click a topic to display it in the InfoViewer window.

3

GE Fanuc PLC Targets



Navigator: New PACSystems™ Project

A ◆ target represents a run-time destination of the programs you develop with Logic Developer - PLC. Each target contains all of the components that will download to it. Logic Developer - PLC supports the following GE Fanuc PLC target families:

- PACSystems™ RX7i
- Series 90™-70 PLC
- Series 90™-30 PLC
- VersaMax® PLC
- VersaMax® Nano/Micro PLC
- Series 90™ Micro PLC

and the following remote I/O interface targets:

- GE Fanuc Series 90™-70 Genius Remote I/O Scanner
- GE Fanuc VersaMax® Ethernet
- GE Fanuc VersaMax® Genius
- GE Fanuc VersaMax® Profibus

ADDINGING, CONFIGURING AND CONVERTING TARGETS

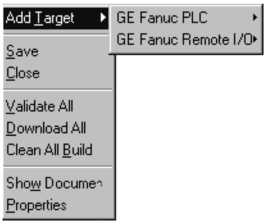
Adding Targets

Normally a target is present in a project when you use a template to create the project (see page 12). A project can contain multiple targets. The actual largest number possible may vary, depending on the available memory on your computer, the operating system you are using, or the available disk space, etc.

One target is required for each PLC or remote I/O adapter your project accesses, except when you are using CPU redundancy. In this case, one target contains a Primary Hardware Configuration and a Secondary Hardware Configuration, which respectively correspond to the primary PLC and the redundant PLC. For more information, see page 50.

Existing targets can be converted from one GE Fanuc PLC family to another. For more information, see page 26.

To add a target to a project



Project right-click menu

1. In the Project tab of the Navigator, right-click the Project node and point to **Add Target**.
2. Point to **GE Fanuc PLC** or **GE Fanuc Remote I/O** and then respectively choose the PLC family or the Remote I/O.

Configuring Targets

The properties of a target specify the PLC family, the communication connections between your computer and the PLC, and various other settings. All properties are edited in the Inspector. The following table describes a PLC target's properties:

Name	Edit the name for your target in this field.
Type	The type of target is set by default to GE Fanuc PLC. Note: Logic Developer - PLC is operational with GE Fanuc PLCs only.
Description	Enter a description of your project in this field. The maximum characters is 255.
Documentation Address	Enter the URL where your project documentation is stored.
Family	By changing the PLC type in this field, you initiate a target conversion. **Caution: Changes are irreversible.**
PLC Target Name	The name of the target as stored on the PLC target.
Update Rate (ms)	Set the rate at which the screen is updated while online.
Sweep Time (ms)	The sweep time of the PLC when online is also displayed on the status bar.
PLC Status	The online/offline, run/stop status of the PLC.
Dual HWC	(Series 90™-70 only.) Indicates whether HWC redundancy is set up. Change the field to False to delete the secondary HWC.
Selected HWC	(Displayed only if Dual HWC is set to True.) Change the selected HWC in this field.
Physical Port	Choose the type of connection to the PLC (Ethernet, COM, or modem).
IP Address	(Ethernet protocol only.) Set the IP address of the PLC.
⊞ **Additional Configuration**	Group of properties used for the detailed configuration of your communication connection.

To configure a PLC target

1. In the Project tab of the Navigator, right-click a target and choose **Properties**.

   The properties of the target appear in the Inspector.

2. In the Inspector, configure the properties as needed.

Converting Targets

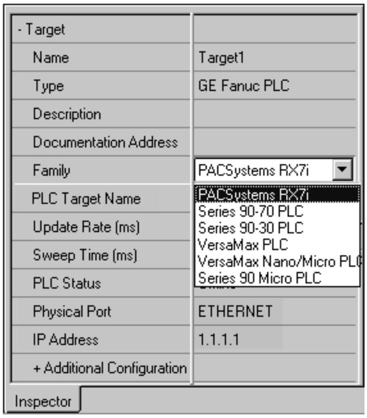
With Logic Developer - PLC, you can convert targets from one GE Fanuc PLC family type to another. This enables you, for example, to take logic written for a Series 90™-70 PLC and convert it for use on a PACSystems™ RX7i. However, target conversions are irreversible; when logic blocks are deleted during a conversion, they cannot be restored. It is recommended that you make a backup of your project before converting a target in it. There may also be execution differences when converting an application from one GE Fanuc PLC family type to another. You must validate the application execution prior to deployment into a production environment.

To convert a target

1. In the Project tab of the Navigator, right-click an existing target and choose **Properties**.

   The Inspector displays the target's properties.

2. In the Inspector, click **Family.**
3. From the list, choose the new PLC Family you want to convert the target to.



- Target	
Name	Target1
Type	GE Fanuc PLC
Description	
Documentation Address	
Family	PACSystems RX7i
PLC Target Name	
Update Rate (ms)	
Sweep Time (ms)	
PLC Status	
Physical Port	ETHERNET
IP Address	1.1.1.1
+ Additional Configuration	

Target conversion involves the following changes:

- Stripping all the configured modules from the original Hardware Configuration (HWC) and setting up the destination family's default HWC, with a single power supply and a CPU.

  Note: PACSystems™ RX7i supports many Series 90™-70 modules and some Series 90™-70 expansion racks. When converting a Series 90™-70 target to a PACSystems™ RX7i target, the supported modules and expansion racks are retained (with rare exceptions). The modules' parameters are also retained or converted to the nearest equivalent. Unsupported expansion racks are converted to the nearest equivalent. which retains the supported modules. All Hardware Configuration changes made during the conversion are documented in a target conversion report.

- Deleting or adding target components, blocks, and/or programs.
- Updating the system variables, including the fault locating references.
- Displaying a conversion report in the InfoViewer when converting to PACSystems™ targets only

Warning: Changing the PLC Family can result in logic in your project becoming invalid.

Note: PLC hardware must be configured before it will be operational. For detailed information on hardware configuration, see page 46..

Want to know more? In the Help Index, look up "Target Conversions (GE Fanuc PLC Targets)".

CONFIGURING COMMUNICATION

In order for Logic Developer - PLC to communicate with a target PLC, a connection must be properly configured. The properties of a target are adjustable to accommodate your connection(s).

To configure an Ethernet or serial connection

1. In the Project tab of the Navigator, right-click a target and choose **Properties**.

   The Inspector opens showing the target's properties.

2. In the Inspector, set the **Physical Port** property to Ethernet or a COM port (or a modem if one is installed).
3. If the **Physical Port** is Ethernet, enter the **IP Address** of the target PLC.

   Note: You can connect to a GE Fanuc PACSystems™ RX7i by means of Ethernet only.

4. Double-click **Additional Configuration** to access the detailed settings for your connection.

   Note: Serial communication with a non-PACSystems™ PLC is always available if it is the only device connected and an SNP_ID is not specified. An IP address must be set in the PLC before an Ethernet link can be established.

Want to know more? In the Help Index, look up "Configuring a direct connection".

Configuring Communication for PACSystems™

The only communication method supported by a PACSystems™ is Ethernet. This ensures fast communication, because every PACSystems™ has an embedded Ethernet adapter.

To configure communication with a PACSystems™ RX7i

1. Physically connect the PACSystems™ RX7i to the Ethernet network.
2. Set up a temporary IP address. For more information, see "To set a temporary IP address for a PACSystems™ RX7i".

   The temporary IP address enables you to communicate with the PACSystems™ RX7i the first time.

3. Do one of the following:

   If there is already a hardware configuration stored on the PACSystems™ RX7i target, it contains a permanent IP address. To obtain this permanent IP address from the PACSystems™, upload the hardware configuration from the PACSystems™ RX7i.

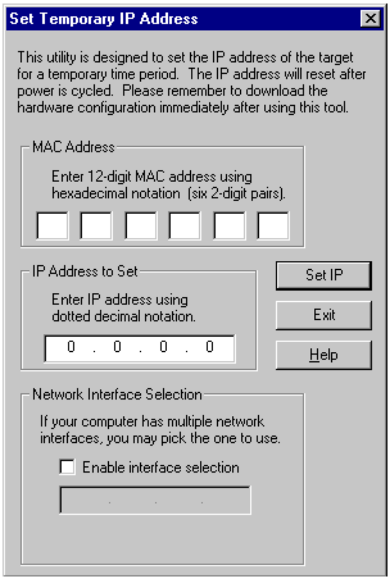
   - OR -

Set up a permanent IP address. For more information, see “To set a permanent IP address for a PACSystems™ RX7i”.

To set a temporary IP address for a PACSystems™ RX7i

1. In the Utilities tab of the Navigator, double-click Set Temporary IP Address.

   The Set Temporary IP Address dialog box appears.



Set Temporary IP Address

This utility is designed to set the IP address of the target for a temporary time period. The IP address will reset after power is cycled. Please remember to download the hardware configuration immediately after using this tool.

MAC Address

Enter 12-digit MAC address using hexadecimal notation (six 2-digit pairs).

IP Address to Set

Enter IP address using dotted decimal notation.

0 . 0 . 0 . 0

Network Interface Selection

If your computer has multiple network interfaces, you may pick the one to use.

□ Enable interface selection

2. In the MAC Address field, specify the MAC address for the PACSystems™ RX7i.
3. In the IP Address to Set field, specify the temporary IP address you want to set on the PACSystems™ RX7i.
4. If required, select the Network Interface Selection check box and specify the network interface the PACSystems™ RX7i is located on.
5. Click the Set IP button.

   The IP address of the specified PLC or device is temporarily set to the indicated address.

   Warning: The IP address set by the Set Temporary IP Address utility will not be retained through a power cycle. If you want to set a permanent IP address, you must do so by other methods.

To set a permanent IP address for a PACSystems™ RX7i

1. In the Project tab of the Navigator, right-click the target and choose **Properties**.

   The Inspector displays the target's properties.

2. In the IP Address property, enter an IP address.
3. Download the hardware configuration to the PACSystems™ RX7i. For more information, see page 35.

   Note: Ensure that you have configured the rest of the hardware configuration before downloading it.

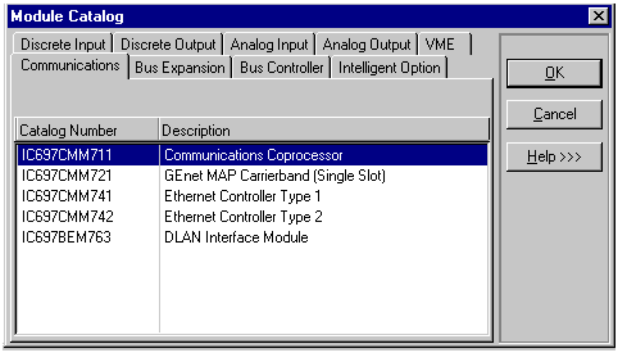
Want to know more? In the Help Index, look up "Configuring communication with a PACSystems™ RX7i" and "Set Temporary IP Address utility".

Configuring Communication for non-PACSystems™ PLCs

To set an IP address for Series 90™-70 PLCs

1. In the Project tab of the Navigator, expand the Hardware Configuration node.
2. Expand the Main Rack and double-click the slot where you want to add a communications module.

   The Module Catalog appears.



Catalog Number	Description
IC697CMM711	Communications Coprocessor
IC697CMM721	GEnet MAP Carrierband (Single Slot)
IC697CMM741	Ethernet Controller Type 1
IC697CMM742	Ethernet Controller Type 2
IC697BEM763	DLAN Interface Module

3. Choose the Communications tab and select the communications module you want to add.

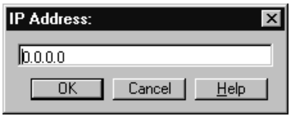
   Select either IC697CMM741 or IC697CMM742.

4. Click **OK**.

   The Parameter editor opens showing the configuration settings for the module.

5. In the Settings tab, double-click the **IP Address** parameter.

The IP Address dialog box appears..



IP Address:

0.0.0.0

6. **Enter the IP Address and click OK.**

To set an IP address for a Series 90™-30 CPU364 or CPU374

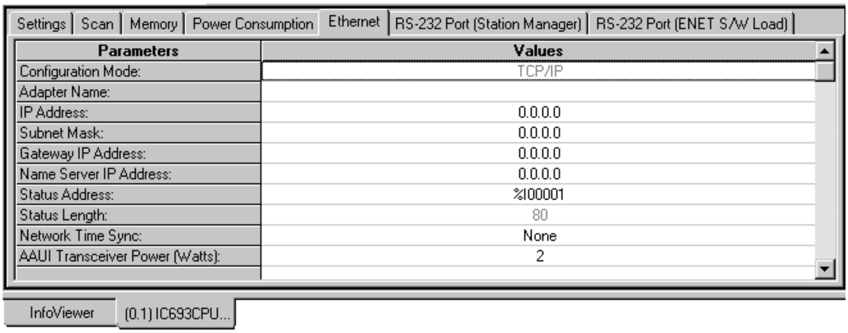
Note: For CPU364 and higher-end Series 90™-30 CPUs, the Ethernet adapter is built into the CPU. For other Series 90™-30 CPUs, the Ethernet connects through an optional expansion slot on the rack.

1. **Obtain an IP address, perhaps from your network administrator.**
2. **In the Project tab of the Navigator, expand the Hardware Configuration node to reveal the rack and slot containing a CPU364 or CPU374.**
3. **Right-click the slot containing the CPU364 or CPU374 and choose Configure.**

   The Parameter editor appears.

4. **In the Parameter editor, click the Ethernet tab.**

   The Parameter editor displays the contents of the Ethernet tab.



Parameters	Values
Configuration Mode:	TCP/IP
Adapter Name:	
IP Address:	0.0.0.0
Subnet Mask:	0.0.0.0
Gateway IP Address:	0.0.0.0
Name Server IP Address:	0.0.0.0
Status Address:	%I00001
Status Length:	80
Network Time Sync:	None
AAUI Transceiver Power (Watts):	2

5. **Double- click the IP address parameter.**

   The IP Address dialog box appears

6. **Enter the IP address in the box and click OK.**

To set an IP address for other Series 90™-30 CPUs (not CPU364 or CPU374)

1. In the Project tab of the Navigator, expand the Hardware Configuration node.
2. Right-click the slot containing an Ethernet Interface Module (IC693CMM321)and choose **Configure**.

   The Parameter editor opens showing the configuration settings for the module.
3. In the Settings tab, double-click the **IP Address** field.

   The IP Address dialog box appears.
4. Enter the IP address and click **OK**.

To download an IP address to a non-PACSystems™ target

1. Configure a CPU or Ethernet COM Module with an IP address using Hardware Configuration.
2. Right-click the target and choose **Properties**.

   The Inspector displays the target's properties.
3. In the Physical Port property, select a serial connection.
4. Right-click the target and choose **Go Online**.
5. Right-click the target and choose **Download to PLC**.

   The Download to PLC dialog box appears.
6. Select **Hardware Configuration** and click **OK**.

   The IP address is assigned to the PLC.
7. Right-click the target anch choose **Go Offline**.
8. Right-click the target and choose **Properties**.
9. In the Physical Port property, select Ethernet.

   The next time you go online, Machine Edition will use an Ethernet connection with the specified IP address.

INTERACTING WITH THE PLC

Communicating with the PLC is necessary to perform such operations as storing and loading programs or monitoring data values and PLC status information. You can connect to a PLC from Logic Developer - PLC over a serial, Ethernet or modem connection, depending on the capabilities of the PLC.

All interactions with a target are available from the target's right-click menu.

Validating a Target

Validating your project detects any syntax errors that may be present. Error messages are generated for each error and displayed in the Feedback Zone. A project containing errors cannot be downloaded. For that reason, whenever you initiate a download, the logic is automatically validated.

To validate a target

- In the Project tab of the Navigator, right-click a target and choose **Validate**.

Logic Developer - PLC checks all items under the target for syntax errors. Any errors detected are noted with messages in the Build tab of the Feedback Zone.

Tip: Double-click an error message to locate the noted error in your project. The appropriate editor or tool opens automatically with the item in question selected. Tips showing you how to proceed are displayed in the Companion. To open the Companion, press SHIFT + F11.

Online/Offline

When offline from a target PLC, there is no ongoing communication between the PLC and your development computer. When offline from the target PLC the number and type of interactions available are limited, and the actual communication link is not required as long as you only edit logic. If a communication link has been configured and the Offline PLC Operations option is enabled, you can:

- Download to the PLC .
- Upload from the PLC.
- Start the PLC.
- Stop the PLC.
- Clear the PLC.

When you issue such commands, the communication link becomes active while performing the operation and then returns to an idle state. When the Offline PLC Operations option is disabled, the only PLC operation you can perform while offline is to go online.

Note: You enable or disable the PLC Offline Operations option in the Options tab of the Navigator. For more information, see page 19.

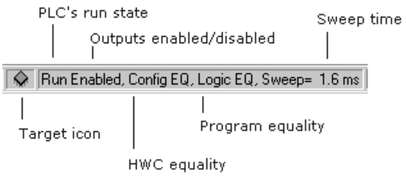
While online to a target PLC, a communication link exists and is active and you have an ongoing real-time communication with the PLC. You can perform commands to monitor and control the PLC's action and memory including the commands available when offline. Also, while online, the LD editor displays a graphical representation of LD logic as it executes, if the PLC's project is equal to the current project. You can edit LD logic while online; you are prompted to download your word-for-word changes. For more information on word-for-word changes, see page 73.

Want to know more? In the Help Index, look up "Offline versus Online".

To go online to a PLC

- In the Project tab of the Navigator, right-click a target PLC and choose **Go Online**.

Logic Developer - PLC connects your project to the PLC. The online status is indicated by the target icon in the Project tab and on the status bar.



Run Enabled, Config EQ, Logic EQ, Sweep= 1.6 ms

Note: When online to a PLC, the target icon in the Project tab of the Navigator appears as (equal), (not equal), or (stop faulted).

To go offline from a PLC

- In the Project tab of the Navigator, right-click a target PLC and choose **Go Offline**.

Logic Developer - PLC goes offline.

Want to know more? In the Help Index, look up "going online with a PLC" and "going offline from a PLC".

Upload/Download

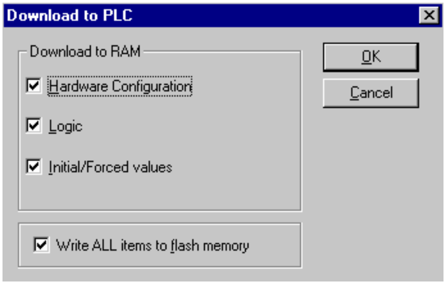
The download process creates (or builds) and validates all runtime files necessary for a target to perform its role in a completed project. The compiled project is then transferred to the target hardware via the communication connection previously configured. For more information, see page 28.

The upload process acquires a project from an active PLC target and transfers it to Logic Developer - PLC for editing.

To download to a target PLC

1. In the Project tab of the Navigator, right-click the target to which you want to download files and choose **Download to PLC**.

   The Download to PLC dialog box appears.



Download to PLC

Download to RAM

☑ Hardware Configuration

☑ Logic

☑ Initial/Forced values

☑ Write ALL items to flash memory

Note: If the PLC is running, you can download only logic that is not equal to the PLC's current logic and the Download to PLC dialog box does not appear.

2. Choose the items you want to download and click **OK**.

   Tip: To download files for all targets in a project, right-click the project node and choose **Download All.** If you want to download files to the active target, choose **Download Active Target.**

   Note: Only one project can be downloaded to a target at a time. If you download to a target machine that already has a project on it, the existing project is overwritten.

   For each target that you download to, Machine Edition saves the project, performs a validation, builds the runtime files and attempts to establish a connection to the target. Any errors that occur are displayed in the Build tab of the Feedback

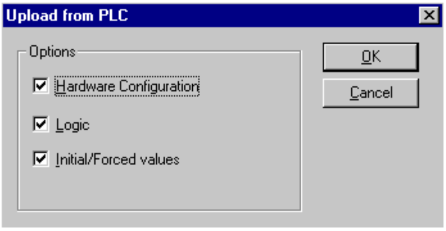
Zone. If connection to a target is successful, Machine Edition sends all the necessary runtime files to the PLC.

Want to know more? In the Help Index, look up "downloading to PLC".

To upload files from a PLC

1. In the Project tab of the Navigator, right-click the target PLC from which you want to upload information and choose **Upload from PLC**.

   The Upload from PLC dialog box appears.



Options

☑ Hardware Configuration

☑ Logic

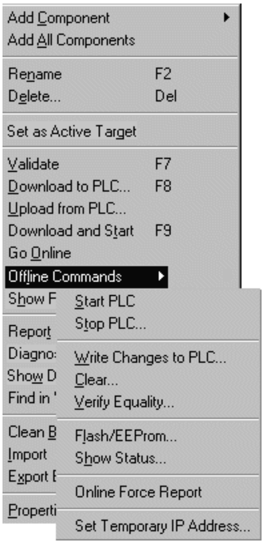
☑ Initial/Forced values

Note: If you are uploading from Logic Developer - State, only the Hardware Configuration can be uploaded.

2. Choose the item(s) you want to upload and click **OK**.

   Logic Developer - PLC connects to the PLC and uploads the selected item(s) to Logic Developer - PLC. If you already had a version of the PLC's project open, the uploaded project merges with the existing project. This ensures that all variable names are retained throughout the uploading process. If you upload to an empty target, all variables are assigned default names. For example, %R00001 is named R00001.

Want to know more? In the Help Index, look up "uploading from PLC".



Run/Stop

You can set a target PLC to Run or Stop mode. In Stop mode, you can choose to enable or disable the outputs.

If you are starting a PACSystems™ RX7i or Series 90™-70 PLC, you can choose to have outputs enabled or disabled.

To start a PLC

- In the Project tab of the Navigator, right-click a target, point to **Online Commands** or to **Offline Commands**, and then choose **Start PLC**.

  The target PLC begins executing its program.

To stop a PLC

1. In the Project tab of the Navigator, right-click a target, point to **Online Commands** or to **Offline Commands**, and choose **Stop PLC**.

   The Stop PLC dialog box appears, prompting you to enable or disable the PLC's outputs.
2. Select an option.
3. Click **OK**.

   The target PLC stops executing its program.

Want to know more? In the Help Index, look up "starting the PLC" and "stopping the PLC".

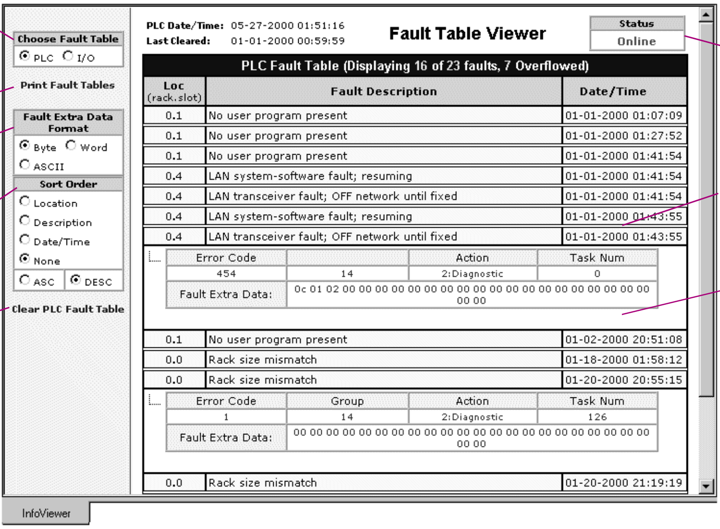
Fault Tables

The PLC and I/O Fault Tables display fault information logged by the CPU or modules in the PLC. This information is used to determine if there are problems with the PLC hardware or software running in the PLC's CPU. To view the PLC and I/O fault tables, your computer must be online to the PLC.

To view the fault table reports

- In the Project tab of the Navigator, right-click the target you want to report on and choose **Diagnostics**.

The fault table appears in the InfoViewer window.



Choose the type of fault information you require.

Print fault table by clicking here.

Select the format of fault data.

Sort fault information.

Clear fault information by clicking here.

Indicates online status of PLC.

View the date and time of the faults.

Double-click a row to view details of faults.

Choose Fault Table
● PLC ○ I/O

Print Fault Tables

Fault Extra Data Format
● Byte ○ Word
○ ASCII

Sort Order
○ Location
○ Description
○ Date/Time
● None
○ ASC ● DESC

Clear PLC Fault Table

PLC Date/Time: 05-27-2000 01:51:16
Last Cleared: 01-01-2000 00:59:59

Fault Table Viewer

Status
Online

PLC Fault Table (Displaying 16 of 23 faults, 7 Overflowed)

Loc (rack.slot)	Fault Description	Date/Time
0.1	No user program present	01-01-2000 01:07:09
0.1	No user program present	01-01-2000 01:27:52
0.1	No user program present	01-01-2000 01:41:54
0.4	LAN system-software fault; resuming	01-01-2000 01:41:54
0.4	LAN transceiver fault; OFF network until fixed	01-01-2000 01:41:54
0.4	LAN system-software fault; resuming	01-01-2000 01:43:55
0.4	LAN transceiver fault; OFF network until fixed	01-01-2000 01:43:55

Error Code		Action	Task Num
454	14	2:Diagnostic	0
Fault Extra Data:	0c 01 02 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00		

Loc (rack.slot)	Fault Description	Date/Time
0.1	No user program present	01-02-2000 20:51:08
0.0	Rack size mismatch	01-18-2000 01:58:12
0.0	Rack size mismatch	01-20-2000 20:55:15

Error Code	Group	Action	Task Num
1	14	2:Diagnostic	126
Fault Extra Data:	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00		

Loc (rack.slot)	Fault Description	Date/Time
0.0	Rack size mismatch	01-20-2000 21:19:19

Want to know more? In the Help Index, look up "fault", then select "Working with the Fault Tables".

Reference View Tables

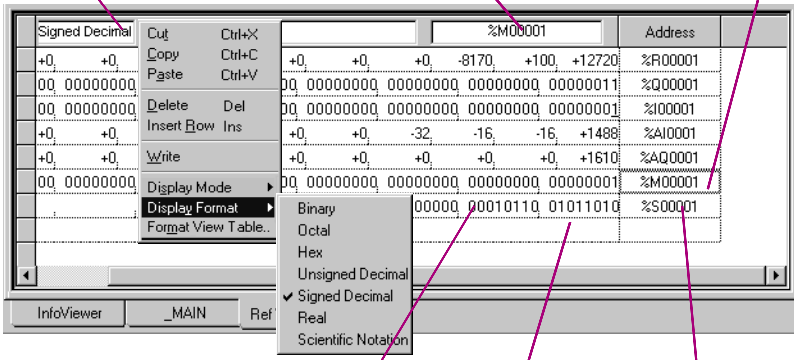
The Reference View Tables (RVTs) are tables of reference addresses that can be monitored and changed in real-time. In the Project tab of the Navigator the Reference View Tables folder contains a Default Tables folder and you can add user-defined tables to the Reference View Tables folder. A target can have zero or more user-defined RVTs.

The number of entries contained in an RVT does not affect performance. Performance is affected only by the number of entries that are displayed and have to be updated in the view.

An RVT displays data when the parent GE Fanuc PLC target is active and online.

You can configure the appearance of your RVTs in the Options tab of the Navigator.

Data values at sequential addresses are displayed, by default, from right to left, starting at the reference address specified. Both default and user-defined RVTs display rows of 8 cells for discrete memory and rows of 10 cells for register memory. The amount of data displayed in the columns depends on the data display format.



Signed Decimal							%M00001	Address
+0,	+0,	+0,	+0,	+0,	-8170,	+100,	+12720	%R00001
00	00000000		00	00000000	00000000	00000000	00000011	%Q00001
00	00000000		00	00000000	00000000	00000000	00000001	%I00001
+0,	+0,	+0,	+0,	-32,	-16,	-16,	+1488	%AI0001
+0,	+0,	+0,	+0,	+0,	+0,	+0,	+1610	%AQ0001
00	00000000		00	00000000	00000000	00000000	00000001	%M00001
					00000	00010110	01011010	%S00001

Format of selected address

Selected address

Starting Address

Subsequent addresses are displayed right to left by default.

This is the data at the starting address.

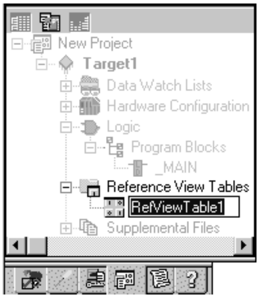
Display format can be selected for individual cells or the entire table.

To create a user-defined Reference View Table

- In the Project tab of the Navigator, right-click on the Reference View Tables folder and choose **New**.

  A new Reference View Table with a default name is added to the folder.

To work with a Reference View Table



Navigator: Project Tab

Reference View Table node

1. n the Project tab of the Navigator, expand the Reference View Tables folder and double-click the table you want to view.

   The Reference View Table appears in the Machine Edition main window.

2. Add reference addresses to the table as required.

   Note: You cannot add reference addresses to a default RVT.

3. Format the table entries as desired.

Want to know more? In the Help Index, look up "RVT", then select "Working with Reference View Tables.

Reports

Reports provide summaries and tables of information about your project. Most reports are displayed in the InfoViewer window (see page 20). The Reports tab of the Feedback Zone contains a list of all reports generated since the last Machine Edition project was opened. The following list shows the types of reports and logic printouts available in Logic Developer - PLC:

Address Use report

Hardware Configuration report

Variables report(s)

CAM profile report

C block report*

IL block report*

Local Logic block report *

Motion block report*

Online Force Report

Notes

- An asterisk (*) indicates a logic printout.
- Reports are not generated for LD blocks. Rather, these blocks are printed directly from the Program Blocks node.

To generate reports

- In the Project tab of the Navigator, right-click a node and choose **Report** to generate a report on that node.

  A report is automatically generated and displayed in the InfoViewer.

Note: To generate an Online Force report for a target, you must be online to the target. Right-click the target, point to Online Commands, and then choose Online Force Report.

To redisplay a previously generated report

1. In the Feedback Zone, double-click the Reports tab.

   A list of previously generated reports appears in the Feedback Zone.

2. From the list choose the report you want to view.

   The report displays in the Infoviewer.

   Many items in a report contain hyperlinks. Click a hyperlinked item to jump to that item in the project. For example, if a variable's name appears hyperlinked in a report, clicking it selects that variable in the Variables tab of the Navigator.

   Large reports are often separated into several pages. To view a different page of the report, scroll to the bottom of the report in the InfoViewer and click the number of the page you want to view.

To print a report displayed in the InfoViewer

1. Do one of the following:

   - Generate the report you want to print.

   - OR -

   - Redisplay a previously generated report.

2. When the report is displayed, right-click the InfoViewer window and select **Print**.

Want to know more? In the Help Index, look up “Reports”.

To print LD Blocks

1. In the Project tab of the Navigator, expand the Logic node.
2. Right-click the Program Blocks node and choose **Print LD Blocks**.

   The Print dialog box appears.

3. Select the blocks to print.

   - To print all of the target's LD blocks, select the **All** option.
   - To print only some of the target's LD blocks, select the **Selection** option, then select the check box in front of each block you want to print.

4. Select options as required and click **OK**.

Want to know more? In the Help Index, look up “printing LD logic”.

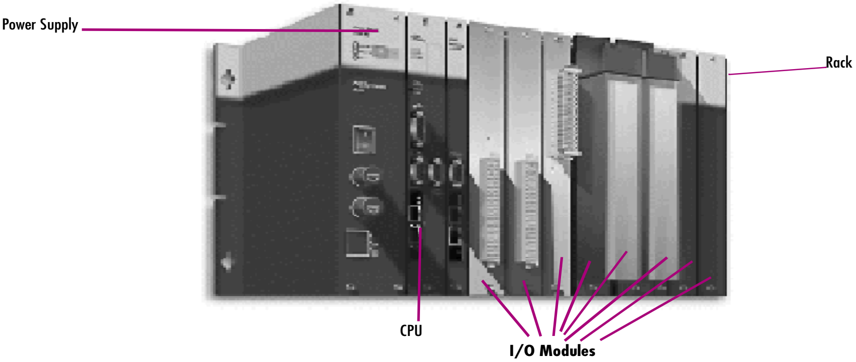
4 Hardware Configuration (HWC)

Logic Developer - PLC supports six GE Fanuc PLC families and various remote I/O interfaces (see page 59) with a variety of CPUs, racks and modules for each. In order to operate, PLC hardware must be configured with Logic Developer - PLC or some other GE Fanuc tool. The HWC component of Logic Developer - PLC provides a way to completely configure your target equipment. This chapter details specifics on configuring PLC hardware for your operational needs.

The first step in configuring PLC hardware is to select the PLC you want to configure (see page 24). When creating a new project, you can use a project template containing default hardware configuration, or you can create an empty project and configure it manually.

PACSystems™ RX7i

The PACSystems™ RX7i, pictured below, is the newest family of GE Fanuc PLCs. Most of its features are based on the features of the Series 90™-70 PLC family. The PACSystems™ RX7i's Ethernet capabilities are based on the Series 90™-30 CPU364.



The PACSystems™ RX7i consists of a main rack and up to seven expansion racks. The PACSystems™ RX7i supports two types of main racks, IC698CHS017 and IC698CHS117. It supports five types of expansion racks, all of them Series 90™-70 racks. All main racks and expansion racks support three non-intelligent Series 90™-70 fan kits.

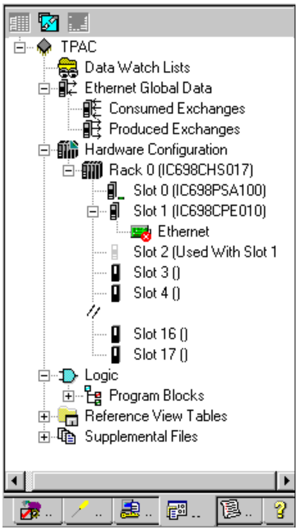
The PACSystems™ RX7i main racks have 18 single-width VME slots. Slot 0 supports two power supply modules: IC698PSA100 and IC698PSA350. Slots 1 and 2 are used to house a double-width CPU. PACSystems™ RX7i supports two CPUs IC698CPE010 (300 mHz) and IC698CPE020 (700 mHz). The PACSystems™ RX7i communicates through Ethernet only and the CPU has an embedded Ethernet adapter. In addition to the Ethernet adapter, up to three IC698ETM001 Ethernet modules can be installed in a PACSystems™ RX7i main rack. The Ethernet modules occupy only one slot. All of the IC698 modules are supported only on the main racks.

PACSystems™ RX7i supports several Series 90™-70 modules. Each one is double-width, that is, it occupies two slots on the main rack, but it occupies only one slot on a Series 90™-70 expansion rack. You can plug double-width modules into any two adjacent slots of the main rack except slots 0, 1, or 2. Because slot 17 is a double-width slot, any module in slot 17 occupies only slot 17. Slot 17 can also accept a single-width module.

PACSystems™ RX7i supports the following Series 90™-70 bus expansion modules:

- IC697BEM711
- IC697BEM713

In addition to the Series 90™-70 support, PACSystems™ also supports numerous Genius devices.



Navigator: Project Tab displaying the HWC node of a PACSystems™ RX7i

Configuring PACSystems™ RX7i Hardware

When you create a target with a PACSystems™ RX7i rack system, the default HWC consists of the main rack, with a power supply in slot 0 and a single CPU in slots 1 and 2. You can change the default power supply and CPU, and add single-width or double-width modules. You can add up to seven secondary racks, and on each of these, you can add Series 90™-70 modules.

Note: On PACSystems™ RX7i targets, only one rack is added by default. On Series 90™-70 and Series 90™-30 PLCs, seven secondary racks are added by default to the HWC. You do not need to add them.

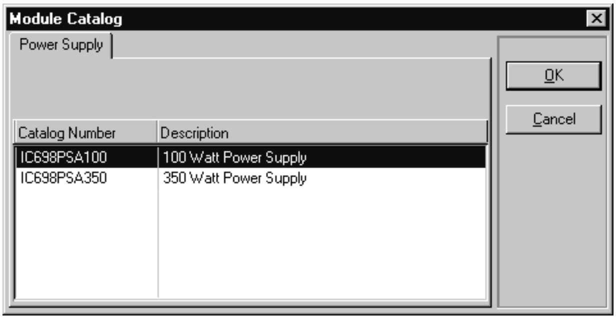
The configuration of the PACSystems™ RX7i is detailed in the following procedures. Configuration procedures for the other PLC types supported by Logic Developer - PLC are almost identical.

To choose a power supply

The default power supply for the PACSystems™ RX7i is the PSA100. To change the power supply:

1. In the Project tab of the Navigator, right-click Slot 0 and choose **Replace Module**.

   A list of available power supplies appears.

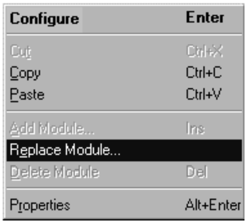


Catalog Number	Description
IC698PSA100	100 Watt Power Supply
IC698PSA350	350 Watt Power Supply

Note: For other GE Fanuc PLC families, there is no Slot 0. Right-click the PWR node instead.

2. Select the power supply you have installed in your rack and click **OK**.

To choose a CPU



HWC right-click menu

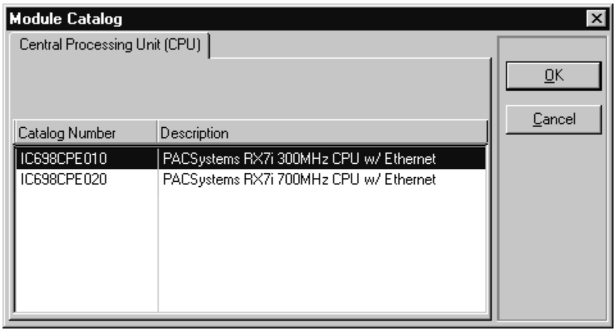
The default CPU specified in all project templates for a PACSystems™ RX7i is the CPE010. To change the CPU:

1. In the Project tab of the Navigator, expand the Hardware Configuration folder.

   All racks are revealed.

2. Expand the Main rack.
3. Right-click Slot 1 and choose **Replace Module**.

The Module Catalog dialog box appears.



Module Catalog

Central Processing Unit (CPU)

Catalog Number	Description
IC698CPE010	PACSystems RX7i 300MHz CPU w/ Ethernet
IC698CPE020	PACSystems RX7i 700MHz CPU w/ Ethernet

4. From the list, select a CPU.
5. Click **OK**.

   A dialog box appears asking if you want to retain the settings from the existing CPU.
6. Click **Yes** or **No**.

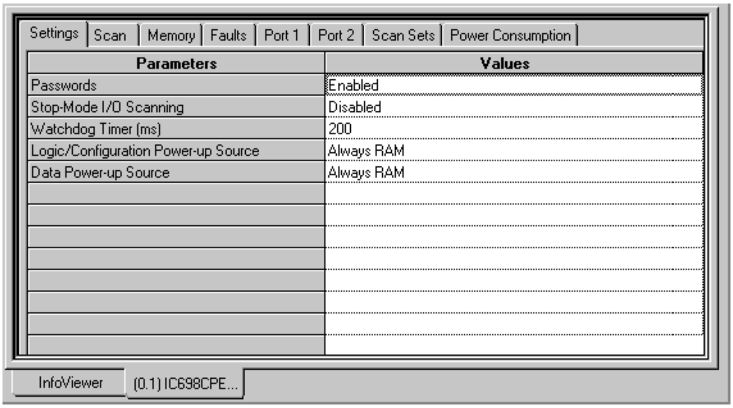
   Note: On targets other than PACSystems™, you are prompted to confirm the replacement.

   The target is configured with the selected CPU.

To configure a CPU

1. In the Project tab of the Navigator, right-click a slot containing a CPU and choose **Configure**.

   The Parameter editor appears showing all configurable settings for the CPU.



Parameters	Values
Passwords	Enabled
Stop-Mode I/O Scanning	Disabled
Watchdog Timer (ms)	200
Logic/Configuration Power-up Source	Always RAM
Data Power-up Source	Always RAM

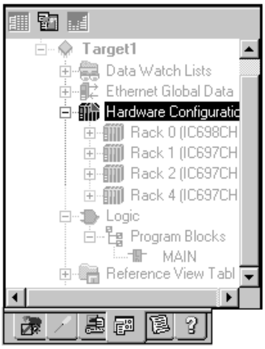
2. Modify the settings as required. For information on any parameter, select the parameter.

   Help is displayed in the Companion.

   Tip: To open the Companion, press SHIFT+F11.

To add a secondary rack (PACSystems™ RX7i only)

Note: On Series 90™-70 and Series 90™-30 PLCs, seven secondary racks are added by default to the HWC. You do not need to add them.

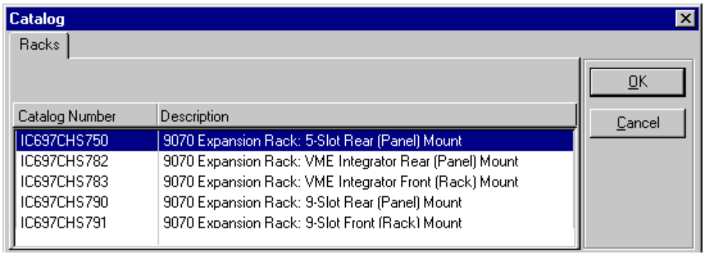


Navigator: Project tab

PACSystems™ HWC configuration

1. In the Project tab of the Navigator, right-click the HWC node and choose **Add Rack**.

   The Module Catalog dialog box appears listing available rack types.

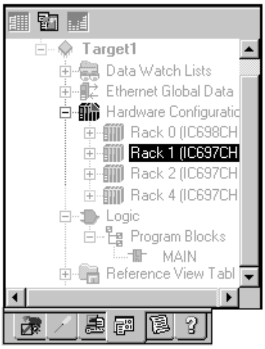


Catalog Number	Description
IC697CHS750	9070 Expansion Rack: 5-Slot Rear (Panel) Mount
IC697CHS782	9070 Expansion Rack: VME Integrator Rear (Panel) Mount
IC697CHS783	9070 Expansion Rack: VME Integrator Front (Rack) Mount
IC697CHS790	9070 Expansion Rack: 9-Slot Rear (Panel) Mount
IC697CHS791	9070 Expansion Rack: 9-Slot Front (Rack) Mount

2. Select a rack and click **OK**.

   The Series 90™-70 expansion rack is added to the PACSystems™ RX7i rack system. It is assigned an available number in the range of 1 through 7, excluding numbers already assigned to other expansion racks.

To replace a rack

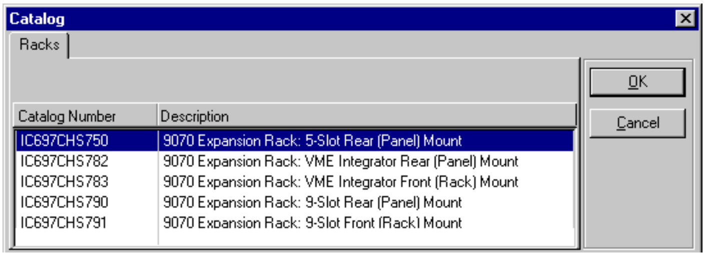


Navigator: Project tab

HWC configuration

1. In the Project tab of the Navigator, right-click a rack node and choose **Replace Rack**.

   The Module Catalog dialog box appears listing available rack types.



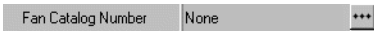
Catalog Number	Description
IC697CHS750	9070 Expansion Rack: 5-Slot Rear (Panel) Mount
IC697CHS782	9070 Expansion Rack: VME Integrator Rear (Panel) Mount
IC697CHS783	9070 Expansion Rack: VME Integrator Front (Rack) Mount
IC697CHS790	9070 Expansion Rack: 9-Slot Rear (Panel) Mount
IC697CHS791	9070 Expansion Rack: 9-Slot Front (Rack) Mount

2. Select a rack and click **OK**.

To add a fan kit to a rack (PACSystems™ RX7i only)

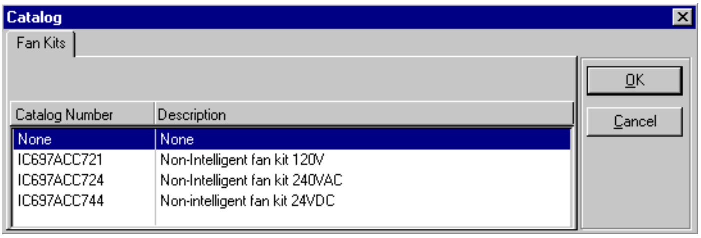
1. In the Project tab of the Navigator, expand the Hardware Configuration folder.
2. Right-click a rack and choose **Properties**.

   The rack's properties are displayed in the Inspector.
3. In the Inspector, to the right of the Fan Catalog Number property, click ⋯.

   Fan Catalog Number None ⋯

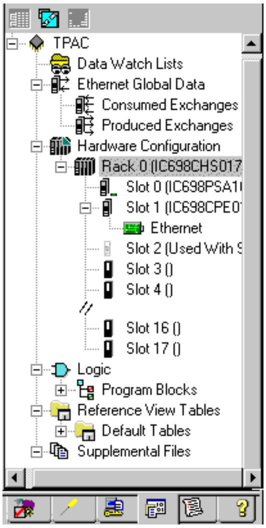
   The Fan Kits catalog opens.

Catalog Number	Description
None	None
IC697ACC721	Non-Intelligent fan kit 120V
IC697ACC724	Non-Intelligent fan kit 240VAC
IC697ACC744	Non-intelligent fan kit 24VDC
4. Select the fan kit you want to add and click **OK**.

   The fan kit is added to the rack.

To configure the Ethernet daughterboard (PACSystems™ RX7i only)



```
TPAC
  Data Watch Lists
  Ethernet Global Data
    Consumed Exchanges
    Produced Exchanges
  Hardware Configuration
    Rack 0 (IC698CHS017
      Slot 0 (IC698PSA1(
      Slot 1 (IC698CPE0'
        Ethernet
      Slot 2 (Used With S
      Slot 3 ()
      Slot 4 ()
      //
      Slot 16 ()
      Slot 17 ()
  Logic
    Program Blocks
  Reference View Tables
    Default Tables
  Supplemental Files
```

Navigator: Project tab PACSystems™ Ethernet Daughterboard

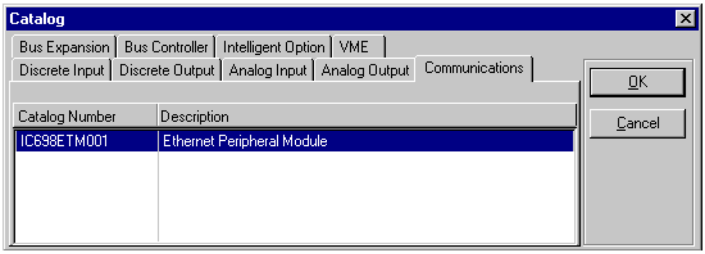
1. In the Project tab of the Navigator, expand the Hardware Configuration folder, then Rack 0 (the Main rack), and then Slot 1.
2. Double-click Ethernet adapter.

   The Parameter Editor window opens.
3. Configure the Ethernet adapter's parameters as needed.

To add an Ethernet module (PACSystems™ RX7i only)

1. In the Project tab of the Navigator, expand the Hardware Configuration folder and then Rack 0 (the Main rack).
2. Right-click the slot you want to add an Ethernet module to and choose **Add Module**.

   The Module Catalog opens.



Catalog

Catalog Number	Description
IC698ETM001	Ethernet Peripheral Module

3. In the Communications tab of the Module Catalog, select the Ethernet Module and click **OK**.

   The Ethernet module is added to the slot.
4. Double-click the Ethernet module (IC698ETM001).

   The Parameter Editor opens.
5. Configure the Ethernet module's parameters as needed.

Want to know more? In the Help Index, look up "configuring a PACSystems™ RX7i Rack System".

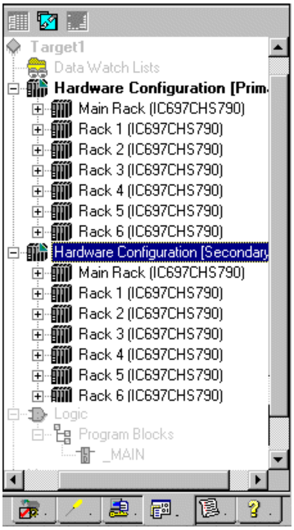
Redundancy (Series 90™-70 and PACSystems™ RX7i only)

In redundant systems, two units are set up and configured to share the responsibility of a single unit. If one unit fails or is taken offline, the other unit assumes responsibility without interrupting operation of the entire system.

There are three types of redundant systems:

- Basic CPU Redundancy (Series 90™-70 only)
- Genius Redundancy
- CPU Redundancy Over Genius (Series 90™-70 only)

Basic CPU Redundancy


Target1
Data Watch Lists
Hardware Configuration [Prim
Main Rack (IC697CHS790)
Rack 1 (IC697CHS790)
Rack 2 (IC697CHS790)
Rack 3 (IC697CHS790)
Rack 4 (IC697CHS790)
Rack 5 (IC697CHS790)
Rack 6 (IC697CHS790)
Hardware Configuration [Secondary
Main Rack (IC697CHS790)
Rack 1 (IC697CHS790)
Rack 2 (IC697CHS790)
Rack 3 (IC697CHS790)
Rack 4 (IC697CHS790)
Rack 5 (IC697CHS790)
Rack 6 (IC697CHS790)
Logic
Program Blocks
_MAIN

Navigation: Project Tab
HWC Node
CPU Redundancy
(Series 90™-70 only)

(Series 90™-70 CPUs CGR772 and CGR935 only.) To implement CPU redundancy, a single ◆ target is associated with two physical PLCs, a Primary and a Secondary. Both PLCs share the same logic, but each has its own Hardware Configuration (HWC): Primary or Secondary. The selected HWC is the HWC that you can go online with, download to, upload from, and so on.

Series 90™-70 rack systems support three types of basic CPU redundancy. These redundant systems can be used in combination with Genius redundancy schemes.

- Single Bus with Preferred Master - uses a single Genius bus with one or more bus controllers in each PLC. The primary unit is always chosen as the active unit when the units initially synchronize.
- Single Bus with Floating Master - uses a single Genius bus with one or more bus controllers in each PLC. No switchover occurs on initial synchronization to make the primary unit the active unit.
- Dual Bus with Floating Master - uses dual busses with one or more bus controllers in each PLC. No switchover occurs on initial synchronization. Bus Switching Modules (BSMs) are required in accordance with configuration of a dual bus network. This option provides redundancy of both the PLC and the I/O bus.

Genius Redundancy

(PACSystems™ RX7i and Series 90™-70.) A redundant Genius system contains duplicate components that are controlled in a way that keeps the Genius system operating properly even if one of the duplicate components fails or is taken out of service. Redundant Genius systems can be used in combination with Series 90™-70 redundant CPU systems.

You can configure five types of redundant Genius systems:

- Genius Dual Bus Redundancy (Paired GBC Internal)
- Genius Dual Bus Redundancy (Paired GBC External)
- Genius Dual GBC Redundancy (Paired GBC Internal)
- Genius Dual GBC Redundancy (Paired GBC External)
- Genius Dual Bus & Dual GBC Redundancy

CPU Redundancy Over Genius

(Series 90™-70 only.) A CPU Redundancy Over Genius system contains duplicate components that are controlled in a way that keeps the system operating properly if one of the duplicate components fails or is taken out of service.

Five types of CPU Redundancy Over Genius systems can be built upon the various types of redundant Genius systems combined with the basic CPU Redundancy schemes.

- CPU Redundancy (GHS) Using Genius Dual GBC Redundancy (Paired GBC External) - Single Bus with Preferred Master
- CPU Redundancy (GDB) using Genius Dual GBC Redundancy (Paired GBC External) - Single Bus with Floating Master
- CPU Redundancy (GDB) using Genius Dual Bus Redundancy (Paired GBC External) - Single Bus with Floating Master
- CPU Redundancy (GDB) using Genius Dual Bus and Dual GBC Redundancy - Dual Bus with Floating Master
- CPU Redundancy (GDB) using a Mixed Genius Redundancy Scheme

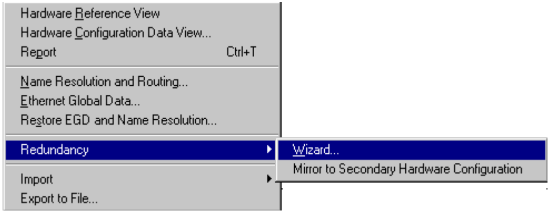
Want to know more? In the Help Index, look up “Redundant HWC Overview”.

Configuring Redundant Systems

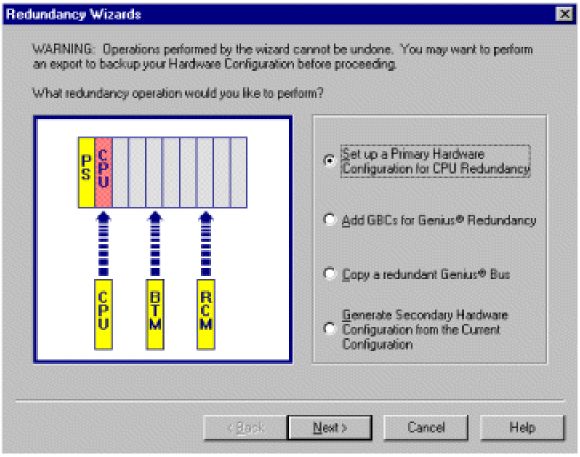
The procedures below are the general steps to follow for configuring redundant systems. For the procedures on configuring specific redundancy sytems, see the online help.

To set up the primary hardware configuration for CPU redundancy (Series 90™-70 only)

1. In the Project tab of the Navigator, expand the target node for which you want to set up CPU redundancy.
2. Right-click Hardware Configuration, point to **Redundancy**, and choose **Wizard**.


Hardware Reference View
Hardware Configuration Data View...
Report Ctrl+T
Name Resolution and Routing...
Ethernet Global Data...
Restore EGD and Name Resolution...
Redundancy
Import
Export to File...
Wizard...
Mirror to Secondary Hardware Configuration

The Redundancy Wizards dialog box opens, with the **Set up a Primary Hardware Configuration for CPU Redundancy** option selected by default.


Redundancy Wizards

WARNING: Operations performed by the wizard cannot be undone. You may want to perform an export to backup your Hardware Configuration before proceeding.

What redundancy operation would you like to perform?

● Set up a Primary Hardware Configuration for CPU Redundancy

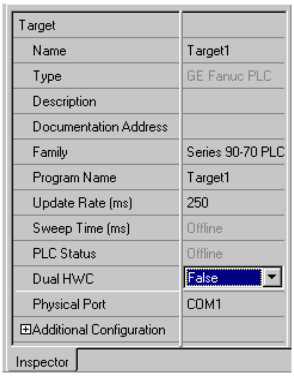
○ Add GBCs for Genius® Redundancy

○ Copy a redundant Genius® Bus

○ Generate Secondary Hardware Configuration from the Current Configuration

3. Click **Next** and follow the wizard to the end. The wizard adds a redundant CPU, the Bus Transmitter Module (BTM) and the Redundancy Communications Module (RCM) to the configuration.

   Note: The target property, **Dual HWC**, is now available in the Inspector and is set to False.

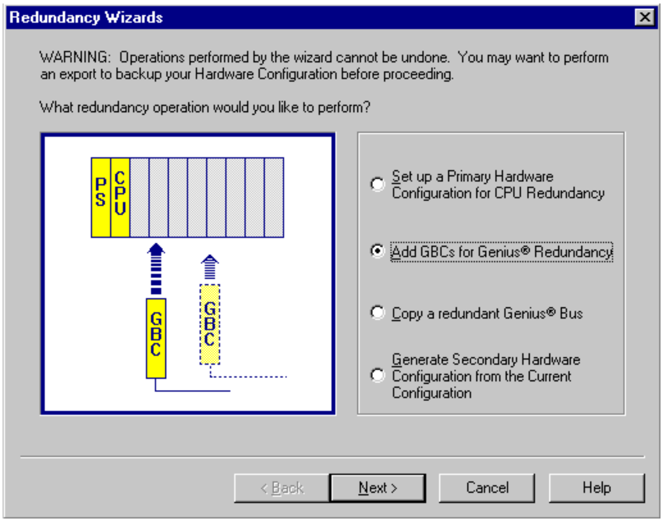


Target	
Name	Target1
Type	GE Fanuc PLC
Description	
Documentation Address	
Family	Series 90-70 PLC
Program Name	Target1
Update Rate (ms)	250
Sweep Time (ms)	Offline
PLC Status	Offline
Dual HWC	False
Physical Port	COM1
⊞Additional Configuration	

Adding Genius Bus Controllers (GBC) to your system (PACSystems™ RX7i and Series 90™-70)

1. In the Project tab of the Navigator, expand the target for which you want to set up redundancy.
2. Right-click Hardware Configuration, point to **Redundancy**, and choose **Wizard**.

   The Redundancy Wizards dialog box appears.



Redundancy Wizards

WARNING: Operations performed by the wizard cannot be undone. You may want to perform an export to backup your Hardware Configuration before proceeding.

What redundancy operation would you like to perform?

○ Set up a Primary Hardware Configuration for CPU Redundancy

● Add GBCs for Genius® Redundancy

○ Copy a redundant Genius® Bus

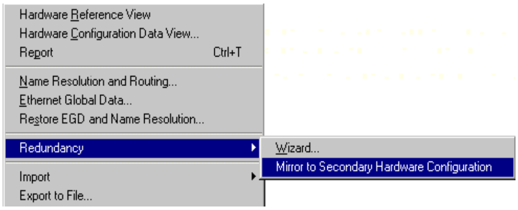
○ Generate Secondary Hardware Configuration from the Current Configuration

3. Select **Add GBCs for Genius Redundancy**.
4. Click **Next** and follow the wizard to the end. The wizard allows you to select a Genius redundancy scheme and the location of the GBC modules. You can run this wizard multiple times to configure additional pairs of redundant busses in the same system.

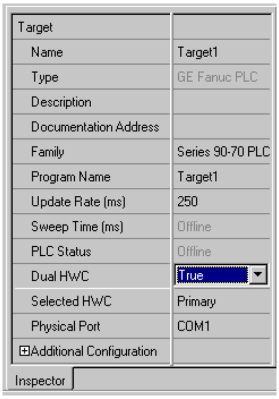
   Note: When you add a Genius Bus Controller (GBC) to a Series 90™-70 rack, a new Genius bus network is automatically created and associated with that slot and GBC module. Up to 31 Genius I/O devices (blocks) can be connected to a GBC through its Genius bus.

Configuring the secondary hardware configuration (Series 90™-70 only)

1. In the Project tab of the Navigator, select the Hardware Configuration folder.
2. Right-click Hardware Configuration, point to **Redundancy**, and choose **Mirror to Secondary Hardware Configuration**.


Hardware Reference View
Hardware Configuration Data View...
Report Ctrl+T
Name Resolution and Routing...
Ethernet Global Data...
Restore EGD and Name Resolution...
Redundancy
Import
Export to File...
Wizard...
Mirror to Secondary Hardware Configuration

A secondary rack system that is a copy of the primary rack system is generated. The target now displays two Hardware Configurations (HWCs), one labeled [Primary] and the other, [Secondary]. The Primary HWC is bolded because it is currently selected. The target property, **Dual HWC**, is now set to True.



Target	
Name	Target1
Type	GE Fanuc PLC
Description	
Documentation Address	
Family	Series 90-70 PLC
Program Name	Target1
Update Rate (ms)	250
Sweep Time (ms)	Offline
PLC Status	Offline
Dual HWC	True
Selected HWC	Primary
Physical Port	COM1
⊞Additional Configuration	

Note: You can mirror as many times as necessary to synchronize the two HWCs after modifying the primary HWC. Each time you mirror the primary HWC, the secondary HWC is updated to reflect those changes.

Want to know more? In the Help Index, look up “Redundancy”.

Series 90™-30: DSM314 Motion Module

The Series 90™-30 supports a module which no other GE Fanuc PLC family supports: the Motion Mate DSM314 (see page 91). The DSM314 is a high performance, easy-to-use multi-axis motion control module. Compatible with Series 90™-30 PLC logic solving and communications functions, the DSM314 supports the following servo types:

- Digital - GE Fanuc digital servo amplifiers and motors.
- Analog - GE Fanuc SL Series analog servos and third-party servos.

The DSM314 Motion module has four axes that can be individually configured in Standard or Follower mode. It can control up to four analog mode servo axes or up to two digital mode servo axes. When axis one and two are controlling digital mode servos, axis three can control an analog servo.

In order to perform motion programming in Logic Developer - PLC, you must have a DSM314 motion module properly configured (see page 91).

To add a DSM314 motion module

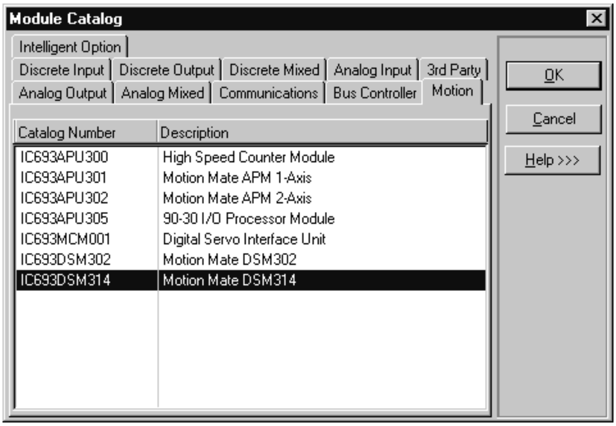
1. With a rack of the Hardware Configuration node expanded, right-click the empty slot you want to add a DSM314 motion module to and choose **Add Module**.

   The Module Catalog dialog box appears.

2. On the Module Catalog dialog box, click the Motion tab.

   A selection of motion modules appears in the Module Catalog dialog box.

3. From the list, select Motion Mate DSM314.



Catalog Number	Description
IC693APU300	High Speed Counter Module
IC693APU301	Motion Mate APM 1-Axis
IC693APU302	Motion Mate APM 2-Axis
IC693APU305	90-30 I/O Processor Module
IC693MCM001	Digital Servo Interface Unit
IC693DSM302	Motion Mate DSM302
IC693DSM314	Motion Mate DSM314

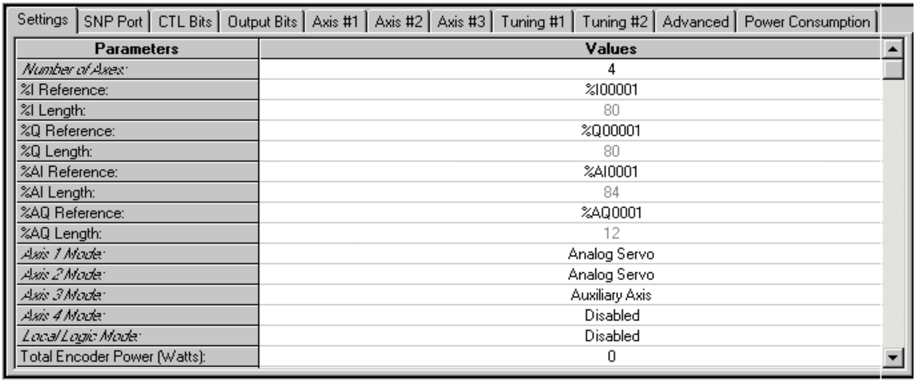
4. Click **OK**.

   A DSM314 is added to the hardware configuration of your project.

To configure a DSM314

1. In the Project tab of the Navigator, double-click the slot containing a Motion Mate DSM314.

   The Parameter editor appears.



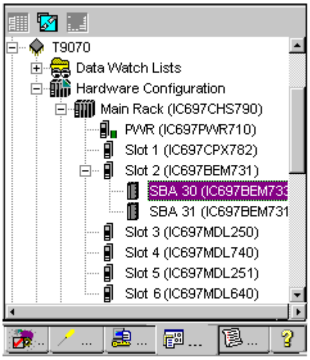
Parameters	Values
Number of Axes:	4
%I Reference:	%I00001
%I Length:	80
%Q Reference:	%Q00001
%Q Length:	80
%AI Reference:	%AI0001
%AI Length:	84
%AQ Reference:	%AQ0001
%AQ Length:	12
Axis 1 Mode:	Analog Servo
Axis 2 Mode:	Analog Servo
Axis 3 Mode:	Auxiliary Axis
Axis 4 Mode:	Disabled
Local Logic Mode:	Disabled
Total Encoder Power (Watts):	0

2. Configure the DSM314 by using the Parameter editor.

   Note: For details on configuring the DSM314, see *GFK-1742, Motion Mate DSM314 for Series 90-30 PLCs Users Manual* .

Series 90™-70 Genius Remote I/O Scanner

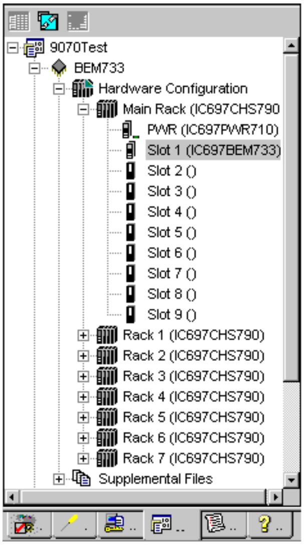
A Remote I/O Scanner (IC697BEM733) is a Genius device that is part of a Genius Bus system. As such, it is added as a Genius device to the Genius Bus Controller (GBC) and it is represented in Logic Developer - PLC by an SBA node under the GBC node in a Series 90™-70 target.



```
T9070
  Data Watch Lists
  Hardware Configuration
    Main Rack (IC697CHS790)
      PWR (IC697PWR710)
      Slot 1 (IC697CPX782)
      Slot 2 (IC697BEM731)
        SBA 30 (IC697BEM733
        SBA 31 (IC697BEM731
      Slot 3 (IC697MDL250)
      Slot 4 (IC697MDL740)
      Slot 5 (IC697MDL251)
      Slot 6 (IC697MDL640)
```

Navigator: Series 90™-70 Remote I/O Scanner as a Genius device under a GBC

A Remote I/O Scanner resides in Slot 1 of the main rack of a Series 90™-70 PLC. I/O modules can be inserted into the other slots of the main rack and on all the slots of the other racks. As such, the Remote I/O Scanner is represented by a target in the Project tab of the Navigator, and is also represented by a module in slot 1 of the main rack of that target.



```
9070Test
  BEM733
    Hardware Configuration
      Main Rack (IC697CHS790
        PWR (IC697PWR710)
        Slot 1 (IC697BEM733)
        Slot 2 ()
        Slot 3 ()
        Slot 4 ()
        Slot 5 ()
        Slot 6 ()
        Slot 7 ()
        Slot 8 ()
        Slot 9 ()
      Rack 1 (IC697CHS790)
      Rack 2 (IC697CHS790)
      Rack 3 (IC697CHS790)
      Rack 4 (IC697CHS790)
      Rack 5 (IC697CHS790)
      Rack 6 (IC697CHS790)
      Rack 7 (IC697CHS790)
    Supplemental Files
```

Navigator: Series 90™-70 Remote I/O Scanner as a target and as a module in Slot 1 of the main rack

To set up a Remote I/O Scanner

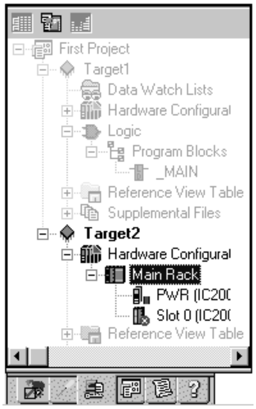
1. Add the Remote I/O Scanner as a Genius device to the GBC.
2. When prompted to add a new target for the Remote I/O Scanner, click **Yes**.

   Logic Developer - PLC automatically sets up some of the properties that link the Remote I/O Scanner to its GBC.
3. Set up the SBA to the same value to the Remote I/O Scanner as a target and to the Remote I/O Scanner as a Genius Device.

   Now whenever you update the I/O map on the Remote I/O Scanner, the I/O map is automatically updated to the GBC.
4. Configure the Remote I/O Scanner's target properties.
5. Add and configure the I/O on the Remote I/O Scanner's rack system.
6. Configure the Remote I/O Scanner's module properties.
7. Configure the properties of the Remote I/O Scanner as a Genius bus device.

Want to know more? In the Help Index, look up "IC697BEM733, Remote I/O Scanner".

VersaMax Remote I/O



Navigator: VersaMax Remote I/O

VersaMax remote I/O consists of a Network Interface Unit (NIU) (Ethernet, Genius or Profibus), and one or more I/O modules. If your target type is remote I/O, you can use Logic Developer - PLC to configure this hardware. Once configured, the remote I/O can be controlled from a PLC or PC controller. The differentiating factor between a VersaMax remote I/O and a PLC is that a remote I/O is simply an input/output device with a communication interface. Unlike a PLC, a remote I/O has no CPU.

When working with the VersaMax Remote I/O hardware configuration, Logic Developer - PLC enables you to add racks, configure the power supply and configure modules.

Remote I/O targets are generally added to a project when you create a project with a template (see page 12). You can add additional Remote I/O targets later.

To create a project containing a GE Fanuc Remote I/O target from a template

1. From the **File** menu, choose **New Project**.

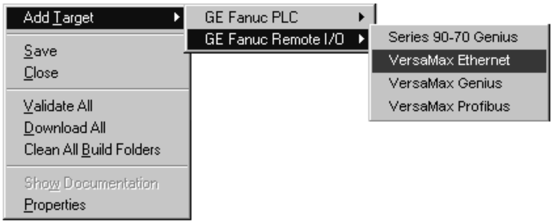
   The New Project dialog box appears.

2. From the Project Template list, choose the GE Fanuc Remote I/O you want to add to your project.
3. Enter a descriptive Project Name.
4. Click **OK**.

   A new Remote I/O project is started.

To add a GE Fanuc Remote I/O target to an existing project

1. In the Project tab of the Navigator, right-click the Project node.
2. Point to **Add Target**, then to **GE Fanuc Remote I/O,** and choose the remote I/O you want to add.

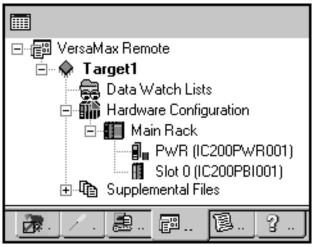


Note: The **Series 90-70 Genius** option is a Series 90™-70 Remote I/O Scanner (see page 57).

To replace the power supply for your remote I/O configuration

1. In the Project tab of the Navigator, expand the Hardware Configuration node of the remote I/O.

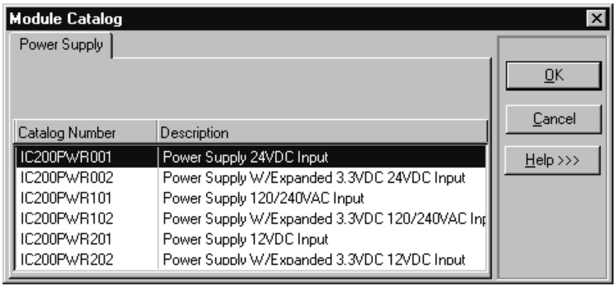
   The Navigator displays the following:



```
VersaMax Remote
  Target1
    Data Watch Lists
    Hardware Configuration
      Main Rack
        PWR (IC200PWR001)
        Slot 0 (IC200PBI001)
    Supplemental Files
```

2. Right-click the PWR node and choose **Replace Module**.

   The Module Catalogue dialog box appears:



Module Catalog

Power Supply

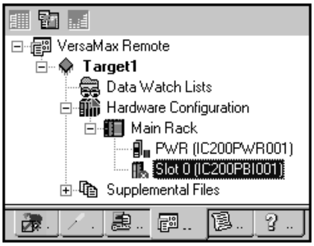
Catalog Number	Description
IC200PWR001	Power Supply 24VDC Input
IC200PWR002	Power Supply W/Expanded 3.3VDC 24VDC Input
IC200PWR101	Power Supply 120/240VAC Input
IC200PWR102	Power Supply W/Expanded 3.3VDC 120/240VAC Inp
IC200PWR201	Power Supply 12VDC Input
IC200PWR202	Power Supply W/Expanded 3.3VDC 12VDC Input

3. From the list, select the power supply that you want to configure for your system.

To add a new Carrier/Base to your VersaMax Remote I/O

1. In the Project tab of the Navigator, select a remote I/O target.
2. Expand the Hardware Configuration node and the Main Rack node.

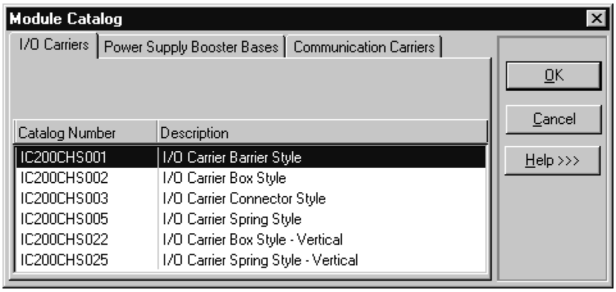
   The Navigator displays the following:



```
VersaMax Remote
  Target1
    Data Watch Lists
    Hardware Configuration
      Main Rack
        PWR (IC200PWR001)
        Slot 0 (IC200PBI001)
    Supplemental Files
```

3. Right-click the Slot 0 node and choose **Add Carrier/Base**.

The Module Catalog dialog box appears.



Catalog Number	Description
IC200CHS001	I/O Carrier Barrier Style
IC200CHS002	I/O Carrier Box Style
IC200CHS003	I/O Carrier Connector Style
IC200CHS005	I/O Carrier Spring Style
IC200CHS022	I/O Carrier Box Style - Vertical
IC200CHS025	I/O Carrier Spring Style - Vertical

4. Select the carrier/base that you want to add to the remote I/O target.

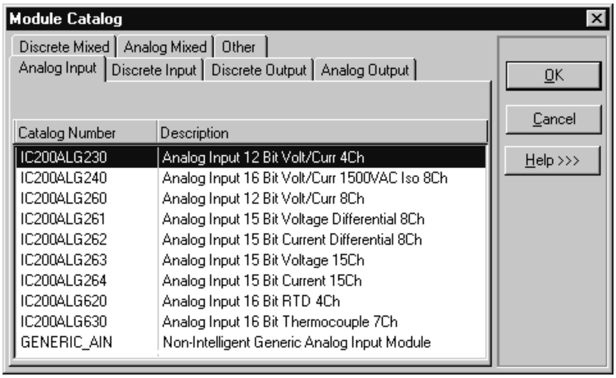
   Note: You can add a maximum of eight carrier modules to each VersaMax® rack.

5. Click **OK**.

To add a module to a carrier/base

1. Double-click an empty carrier/base.

   The Module Catalog appears.

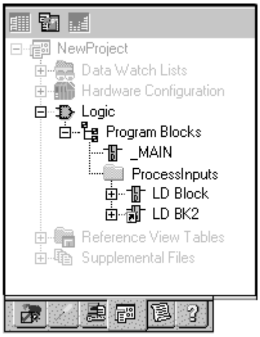


Catalog Number	Description
IC200ALG230	Analog Input 12 Bit Volt/Curr 4Ch
IC200ALG240	Analog Input 16 Bit Volt/Curr 1500VAC Iso 8Ch
IC200ALG260	Analog Input 12 Bit Volt/Curr 8Ch
IC200ALG261	Analog Input 15 Bit Voltage Differential 8Ch
IC200ALG262	Analog Input 15 Bit Current Differential 8Ch
IC200ALG263	Analog Input 15 Bit Voltage 15Ch
IC200ALG264	Analog Input 15 Bit Current 15Ch
IC200ALG620	Analog Input 16 Bit RTD 4Ch
IC200ALG630	Analog Input 16 Bit Thermocouple 7Ch
GENERIC_AIN	Non-Intelligent Generic Analog Input Module

2. From the Module Catalog list, select the module that you want to install.

Want to know more? In the Help Index, look up “Hardware Configuration”.

5 Logic Editors



The following logic types are supported by Logic Developer - PLC (not including motion programming) and are compiled and downloaded to the PLC represented by the associated GE Fanuc PLC target. The Logic folder of a GE Fanuc PLC target includes:

- Ladder Diagram (LD) Blocks
- Instruction List (IL) Blocks
- C Blocks
- C programs

These items will be downloaded to, and run on, the target. Each block and user program is a named section of executable code. Blocks can be grouped under user-defined folders in the Program Blocks folder. C programs are grouped under the main Logic folder.

Each target must contain one block or user program named "_MAIN". On any target except a release 6 or later Series 90™-70 PLC, the _MAIN block is first to execute when the project is downloaded to a PLC.

Depending on the type of target PLC, blocks other than"_ MAIN" can be scheduled for execution based on timer or I/O interrupts.

Note: On release 6 or later of Series 90™-70 PLCs, the LD program can be scheduled. That is, the Series 90™-70 PLC does not necessarily execute the _MAIN LD block first.

Want to know more? In the Help Index, look up "LD Program".

To create a user-defined folder

1. In the Project tab of the Navigator, expand the target with the logic you want to organize and then expand the Logic folder.
2. Right-click the Program Blocks folder, point to **New**, and choose **Folder**.

   A new user-defined folder appears with a default name.
3. Optionally enter a new folder name, which must be unique among the folders directly under the Program Blocks folder.

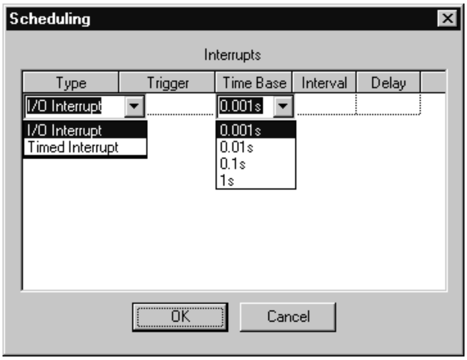
Want to know more? In the Help Index, look up "PLC" then choose "Organizing Your PLC Logic".

To schedule execution of a logic block

1. In the Project tab of the Navigator, right-click an existing LD, C or IL block, and choose **Properties**.

   The block's properties appear in the Inspector.
2. In the Inspector, click the ••• button in the Scheduling property.

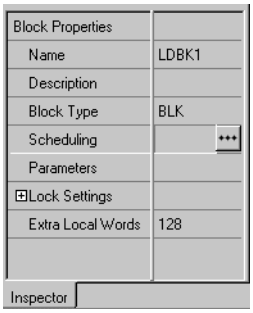
   The Scheduling dialog box appears.



Scheduling

Interrupts

Type	Trigger	Time Base	Interval	Delay
I/O Interrupt		0.001s		



Block Properties	
Name	LDBK1
Description	
Block Type	BLK
Scheduling	•••
Parameters	
⊞Lock Settings	
Extra Local Words	128

Inspector: IL, LD, C properties

3. Configure scheduling by entering values in each of the fields.

Want to know more? In the Help Index, look up "Scheduling."

To set access control

1. Right-click an LD, IL or C Block and choose **Properties**.
2. In the Inspector, expand the Lock Settings property.
3. In the Lock Type property, choose a setting from the list.
4. In the Password property, enter a password.

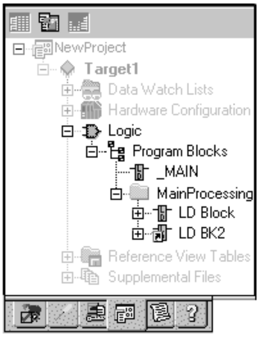
To search/replace in one block

1. Double-click an LD or IL block to open it.
2. From the **Search** menu, choose **Find** or **Replace**.
   A dialog box appears.
3. In the **Find what** or in the **Text to find** field, enter the text to find.
4. (Only if you want to replace text) In the **Replace with** field or in the **New text** field, enter the text to replace the found text with.
5. Select or clear each search/replace option, as required.
6. Click **Find**, **Find next**, **Replace**, **Replace All**, **Close**, or **Cancel**, as required.

   Note: Logic Developer - PLC provides the capability to search for some text in an entire target or portions thereof, which you can specify. Various options are available to narrow a search.

Want to know more? In the Help Index, look up "Global" and select the "Conducting a Global Search" help topic.

LD EDITOR



Navigator: Project tab

An LD Block

The Ladder Diagram (LD) editor is used to create programs with the Ladder Diagram programming language. LD logic graphically represents the programmed actions performed by a PLC as it executes.

The LD editor is cell-based with rungs constructed of horizontal sequences of instructions that are wired together. A given instruction and its operands can occupy one or more cells.

You can work with the LD editor while offline to edit a disk copy of a project, or while online to monitor the execution of the logic while you fine tune the project by making word-for-word changes (see page 73).

You can customize the appearance and behavior of the LD editor.

An LD block is a named section of LD Logic that is compiled and downloaded to the PLC represented by the associated target. The following table describes the number of blocks supported by each CPU type for a given target.

CPU Type	Number of Blocks	Maximum Number of Blocks
VersaMax	64 subroutine blocks plus one _MAIN block	65
Series 90™-30	64 subroutine blocks plus one _MAIN block	65
Series 90™-70	255 subroutine blocks plus one _MAIN block	256
PACSystems™	511 subroutine blocks plus one _MAIN block	512

To customize the LD editor

1. In the Options tab of the Navigator, expand the Editors folder and then the Ladder folder.
2. Right-click a page (Confirmations, Editing, Font and Colors, or View), and choose **Properties**.

   The configurable settings appear as properties in the Inspector.
3. In the Inspector, adjust settings as required.

To create an LD block

1. In the Project tab of the Navigator, right-click the Program Blocks folder point to **New**, and then choose LD Block.

A new LD block with a default name is created.

Note: If you use a template or add a target, the first block added to a target is named "_MAIN" and subsequent blocks added are named LDBK1, LDBK2, and so on, by default.

2. Rename the block as desired.

To open an LD block for editing

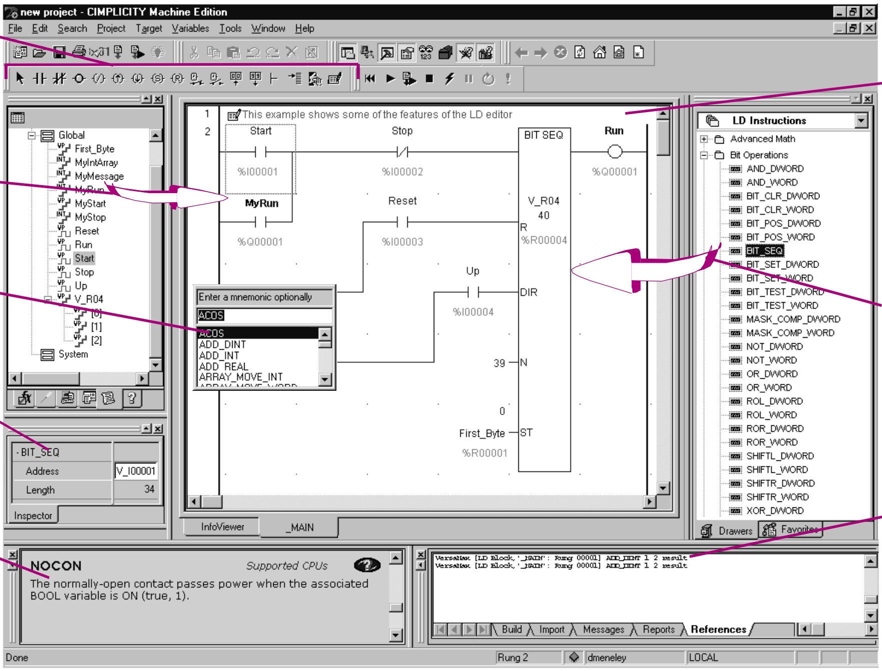
- In the Project tab of the Navigator, double-click an LD block.

The block opens in the LD editor.

Note: You can have multiple blocks open for editing. To navigate to another open LD block, click the tab that displays its name at the bottom of the editor window.

Working with the LD Editor Offline

While in offline mode, there is no live communication between the LD editor and the target. Most logic development is done while offline. The following diagram illustrates some of the more common operations you can perform using the ladder editor offline.



NOCON

The normally-open contact passes power when the associated BOOL variable is ON (true, 1).

```
VersaMax [LD Block, '_MAIN': Rung 00001] ADD_DINT 1 2 result
VersaMax [LD Block, '_MAIN': Rung 00001] ADD_DINT 1 2 result
```

Insert common instructions and wiring with the ladder instruction toolbar.

Drag variables to instruction operands to assign them.

Right-click to insert an instruction.

Use the Inspector to configure address and length for instructions

The Companion tracks your moves and provides information on what you click.

In-place editor comment rungs.

Drag LD instructions from the Toolchest.

Displays a list of the places the selected variable is used in the References tab of the Feedback Zone.

To insert an instruction

1. In the LD editor, right-click an empty cell and choose **Place Instruction**.

   A smart list appears listing all available instruction mnemonics.

2. Choose an instruction mnemonic from the list and press ENTER.

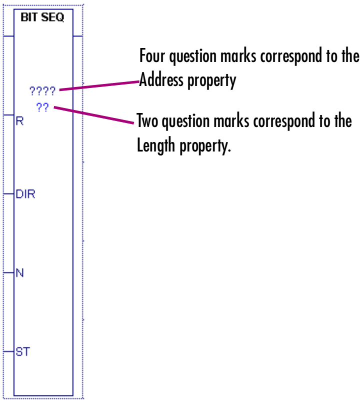
   Note: Only functions that have no inputs can be placed in the first column.

To configure an instruction's address and length properties

There are two methods to configure an instruction's address and length properties.

First method

1. In the LD editor, insert an instruction that requires Address and/or Length configuration.

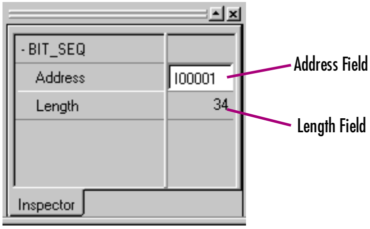


Four question marks correspond to the Address property

Two question marks correspond to the Length property.

2. Right-click the instruction and choose **Properties**.

   The Inspector displays the instruction's properties.



- BIT_SEQ	
Address	I00001
Length	34

Address Field

Length Field

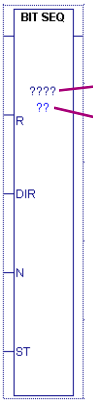
3. In the Address property, enter a variable name or a reference address to specify the start of a memory block.

   Note: If you type a reference address, it is converted to a variable name automatically.

4. In the Length property, enter the number of PLC registers that the instruction requires in the memory block.

Second method

1. In the LD editor, insert an instruction that requires Address and Length configuration.

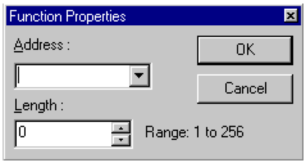


Four question marks correspond to the Address property

Two question marks correspond to the Length property.

2. Double-click the instruction or select it and press ENTER.

The Function Properties dialog box appears.



3. In the Address property, enter a variable name or a reference address to specify the start of a memory block.

Note: If you type a reference address, it is converted to a variable name automatically.

4. In the Length property, enter the number of PLC registers that the instruction requires in the memory block.

To assign variables to instruction operands

1. In the LD editor, double-click beside any operand of an instruction, or click there and press ENTER.

   A smart list appears prompting you to enter a variable name or reference address.

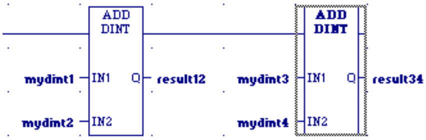
   Note: If the smart list that appears prompts you for a mnemonic, supply a contact or a wire.

2. Type, or choose from the list, a variable name or reference address.

   If you enter a reference address, a variable name will be automatically substituted.

Editing Logic as Text

You can enter LD logic into the LD editor by starting to type right into a cell. The smart list will appear and you can contirue type your instructions and operands. When you press ENTER, the logic you typed will appear in customary graphic form in the LD editor. For example, in the first cell of a new rung, if you type AD MyDint1 MyDint2 Result12;AD MyDint3 MyDint4 Result34, the following logic will appear in the LD editor:



A horizontal wire was inserted in the first cell to make room for the ADD_DINT insturction's operands and the operands were inserted in their proper places. In the keyboard entry, "AD" stood for "ADD_DINT", because it was the first available instruction that begins with "AD" in the smart list. A semicolon separates the ADD_DINT instructions. The required horizontal wires are supplied automatically..

Want to know more? In the Help Index, look up "Keyboard Method".

A powerful extension of typing logic into the LD editor is the ability to write LD logic in any text editor and copy and paste it into the LD editor, or to copy and paste logic from the LD editor to a text editor. You can copy an entire block of LD logic from the Navigator to any text editor, or copy sections of LD logic as text from the LD editor to any text editor. You can then edit the logic in the text editor and copy the edited logic back into the LD editor.

When LD logic is copied as text, a verbose format is used to make it easier to read, but when you edit the logic as text you can use the same shorthand used in the keyboard method of entering LD logic in the LD editor.

To copy an entire LD block as text

1. Validate the target to ensure that the LD block contains only valid logic.
2. In the Project tab of the Navigator, expand the target and expand the Logic folder.
3. Expand the Program Blocks folder and, if the LD block is in a user-defined folder, expand the user-defined folder.
4. Right-click the LD block and choose **Copy**.

   The contents of the LD block are copied to the Windows Clipboard.
5. Paste the contents of the Windows Clipboard into your text editor.

   The LD logic is pasted as text.

To copy a section of LD logic as text

1. Validate the target to ensure that the LD block contains only valid logic.
2. In the LD editor, select the cells that contain the logic you want to copy as text.
3. Right-click the selected logic and choose **Copy**.

   The LD logic is copied to the Windows Clipboard.
4. Paste the contents of the Windows Clipboard into your text editor.

   The LD logic is pasted as text.

To copy text into the LD editor

1. In the text editor, select and copy the LD logic to the Windows clipboard.
2. In the LD editor, do one of the following:
   - Select the cells that you want to overwrite.

   - OR -

   - Click the cell that will be the upper left corner of the LD logic you want to paste.
3. Right-click and choose Paste.

   Existing cells in the LD editor are overwritten with the contents of the Windows clipboard.

Want to know more? In the Help Index, look up “Copying LD Logic as Text: Overview”.

Working with the LD Editor Online

In online mode, there is a live communication connection to the target PLC enabling increased interaction with Logic Developer - PLC.

While online, the LD editor animates the LD logic to reflect program execution in the target PLC. Data values change in real time while coils and contacts indicate power flow. Many GE Fanuc targets also supports Run Mode Store (RMS), that is, they support the downloading of logic to a running target.

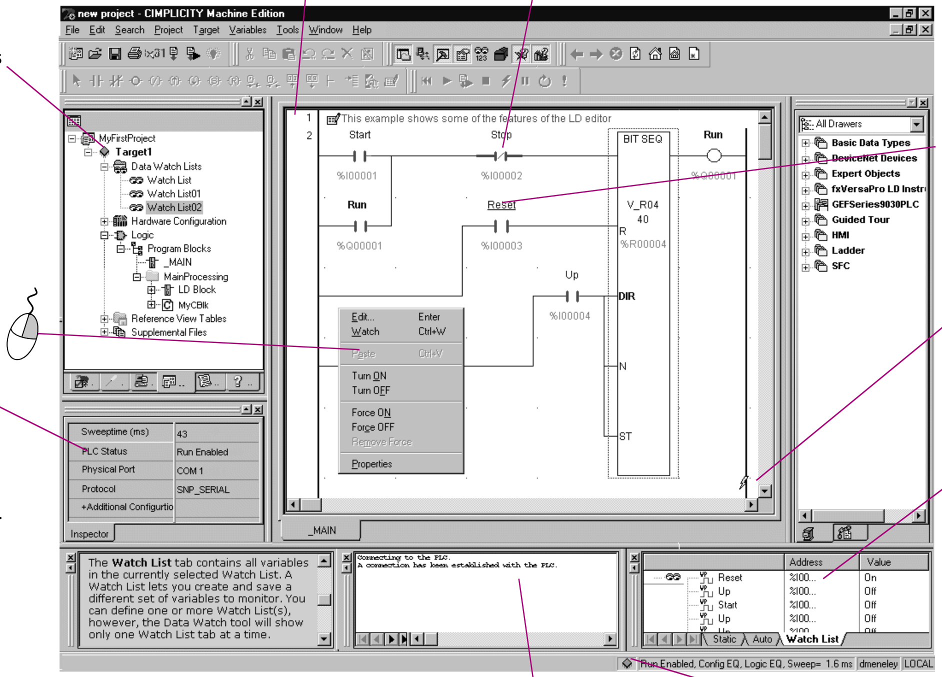
Three methods are at your disposal to make changes in your LD logic and download the changes to an online running PLC:

- **Online Editing** (PACSystems™ only): While you make your changes in your logic, the LD editor displays both the original logic and the modified logic, and the PACSystems™ executes the original logic. You can test your changes online, and the PACSystems™ retains an inactive copy of the original logic while executing the modified logic. You can then commit the modified logic permanently to the PACSystems™, or make the PACSystems™ revert back to the original logic, or cancel the test and continue editing the logic before testing the logic again or abandoning the modified logic.
- **Word-for-word changes:** Changes in the logic made while online that fit in the same amount of memory as the original logic. For example, changing an operand is usually a word-for-word change. You can make a word-for-word change and download it to the PLC while online without having to download all the logic.
- **Other logic changes:** Changes in the logic that do not fit in the same amount of memory as the original logic, for example, adding a new function in a rung or adding a new rung. Once you have completed a change, you can write the modified logic to the PLC while it is still running. (For some types of changes, you must stop the PLC and then download to it.)

To go online to a target PLC

- In the Project tab of the Navigator, right-click the Target and choose **Go Online**.

The grey target icon turns green to indicate that it is online. The status bar is updated to reflect the online status. The LD editor, if equal to the PLC, displays various online features, as shown in the following illustration:



Sweeptime (ms)	43
PLC Status	Run Enabled
Physical Port	COM 1
Protocol	SNP_SERIAL
+Additional Configurtio	

The **Watch List** tab contains all variables in the currently selected Watch List. A Watch List lets you create and save a different set of variables to monitor. You can define one or more Watch List(s), however, the Data Watch tool will show only one Watch List tab at a time.

```
Connecting to the PLC.
A connection has been established with the PLC.
```

	Address	Value
Reset	%I00...	On
Up	%I00...	Off
Start	%I00...	Off
Up	%I00...	Off

Run Enabled, Config EQ, Logic EQ, Sweep= 1.6 ms | dmeneley | LOCAL

Rung Number

State Flow is indicated by bolded lines.

Online Status is indicated by the color of the target icon.

A red, underlined variable indicates that it has been forced ON.

Right-click a variable to force it.

Online indicator

PLC status and sweep time are displayed in real-time in the Inspector.

Monitor and change values in real-time with the Data Watch tool.

Feedback Zone

PLC status is indicated in the status bar.

Word-for-Word Changes

Word-for-word changes may be completed online to PACSystems™, Series 90™-30, Series 90™-70, Series 90™ Micro, and VersaMax® modular PLCs. (VersaMax Nano/ Micro PLCs do not support word-for-word changes.)

Several of the changes to the program that do not modify its size are considered word-for-word changes. Examples include changing the type of contact or coil, or changing a reference address used for an existing function block.

To make word-for-word changes

1. While online to a target PLC, make a change to LD logic that does not change the logic size.

   You are prompted to download the change.

2. Click **Yes**.

   The changes are written to the PLC.

Writing Changes to a Target PLC

If you change the size of the program, you must write the changes to the PLC to maintain equality. You can do so whether the target is running or not. All PLC families support this run-mode store capability, but not every PLC in every family.

To write changes to the target PLC

1. While online to a target, make a change to LD logic.
2. In the Project tab of the Navigator, right-click the target, point to **Online Commands**, and choose **Write Changes**.

   New logic is immediately written to the PLC without stopping the PLC. If the LD logic was altered, other than a word-for-word change, you are prompted to download to the running PLC. The entire target is validated, but only the changed blocks are downloaded.

To turn on/off or force a variable

- In the LD editor, right-click a BOOL variable anywhere in LD logic and choose **Force ON**, **Force OFF**, **Turn ON**, or **Turn OFF**.

  Note: Forcing a variable ON or OFF overrides any actions the application may take during runtime. That is, if a variable is forced OFF (0), but LD logic is trying to turn it ON (1), it stays OFF.

Want to know more? In the Help Index, look up “Online Editing: an Overview” and “working online with LD editor: overview".

LD Functions

The following is a list of all LD functions available in Logic Developer - PLC. An asterisk followed by the letter P (*^{P}) indicates the functions exclusive to PACSystems™ PLCs. An asterisk followed by "70" (*^{70}) indicates the functions exclusive to Series 90™-70 PLCs. A simple asterisk (*) indicates the functions shared by PACSystems™ and Series 90™-70 PLCs and exclusive to them. Companion help indicates which PLCs support the other functions.

Want to know more? In the Help Index, look up "LD Functions".

Advanced Math

- ACOS
- ASIN
- ATAN
- COS
- EXP
- EXPT
- LN
- LOG
- SIN
- SQRT_DINT
- SQRT_INT
- SQRT_REAL
- TAN

Bit Operations

- AND_DWORD*
- AND_WORD
- BIT_CLR_DWORD*
- BIT_CLR_WORD
- BIT_POS_DWORD*
- BIT_POS_WORD
- BIT_SEQ
- BIT_SET_DWORD*
- BIT_SET_WORD
- BIT_TEST_DWORD*
- BIT_TEST_WORD
- MASK_COMP_DWORD
- MASK_COMP_WORD
- NOT_DWORD*
- NOT_WORD
- OR_DWORD*
- OR_WORD
- ROL_DWORD*
- ROL_WORD
- ROR_DWORD*
- ROR_WORD
- SHIFTL_DWORD*
- SHIFTL_WORD
- SHIFTR_DWORD*
- SHIFTR_WORD
- XOR_DWORD*
- XOR_WORD

Coils

- COIL
- CONTCOIL
- NCCOIL
- NEGCOIL
- NTCOIL*^{P}
- POSCOIL
- PTCOIL*^{P}
- RESETCOIL
- SETCOIL

Contacts

- CONTCON
- FAULT*
- HIALR*
- LOALR*
- NCCON
- NEGCON*
- NOCON
- NOFLT*
- NTCON*^{P}
- POSCON*
- PTCON*^{P}

Control

DO_IO

DRUM

END_FOR*

EXIT_FOR*

FOR_LOOP*

PID_IND

PID_ISA

SER

SUS_IO*

SVC_REQ

Conversions

BCD4_TO_INT

BCD4_TO_REAL

BCD4_TO_UINT*

BCD8_TO_DINT*

BCD8_TO_REAL*

DEG_TO_RAD

DINT_TO_BCD8*

DINT_TO_INT*

DINT_TO_REAL

DINT_TO_UINT*

INT_TO_BCD4

INT_TO_DINT*

INT_TO_REAL

INT_TO_UINT*

RAD_TO_DEG

REAL_TO_DINT

REAL_TO_INT

REAL_TO_UINT*

REAL_TO_WORD

TRUNC_DINT

TRUNC_INT

UINT_TO_BCD4*

UINT_TO_DINT*

UINT_TO_INT*

UINT_TO_REAL*

WORD_TO_REAL

Counters

DNCTR

UPCTR

Data Move

BLK_CLR_WORD

BLKMOV_DINT*

BLKMOV_DWORD*

BLKMOV_INT

BLKMOV_REAL

BLKMOV_UINT*

BLKMOV_WORD

BUS_RD_BYTE*^{P}

BUS_RD_DWORD*^{P}

BUS_RD_WORD*^{P}

BUS_RMW_BYTE*^{P}

BUS_RMW_DWORD*^{P}

BUS_RMW_WORD*^{P}

BUS_TS_BYTE*^{P}

BUS_TS_DWORD*^{P}

BUS_WRT_BYTE*^{P}

BUS_WRT_DWORD*^{P}

BUS_WRT_WORD*^{P}

COMM_REQ

DATA_INIT_ASCII*

DATA_INIT_COMM*

DATA_INIT_DINT*

DATA_INIT_DLAN*^{70}

DATA_INIT_DWORD*

DATA_INIT_INT*

DATA_INIT_REAL*

DATA_INIT_UINT*

DATA_INIT_WORD*

MOVE_BOOL

MOVE_DINT*

MOVE_DWORD*

MOVE_INT

MOVE_REAL

MOVE_UINT*

MOVE_WORD

SHFR_BIT

SHFR_DWORD*

SHFR_WORD

SWAP_DWORD*

SWAP_WORD*

VME_CFG_READ*^{70}

VME_CFG_WRITE*^{70}

VME_RD_BYTE*^{70}

VME_RD_WORD*^{70}

VME_RMW_BYTE*^{70}

VME_RMW_WORD*^{70}

VME_TS_BYTE*^{70}

VME_TS_WORD*^{70}

VME_WRT_BYTE*^{70}

VME_WRT_WORD*^{70}

Data Table

ARRAY_MOVE_BOOL
ARRAY_MOVE_BYTE
ARRAY_MOVE_DINT
ARRAY_MOVE_DWORD*
ARRAY_MOVE_INT
ARRAY_MOVE_UINT*
ARRAY_MOVE_WORD
ARRAY_RANGE_DINT*
ARRAY_RANGE_DWORD*
ARRAY_RANGE_INT*
ARRAY_RANGE_UINT*
ARRAY_RANGE_WORD*
FIFO_RD_DINT*
FIFO_RD_DWORD*
FIFO_RD_INT*
FIFO_RD_UINT*
FIFO_RD_WORD*
FIFO_WRT_DINT*
FIFO_WRT_DWORD*
FIFO_WRT_INT*
FIFO_WRT_UINT*
FIFO_WRT_WORD*
LIFO_RD_DINT*
LIFO_RD_DWORD*
LIFO_RD_INT*
LIFO_RD_UINT*
LIFO_RD_WORD*
LIFO_WRT_DINT*
LIFO_WRT_DWORD*
LIFO_WRT_INT*
LIFO_WRT_UINT*
LIFO_WRT_WORD*
SEARCH_EQ_BYTE
SEARCH_EQ_DINT
SEARCH_EQ_DWORD*
SEARCH_EQ_INT
SEARCH_EQ_UINT*
SEARCH_EQ_WORD
SEARCH_GE_BYTE
SEARCH_GE_DINT
SEARCH_GE_DWORD*
SEARCH_GE_INT
SEARCH_GE_UINT*
SEARCH_GE_WORD
SEARCH_GT_BYTE
SEARCH_GT_DINT
SEARCH_GT_DWORD*
SEARCH_GT_INT
SEARCH_GT_UINT*
SEARCH_GT_WORD
SEARCH_LE_BYTE
SEARCH_LE_DINT
SEARCH_LE_DWORD*
SEARCH_LE_INT
SEARCH_LE_UINT*
SEARCH_LE_WORD
SEARCH_LT_BYTE
SEARCH_LT_DINT
SEARCH_LT_DWORD*
SEARCH_LT_INT
SEARCH_LT_UINT*
SEARCH_LT_WORD
SEARCH_NE_BYTE
SEARCH_NE_DINT
SEARCH_NE_DWORD*
SEARCH_NE_INT
SEARCH_NE_UINT*
SEARCH_NE_WORD
SORT_INT*
SORT_DINT*
SORT_WORD*
TBL_RD_DINT*
TBL_RD_DWORD*
TBL_RD_INT*
TBL_RD_UINT*
TBL_RD_WORD*
TBL_WRT_DINT*
TBL_WRT_DWORD*
TBL_WRT_INT*
TBL_WRT_UINT*
TBL_WRT_WORD

Math

ABS_DINT*
ABS_INT*
ABS_REAL*
ADD_DINT
ADD_INT
ADD_REAL
ADD_UINT*
DIV_DINT
DIV_INT
DIV_MIXED*
DIV_REAL
DIV_UINT*
MOD_DINT
MOD_INT
MOD_UINT*
MUL_DINT
MUL_INT
MUL_MIXED*
MUL_REAL
MUL_UINT*
SCALE_INT
SCALE_WORD
SUB_DINT
SUB_INT
SUB_REAL
SUB_UINT*

Program Flow

CALL
COMMENT
END
ENDMCR
ENDMCRN
H_WIRE
JUMP
JUMPN
LABEL
LABELN
MCR
MCRN
V_WIRE

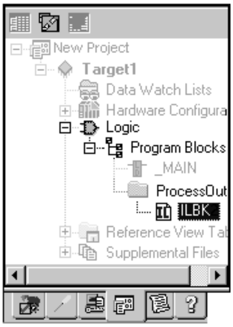
Relational

CMP_DINT*
CMP_INT*
CMP_REAL*
CMP_UINT*
EQ_DINT
EQ_INT
EQ_REAL
EQ_UINT*
GE_DINT
GE_INT
GE_REAL
GE_UINT*
GT_DINT
GT_INT
GT_REAL
GT_UINT*
LE_DINT
LE_INT
LE_REAL
LE_UINT*
LT_DINT
LT_INT
LT_REAL
LT_UINT*
NE_DINT
NE_INT
NE_REAL
NE_UINT*
RANGE_DINT
RANGE_DWORD*
RANGE_INT
RANGE_UINT*
RANGE_WORD

Timers

OFDT_HUNDS
OFDT_SEC*
OFDT_TENTHS
OFDT_THOUS
ONDTR_HUNDS
ONDTR_SEC*
ONDTR_TENTHS
ONDTR_THOUS
TMR_HUNDS
TMR_SEC*
TMR_TENTHS
TMR_THOUS

IL EDITOR



New Project
Target1
Data Watch Lists
Hardware Configura
Logic
Program Blocks
_MAIN
ProcessOut
ILBK

Reference View Tal
Supplemental Files

Navigator: Project tab

An IL Block

Instruction List (IL) is a programming language specified by the IEC 61131-3 standard. This text language is accumulator-based and much like the assembly languages used for programming microprocessors. The instructions executed by the IL program modify or use an accumulator that is located in PLC memory. Two types of accumulators are defined: one analog accumulator for numeric and bitwise operations and eight boolean accumulators for discrete logic to support eight levels of nested boolean expressions. The IL editor is free-form with an option to apply a standard formatting rule. The appearance and behavior of the IL editor is user-configurable.

Note: Only Series 90™-30, VersaMax PLCs, and VersaMax Nano/Micro support IL logic.

To configure accumulators

1. In the Project tab of the Navigator, right-click the Program Blocks folder and choose **Properties**.

   The Inspector opens, displaying the Accumulator Address properties.

2. In the Boolean Start property, enter the reference address of the first of eight PLC memory locations to use for boolean accumulators.

   The ending address is calculated automatically. The memory area must be %T, %M, or %Q.

3. In the Analog Start property, enter the PLC memory locations to use for the analog accumulator.

   The ending address is calculated automatically. The memory area must be %R, %AI or %AQ.

To create an IL block

1. In the Projects tab of the Navigator, right-click the Program Blocks folder, point to **New**, and choose **IL Block**.

   An empty IL block with the default name "ILBk*n*" is added to the folder, where *n* represents a unique number.

2. Rename the block as desired.

To open an IL block for editing

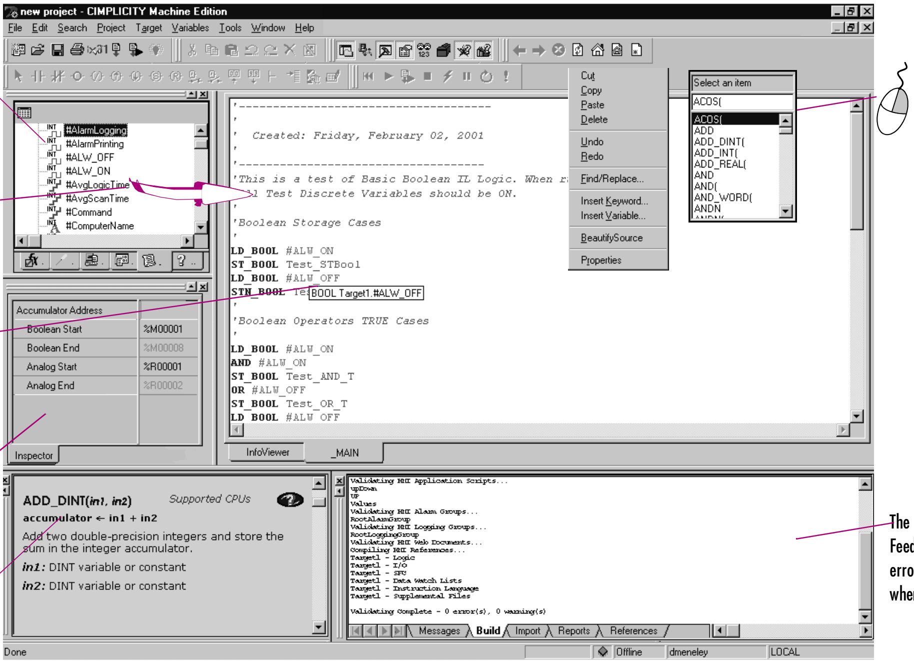
- In the Project tab of the Navigator, right-click an IL Block and choose **Open**.

  The block opens in the IL editor.

Note: You can have multiple blocks open for editing. To navigate to another open IL block, click the tab displaying its name at the bottom of the editor window.

Working with the IL Editor Offline

Most project development is carried out while offline from the target PLC. Editing while offline provides maximum flexibility in editing and allows you to interact with the Machine Edition tools as shown in the following diagram.



Accumulator Address	
Boolean Start	%M00001
Boolean End	%M00008
Analog Start	%R00001
Analog End	%R00002

```
'------------------------------------
'
'  Created: Friday, February 02, 2001
'
'------------------------------------
'This is a test of Basic Boolean IL Logic. When r
All Test Discrete Variables should be ON.
'
'Boolean Storage Cases
'
LD_BOOL #ALW_ON
ST_BOOL Test_STBool
LD_BOOL #ALW_OFF
STN_BOOL Tes
'
'Boolean Operators TRUE Cases
'
LD_BOOL #ALW_ON
AND #ALW_ON
ST_BOOL Test_AND_T
OR #ALW_OFF
ST_BOOL Test_OR_T
LD_BOOL #ALW_OFF
```

ADD_DINT(*in1*, *in2*)

accumulator ← in1 + in2

Add two double-precision integers and store the sum in the integer accumulator.

***in1*:** DINT variable or constant

***in2*:** DINT variable or constant

```
Validating HMI Application Scripts...
upDown
UP
Values
Validating HMI Alarm Groups...
RootAlarmGroup
Validating HMI Logging Groups...
RootLoggingGroup
Validating HMI Web Documents...
Compiling HMI References...
Target1 - Logic
Target1 - I/O
Target1 - SFC
Target1 - Data Watch Lists
Target1 - Instruction Language
Target1 - Supplemental Files

Validating Complete - 0 error(s), 0 warning(s)
```

The Variables tab of the Navigator lists all the variables in your projects.

Drag and drop variables from the Variables list into the IL editor.

A description of a variable pops up when you hover the mouse over it.

Configure the accumulators in the Inspector.

The Companion tracks all of your moves and provides information on what you click.

Right click in the IL Editor to insert an instruction or variable.

The Build tab of the Feedback Zone lists error messages when you validate.

To insert an instruction or function

1. In the IL editor, right-click and choose **Insert Keyword**.

   A smart list appears listing all available instruction mnemonics.

2. From the list, select an instruction and press ENTER.

   The instruction is inserted in your logic.

To assign operands to an instruction

1. In the IL editor, right-click and choose **Insert Variable**.

   A smart list appears showing all your defined variables.

2. Type, or choose from the list, a variable name or reference address and then press ENTER.

   The name appears in your logic.

   Note: If you entered a reference address or a new variable name, you must create a variable from it.

To create a variable from a reference address

1. In the IL editor, right-click a reference address, point to **Create "name" as**, and then choose a data type.

   A variable is created and a default name is applied. For example, if the reference address is %R0032, the auto-created variable is named R00032.

To create a variable from a name

1. In the IL editor, right-click a name, point to **Create "name" as**, and then choose a data type.

   A variable is created with the name you right-clicked.

2. Map the variable to PLC memory. (See page 17.)

To move or duplicate IL logic

1. In the IL editor, select a range of logic.
2. To move it, click the selection and drag it to a new location. To duplicate it, press CTRL while clicking the selection, and drag the selection to where you want to place the duplicate.

   When you release the mouse button, the selection is respectively moved to the new location or a duplicate copy of the selected logic is placed in the new area.

To insert an inline comment

1. In the IL editor, click where you want to insert an inline comment.
2. Type an apostrophe (') followed by comment text.

   Press ENTER to complete the comment.

To insert a block comment

1. In the IL editor, click where you want to insert a block comment.
2. Type (* followed by comment text.

   A block comment can contain any number of characters and can span multiple lines.

3. Type *) to complete the block comment.

To reformat IL code

- In the IL editor, right-click and choose **Beautify Source**.

  The entire content of the IL editor is reformatted according to the default formatting (indentation) rules.

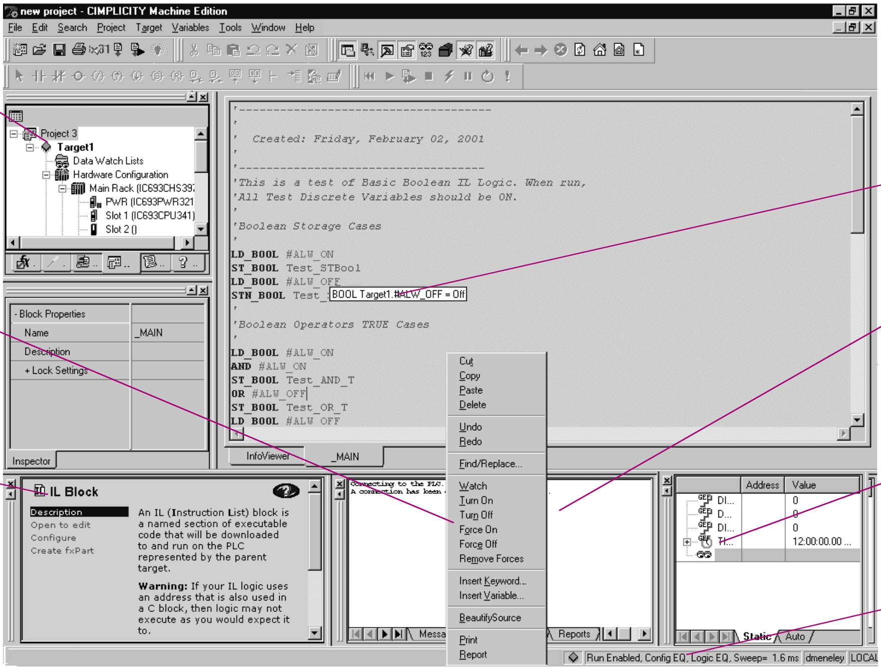
Working with the IL Editor Online

While online to a target PLC, the IL editor enables you to edit logic, monitor data values, and change or force the state of BOOL variables in real-time. This allows you to test the execution of logic, to trigger an event within an executing project, or to remove an element from logic execution.

Target icon changes to indicate status of the PLC.

Right-click a BOOL to change or force its state.

The Companion tracks your moves and provides information on what you click.



```
'----------------------------------
'
'  Created: Friday, February 02, 2001
'
'---------------------------------
'This is a test of Basic Boolean IL Logic. When run,
'All Test Discrete Variables should be ON.
'
'Boolean Storage Cases
'
LD_BOOL #ALW_ON
ST_BOOL Test_STBool
LD_BOOL #ALW_OFF
STN_BOOL Test_
'
'Boolean Operators TRUE Cases
'
LD_BOOL #ALW_ON
AND #ALW_ON
ST_BOOL Test_AND_T
OR #ALW_OFF
ST_BOOL Test_OR_T
LD_BOOL #ALW_OFF
```

BOOL Target1.#ALW_OFF = Off

IL Block

Description
Open to edit
Configure
Create fxPart

An IL (Instruction List) block is a named section of executable code that will be downloaded to and run on the PLC represented by the parent target.

Warning: If your IL logic uses an address that is also used in a C block, then logic may not execute as you would expect it to.

Connecting to the PLC.
A connection has been

	Address	Value
DI...		0
D...		0
DI...		0
TI...		12:00:00.00 ...

Run Enabled, Config EQ, Logic EQ, Sweep= 1.6 ms | dmeneley | LOCAL

Hover over a variable to show a popup of its value.

The Feedback Zone indicates that a connection has been established with the PLC.

Monitor and change variable values in the Data Watch.

PLC status is indicated in the status bar.

To monitor a data value

- Click anywhere in the IL editor and hover the mouse pointer over a variable.

A tooltip appears, showing the variable's current value. This value, however, does not update. You must move the mouse pointer away and back over the variable.

To change a BOOL variable's state

- In the IL editor, right-click the BOOL variable whose value you want to change and choose **Turn On** or **Turn Off**.

The state of the variable in the target PLC changes when the command is received. It remains in that state until acted on by the PLC's logic.

To force a BOOL variable's state

- In the IL editor, right-click a BOOL variable and choose **Force On** or **Force Off**.

  The state of the forced variable will remain unchanged, regardless of any actions by the PLC's logic.

To remove the force from a BOOL variable

- In the IL editor, right-click a BOOL variable and choose **Remove Forces**.

  The state of the forced variable will be controlled by the PLC's logic.

Writing Changes to a Target PLC

You can change your IL logic while online, but you must write the changes to the PLC to maintain equality. Writing changes to a target PLC requires the PLC to be online and running.

Note: If you go offline, you can do a regular download.

To write changes to the target PLC (if the target PLC supports it)

1. While online to a target PLC, make a change to IL logic.
2. In the Project tab of the Navigator, right-click the target, point to **Online Commands**, and choose **Write Changes to PLC**.

   You are prompted to confirm a Run Mode Store. That is, the altered IL block will be downloaded to the PLC without stopping the PLC.

Want to know more? In the Help Index, look up "Writing Changed Logic to the PLC"

IL Instructions and Functions

The following is a list of all IL instructions and functions available in Logic Developer - PLC. An asterisk (*) indicates the functions exclusive to VersaMax® PLCs. Companion help indicates which PLCs support the other functions.

Basic Instructions

- ADD
- AND
- AND_WORD
- ANDN
- CAL
- DIV
- EQ
- GE
- GT
- LE
- LT
- MCRN
- MOD
- MUL
- NE
- NOT
- NT
- OR
- ORN
- PT
- R
- RET
- RETC
- S
- SUB
- XORN

Advanced Math

- ACOS
- ASIN
- ATAN
- COS
- EXP
- EXPT
- LN
- LOG
- SIN
- SQRT_INT
- SQRT_DINT
- SQRT_REAL
- TAN

Bit Operations

- AND_WORD
- BIT_CLR_WORD
- BIT_POS_WORD
- BIT_SEQ
- BIT_SET_WORD
- BIT_TEST_WORD
- MASK_COMP_DWORD
- MASK_COMP_WORD
- NOT_WORD
- OR_WORD
- ROL_WORD
- ROR_WORD
- SHIFTL_WORD

Control

- DO_IO
- DRUM
- PID_IND
- PID_ISA
- SER
- SVC_REQ

Conversions

- BCD4_TO_INT
- BCD4_TO_REAL
- DEG_TO_RAD
- DINT_TO_REAL
- INT_TO_BCD4
- INT_TO_REAL
- RAD_TO_DEG
- REAL_TO_DINT
- REAL_TO_INT
- REAL_TO_WORD
- TRUNC_DINT
- TRUNC_INT
- WORD_TO_REAL

Counters

- DNCTR
- UPCTR

Data Move

- BLK_CLR_WORD
- BLKMOV_INT
- BLKMOV_REAL
- BLKMOV_DINT
- COMM_REQ
- MOVE_INT
- MOVE_BOOL
- MOVE_REAL
- SHFR_BIT
- MOVE_WORD
- SHFR_WORD

Data Table

- ARRAY_MOVE_BOOL
- ARRAY_MOVE_BYTE
- ARRAY_MOVE_DINT
- ARRAY_MOVE_INT
- ARRAY_MOVE_WORD
- SEARCH_EQ_BYTE
- SEARCH_EQ_DINT
- SEARCH_EQ_INT
- SEARCH_EQ_WORD
- SEARCH_GE_BYTE
- SEARCH_GE_DINT
- SEARCH_GE_INT
- SEARCH_GE_WORD
- SEARCH_GT_BYTE
- SEARCH_GT_DINT
- SEARCH_GT_INT
- SEARCH_GT_WORD
- SEARCH_LE_BYTE
- SEARCH_LE_DINT
- SEARCH_LE_INT
- SEARCH_LE_WORD
- SEARCH_LT_BYTE
- SEARCH_LT_DINT
- SEARCH_LT_INT
- SEARCH_LT_WORD
- SEARCH_NE_BYTE
- SEARCH_NE_DINT
- SEARCH_NE_INT
- SEARCH_NE_WORD

Math

- ADD_DINT
- ADD_INT
- ADD_REAL
- DIV_DINT
- DIV_INT
- DIV_REAL
- MOD_DINT
- MOD_INT
- MUL_INT
- MUL_DINT
- MUL_REAL
- SCALE_INT*
- SCALE_WORD*
- SUB_DINT
- SUB_INT
- SUB_REAL

Program Flow

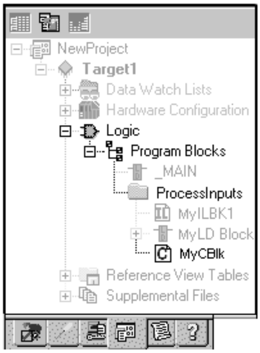
- CALL
- COMMENT
- END
- ENDMCR
- ENDMCRN
- H_WIRE
- JUMP
- JUMPN
- LABEL
- LABELN
- MCR
- MCRN
- V_WIRE

Relational

- EQ_DINT
- EQ_INT
- EQ_REAL
- GE_DINT
- GE_INT
- GE_REAL
- GT_DINT
- GT_INT
- GT_REAL
- LE_DINT
- LE_INT
- LE_REAL
- LT_DINT
- LT_INT
- LT_REAL
- NE_DINT
- NE_INT
- NE_REAL
- RANGE_DINT
- RANGE_INT
- RANGE_WORD

Timers

- OFDT_HUNDS
- OFDT_TENTHS
- OFDT_THOUS
- ONDTR_HUNDS
- ONDTR_TENTHS
- ONDTR_THOUS
- TMR_HUNDS
- TMR_TENTHS
- TMR_THOUS



Navigator: Project tab

A C Block

C BLOCKS

A C block is an independent section of executable code written in the C programming language, that is downloaded to and executed on the target PLC. C blocks are created externally using GE Fanuc's C Programming Toolkit and then imported into a project. A C block compiled for PACSystems™ has a .gefelf extension. A C block compiled for Series 90™-70 or Series 90™-30 has a .exe extension. C Blocks can be called as a subroutine from another block (LD or IL) but cannot call another block.

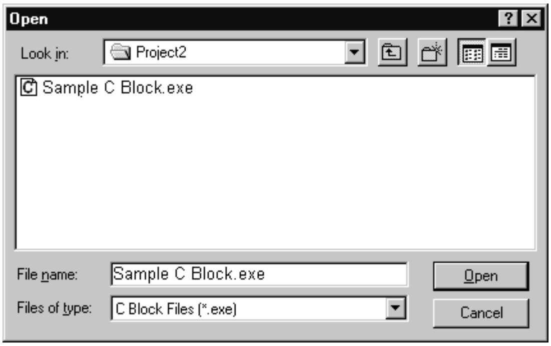
For more information on developing C Blocks, refer to *C Programmer's Toolkit for Series 90 PLCs* (GFK-0646) and *PACSystems RX7i C Toolkit User's Guide* (GFK-2259).

Working with C blocks

To import a C block

1. In the Projects tab of the Navigator, right-click the Program Blocks folder and choose **Add C block**.

   The Open dialog box appears.



Open

Look in: Project2

Sample C Block.exe

File name: Sample C Block.exe

Files of type: C Block Files (*.exe)

2. Browse to the .exe or .gefelf file you want to import and click **Open**.

   The selected file is added to the Program Blocks folder with the same name as the .exe or gefelf file.

   Note: You can then move the C Block to a user-defined folder.

Want to know more? In the Help Index, choose "C" and "User-Defined Folder".

To set a C block's parameters

Note: This procedure applies only to PACSystems™ and to Series 90™-70 targets and to C blocks that were written to require parameters.

1. In the Projects tab of the Navigator, right-click the C block and choose **Properties**.

   The Inspector displays the block's properties.

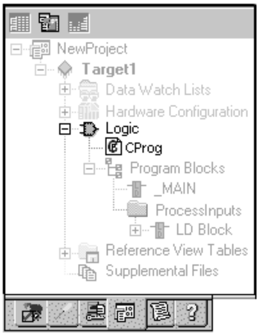
2. In the Inspector, select the Parameters property and click ... .

   The Parameters dialog box opens.

3. Type a name and description for each required input and output parameter.

   For information on the required parameters, consult the written documentation for the C block. The names you enter will display in the CALL instruction. The names and descriptions will display as tooltip help when you hover over the CALL instruction.

Want to know more? In the Help Index, enter "Parameterized" and select the "C Block" help topic.



Navigator: Project Tab

A C Program

C PROGRAMS

Note: C programs are supported only on Series 90™-70 CPUs, firmware release 6.00 and later.

A C program is an independent section of executable code, written in C language, that is downloaded to and executed on the associated target PLC. To develop a C program, use GE Fanuc's C *Programmer's Toolkit for Series 90 PLCs User's Manual* (GFK-0646). You then import it into a project.

A C program has access to all the % reference tables of the PLC except for the _MAIN LD block's %P memory and the %L memory of any other LD block. A C program can also call any of the numerous PLC-embedded function blocks, which are included in the C Programmer's Toolkit.

A C program cannot be called as a subroutine. Execution is controlled only through scheduling. A C program cannot call another block as a subroutine.

By setting the parameters of a C program, you enable it to access memory directly. When a C program begins to execute, it reads the data for all the parameters and makes a copy of the data. If the C program's execution is interrupted or time-sliced over multiple scans, the C program, when it resumes execution, uses the copy of the data that it made upon beginning to execute.

You can add C programs to a Series 90™-70 target only if the _MAIN block is an LD block. The LD program is then treated as a user program, which can be scheduled. The maximum number of C programs you can add is 15.

If you have State Logic on a Series 90™-70 target, it is compiled into a C Program called _STATE, whether State Logic coexists with LD logic or not. If State Logic does not coexist with LD logic, _STATE is the only C program supported by the target.

C programs can coexist with State Logic on a Series 90™-70 PLC. For such a target, the State Logic is compiled into a C program. This C program is named _MAIN if there is no LD logic; however, if State Logic coexists with LD logic, the State Logic is compiled into a C program named _STATE and one LD block must be named _MAIN.

User Programs

User programs consists of:

- C programs
- The LD program, if the _MAIN block is an LD block.

Working with User Programs

To configure execution scheduling

1. In the Projects tab of the Navigator, right-click a C program or the _MAIN LD block, and choose **Properties**.

   The Inspector displays the user program's properties.

2. In the Inspector, expand the **Scheduling** property.
3. Select a Schedule Mode.
4. Select the other properties used in the schedule mode you selected.
5. Click **OK**.

   Note: If you made any entries, they are checked when you click **OK**. You must correct any errors before you can close the dialog box by clicking the OK button.

Setting a C program's parameters

Note: You must provide a list of all the input and output parameters that the C program requires. The LD program does not use parameters.

1. In the Projects tab of the Navigator, right-click a C program and choose **Properties**.

   The Inspector displays the C program's properties.

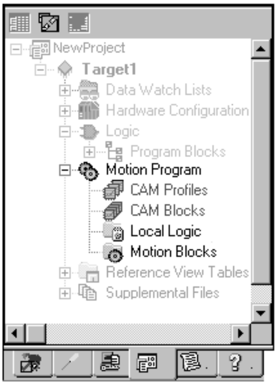
2. In the Inspector, select the Parameters property and click ... .

   The Parameters dialog box opens.

3. On the Input and Output tabs, enter up to 8 input and up to 8 output parameters. Each parameter has its own row on the tab. For each parameter, double-click the following cells and enter the required data:
   - **Name:** The parameter's name.
   - **Type:** The parameter's data type.
   - **Length:** The length of the input or output reference.
   - **Variable:** The first data item associated with the parameter.
   - **Description:** (Optional) The parameter's description.

Want to know more? In the Help Index, choose "C Program".

6 Motion Programming



Navigator: Project tab

Motion Program nodes

Logic Developer - PLC supports motion programming for the Motion Mate DSM314 motion control module. A high performance, easy-to-use, multi-axis motion control module, the Motion Mate DSM314 is highly integrated with the Series 90™-30 PLC logic solving and communication functions.

The DSM314 (see page 55) supports 10 motion programs, 40 subroutines and a maximum total of 1000 motion program statements. Logic Developer - PLC, making motion programming possible, supports the following motion editors:

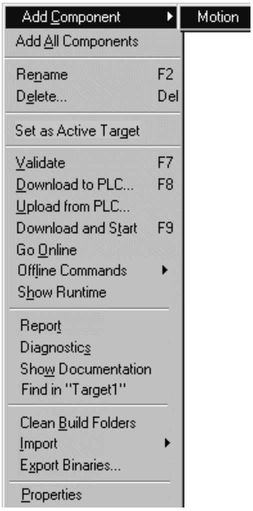
PLC Motion Editor

Local Logic Editor

CAM Editor

This chapter outlines basic procedures that will get you started with Logic Developer - PLC to create motion programs, using these three motion editors.

To add a Motion component to a target



Target right-click menu

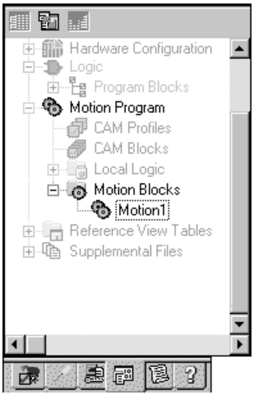
- In the Project tab of the Navigator, right-click the target, point to **Add Component** and then choose **Motion**.

A Motion Program node is added to your project. Included are empty Motion Blocks, Local Logic, CAM Profiles and CAM Blocks folders.

PLC MOTION EDITOR

Logic Developer - PLC includes a PLC Motion Editor, which enables you to create PLC Motion blocks for the DSM314. This text-based editor is configurable as to its appearance and behavior. Comments and white space are not considered as PLC Motion program statements. Motion programming has a different programming syntax from Local Logic.

To add a Motion Block



Navigator: Project tab

Motion Blocks

1. In the Project tab of the Navigator, expand the Motion Program folder.
2. Right-click the Motion Blocks folder and choose **New**.

   A new empty PLC Motion block with a default name is added to your project.
3. Rename the block as desired.

To open a motion block for editing

- In the Project tab of the Navigator, right-click the **Motion Block** node and choose **Open**.

  The block opens for editing in the PLC Motion editor

Working with the Motion Editor

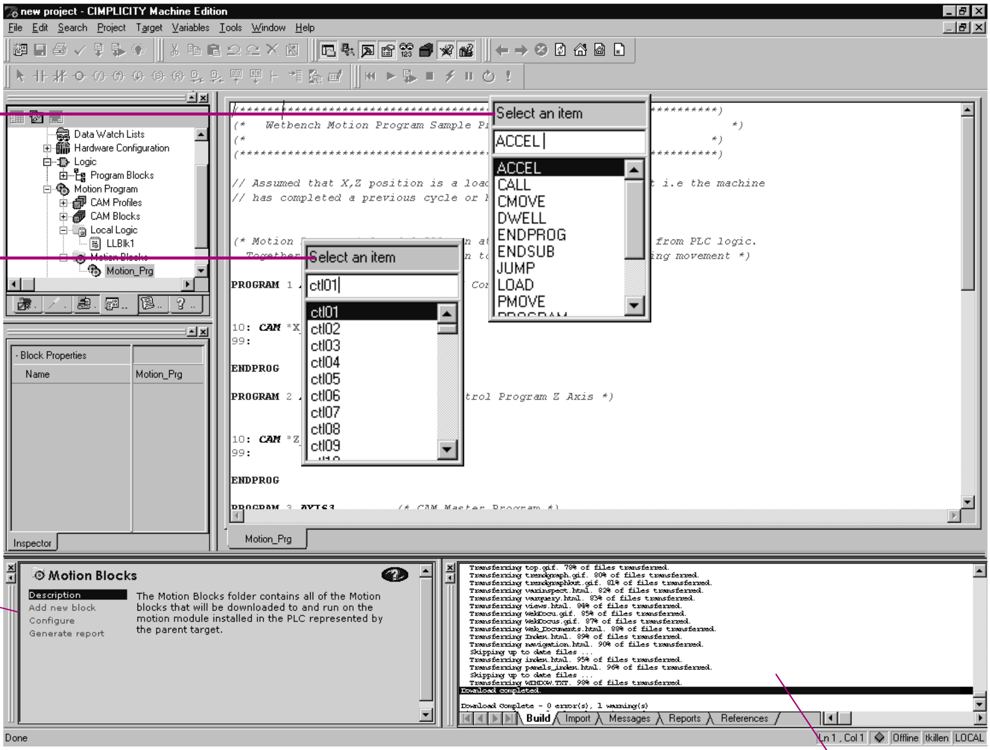
To insert a command

1. In the Motion editor, right-click and choose **Insert Keyword**.

   A smart list appears showing all available motion commands.

2. Select the appropriate command from the smart list and press ENTER.

   The command is placed in the motion editor.



```
(*****************************************             **********)
(*   Wetbench Motion Program Sample Pr                            *)
(*                                                               *)
(*****************************************             **********)

// Assumed that X,Z position is a load               t i.e the machine
// has completed a previous cycle or h

(* Motion                         n at               from PLC logic.
  Together                        n to               ing movement *)

PROGRAM 1                         Con

10: CAM "X
99:

ENDPROG

PROGRAM 2                         trol Program Z Axis *)

10: CAM "Z
99:

ENDPROG

PROGRAM 3  AXIS3          (* CAM Master Program *)
```

The Motion Blocks folder contains all of the Motion blocks that will be downloaded to and run on the motion module installed in the PLC represented by the parent target.

```
Transferring top.gif. 79% of files transferred.
Transferring trendgraph.gif. 80% of files transferred.
Transferring trendgraphlout.gif. 81% of files transferred.
Transferring varinspect.html. 82% of files transferred.
Transferring varquery.html. 83% of files transferred.
Transferring views.html. 84% of files transferred.
Transferring WebDocu.gif. 85% of files transferred.
Transferring WebDocus.gif. 87% of files transferred.
Transferring Web_Documents.html. 88% of files transferred.
Transferring Index.html. 89% of files transferred.
Transferring navigation.html. 90% of files transferred.
Skipping up to date files ...
Transferring index.html. 95% of files transferred.
Transferring panels_index.html. 96% of files transferred.
Skipping up to date files ...
Transferring WINDOW.TXT. 98% of files transferred.
Download completed.

Download Complete - 0 error(s), 1 warning(s)
```

Insert a PLC Motion command by choosing a keyword.

Insert a PLC Motion variable by selecting a variable from the smart list.

The Companion tracks all mouse clicks.

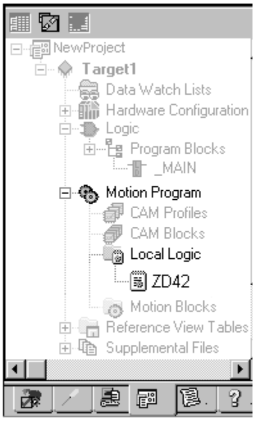
The Feedback Zone indicates that a connection has been established with the PLC.

Want to know more? In the Help Index, choose "PLC Motion Editor".

Motion Commands

ACCEL	The ACCEL statement sets the axis acceleration for subsequent moves and remains in effect in a given program unless changed. Note: If a move instruction is executed before ACCEL, the tag Acceleration is used.
BLOCK NUMBER	Block numbers may be used as the destination of JUMP commands. Block numbers must be unique and can be between 1 and 65535.
CAM	The CAM statement starts CAM motion and specifies exit conditions.
CAM-LOAD	CAM-LOAD loads a parameter register with the starting location for a CAM slave axis.
CAM-PHASE	CAM-PHASE sets the phase for CAM commands.
CALL	The CALL command executes another block as a subroutine
CMOVE	The CMOVE command programs a continuous move using the specified position and acceleration mode.
DWELL	DWELL causes motion to cease for a specified time period before processing the next command.
ENDPROG	The ENDPROG statement terminates a PLC Motion program definition.
ENDSUB	The ENDSUB statement terminates a PLC Motion subroutine definition.
JUMP	Jump to a block number or a sync block within the current program or subroutine. The jump may be unconditional or conditional based on the status of a CTL bit.
LOAD	Initializes or changes a parameter data register with a 32-bit twos-complement integer value.
PMOVE	The PMOVE command programs a positioning move using the specified position and accelerator mode.
PROGRAM	The PROGRAM statement is the first statement in a motion program. The program statement identifies the program number (1-10) and the axis configuration. Program definitions cannot nest.
SUBROUTINE	The SUBROUTINE statement is the first statement in a motion subroutine. The subroutine statement identifies the subroutine number (1-40) and the axis configuration.
SYNC BLOCK	A sync block is a special case of a block number. A sync block may only be used in multi-axis programs.
VELOC	Sets the process VELOCITY used by subsequent motion program move commands and remains in effect until changed by another VELOC statement.

LOCAL LOGIC



Navigator: Project tab

Local Logic

A Local Logic program runs synchronously with the Motion program, but is independent of the PLC's CPU scan. This allows the DSM314 to interact much more quickly with motion I/O signals on its faceplate connectors than would be possible if the logic for the signals was handled in the main ladder program running on the PLC.

Local Logic language uses free-form, text-based circuits and contains basic mathematical and logical constructs. Local Logic programming syntax allows you to assign a variety of logic tasks to your motion programs while working in conjunction with PLC Logic programs and motion programs to yield a flexible programming environment. Because it uses straightforward, understandable syntax, it is easy to gain proficiency with this editor.

The Local Logic programming language supports assignments, conditional statements, arithmetic, logical and relational statements. Local Logic provides the user access to motion controller data, parameters using a fixed set of variables, control and status bits.

- Parameter data - accessible from Local Logic host PLC and motion programs. The parameter data are similar to variables in a program.
- CTL bits - allow the Local Logic program or host PLC to signal the motion program to start an event.
- Motion program block numbers - the current block number can be used within the Local Logic program or host PLC to make an action occur only during a specific motion programming section.

To create a Local Logic block

1. In the Projects tab of the Navigator, right-click the Local Logic folder and choose **New**.

   A new Local Logic block with a default name is created.

2. Rename the block as required.

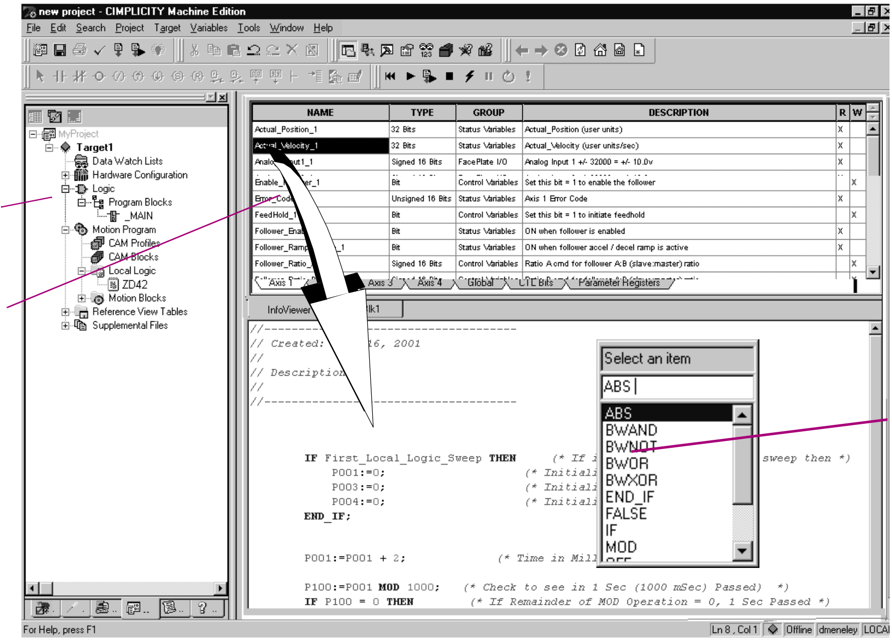
To open a Local Logic block for editing

- In the Projects tab of the Navigator, right-click the Local Logic block and choose **Open**.

  The Local Logic block opens in the Local Logic editor and is ready for editing.

Working with Local Logic Editor

The Local Logic editor has its own distinctive syntax for constructing Local Logic programs.



NAME	TYPE	GROUP	DESCRIPTION	R	W
Actual_Position_1	32 Bits	Status Variables	Actual_Position (user units)	X	
Actual_Velocity_1	32 Bits	Status Variables	Actual_Velocity (user units/sec)	X	
Analo put1_1	Signed 16 Bits	FacePlate I/O	Analog Input 1 +/- 32000 = +/- 10.0v	X	
Enable_ er_1	Bit	Control Variables	Set this bit = 1 to enable the follower		X
Error_Code	Unsigned 16 Bits	Status Variables	Axis 1 Error Code	X	
FeedHold_1	Bit	Control Variables	Set this bit = 1 to initiate feedhold		X
Follower_Enab	Bit	Status Variables	ON when follower is enabled	X	
Follower_Ramp _1	Bit	Status Variables	ON when follower accel / decel ramp is active	X	
Follower_Ratio_	Signed 16 Bits	Control Variables	Ratio A cmd for follower A:B (slave:master) ratio		X

```
//-----------------------------------------
// Created:        16, 2001
//
// Description
//
//-----------------------------------------


     IF First_Local_Logic_Sweep THEN      (* If i                      sweep then *)
          P001:=0;                       (* Initiali
          P003:=0;                       (* Initiali
          P004:=0;                       (* Initiali
     END_IF;


     P001:=P001 + 2;               (* Time in Mill

     P100:=P001 MOD 1000;    (* Check to see in 1 Sec (1000 mSec) Passed)  *)
     IF P100 = 0 THEN         (* If Remainder of MOD Operation = 0, 1 Sec Passed *)
```

Navigator shows the organization of your project.

Drag and drop variables from the Local Logic Variable table into the Local Logic editor.

Right-click to choose commands from a list.

To insert a Local Logic command

1. In the Local Logic editor, right-click and choose **Insert Keyword** from the menu.

   A smart list appears showing all available Local Logic commands.

2. Select the desired command in the smart list and press ENTER

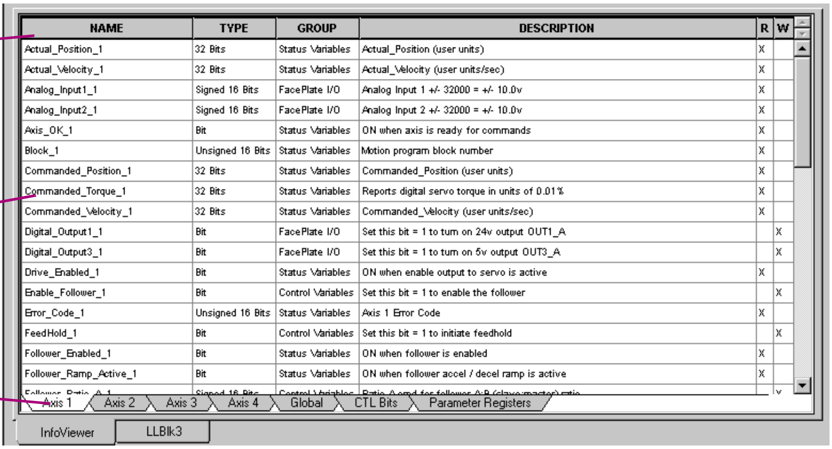
   The command is inserted.

   Note: You can drag variables from the Local Logic Variable Table to the Local Logic editor.

Local Logic Variables

Local Logic is designed to complement a PLC's logic and mathematical capabilities. Solving small Local Logic and mathematical sets require a tight synchronization with the controlled motion.

Logic Developer - PLC includes a table containing Local Logic variables, the Local Logic Variable Table (LLVT), that you can drag into your logic programs. As illustrated in the diagram below, the LLVT has several tabs that organize the variables by category:



NAME	TYPE	GROUP	DESCRIPTION	R	W
Actual_Position_1	32 Bits	Status Variables	Actual_Position (user units)	X	
Actual_Velocity_1	32 Bits	Status Variables	Actual_Velocity (user units/sec)	X	
Analog_Input1_1	Signed 16 Bits	FacePlate I/O	Analog Input 1 +/- 32000 = +/- 10.0v	X	
Analog_Input2_1	Signed 16 Bits	FacePlate I/O	Analog Input 2 +/- 32000 = +/- 10.0v	X	
Axis_OK_1	Bit	Status Variables	ON when axis is ready for commands	X	
Block_1	Unsigned 16 Bits	Status Variables	Motion program block number	X	
Commanded_Position_1	32 Bits	Status Variables	Commanded_Position (user units)	X	
Commanded_Torque_1	32 Bits	Status Variables	Reports digital servo torque in units of 0.01%	X	
Commanded_Velocity_1	32 Bits	Status Variables	Commanded_Velocity (user units/sec)	X	
Digital_Output1_1	Bit	FacePlate I/O	Set this bit = 1 to turn on 24v output OUT1_A		X
Digital_Output3_1	Bit	FacePlate I/O	Set this bit = 1 to turn on 5v output OUT3_A		X
Drive_Enabled_1	Bit	Status Variables	ON when enable output to servo is active	X	
Enable_Follower_1	Bit	Control Variables	Set this bit = 1 to enable the follower		X
Error_Code_1	Unsigned 16 Bits	Status Variables	Axis 1 Error Code	X	
FeedHold_1	Bit	Control Variables	Set this bit = 1 to initiate feedhold		X
Follower_Enabled_1	Bit	Status Variables	ON when follower is enabled	X	
Follower_Ramp_Active_1	Bit	Status Variables	ON when follower accel / decel ramp is active	X	
Follower_Ratio_A_1	Signed 16 Bits	Control Variables	Ratio A cmd for follower A:B (slave:master) ratio		X

Click a heading to sort the table in ascending order. Click again to sort descending.

Right-click a name to copy it to the clipboard.

Click a tab to view a group of variables

To view the LLVT

1. In the InfoViewer tab of the Navigator, expand the Logic Developer - PLC library then expand the Local Logic Editor book and double-click Local Logic Variable Table.

The LLVT appears in the Infoviewer.

The variables or data in each tab are:

Axis 1	Variables specific to axis 1
Axis 2	Variables specific to axis 2
Axis 3	Variables specific to axis 3
Axis 4	Variables specific to axis 4
Global	Global data such as module status code
CTL bits	DSM general Control/Status bits
Parameter Registers	DSM parameter data

The table has six columns:

Name	Contains the variable name that is to be used within a Local Logic program
Type	The data type for this variable. For example, 32-bit means that this variable is a 32-bit variable.
Group	The group this variable is placed in. For example, Faceplate I/O means that this variable refers to a point on the module faceplate.
Description	This column contains a textual description of the variable. When the user hovers the mouse pointer over the description, a tool tip displays the description.
R	This column indicates if the variable can be read by a Local Logic program.
W	This column indicates if the variable can be written by a Local Logic program.

To insert a Local Logic variable

1. In the Local Logic editor, right-click and choose **Insert Variable**.

   A smart list appears prompting you to choose a Local Logic variable name.

2. Select a variable in the list and press ENTER.

   The variable is inserted in your Local Logic.

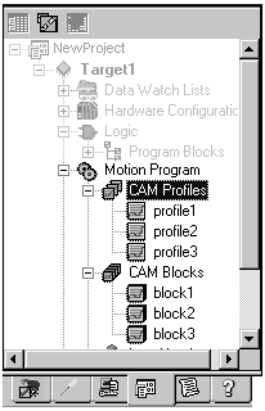
Local Logic Commands and Operators

Local Logic enables you to execute basic logic and mathematical functions on the DSM module. Commands use upper case characters only and are case sensitive.

ABS	TRUE	-(minus)	<= (less than or equal to)
BWAND	FALSE	/ (divide)	<> (not equal)
BWOR	IF	* (multiply)	
BWXOR	THEN	:=(assign)	
BWNOT	END_IF	>(greater than)	
ON	MOD	< (less than)	
OFF	+ plus	>= (greater than or equal to)	

Want to know more? In the Help Index, choose "Local Logic: an Overview".

CAM EDITOR



Project Tab: Navigator

CAM Blocks

The CAM editor is an accessory for Logic Developer - PLC motion programming that provides a means to create, edit, and manage electronic CAM profiles. Each CAM profile is a curve that specifies the response of a slave servo to a master position index. CAM profiles are referenced by name in the associated motion program and grouped into CAM blocks. Each block is intended for download to a specific motion module by means of a PLC controller. The hardware components are specified in the HWC for the associated project.

CAM profiles are user-defined in a library and then grouped into blocks by aliasing them. This allows you to reuse CAM profiles by including them in multiple CAM blocks.

To create a CAM block

1. In the Project tab of the Navigator, expand the Motion Program folder.
2. Right-click the CAM blocks folder and choose **New**.

   A new CAM block with a default name is created.
3. Rename the block as desired.

To import CAM blocks

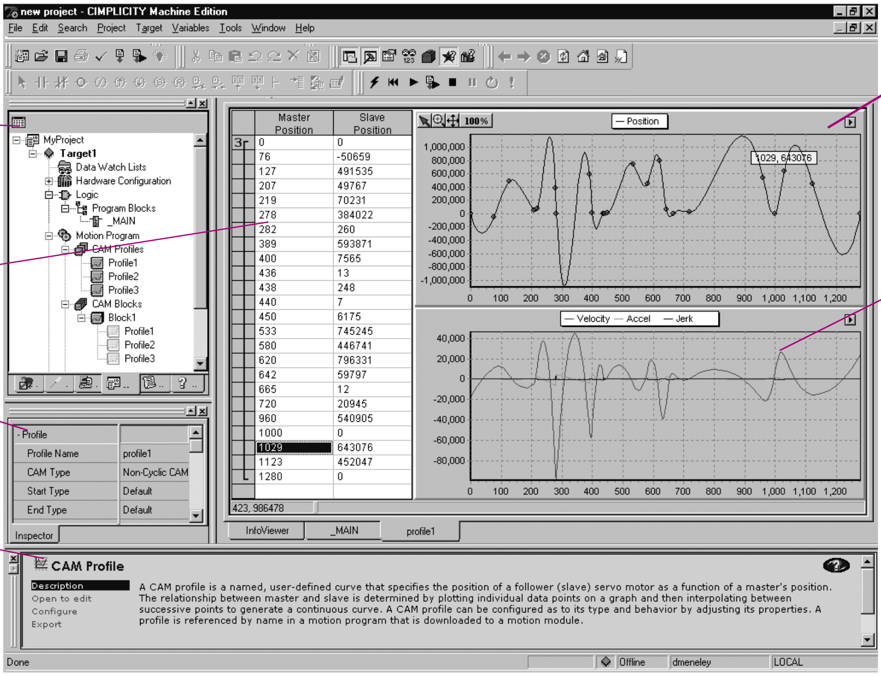
1. In the Project tab of the Navigator, expand the Motion Program folder.
2. Right-click the CAM blocks folder and choose **Import from File**.

   The Open dialog box appears.
3. Browse to the CAM block you want to import (.csv or .txt file).
4. Click **Open**.

   The imported block appears in your project.

Working with the CAM Editor

You can adjust the curves of your CAM profile to suit the specific needs of your project. With the CAM editor you create profiles by defining points on a master/slave position curve. Groups of adjoining points are allocated to sectors. Each sector is assigned a polynomial curve fit order (1,2,3) that specifies how the curve will be interpolated between points.



	Master Position	Slave Position
3	0	0
	76	-50659
	127	491535
	207	49767
	219	70231
	278	384022
	282	260
	389	593871
	400	7565
	436	13
	438	248
	440	7
	450	6175
	533	745245
	580	446741
	620	796331
	642	59797
	665	12
	720	20945
	960	540905
	1000	0
	1029	643076
	1123	452047
	1280	0

423, 986478

- Profile	
Profile Name	profile1
CAM Type	Non-Cyclic CAM
Start Type	Default
End Type	Default

CAM Profile

Description
Open to edit
Configure
Export

A CAM profile is a named, user-defined curve that specifies the position of a follower (slave) servo motor as a function of a master's position. The relationship between master and slave is determined by plotting individual data points on a graph and then interpolating between successive points to generate a continuous curve. A CAM profile can be configured as to its type and behavior by adjusting its properties. A profile is referenced by name in a motion program that is downloaded to a motion module.

Navigator displays CAM profiles and blocks.

CAM profile table allows numeric editing and curve order grouping

Configure profiles and blocks in the Inspector.

The Companion tracks your moves and provides information on what you click.

Curves of the profile can be adjusted and edited graphically.

Secondary curves show the velocity, acceleration and jerk of the CAM profile.

To create a CAM profile

- In the Project tab of the Navigator, right-click the CAM Profiles folder and choose **New**.

  A new CAM profile with a default name is added to your project.

To configure a CAM profile

1. In the Project tab of the Navigator, right-click a CAM profile and choose **Properties**.

   The Inpector displays the properties of the CAM profile.
2. Adjust the properties of the CAM profile in the Inspector to specify its type and boundary conditions.

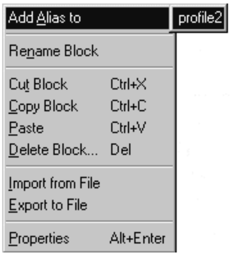
To edit a CAM profile

1. In the Project tab of the Navigator, expand the Motion Program folder and double-click a CAM profile.

   A graphical representation of your profile appears in the profile editor and a numeric representation appears in the profile table.

2. Insert and move points in the profile editor or table.
3. Group points into sectors in the profile table and assign curve fit order to each sector.

To add an alias to a CAM block



- In the Project tab of the Navigator, right-click a CAM block, point to **Add Alias to**, and then choose a profile.

  Note: Aliases correspond to CAM profiles within CAM blocks. In order to create aliases for CAM blocks, you must have previously created CAM profiles.

Want to know more? In the Help Index, choose "CAM".

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