

CYRANO USER'S GUIDE

Form 702-990421 – April, 1999

OPTO 22

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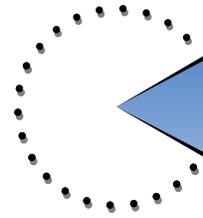
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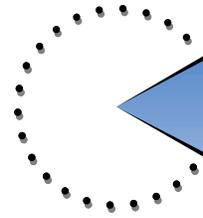
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WELCOME



ABOUT CYRANO

The Cyrano 200 Visual Control Language (“Cyrano,” for short) is a powerful, easy-to-use program that enables you to develop control applications for Opto 22’s Mystic systems right from your PC. These applications are based on simple flowcharts familiar to anyone involved in program and process control design. Because these flowchart concepts are fundamental, and because the terminology used to program Cyrano is plain English rather than techno-jargon, you will find Cyrano easy to learn and intuitive, whether or not you have any previous programming experience.

But don’t be fooled by Cyrano’s ease of use. Features such as multicharting, full debugging capabilities, and an extensive set of built-in advanced tools combine to make Cyrano the most powerful and versatile control design program you will ever need.

An inexpensive and readily available IBM-compatible PC workstation, equipped with color graphics and a mouse, is all that you need to run Cyrano. By making selections from Cyrano’s color graphic menus on your PC and using your mouse to draw interconnections, you can create a control chart that defines how you want your application to work. Cyrano then does the rest of the work for you by creating a computer program that runs your application on the Opto 22 Controller.

ABOUT THIS MANUAL

The *Cyrano User's Guide* is the first of three volumes in the Cyrano documentation set. This manual is intended to provide general information on installing and using Cyrano plus a description of all tools, menus, and dialog box options.

The other two Cyrano manuals are:

- *Cyrano Command Reference*(Opto 22 form 703) — detailed information on every Cyrano command plus important technical information on various command groups.
- *Cyrano Tutorial*(Opto 22 form 704) — a step-by-step introduction to Cyrano application development.

This manual is organized as follows:

- **Chapter 1: Installation** — requirements and procedures for installing Cyrano, plus general control concepts and programming terms.
- **Chapter 2: Getting Started** — overview of Cyrano procedures, getting around in Cyrano, starting Cyrano, and using the Environment Manager.
- **Chapter 3: Configurator Module** — descriptions of every tool and menu command in the Cyrano Configurator.
- **Chapter 4: Debugger Module** — descriptions of every tool and menu command in the Cyrano Debugger.
- **Chapter 5: Other Modules and Tools** — descriptions of the Subroutine module, OnLine module, Cyrano tools, the Flash200 utility, and the Enable NULOGIC command.
- **Appendix A: Hardware and Firmware** — specifications on hardware and firmware required to run a Cyrano application on a Mystic controller.
- **Appendix B: Cyrano Files** — listing of file types and special files in the Cyrano directory.
- **Appendix C: Special Keys** — description of special key functions within Cyrano.
- **Appendix D: Product Support** — how to reach Opto 22.



DOCUMENT CONVENTIONS

- **Bold** typeface indicates text to be typed. Unless otherwise noted, such text may be entered in upper or lower case. (Example: “At the DOS prompt, type **cd\windows**.”)
- *Italic* typeface indicates emphasis and is used for book titles. (Example: “See the *Cyrano User’s Guide* for details.”)
- Names of menus, commands, dialog boxes, fields, and buttons are capitalized as they appear in the product. (Example: “From the File menu, select Print to bring up the PRINT TOPIC dialog box.”)
- File names appear in all capital letters. (Example: “Open the file TEST1.TXT.”)
- Key names appear in small capital letters. (Example: “PressSHIFT.”)
- Key press combinations are indicated by hyphens between two or more key names. For example, SHIFT-F1 is the result of holding down the SHIFT key, then pressing and releasing the F1 key. Similarly, CTRL-ALT-DELETE is the result of pressing and holding the CTRL and ALT keys, then pressing and releasing the DELETE key.
- “Press” (or “click”) means press and release when used in reference to a mouse button.
- Menu commands are sometimes referred to with the Menu→Command convention. For example, “Select File→Run” means to select the Run command from the File menu.
- Numbered lists indicate procedures to be followed sequentially. Bulleted lists (such as this one) provide general information.

GENERAL CONTROL CONCEPTS

AUTOMATION

Automation is a means of adding intelligence to an industrial process. Automating a process decreases the need for active personal participation in the process. It also improves the performance, accuracy, and reliability of a process.

Programmable electronic components called “controllers” provide the intelligence required for automation. An Opto 22 Mystic controller receives a set of instructions on how to control every aspect of a process. A programmer creates an instruction set and passes it to the controller (downloads it) using a software package called the Cyrano 200 Visual Control Language (“Cyrano,” for short). Since the instruction set is stored in the controller’s electronic memory, much as a small computer would store it, the instructions can easily be modified.

DIGITAL AND ANALOG INPUTS AND OUTPUTS

An industrial process can be composed of many different components. All of the system components communicate with the processor by way of input/output (I/O) points, also called I/O modules.

Input points are wired to hardware that brings information *into* the controller from the process. Examples of devices wired to input points are buttons, switches, and sensors. The controller takes the information from the input points, processes it using the software instruction set, and returns information pertinent to the process. This information is returned to the process by means of output points.

Output points are wired to hardware that receives information *from* the controller and use this information to control different components of the process. For example, lights, motors, and valves are all devices wired to output points.

There are two types of I/O points, digital and analog. **Digital** points have only two values, on or off (true or false). Push buttons and LEDs are examples of digital devices. **Analog** points have a range of values. Temperature and pressure are examples of analog information.



PROGRAMMING TERMS

Variables	<p>A variable represents information. The information that a variable represents is called the value of the variable. The name of a variable remains the same during program execution. However, the value of a variable can change. There are three types of variables: floating point, integer, and string. The difference between them is the type of data they store.</p>
Floats	<p>A floating point value (or "float") is a numeric value that contains a decimal point, such as 3.14159, 1.0, and 1234.2. Cyrano uses IEEE single-precision floats with rounding errors of no more than one part per million.</p>
Integers	<p>An integer value is a whole number with no fractional part. Examples of integer values are -1, 0, 1, 999, and -456. Cyrano uses 32-bit signed integers.</p>
Strings	<p>A string variable stores text and any combination of ASCII characters, including control codes and extended characters. When defining a string variable, you must specify the width of the string. The width is the maximum number of characters that the variable may hold.</p> <p>A string variable can contain numeric characters. However, ASCII characters representing a number are <i>not</i> the same as the numeric value. In other words,</p> <p style="text-align: center;"><i>"3.33"</i> does not equal 3.33 <i>string</i> does not equal <i>value</i></p> <p>A string of numeric characters can be converted into a number and vice versa. <i>A numeric value must be converted into a string of characters to be displayed on a screen.</i></p> <p>When converting floating point values into strings, you must describe the format, that is, how many characters and decimal places should be displayed. Floating point numbers can be formatted to display in many different ways. For example, the float variable $PI = 3.14159$ can be displayed as 3., 3.1, 3.14, 3.141, etc., depending on how many decimal places are specified.</p>
Constants	<p>A constant is a string or numeric value that <i>never</i> changes.</p>
Tables	<p>Tables in Cyrano are one-dimensional arrays. A one-dimensional array is a single variable name that represents several values. Each different value is referenced by an index number. For example, a string table named OPTO_SSR_RELAYS with a length of 99 can store 100 different relay names (note that 0 is a valid index value). Each model of relay can then be referenced by an index number.</p>

ABOUT OPTO 22

Opto 22's goal to deliver total control to industrial automation customers dates back to its beginnings in 1974 with the introduction of optically-isolated solid-state relays. Today, Opto 22 is the number one provider of I/O systems, with more than 80 million points of I/O working reliably worldwide. After earning a reputation for consistent innovation and leadership in automation hardware, Opto 22 realized it was time to take a new approach to control software. In 1988, Opto 22 introduced the first flowchart-based control programming language. Opto 22 continues to deliver successively more advanced generations of hardware and software.

All Opto 22 products are manufactured in the U.S. at the company's headquarters in Temecula, California, and are sold through a global network of distributors, system integrators, and OEMs. Sales offices are located throughout the United States. For more information, contact Opto 22, 43044 Business Park Drive, Temecula, CA 92590-3614. Phone Opto 22 Inside Sales at 1-800-452-OPTO or Opto 22 headquarters at 951-695-3000. Fax us at 951-695-3095.

You can also visit our Web site at www.opto22.com.

INSTALLATION



OVERVIEW

This chapter provides complete installation procedures, including a list of hardware and software requirements for running the application.

INSTALLATION REQUIREMENTS

This section details the minimum hardware and software requirements you will need to install and run Cyrano.

HARDWARE REQUIREMENTS

- IBM-compatible personal computer with minimum 640 KB RAM, a 10-MB hard drive (with at least 1 MB of available disk space), and a 3.5-inch disk drive
- EGA or VGA graphics monitor
- EGA or VGA graphics adapter card with 256 KB video RAM
- Mouse (recommended brands: Microsoft Mouse, Mouse Systems, or Logitech)
- RS-232 serial port or mouse
- *(Optional)* Printer and parallel port for printing (over 200 printer types are supported)

SOFTWARE REQUIREMENTS

- MS-DOS (version 5.0 or higher)
- Microsoft Mouse Driver (version 6.11) or equivalent

Note that Microsoft Windows is not required, although you may run Cyrano directly from Windows if you wish.

To download and run Cyrano applications, you will require additional hardware, and you may also need to download firmware to the Mystic controller. These requirements are detailed in Appendix A.

INSTALLATION PROCEDURES

CYRANO INSTALLATION

The Cyrano installation program runs from DOS or Microsoft Windows. Before running the installation, make backup copies of Cyrano installation disks 1 and 2 (by using DISKCOPY from DOS or the File Manager's Copy Disk function from Windows). Note that Cyrano is not copy-protected.

If you are upgrading your version of Cyrano, you may wish to install the new version to your existing Cyrano directory. This will update all Cyrano program files but will not affect your project files.

The installation program is intuitive and straightforward. In most cases, you can simply press ENTER when prompted to accept installation defaults. In any case, press ENTER after typing each response or after supplying requested text.

If you have not already done so, exit any active applications, then follow the step-by-step procedures below to install Cyrano:

1. Insert disk 1 into a disk drive. From the Windows Program Manager, select Run from the File menu and type:

A:INSTALL (or **B:INSTALL**)

You may also type the above command directly from a DOS prompt.

2. The installation begins by presenting an initial information screen followed by a prompt to install Cyrano or exit the installation. Press ENTER to proceed.
3. You will be prompted for the disk drive to which Cyrano will be installed, typically C or D. Press ENTER to accept the default C drive, or type another drive letter.
4. You will be prompted for the name of the Cyrano directory. This directory will contain all Cyrano program files and related files. Type a name of up to eight characters, or press ENTER immediately to accept the default CYRANO directory.

You will be alerted if the directory you specified already exists. Press ENTER to continue the installation, overwriting any existing Cyrano program files in the directory. To cancel the installation, press N or ESC.

You will also be alerted if you specified an invalid directory name. After pressing any key to continue, you will be returned to step 3 to enter the drive letter.

5. You will be notified that the installation is ready to proceed with file copying. Press ENTER to continue, or press N to cancel the installation.

If you did not cancel the installation, file copying will begin. You will be informed of file copying progress throughout. When prompted for the next disk, insert disk 2 and press ENTER to continue.

You will be notified when file transfer is complete.

6. A message will appear indicating that Cyrano is searching for a WIN.INI file. Press any key to continue. Another message appears indicating that Cyrano has modified the WIN.INI file. Press any key to continue.

*Note: If you are installing from DOS and your PC does not have Windows, a message will appear indicating that Cyrano could not find the WIN.INI file. To continue with the installation, type **Y** and press **ENTER**.*

7. Cyrano will automatically create a program group and icon which will be added the next time Windows is executed. Press any key and you will be notified that the installation is complete. Press any key to continue.

Note: The working directory of the new program icon has been set to your Cyrano directory (view the icon properties to verify this). This working directory cannot be changed.

8. A message will appear reminding you to install the latest version of firmware. See the following section, Flash200 Firmware Installation, for instructions. Press any key to finish the installation.

FLASH200 FIRMWARE INSTALLATION

If you will be updating the Flash memory on a Mystic controller, you will also need to install the Flash200 firmware utility. This installation program also runs from DOS or Windows and is identical in structure to the Cyrano installation. Before running the installation, make a backup copy of the Flash firmware disk (by using DISKCOPY from DOS or the File Manager's Copy Disk function from Windows). Note that the firmware is not copy-protected.

As with the Cyrano installation, in most cases you can simply press **ENTER** when prompted to accept installation defaults. In any case, press **ENTER** after typing each response or after supplying requested text.

If you have not already done so, exit any active applications, then follow the step-by-step procedures below to install the Flash200 firmware:

1. Insert the Flash firmware installation disk into a disk drive. From the Windows Program Manager, select Run from the File menu and type:

A:INSTALL (or **B:INSTALL**)

You may also type the above command directly from a DOS prompt.

2. The installation begins by presenting an initial information screen followed by a prompt to install the Flash firmware or exit the installation. Press **ENTER** to proceed.
3. You will be prompted for the disk drive to which Cyrano will be installed, typically C or D. Press **ENTER** to accept the default C drive, or type another drive letter.

4. You will be prompted for the name of the firmware directory. This directory will contain all Flash200 firmware files. Type a name of up to eight characters, or press **ENTER** immediately to accept the default **FIRMWARE** directory.

You will be alerted if the directory you specified already exists. Press **ENTER** to continue the installation, overwriting any existing firmware files in the directory. To cancel the installation, press **N** or **ESC**.

You will also be alerted if you specified an invalid directory name. After pressing any key to continue, you will be returned to step 3 to enter the drive letter.

5. You will be notified that the installation is ready to proceed with file copying. Press **ENTER** to continue, or press **N** to cancel the installation.

If you did not cancel the installation, file copying will begin. You will be kept informed of file copying progress throughout and notified when the file transfer is complete.

6. A message will appear indicating that if you will be running the Flash200 firmware utility from Windows, you can install an Opto 22 program group with a firmware program icon. Press any key and you will be informed that installation is complete. Press any key again to exit the installation program.

7. To create a program group and icon:

1. Run Windows.
2. Select **File**→**Run** from the Program Manager.
3. Type **C:\FIRMWARE\EZGRP.EXE** (where **C:\FIRMWARE** is your firmware directory) and click **OK**. A Flash 200 dialog box will appear; click **Continue** and the Flash200 firmware program icon will appear in the **OPTO 22** program group. Click **OK** at the information dialog box that will appear after a few seconds.

For convenience, you may wish to add the Flash200 utility to the Cyrano Environment Manager's Tools menu. See page 5-17 for details.

CONFIGURATION FILES

Before running Cyrano, compare your AUTOEXEC.BAT and CONFIG.SYS configuration files to the following:

CONFIG.SYS

```
DOS=HIGH,UMB  
DEVICE=C:\HIMEM.SYS  
FILES=30  
BUFFERS=10  
SHELL=C:\DOS\COMMAND.COM C:\DOS\ /e:512 /p
```

AUTOEXEC.BAT

```
LOADHIGH C:\SMARTDRV.EXE  
LOADHIGH C:\MOUSE.COM  
PATH C:\;C:\DOS;C:\CYRANO  
PROMPT $P$G
```

If you need to modify these files, be sure to back them up first. Reboot your PC to allow your changes to take effect.

Note that unlike previous versions of Cyrano, this version does **not** allow the use of a FRAME option with the EMM386 statement (for example, DEVICE=C:\EMM386.EXE NOEMS FRAME=E000). Be sure to remove the FRAME option if it is included in your CONFIG.SYS file.

GETTING STARTED



OVERVIEW

This chapter provides a general overview of using Cyrano, tips on getting around in Cyrano, instructions on starting the application, and a guide to using the Cyrano Environment Manager.

USING CYRANO: AN OVERVIEW

Cyrano allows you to write control applications with little or no prior programming experience. Cyrano is a self-documenting language based on flowcharts that makes it easy to turn thoughts into action.

There are three fundamental steps to creating and running a Cyrano program:

1. Develop an application in the Cyrano Configurator.
2. Download the application to a Mystic controller and debug it in the Cyrano Debugger.
3. Run the application stand-alone on the Mystic controller.

PROGRAM STRUCTURE

A Cyrano program is divided into segments called flowcharts ("charts," for short). A chart has three different status levels: running, suspended, and stopped. A running chart is actively performing its assigned task. A suspended chart is temporarily paused. A stopped chart is inactive. Every chart in a Cyrano program can change the status of any other chart in the program. Every chart is independent of every other chart. Any combination of charts may be running simultaneously.

Every chart in Cyrano has a BLOCK-0, which is the location at which each chart begins executing its logic. BLOCK-0 can be renamed but never deleted.

Every Cyrano program has a POWERUP chart and an INTERRUPT chart. The POWERUP chart is the only chart started automatically at power-up or run time; hence, program execution begins in BLOCK-0 of the POWERUP chart. All other charts must be started with a START CHART command at the appropriate time in the control strategy.

The ability to run several charts, each performing a different task, is accomplished through a time-slicing technique called **multitasking** (also called multicharting). The Mystic 200 Processor (also called the Mystic controller) contains a multitasking kernel that gives a single processor the ability to simultaneously run up to 31 charts, in addition to the HOST task, by assigning each task a 500-microsecond time slice.

The HOST task, an invisible “chart” whose purpose is to communicate to a Cyrano Debugger or to a Mystic Man-Machine Interface (MMI), is assigned the first 500-microsecond time slice. *Each chart in a running or suspended state is considered a task and is allocated a 500-microsecond time slice.* Charts that are stopped are not assigned a time slice.

When the POWERUP chart is running, it is always assigned the time slice after the HOST task. When a chart ends or its time slice expires (whichever occurs first), control passes to another chart or task in the program. Control continues passing in a round-robin manner, eventually returning to the HOST task and repeating the cycle. The list of ordered tasks is called the task queue.

The INTERRUPT chart is special in that it is normally in a suspended state. If an interrupt generated by an I/O unit causes the INTERRUPT chart to start running, it is always the next chart to receive a time slice. The INTERRUPT chart floats in the task queue.

Any chart can be allocated several time slices in a row if its priority is changed through the SET PRIORITY command. When 32 charts are running, each with a single time slice, each chart will be executed at least once every 16 milliseconds, sooner if fewer charts are running. With this quick control pass, all charts appear to run simultaneously. By placing time-critical tasks, such as the monitoring of an emergency stop, in separate charts, you will ensure that these processes receive attention at predictable intervals.

PROGRAM DESIGN

When a new Cyrano program is created, there are two predetermined charts: POWERUP and INTERRUPT. Every other chart in Cyrano is added by the programmer.

Each chart should control one aspect of the application. Hence, the first step in designing a Cyrano program is to take the desired control application and divide it into related tasks. When dividing your application into tasks, keep in mind that only 32 charts (including the HOST task) can be running or suspended at any time. However, you can write up to 1,295 charts in a single program, given enough processor memory.

Tasks that need to be continuously monitored can be placed in a chart that is continuously running. Tasks that need to be performed only at given times can be stopped and started by other charts. When the application is complex and consists of many tasks, it is beneficial to have one chart that starts and stops the other charts. The POWERUP chart or another user-created chart called MAIN can be used for this purpose. The POWERUP chart should be used to initialize variables, perform setup commands, and start other charts. However, the POWERUP chart should *not* be used for major control strategy.

CHART DESIGN

After dividing your application into tasks, it is time to start planning each chart’s strategy. There are essentially two types of flowchart logic:

Flow-Through Logic

A chart with flow-through logic performs a set of specific commands and then stops. A flow-through logic chart has a beginning and an end. The end of a chart is a condition or operation block that has no exit.

The POWERUP and INTERRUPT charts (as well as subroutine charts) should always have flow-through logic. Any user-created chart that does not need to run continuously should be designed with flow-through logic.

Although iteration looping can be used in flow-through logic, condition looping (such as waiting for something to occur) cannot be used. Delays are allowed in flow-through logic but should be used sparingly.

Loop Logic

A chart that needs to run continuously should be designed with loop logic. A chart with loop logic has no end. It loops through a set of operations and conditions continuously. A loop logic chart can have several paths through which the direction of the logic may flow depending on certain criteria.

There are three basic building blocks you can use to create your program logic:

Operation Blocks

Rectangles that contain instructions to be executed in a program. Several instructions or commands can be placed in one block. Operation blocks can have many entrances but only *one* exit.



Figure 2-1: Operation Block

Condition Blocks

Diamonds that contain questions that control the logical flow of a program. Condition blocks can have many entrances, but only *two* exits: True and False. More than one question may be asked within a single condition block. If *all* questions within the block evaluate True, the block will exit True. If any question in the block evaluates False, the block will exit False.



Figure 2-2: Condition Block

Connection Lines

Arrows that define the path of the program logic.



Figure 2-3: Connection Line

GETTING AROUND IN CYRANO

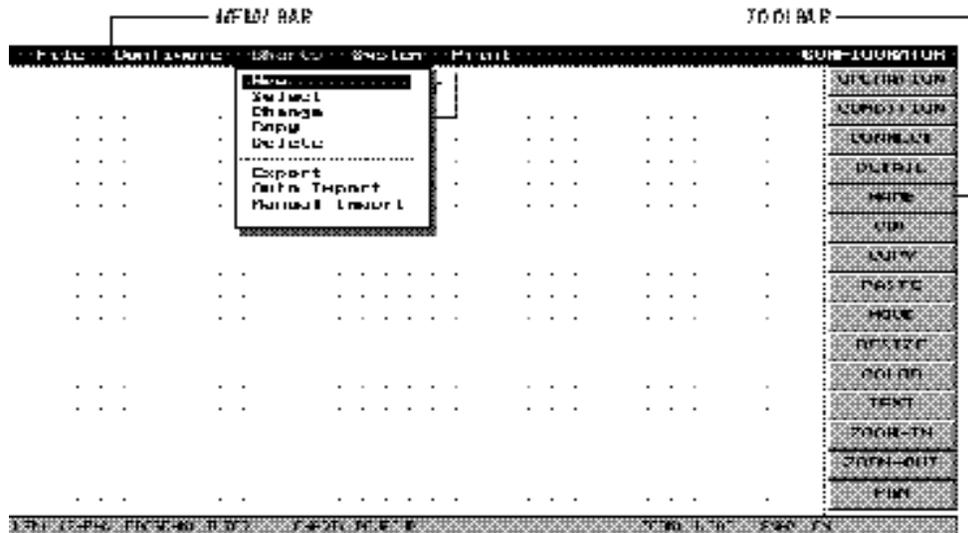


Figure 2-4: Menu Bar and Toolbar

MENU BAR

Items on the menu bar in Cyrano can be accessed using the keyboard, mouse, or any combination of mouse and keyboard. The menu bar toggles on and off from the keyboard when you press the ESC key. To select a menu on the menu bar using the mouse, position the cursor on the item and press the left mouse button. Click the right mouse button to release the menu bar.

Once a menu is selected (as evidenced by a highlighted item), you can use the four arrow keys or mouse movements to maneuver through the available commands. Press ENTER or click the left mouse button to execute a highlighted command.

In summary, the left mouse button functions like the ENTER key and the right mouse button performs like the ESC key:

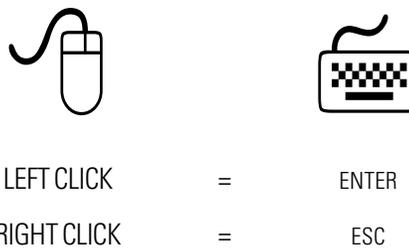


Figure 2-5: Mouse and Keyboard Equivalents

STARTING CYRANO

To run Cyrano from DOS, change directory to your Cyrano directory (C:\CYRANO, by default), then type **CYRANO** at the prompt. For example:

```
C:\>CD CYRANO
```

```
C:\CYRANO>CYRANO
```

To launch Cyrano from Windows, double-click the left mouse button over the Cyrano icon in the Opto 22 program group:

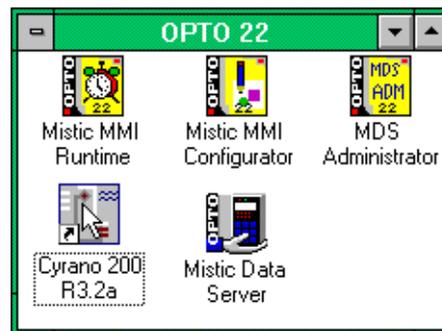


Figure 2-7: Cyrano Program Icon

USING THE ENVIRONMENT MANAGER

The Cyrano Environment Manager is the first screen displayed when Cyrano is launched. The Environment Manager consists of a menu bar and the Cyrano logo. The menu bar includes three menu choices: Cyrano, Tools, and System. Each menu includes several options.

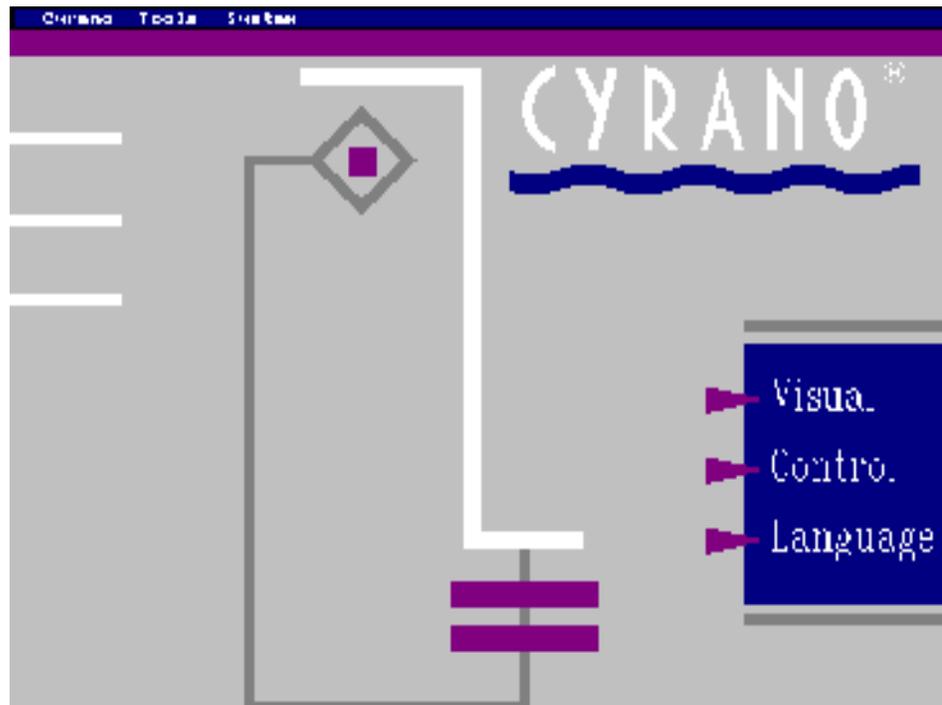


Figure 2-8: Cyrano Environment Manager

CYRANO MENU

Configurator

Use this command to launch the Configurator, the module in which Cyrano programs are written and edited.

See Chapter 3 for a complete description of this module and all Configurator commands.

Debugger

Use this command to launch the Debugger, the module that compiles programs and downloads them to the Mystic controller. From this module you can examine and modify I/O points, variables, and other program parameters. You can also monitor the step-by-step execution of your Cyrano programs.

See Chapter 4 for a complete description of this module and all Debugger commands.

OnLine

Use this command to launch the OnLine module, which allows you to make changes to a completed Cyrano program after it is running on the processor without stopping the process. Use this module to make changes to applications that cannot be interrupted for minor modifications or enhancements.

See Chapter 5 for a complete description of this module and all OnLine commands.

Subroutine

Use this command to launch the Subroutine module, a subset of the Configurator module in which subroutines can be written. Subroutines are procedures used to customize multiple Cyrano programs or multiple charts within a single Cyrano program. Subroutines are created to perform tasks that may be executed several times. Once created, subroutines can be used like regular commands in Cyrano.

See Chapter 5 for a complete description of this module and all Subroutine commands.

Version

Use this command to view the Environment Manager's version number, release date, and copyright information.

Quit

Use this command to exit Cyrano.

TOOLS MENU

This menu contains four standard items. In addition, you may add other applications (such as the Flash200 utility) to this menu. See page 5-17 for details.

Init

Use this command to launch the Init utility. This program initializes variables and table values in a Cyrano program using a MISTIC.INC file. The MISTIC.INC file contains initialization values for variables.

See Chapter 5 for details on this program.

Backup/Restore

Use this command to launch the Backup/Restore utility. This program creates a full backup of a Cyrano program, including all associated files, such as the MISTIC.INC and subroutine files. The program can also be used to restore a previously backed up program.

See Chapter 5 for details on this program.

ChartDXF

Use this command to launch the ChartDXF utility. This program converts Cyrano chart files into .DXF format files, allowing them to be plotted on CAD-supported devices.

See Chapter 5 for details on this program.

Bill of Material

Use this command to launch the Bill of Materials utility. This program generates a file listing all hardware referenced in a Cyrano program.

See Chapter 5 for details on this program.

SYSTEM MENU

Enable NULOGIC

Use this command to toggle access to the Cyrano motion commands on and off. If your application does not require motion control, this option should be left disabled.

See Chapter 5 for details.

CONFIGURATOR

OVERVIEW

This chapter provides a general overview of the Cyrano Configurator module, which is the primary location for creating and modifying a program.

Use the Configurator to create a program strategy by drawing one or more flowcharts. You can also use this module to configure the Mystic controller plus all I/O units, I/O points, variables, PID loops, and event/reactions.

The Configurator screen appears below.

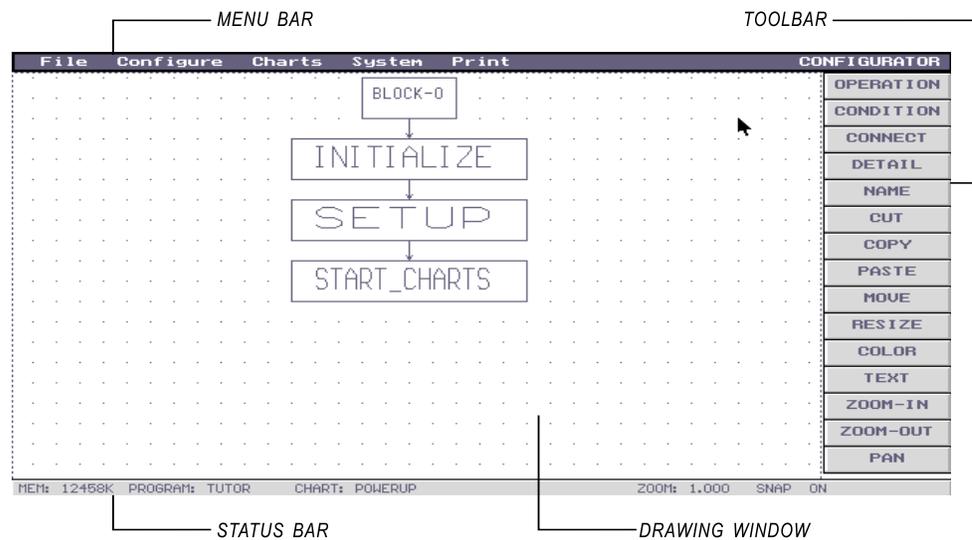


Figure 3-1: Configurator Screen

CONFIGURATOR TOOLBAR

Configurator tools are located in a toolbar at the right of the drawing window. To select a tool, position the cursor over the tool and press ENTER or the left mouse button. The selected tool will be highlighted in blue. To release a tool, press ESC or the right mouse button.

OPERATION

Use this tool to add an operation block to the chart.

After selecting the tool, an empty rectangular block will appear. Move the mouse to position the block, then press and release the left mouse button to place it at the indicated size. To resize the block before placing it, press the left mouse button and drag the mouse before releasing the button.

The new block will be named BLOCK- n , where n is the next available block number.

CONDITION

Use this tool to add a condition block to the chart.

After selecting the tool, an empty diamond-shaped block will appear. Move the mouse to position the block, then press and release the left mouse button to place it at the indicated size. To resize the block before placing it, press the left mouse button and drag the mouse before releasing the button.

The new block will be named BLOCK- n , where n is the next available block number.

CONNECT

Use this tool to draw connection lines between blocks.

After selecting the tool, position the cursor over the block you wish to connect from (the source block). When the block begins to flash, click the left mouse button to select it. Move the cursor and a line will follow. Move the cursor over the block you wish to connect to (the destination block) and click the left mouse button to complete the connection.

To introduce a right-angle bend in a line, click the left mouse button wherever you want the line to bend.

If the source block is a condition, you will be prompted to select either the True exit or the False exit. The next time you connect from this block, the remaining exit (True or False) will be selected automatically.

You may connect *to* a block more than once, but an operation block will have only one exit and a condition block will have only two exits.

DETAIL

Use this tool to view or change existing commands or add new commands in an operation or condition block.

After selecting the tool, position the mouse cursor over the block you wish to view or edit. Press the left mouse button to bring up the block's detail window.

(Note: Double-clicking the left mouse button directly over a block is equivalent to selecting the DETAIL tool and then selecting a block. Note that the DETAIL tool will be selected and the detail window will open.)



The detail window displays the block's operations or conditions. A small cursor bar at the right of the detail window shows where the highlight bar is relative to the block's entire list of instructions.

Use the mouse or the up or down arrow keys to move through the command list. Press HOME to position the highlight bar at the beginning of the list, or END to position the highlight bar at the last instruction on the list.

To add a command, select the ADD button. If you are adding the first command to the block, the ITEM EDITOR dialog box will immediately appear. Otherwise, several highlighted rows will appear representing the new command. Use the mouse or cursor keys to position the new command to follow or precede existing instructions, then press ENTER to open the ITEM EDITOR dialog box.

The ITEM EDITOR dialog box allows you to enter the details of a command. Begin by entering the command name in one of three ways:

1. Type the complete command. Once you become familiar with Cyrano, you will often know the exact name of a command you wish to enter. If you type an unrecognized command, the GROUP SELECTIONS dialog box will appear. (See method 3 below.)
2. Type the first few letters of the command. If you know the first few letters of a command, type them in and press ENTER or the left mouse key to open a dialog box listing all commands beginning with that pattern. Use the mouse or the up or down arrow keys to highlight the desired command, then press ENTER.
3. Press ENTER without typing any characters. This will bring up the GROUP SELECTIONS dialog box, from which you can use the mouse or the up or down arrow keys to select a command group and then a command. Use this method when you have no idea what command name to type.

Note that when you select a command from a list, standard commands appear in black, subroutines appear in bright red, and custom commands (from a MISTICA.DEF or MISTICC.DEF file) appear in dark red.

Once you have entered a command name, a new field will appear representing the argument type. Use the mouse or the left or right arrow keys to scroll through the list of argument types. Only types allowed for the command will appear. Press ENTER to accept a type.

A new field will appear representing the name of the first argument. As with the command name above, you can enter the name by typing it in full, typing in the first few letters and pressing ENTER, or pressing ENTER immediately. If no argument of the indicated type has been defined, you will be asked to define one. If you select YES, you will be led through the same data entry dialog boxes used to configure variables, I/O points, etc., through the Configure menu commands.

If you make any mistakes along the way, you can press ESC to undo the operation.

Once you have finished entering information in the ITEM EDITOR dialog box, highlight the ACCEPT button and press ENTER. The new command will appear in the detail window.

You can also cut, copy, and paste commands in the detail window. To cut or copy, use the mouse or up or down arrow keys to highlight one or more commands (select multiple commands by pressing shift while moving the highlight bar), then use the mouse or left or right arrow keys to highlight CUT or COPY and press ENTER. To paste the commands you have just cut or copied, move the highlight bar with the mouse or up or down arrow keys, then use the mouse or left or right arrow keys to highlight PASTE and press ENTER. The command(s) will be inserted above the highlighted command.

Press ESC to close the detail window.

NAME

Use this tool to rename a block. Every block within a chart must have a unique name, although the same block name may appear in several charts.

After selecting the tool, move the cursor over a block until it flashes, then click the left mouse button. A dialog box will appear to allow you to enter a new name. Type in a unique name for the block and press ENTER twice. A warning will appear if the name already exists.

CUT

Use this tool to cut (delete) one block or a group of blocks along with any associated connection lines. You can also use this tool to delete individual connection lines. Blocks that are cut can immediately be pasted back into the drawing window, although any associated connection lines will be lost. Connection lines, once cut, cannot be restored.

After selecting the tool, delete a block by moving the cursor over the block until it flashes and clicking the left mouse button. You will be prompted to confirm the cut operation. To delete a group of blocks, position the cursor above and to the left of the upper left block, press and hold the left mouse button, then move the cursor down and to the right until all blocks in the group have been completely surrounded. Release the mouse button and you will be prompted to confirm the cut operation.

Note that once a block is cut, all connections to or from the block and all commands contained in the block are deleted. Note also that BLOCK-0 in every chart is a special block that can never be cut.

To delete a connection line, move the cursor close to an endpoint or a bend point to cause the line to flash. Click the left mouse button once the line is flashing and you will be prompted to confirm the cut operation.

COPY

Use this tool to copy one block or a group of blocks along with any associated connection lines. You can later decide to paste the copied objects anywhere in the drawing window.

After selecting the tool, copy one block by moving the cursor over the block until it flashes and pressing the left mouse button. To copy a group of blocks, position the cursor above and to the left of the upper left block, press and hold the left mouse button, then move the cursor down and to the right until all blocks in the group have been completely surrounded. Release the mouse button and the group will be copied to a buffer, from which it can immediately be pasted.

You may copy up to 50 operation and 50 condition blocks at a time as long as you have enough available memory to create the new blocks and connections. A warning message will appear if you exceed the memory limit.

PASTE

Use this tool to retrieve objects that were most recently cut or copied into a buffer.

After selecting the tool, a rectangular area will appear in the drawing object representing the items to be pasted, if any (you will be alerted if there is nothing in the buffer to be pasted). Move the cursor to position the objects, then press the left mouse button to complete the paste, or press ESC to cancel the operation.



MOVE

Use this tool to move one block or a group of blocks along with any associated connection lines to another area of the drawing window.

After selecting the tool, move one block by positioning the cursor over the block until it flashes, pressing the left mouse button once, moving the cursor to a new position in the drawing window, and pressing the left mouse button again.

To move a group of blocks, position the cursor above and to the left of the upper left block, press and hold the left mouse button, then move the cursor down and to the right until all blocks in the group have been completely surrounded. Release the mouse button and a rectangle representing the surrounded objects will appear. Position the rectangle where you wish and click the left mouse button to complete the move. You may move up to 50 operation and 50 condition blocks at a time.

To cancel the operation, press ESC before the second left mouse press.

RESIZE

Use this tool to change the size of a block.

After selecting the tool, position the cursor over any block. Press and hold the left mouse button, then move the mouse up to shrink the block or down to enlarge it. Release the mouse button and the block will be resized.

COLOR

Use this tool to change the color of the drawing window or objects within the window.

After selecting the tool, the SELECT COLOR OPTION dialog box will immediately appear. Use the mouse or the up or down arrow keys to select from the following:

- **CHANGE ENVIRONMENT COLOR** — Select foreground and background colors for the drawing window environment, then press ESC. All new objects (blocks, connection lines, and text) will appear in the foreground color.
- **EDIT OBJECT COLOR** — Select a foreground and background color, then press ENTER or click the left mouse button over ACCEPT in the EDIT OBJECT COLOR dialog box. Now move the cursor over any object to which you wish to apply the new color scheme and click the left mouse button. You may apply the new object color repeatedly before pressing ESC to release the tool.
- **EDIT ALL OPERATION BLOCKS** — Select a foreground and background color for all new and existing operation blocks, then press ENTER or click the left mouse button over ACCEPT in the EDIT OBJECT COLOR dialog box.
- **EDIT ALL CONDITION BLOCKS** — Select a foreground and background color for all new and existing condition blocks, then press ENTER or click the left mouse button over ACCEPT in the EDIT OBJECT COLOR dialog box.
- **EDIT ALL CONNECTIONS** — Select a color for all new and existing connection lines, then press ENTER or click the left mouse button over ACCEPT in the EDIT OBJECT COLOR dialog box.

- **EDIT ALL TEXT** — Select a color for all new and existing text entered directly on the drawing window, then press **ENTER** or click the left mouse button over **ACCEPT** in the **EDIT OBJECT COLOR** dialog box.

TEXT

Use this tool to place text anywhere in the drawing window. This is useful for adding comments to document your chart logic. You can also use this tool to edit existing text blocks.

After selecting the tool, add text by clicking the left mouse button anywhere and typing. Press **ENTER** once to complete a line of text. Continue typing to add additional text directly below the first line, or press **ENTER** to halt text entry. You can then move the cursor to a new position and press **ENTER** to begin a new text block, or press **ESC** to release the tool.

To edit an existing text block, select the tool and click the left mouse button over the text. The **Edit Text** dialog box will appear; modify the text as needed, then press **ENTER** twice to accept the change.

ZOOM-IN

Use this tool to magnify the drawing window by a factor of two.

Click the left mouse button over the tool to enlarge the window and all objects within it to twice their size. The **ZOOM** displayed in the status bar at the bottom of the drawing window will be cut in half each time down to a minimum of .125 (one-eighth of the normal drawing window is in view).

ZOOM-OUT

Use this tool to shrink the drawing window by a factor of two.

Click the left mouse button over the tool to reduce the window and all objects within it to half their size. The **ZOOM** displayed in the status bar will double each time up to a maximum of 32 (32 times the normal drawing window is in view).

PAN

Use this tool to move to other areas of the drawing window.

After selecting this tool, position the cursor anywhere in the drawing window, then press and hold the left mouse button as you move (drag) the cursor in the direction you wish the drawing window to move. Release the left mouse button and the drawing window will appear in its new position.

To select a new center point for the drawing window, select the tool, position the cursor where you want the new center to be, and press the left mouse button. The drawing window will immediately shift so that the spot you have selected is at the center.

It is advisable to pan by small amounts until you become familiar with this tool. (Note: The **PAN** tool will be selected automatically if you click the left mouse button on an empty area of the drawing window when no other tool is selected.)



CONFIGURATOR MENU BAR

The Configurator menu bar includes five menus: File, Configure, Charts, System, and Print.

FILE MENU

Load

Use this command to load an existing program or to create a new program.

The LOAD FILE dialog box will appear, displaying the current path, current file name, and a directory box listing all subdirectories and Cyrano programs in the current path.

To create a new program, use the mouse or cursor keys to highlight the FILE NAME button and press ENTER. This will highlight the FILE NAME field. Enter a new file name (up to eight characters) and press ENTER. To change directory, use either the DIRECTORY or PATH buttons. If you select the DIRECTORY button, the first entry in the DIRECTORY box will be highlighted. Use the mouse or cursor keys to move down a level (by opening a subdirectory, indicated by <brackets>) or up a level (by selecting <..>), then press ESC to exit the box. If you select the PATH button, enter a full path (up to 80 characters) in the PATH field and press ENTER. Press ENTER with the ACCEPT button highlighted to create the program file. A new chart will appear and the new program name will be listed in the status bar.

To load an existing file, you can use the same procedure to type in a file name (and path, if necessary) or browse for a file. Once you have specified the file, press ENTER with the ACCEPT button highlighted to load the program.

To cancel a file load, press ESC or select the CANCEL button.

Save

Use this command to save the current program to a new or existing file name.

The SAVE FILE dialog box will appear. This dialog box is identical to the LOAD FILE dialog box (see the Load command above for details).

To save a file to a new name, select the FILE NAME button, enter a new name in the FILE NAME field, and press ENTER. If necessary, select a new directory by using the DIRECTORY or PATH buttons. Press ENTER with the ACCEPT button highlighted to save the program file.

Version

Use this command to view the Configurator's version number, release date, and copyright information.

Quit

Use this command to exit the Configurator and return to the Cyrano Environment Manager. If you have made changes to the program strategy that have not been saved, you will be asked if you wish to save your strategy.

CONFIGURE MENU

Mistic

Use this command to configure the parameters needed for downloading a file to the proper Mistic controller.

The CONFIGURE MISTIC COMMUNICATIONS dialog box will appear, displaying the following fields:

NAME Enter a descriptive name of up to 30 characters for the Mistic controller, then press ENTER. This name is optional.

TYPE Select the Mistic controller type from the scrolling list (use left or right arrow keys to view options, then press ENTER to select one). Choices are: G4LC32, G4LC32SX, G4LC32ISA, and M4RTU.

Unless you select the G4LC32, a COM Port Configuration dialog box will appear. Use the left or right arrow keys within each field to select a baud rate or to determine whether CTS control will be enabled for each COM port. For the G4LC32ISA, you can also select the DMA channel (0, 5, 6, or 7).

COM MODE Specify whether communication between the PC and the Mistic controller will be in Opto 22 binary communication mode (default) or Opto 22 ASCII communication mode (used for talking via modem on a HOST port).

ADDRESS Enter the address (1 to 255) of the Mistic controller. This must match the address set on the Mistic controller. The default is 1. (Note: Address 0 is reserved for ARCNET broadcast operations and cannot be selected.)

PORT Specify the communication port **on your PC** to use for downloading the Cyrano program. Select from the scrolling list (use left or right arrow keys to view options). Choices are: COM1, COM2, COM3, COM4, COM5, COM6, CUSTOM, and ARCNET.

- COM ports: Cyrano automatically assigns the following addresses and interrupts:

COM1: Base Address 3F8, IRQ 4

COM2: Base Address 2F8, IRQ 3

COM3: Base Address 348, IRQ 2

COM4: Base Address 340, IRQ 5

COM5: Base Address 248, IRQ 10

COM6: Base Address 240, IRQ 11

- CUSTOM: Select a custom base address and interrupt for the communication port on the PC.



- ARCNET: If ARCNET is selected, two other fields appear:

BASE ADDR. Specify the hex base memory address of the ARCNET card in the PC. Select from the scrolling list (use left or right arrow keys to view options). Choices are: 260, 290, 2E0, 2F0, 300, 350, 380, and 3E0.

RAM ADDR. Specify the hex RAM address of the ARCNET card in the PC. Select from the scrolling list (use left or right arrow keys to view options). Choices are: C0000, C4000, C8000, CC000, D0000, D4000, D8000, DC000, and E0000.

Consult your ARCNET card documentation for configuration and installation instructions. Once the card is configured, match the base and RAM addresses with those above. Cyrano does not use interrupts (IRQs) with ARCNET cards. Therefore, remove all IRQ jumpers from the ARCNET card.

BAUD	Specify the baud rate to be used for downloading the Cyrano program. This baud rate must match the one set for the Mystic controller HOST port. Select from the scrolling list (use left or right arrow keys to view options). Choices are: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 76800, and 115200 (the last two require a high-speed serial port, such as the Opto 22 AC37 RS-485 card).
	If the port specified is ARCNET, the baud rate is fixed at 2.5Mb. and cannot be changed.
CTS	Choose whether the CTS line should be disabled or enabled. Select DISABLED (default) or ENABLED from the scrolling list (use left or right arrow keys to toggle between the two). ENABLED is <i>required</i> if you are using a modem.
RETRY	Specify the number of times Cyrano will retry an attempt to communicate with the Mystic controller before reporting a — communications error. The range is 1 (default) to 9 retries.
TIMEOUT	Specify the number of seconds Cyrano will wait for a response from the Mystic controller. If this time expires, Cyrano will try again as many times as specified by the RETRY setting above before reporting a communications error. The range is 0.01 to 655.35 seconds. The default is 1.

I/O Unit

Use this command to configure one or more I/O units (bricks).

The CURRENT I/O UNITS dialog box will appear. Select ADD or CHANGE to bring up the ADD (or CHANGE) I/O UNIT dialog box, which contains the following fields:

NAME	Enter a name of up to 30 characters to identify the I/O unit with a meaningful tag name that can be referenced by operations and conditions. This name must be unique among I/O units. Cyrano will alert you if you have entered a name that already exists and will prompt you for a new name.
TYPE	Select the I/O unit type from the scrolling list (use left or right arrow keys to view options). Choices are:

- NON MF DIGITAL — Local Non-Multifunction Digital I/O unit, also called Local Simple (G4D16LS) (uses local port only)
- DIGITAL MF — Local Multifunction Digital or Remote Multifunction Digital I/O unit (G4D16L or G4D16R)
- REMOTE SIMPLE PLUS — Remote Non-Multifunction Digital I/O unit, also called Remote Simple (G4D32RS)
- ANALOG MF — Multifunction Analog I/O unit (G4A8L, G4A8R, G4HDAL, G4HDAR)

If you select ANALOG MF, an additional field will appear to allow you to choose the type of multifunction analog I/O unit. Select a type from the scrolling list (use left or right arrow keys to view options). Choices are: SINGLE POINT, HRD THERMOCOUPLE, HRD VOLT/CURRENT, HRD VOLTAGE OUT, HRD CURRENT OUT, and HRD RTD.

PORT Specify the communication port on the Mystic controller to which this I/O unit is connected. Select from the scrolling list (use left or right arrow keys to view options). Choices are: LOCAL, REMOTE 0, REMOTE 1, REMOTE 2, and REMOTE 3.

The port is automatically set to LOCAL when the I/O unit type is NON MF DIGITAL and cannot be changed unless you change the type.

ADDRESS Enter the address (0 to 255) set by the jumpers on the I/O unit. Each I/O unit on the same port must have a unique address. Refer to the I/O unit's installation instructions for the correct jumper configuration. The default is 1.

WATCHDOG Select DISABLED (default) or the number of seconds the I/O unit will wait since the last communications activity on this port. If there is no communication activity on the port for the specified number of seconds, the I/O unit will go to a watchdog state.

When enabled, the watchdog function causes selected outputs to go to a specified value. This depends on the WATCHDOG enable and value fields in the DIGITAL MF and ANALOG MF I/O point data screens.

Select a watchdog value from the scrolling list (use left or right arrow keys to view options). Choices are: DISABLED, 200 MS (milliseconds), 500 MS, 1 SEC, 5 SEC, 10 SEC, and 100 SEC.

SECURITY Select a security level for use with a Mystic Data Server (MDS) for non-Mistic MMI clients, or for use on the G4LC32 front panel display to control the viewing and changing of values for variables and points.

For security details with respect to MDS, see the *MDS User's Guide* (Opto 22 form 691).

To enable security for use with the G4LC32, the local terminal option must be made active by selecting the System → Download Options command and choosing YES in the MISTIC.TRM field. The MISTIC.TRM file must reside in the project directory.

To view or change a parameter, an operator must enter the correct password at the G4LC32 front panel for the selected security level. The operator can view and change all parameters secured at a level equal to or less than his or her level.



Select a security level from the scrolling list (use left or right arrow keys to view options). Choices are:

- Level 0 (default)—No password required (lowest level)
- Level 1 — Level 1 password required
- Level 2 — Level 2 password required
- Level 3 — Level 3 password required (highest level)

ENABLE

Choose whether communication to the I/O unit should be enabled or disabled. Select YES (default) or NO from the scrolling list (use left or right arrow keys to toggle between the two). Disabling communication to an I/O unit is the same as disabling communication to all sixteen channels on the unit. Note that even when communication is disabled, the I/O unit remains fully operational.

Internal values (IVALs) used by Cyrano for each I/O channel will remain at the values set the last time the channels were referenced. The real-world I/O channel states (XVALs) will remain at the values set when that channel was last referenced (if communication is enabled).

This field does not affect the state of ENABLE fields for individual I/O channels, but rather takes priority over all I/O channels on an I/O unit. This field is useful for taking an entire I/O unit “off line” (from a communication standpoint) without having to disable each I/O point manually.

I/O Point

Use this command to configure one or more I/O points.

The SELECT I/O UNIT dialog box will appear, displaying a list of all configured I/O units (bricks). Select a unit and a CONFIGURE DIGITAL (ANALOG) I/O POINT dialog box appears, displaying all 16 points (channels) of the selected unit.

Select ADD, or highlight an existing channel and select CHANGE or DUP, to bring up a second CONFIGURE DIGITAL (ANALOG) I/O POINT dialog box displaying several data fields. These fields vary depending on the type of I/O unit selected. Fields for all three I/O unit types are described below:

Non MF Digital I/O Point

NAME Enter a name of up to 30 characters to identify the I/O point with a meaningful tag name that can be referenced by operations and conditions. This name must be unique among I/O points. Cyrano will alert you if you have entered a name that already exists and will prompt you for a new name.

TYPE Select the I/O channel type from the scrolling list (use left or right arrow keys to view options). Choices are: DIN (digital input) or DOUT (digital output).

MODULE Select a description of the I/O module from the scrolling list (use left or right arrow keys to view options). The choices available depend on the TYPE selection above.

This field is used for documentation only and has no effect on the Cyrano program.

DEFAULT	<p>Select the value to which to initialize the internal and external values for this I/O channel when the Cyrano program is run.</p> <p>If communication to the point is disabled, only the internal values (IVALs) are affected. The real-world (external) values (XVALs) for inputs are not set because they are controlled by external devices. The internal values for inputs are set and will be overwritten by the external values unless communication to the channel is disabled.</p> <p>Select a value from the scrolling list (use left or right arrow keys to view options). Choices are:</p> <ul style="list-style-type: none"> • LAST (default) — Does not initialize the point; leaves internal/external values at their last state. This is very useful for bumpless downloading and running. • OFF — Sets internal and external values to off. • ON — Sets internal and external values to on.
ENABLE	<p>Choose whether communication to this I/O point should be enabled or disabled. Select YES (default) or NO from the scrolling list (use left or right arrow keys to toggle between the two).</p> <p>Internal values (IVALs) used by Cyrano for each I/O channel will remain at the values set the last time the channels were referenced. The real-world I/O channel states (XVALs) will remain at the values set when that channel was last referenced (if communication is enabled).</p>
SECURITY	<p>Select a security level for use with a Mystic Data Server (MDS) for non-Mistic MMI clients, or for use on the G4LC32 front panel display to control the viewing and changing of values for variables and points.</p> <p>For security details with respect to MDS, see the <i>MDS User's Guide</i> (Opto 22 form 691).</p> <p>To enable security for use with the G4LC32, the local terminal option must be made active by selecting the System→Download Options command and choosing YES in the MISTIC.TRM field. The MISTIC.TRM file must reside in the project directory.</p> <p>To view or change a parameter, an operator must enter the correct password at the G4LC32 front panel for the selected security level. The operator can view and change all parameters secured at a level equal to or less than his or her level.</p> <p>Select a security level from the scrolling list (use left or right arrow keys to view options). Choices are:</p> <ul style="list-style-type: none"> • Level 0 (default) — No password required (lowest level) • Level 1 — Level 1 password required • Level 2 — Level 2 password required • Level 3 — Level 3 password required (highest level)



Digital MF I/O Point

NAME	Enter a name of up to 30 characters to identify the I/O point with a meaningful tag name that can be referenced by operations and conditions. This name must be unique among I/O points. Cyrano will alert you if you have entered a name that already exists and will prompt you for a new name.
TYPE	Select the I/O channel type from the scrolling list (use left or right arrow keys to view options). Choices are: DIN (digital input) or DOUT (digital output).
MODULE	Select a description of the I/O module from the scrolling list (use left or right arrow keys to view options). The choices available depend on the TYPE selection above. This field is used for documentation only and has no effect on the Cyrano program.
FEATURES	Specify the features, if any, this point should be configured for. Select from the scrolling list (use left or right arrow keys to view options). Choices are: <ul style="list-style-type: none"> • For DIN points: NONE, COUNTER, ON LATCH, OFF LATCH, ON PULSE MEAS, OFF PULSE MEAS, FREQUENCY, PERIOD, TOTALIZER ON, and TOTALIZER OFF • For DOUT points: NONE and TPO (time proportional output)
DEFAULT	Select the value to which to initialize the internal and external values for this I/O channel when the Cyrano program is run. If communication to the point is disabled, only the internal values (IVALs) are affected. The real-world (external) values (XVALs) for inputs are not set because they are controlled by external devices. The internal values for inputs are set and will be overwritten by the external values unless communication to the channel is disabled. Select a value from the scrolling list (use left or right arrow keys to view options). Choices are: <ul style="list-style-type: none"> • LAST (default) — Does not initialize the point; leaves internal/external values at their last state. • OFF — Sets internal and external values to off. • ON — Sets internal and external values to on.
ENABLE	Choose whether communication to this I/O point should be enabled or disabled. Select YES (default) or NO from the scrolling list (use left or right arrow keys to toggle between the two). Internal values (IVALs) used by Cyrano for each I/O channel will remain at the values set the last time the channels were referenced. The real-world I/O channel states (XVALs) will remain at the values set when that channel was last referenced (if communication is enabled).

WATCHDOG This field is used only when DOUT is selected as the TYPE above. When enabled, the watchdog causes the outputs to go to the selected value (on or off) during a watchdog condition. A watchdog condition occurs if there is no communication activity on the bus for the amount of time specified in the WATCHDOG field of this point's corresponding I/O unit.

Select DISABLED (default) or ENABLED from the scrolling list (use left or right arrow keys to toggle between the two). If you select ENABLED, then select ON or OFF from the scrolling list in the adjacent field.

SECURITY Select a security level for use with a Mystic Data Server (MDS) for non-Mistic MMI clients, or for use on the G4LC32 front panel display to control the viewing and changing of values for variables and points.

For security details with respect to MDS, see the *MDS User's Guide* (Opto 22 form 691).

To enable security for use with the G4LC32, the local terminal option must be made active by selecting the System→Download Options command and choosing YES in the MISTIC.TRM field. The MISTIC.TRM file must reside in the project directory.

To view or change a parameter, an operator must enter the correct password at the G4LC32 front panel for the selected security level. The operator can view and change all parameters secured at a level equal to or less than his or her level.

Select a security level from the scrolling list (use left or right arrow keys to view options). Choices are:

- Level 0 (default) — No password required (lowest level)
- Level 1 — Level 1 password required
- Level 2 — Level 2 password required
- Level 3 — Level 3 password required (highest level)

Analog MF I/O Point

NAME Enter a name of up to 30 characters to identify the I/O point with a meaningful tag name that can be referenced by operations and conditions. This name must be unique among I/O points. Cyrano will alert you if you have entered a name that already exists and will prompt you for a new name.

TYPE Select the I/O channel type from the scrolling list (use left or right arrow keys to view options). Choices are: AIN (analog input) or AOUT (analog output).



MODULE	<p>Select a description of the I/O module from the scrolling list (use left or right arrow keys to view options). The choices available depend on the TYPE selection above.</p> <p>This field is used primarily to notify the I/O unit as to which type of input module is installed in each channel. For inputs such as thermocouple, RTD, and frequency, you <i>must</i> specify the exact model number. For inputs such as voltage and current, you may select the model number <i>or</i> ANALOG INPUT.</p> <p>This field determines the default values for the UNITS, LO SCALE, and HI SCALE fields below. If you select ANALOG INPUT or ANALOG OUTPUT, you may modify the following three fields.</p>
UNITS	<p>If this field is accessible, enter a description of the input or output engineering units for the I/O point. The default is COUNTS. If you cannot access this field, it has been set automatically based on the MODULE field above.</p> <p>This field is for reference only and has no effect on a Cyrano program.</p>
LO SCALE	<p>If this field is accessible, enter the low-scale setting for the module in engineering units. The range is -32,767.0000 to 32,767.0000, and the default is 0.0000, representing the zero-scale value of 0 counts.</p> <p>If you cannot access this field, it has been set automatically based on the MODULE field above.</p>
HI SCALE	<p>If this field is accessible, enter the high-scale setting for the module in engineering units. The range is -32,767.0000 to 32,767.0000, and the default is 4095.0000, representing the full-scale value of 4,095 counts.</p> <p>If you cannot access this field, it has been set automatically based on the MODULE field above.</p>
DEFAULT	<p>Select whether to initialize the internal and external values for this I/O channel when the Cyrano program is run. If you select NO, the point will not be initialized and the internal/external values will remain at their last state. If you select YES, internal and external values will be set to the value you specify.</p> <p>If communication to the point is disabled, only the internal values (IVALs) are affected. The real-world (external) values (XVALs) for inputs are not set because they are controlled by external devices. The internal values for inputs are set and will be overwritten by the external values unless communication to the channel is disabled.</p> <p>Select NO (default) or YES from the scrolling list (use left or right arrow keys to toggle between the two). If you select YES, enter a default value in the range from LO SCALE to HI SCALE in the adjacent field.</p>

ENABLE	<p>Choose whether communication to this I/O point should be enabled or disabled. Select YES (default) or NO from the scrolling list (use left or right arrow keys to toggle between the two).</p>
WATCHDOG	<p>Internal values (IVALs) used by Cyrano for each I/O channel will remain at the values set the last time the channels were referenced. The real-world I/O channel states (XVALs) will remain at the values set when that channel was last referenced (if communication is enabled).</p> <p>This field is used only when AOUT is selected as the TYPE above. When enabled, the watchdog causes the outputs to go to the selected value during a watchdog condition. A watchdog condition occurs if there is no communication activity on the bus for the amount of time specified in the WATCHDOG field of this point's corresponding I/O unit.</p>
SECURITY	<p>Select DISABLED (default) or ENABLED from the scrolling list (use left or right arrow keys to toggle between the two). If you select ENABLED, then specify a value in the range from LO SCALE to HI SCALE in the adjacent field.</p> <p>Select a security level for use with a Mystic Data Server (MDS) for non-Mistic MMI clients, or for use on the G4LC32 front panel display to control the viewing and changing of values for variables and points.</p> <p>For security details with respect to MDS, see the <i>MDS User's Guide</i> (Opto 22 form 691).</p> <p>To enable security for use with the G4LC32, the local terminal option must be made active by selecting the System→Download Options command and choosing YES in the MISTIC.TRM field. The MISTIC.TRM file must reside in the project directory.</p> <p>To view or change a parameter, an operator must enter the correct password at the G4LC32 front panel for the selected security level. The operator can view and change all parameters secured at a level equal to or less than his or her level.</p> <p>Select a security level from the scrolling list (use left or right arrow keys to view options). Choices are:</p> <ul style="list-style-type: none"> • Level 0 (default) — No password required (lowest level) • Level 1 — Level 1 password required • Level 2 — Level 2 password required • Level 3 — Level 3 password required (highest level)

Variables

Use this command to configure variables.

The VARIABLE TYPES dialog box will appear, listing the variable types to select from. Choose from NUMERIC VARIABLE, STRING VARIABLE, NUMERIC TABLE, and STRING TABLE.

Select a type and, if variables of that type have been defined, a dialog box listing those variables will appear.



Select ADD, or highlight a variable and select CHANGE, to bring up a second dialog box displaying several data fields. These fields vary depending on the variable type selected. Fields for all four variable types are described below.

Numeric Variable

NAME	Enter a name of up to 30 characters to identify the numeric variable with a meaningful tag name that can be referenced by operations and conditions. This name must be unique among numeric variables. Cyrano will alert you if you have entered a name that already exists and will prompt you for a new name.
TYPE	Select the variable type from the scrolling list (use left or right arrow keys to view options). Choices are: <ul style="list-style-type: none"> • INTEGER — All integers are 32-bit signed integers requiring four bytes of storage in the Mystic controller. • FLOAT — All floats are single-precision IEEE-format floats requiring four bytes of storage in the Mystic controller. • TIMER — All timers are floating point types. A timer is a special variable that gets decremented internally in the Mystic controller by steps of 1 millisecond. Timing stops when a timer reaches 0. The maximum number of timers is limited only by available memory. Use of timers does not cause performance degradation because timers are calculated only when accessed in a program.
INIT.	Choose whether the variable should be initialized to a particular value upon a power-up or run, or should be left at the state it was at before a power-up or run. Select YES (default, enables initialization) or NO from the scrolling list (use left or right arrow keys to toggle between the two). Note: Numeric variables with INIT set to NO are initialized to null when a program is downloaded to the controller.
INIT VAL	Choose whether the variable should be initialized to 0 upon a power-up or run, or should be left at the state it was at before a power-up or run. Select YES (default, enables initialization) or NO from the scrolling list (use left or right arrow keys to toggle between the two).
SECURITY	Select a security level for use with a Mystic Data Server (MDS) for non-Mistic MMI clients, or for use on the G4LC32 front panel display to control the viewing and changing of values for variables and points. <p>For security details with respect to MDS, see the <i>MDS User's Guide</i> (Opto 22 form 691).</p> <p>To enable security for use with the G4LC32, the local terminal option must be made active by selecting the System→Download Options command and choosing YES in the MISTIC.TRM field. The MISTIC.TRM file must reside in the project directory.</p> <p>To view or change a parameter, an operator must enter the correct password at the G4LC32 front panel for the selected security level. The operator can view and change all parameters secured at a level equal to or less than his or her level.</p>

Select a security level from the scrolling list (use left or right arrow keys to view options). Choices are:

- Level 0 (default) — No password required (lowest level)
- Level 1 — Level 1 password required
- Level 2 — Level 2 password required
- Level 3 — Level 3 password required (highest level)

String Variable

NAME	Enter a name of up to 30 characters to identify the string variable with a meaningful tag name that can be referenced by operations and conditions. This name must be unique among string variables. Cyrano will alert you if you have entered a name that already exists and will prompt you for a new name.
WIDTH	Specify the maximum number of characters the string can contain. This determines how much memory should be reserved for the string. The range is 1 to 127. If an attempt is made to store strings longer than the specified width into the variable, only the part of the string that will fit into the variable will be stored; remaining characters will be lost.
INIT.	Choose whether the variable should be initialized to empty upon a power-up or run, or should be left at the state it was at before a power-up or run. Select YES (default, enables initialization) or NO from the scrolling list (use left or right arrow keys to toggle between the two). Note: String variables with INIT set to NO are initialized to empty when a program is downloaded to the controller.
SECURITY	<p>Select a security level for use with a Mystic Data Server (MDS) for non-Mistic MMI clients, or for use on the G4LC32 front panel display to control the viewing and changing of values for variables and points.</p> <p>For security details with respect to MDS, see the <i>MDS User's Guide</i> (Opto 22 form 691).</p> <p>To enable security for use with the G4LC32, the local terminal option must be made active by selecting the System→Download Options command and choosing YES in the MISTIC.TRM field. The MISTIC.TRM file must reside in the project directory.</p> <p>To view or change a parameter, an operator must enter the correct password at the G4LC32 front panel for the selected security level. The operator can view and change all parameters secured at a level equal to or less than his or her level.</p> <p>Select a security level from the scrolling list (use left or right arrow keys to view options). Choices are:</p> <ul style="list-style-type: none"> • Level 0 (default) — No password required (lowest level) • Level 1 — Level 1 password required • Level 2 — Level 2 password required • Level 3 — Level 3 password required (highest level)

**Numeric Table Variable**

NAME	Enter a name of up to 30 characters to identify the numeric table variable with a meaningful tag name that can be referenced by operations and conditions. This name must be unique among numeric table variables. Cyrano will alert you if you have entered a name that already exists and will prompt you for a new name.
LENGTH	<p>Specify the maximum number of elements that can be stored in the table. The range is 0 to 1,000,000. This number is used to reserve memory in the Mystic controller. The approximate amount of memory needed in the Mystic controller can be calculated by multiplying the LENGTH by four.</p> <p>Elements can be accessed by setting the index number in the TABLE instructions to a value from 0 to LENGTH. Any references to a table element number (index) greater than LENGTH or less than 0 will place a bad table index error (error 32) in the error queue. The operation will not be performed if writing to a table, and a 0 will be returned if reading from a table.</p> <p>Note that LENGTH actually reserves memory for (LENGTH+1) elements, which enables you to address elements either as 0 through (LENGTH-1) or as 1 through (LENGTH). For example, for a LENGTH of 10, you may address elements as 0–9 or 1–10.</p>
TYPE	<p>Select the variable type from the scrolling list (use left or right arrow keys to view options). Choices are:</p> <ul style="list-style-type: none">• INTEGER — All integers are 32-bit signed integers requiring four bytes of storage in the Mystic controller.• FLOAT — All floats are single-precision IEEE-format floats requiring four bytes of storage in the Mystic controller. <p>Timers are not supported as table elements.</p>
INIT.	Choose whether all table elements should be initialized to 0 upon a power-up or run, or should be left at the state they were at before a power-up or run. Select YES (default, enables initialization) or NO from the scrolling list (use left or right arrow keys to toggle between the two). Note: Numeric variables with INIT set to NO are initialized to null when a program is downloaded to the controller.
SECURITY	<p>Select a security level for use with a Mystic Data Server (MDS) for non-Mistic MMI clients, or for use on the G4LC32 front panel display to control the viewing and changing of values for variables and points.</p> <p>For security details with respect to MDS, see the <i>MDS User's Guide</i> (Opto 22 form 691).</p> <p>To enable security for use with the G4LC32, the local terminal option must be made active by selecting the System→Download Options command and choosing YES in the MISTIC.TRM field. The MISTIC.TRM file must reside in the project directory.</p>

To view or change a parameter, an operator must enter the correct password at the G4LC32 front panel for the selected security level. The operator can view and change all parameters secured at a level equal to or less than his or her level.

Select a security level from the scrolling list (use left or right arrow keys to view options). Choices are:

- Level 0 (default) — No password required (lowest level)
- Level 1 — Level 1 password required
- Level 2 — Level 2 password required
- Level 3 — Level 3 password required (highest level)

String Table Variable

NAME	Enter a name of up to 30 characters to identify the string table variable with a meaningful tag name that can be referenced by operations and conditions. This name must be unique among string table variables. Cyrano will alert you if you have entered a name that already exists and will prompt you for a new name.
LENGTH	<p>Specify the maximum number of elements that can be stored in the table. The range is 0 to 65,535. This number is used to reserve memory in the Mystic controller. The approximate amount of memory needed in the Mystic controller can be calculated by multiplying the LENGTH by the WIDTH.</p> <p>Elements can be accessed by setting the index number in the TABLE instructions to a value from 0 to LENGTH. Any references to a table element number (index) greater than LENGTH or less than 0 will place a bad table index error (error 32) in the error queue. The operation will not be performed if writing to a table, and a 0 will be returned if reading from a table.</p> <p>Note that LENGTH actually reserves memory for (LENGTH+1) elements, which enables you to address elements either as 0 through (LENGTH-1) or as 1 through (LENGTH). For example, for a LENGTH of 10, you may address elements as 0–9 or 1–10.</p>
WIDTH	Specify the maximum number of characters each table element can contain. This determines how much memory should be reserved for the table elements. The range is 1 to 127. Use a value that will accommodate the largest possible string to be stored in the table. If an attempt is made to store strings longer than the specified width into the element, only the part of the string that will fit into the element will be stored; remaining characters will be lost.
INIT.	Choose whether all table elements should be initialized to empty upon a power-up or run, or should be left at the state they were at before a power-up or run. Select YES (default, enables initialization) or NO from the scrolling list (use left or right arrow keys to toggle between the two). Note: String variables with INIT set to NO are initialized to empty when a program is downloaded to the controller.

SECURITY

Select a security level for use with a Mystic Data Server (MDS) for non-Mistic MMI clients, or for use on the G4LC32 front panel display to control the viewing and changing of values for variables and points.

For security details with respect to MDS, see the *MDS User's Guide* (Opto 22 form 691).

To enable security for use with the G4LC32, the local terminal option must be made active by selecting the System→Download Options command and choosing YES in the MISTIC.TRM field. The MISTIC.TRM file must reside in the project directory.

To view or change a parameter, an operator must enter the correct password at the G4LC32 front panel for the selected security level. The operator can view and change all parameters secured at a level equal to or less than his or her level.

Select a security level from the scrolling list (use left or right arrow keys to view options). Choices are:

- Level 0 (default) — No password required (lowest level)
- Level 1 — Level 1 password required
- Level 2 — Level 2 password required
- Level 3 — Level 3 password required (highest level)

PID

Use this command to configure PID loops. You may configure up to eight PID loops per analog I/O unit.

The SELECT I/O UNIT dialog box will appear, listing analog units to select from. Select a unit and, if PID loops have been defined for the unit, a PID LOOPS dialog box will appear listing those PID loops.

Select ADD, or highlight a PID loop and select CHANGE, to bring up a second dialog box displaying the following data fields:

NAME Enter a name of up to 30 characters to identify the PID loop with a meaningful tag name that can be referenced by operations and conditions. This name must be unique among PID loops. Cyrano will alert you if you have entered a name that already exists and will prompt you for a new name.

INPUT Specify whether the input to the PID loop will be an I/O point or a variable from the host Mistic controller. Select I/O POINT (default) or FROM HOST from the scrolling list (use left or right arrow keys to toggle between the two).

If you choose I/O POINT, a SELECT INPUT MODULE dialog box will immediately appear. Highlight a configured I/O point (channel), or select ADD to configure a new point. You may also delete or change previously configured I/O points. After highlighting the desired I/O point, select ACCEPT and its name will be added to the right of I/O POINT in the ADD PID LOOP dialog box. The SELECT OUTPUT MODULE will then open immediately. (See below for details.)

If you choose FROM HOST, enter in the adjacent field an initial value for the input. On the next line enter the minimum (LO SCALE) and maximum (HI SCALE) allowable input values.

Note that if the input is specified as FROM HOST, the program must include the SET PID INPUT command to copy the value to the input continuously.

OUTPUT CH.	<p>Specify the output point to be used as the output of the loop.</p> <p>The SELECT OUTPUT MODULE dialog box will open automatically once you have filled in the preceding field. Highlight a configured output point (channel), or select ADD to configure a new point. You may also delete or change previously configured I/O points. After highlighting the desired output point, select ACCEPT and its name will appear in the ADD PID LOOP dialog box.</p> <p>If desired, you can enter new minimum (LOWER CLAMP) and maximum (UPPER CLAMP) values to which you will allow the output channel to be driven by the PID loop. You can use these values to prevent the output from reaching the low-scale or high-scale values.</p>
SCAN RATE	<p>Specify the sampling rate in seconds for performing the PID calculation. The range of values is 0.1 to 6,553.5 seconds.</p>
SETPOINT	<p>Specify whether the setpoint for the PID loop will be an I/O point or a variable from the host Mistic controller. Select I/O POINT (default) or FROM HOST from the scrolling list (use left or right arrow keys to toggle between the two).</p> <p>If you choose I/O POINT, a SELECT SETPOINT MODULE dialog box will immediately appear. Highlight a configured I/O point (channel), or select ADD to configure a new point. You may also delete or change previously configured I/O points. After highlighting the desired I/O point, select ACCEPT and its name will appear to the right of SETPOINT in the ADD PID LOOP dialog box.</p> <p>If you choose FROM HOST, enter in the adjacent field an initial value for the setpoint. If desired, you can also enter new minimum (LOWER CLAMP) and maximum (UPPER CLAMP) allowable setpoint values. You can use these values to define a setpoint range that is narrower than the input range.</p> <p>Note that if the setpoint is specified as FROM HOST, the program must include the SET PID SETPOINT command to copy the value to the setpoint on a periodic basis or only upon a change.</p>
GAIN	<p>Specify a gain (proportional) term in the range from -32767.0000 to 32767.0000. A gain which is negative causes the output to increase in response to an increasing input. A positive gain causes the output to decrease in response to an increasing input.</p>
INTEGRAL	<p>Specify an integral term in the range from 0 to 65535.0000.</p>
DERIVATIVE	<p>Specify a derivative term in the range from 0 to 65535.0000.</p>
MAX CHANGE RATE	<p>Specify the maximum amount of change in output allowed per scan period. The default is the full-scale value of the output channel, representing 100% of the output span.</p>
LOOP	<p>Specify the operation of the loop. Select AUTO (default) or MANUAL from the scrolling list (use left or right arrow keys to toggle between the two). Setting the loop to MANUAL disables the PID equation so that the output will not change <i>unless</i> the output channel is written to by an I/O command (which can override any output clamping values).</p>



ENABLE	<p>Choose whether communication to this PID loop should be enabled or disabled. Select YES (default) or NO from the scrolling list (use left or right arrow keys to toggle between the two).</p>
	<p>Internal values (IVALs) used by Cyrano for each of the PID loop parameters will remain at the values set the last time the loop parameters were changed or referenced. The real-world PID loop values (XVALs) will remain at the values set when that loop was last referenced (if communication is enabled). The PID loop will still continue to operate normally if ENABLE is set to NO and LOOP is set to AUTO.</p>
SECURITY	<p>Select a security level for use with a Mystic Data Server (MDS) for non-Mistic MMI clients, or for use on the G4LC32 front panel display to control the viewing and changing of values for variables and points.</p>
	<p>For security details with respect to MDS, see the <i>MDS User's Guide</i> (Opto 22 form 691).</p>
	<p>To enable security for use with the G4LC32, the local terminal option must be made active by selecting the System→Download Options command and choosing YES in the MISTIC.TRM field. The MISTIC.TRM file must reside in the project directory.</p>
	<p>To view or change a parameter, an operator must enter the correct password at the G4LC32 front panel for the selected security level. The operator can view and change all parameters secured at a level equal to or less than his or her level.</p>
	<p>Select a security level from the scrolling list (use left or right arrow keys to view options). Choices are:</p>
	<ul style="list-style-type: none">• Level 0 (default) — No password required (lowest level)• Level 1 — Level 1 password required• Level 2 — Level 2 password required• Level 3 — Level 3 password required (highest level)

Event/Reaction

Use this command to configure event/reactions. You may configure up to 256 event/reactions per I/O unit.

The Select I/O Unit Type dialog box will appear, listing I/O unit types to select from. Make a selection and all I/O units of that type will appear in another dialog box. You may then select a configured I/O unit or select ADD to configure a new one (see configuration details for the ADD I/O UNIT dialog box under Configure→I/O Unit).

Select an I/O unit and, if event/reactions have been defined for the unit, the EVENT/REACTION FOR I/O UNIT dialog box will appear, listing those event/reactions.

Select ADD, or highlight an existing event/reaction and select CHANGE, to bring up a dialog box with the following data fields:

NAME	Enter a name of up to 30 characters to identify the event/reaction with a meaningful tag name that can be referenced by operations and conditions. This name must be unique among event/reactions. Cyrano will alert you if you have entered a name that already exists and will prompt you for a new name.
ENABLE	Choose whether communication to this event/reaction should be enabled or disabled. Select YES (default) or NO from the scrolling list (use left or right arrow keys to toggle between the two).
INTERRUPT	Choose whether to enable or disable the interrupt to the Mystic controller. This depends on whether you want the event/reaction to interrupt the Mystic controller and begin executing the INTERRUPT chart. Select DISABLED (default) or ENABLED from the scrolling list (use left or right arrow keys to toggle between the two).
SECURITY	<p>Select a security level for use with a Mystic Data Server (MDS) for non-Mistic MMI clients, or for use on the G4LC32 front panel display to control the viewing and changing of values for variables and points.</p> <p>For security details with respect to MDS, see the <i>MDS User's Guide</i> (Opto 22 form 691).</p> <p>To enable security for use with the G4LC32, the local terminal option must be made active by selecting the System→Download Options command and choosing YES in the MISTIC.TRM field. The MISTIC.TRM file must reside in the project directory.</p> <p>To view or change a parameter, an operator must enter the correct password at the G4LC32 front panel for the selected security level. The operator can view and change all parameters secured at a level equal to or less than his or her level.</p> <p>Select a security level from the scrolling list (use left or right arrow keys to view options). Choices are:</p> <ul style="list-style-type: none"> • Level 0 (default) — No password required (lowest level) • Level 1 — Level 1 password required • Level 2 — Level 2 password required • Level 3 — Level 3 password required (highest level)
INIT. STATUS	Choose whether the event should be scanned upon initialization. Select SCAN (default) or DON'T SCAN from the scrolling list (use left or right arrow keys to toggle between the two).
EVENT TYPE	Choose the type of event you wish to occur to initiate a response. Choices are:



- **Digital events:**
 COMMUNICATION WATCHDOG TIMEOUT
 COUNTER >= VALUE
 COUNTER <= VALUE
 QUADRATURE >= VALUE
 QUADRATURE <= VALUE
 FREQUENCY >= VALUE
 FREQUENCY <= VALUE
 TOTALIZE ON >= VALUE
 TOTALIZE OFF >= VALUE
 ON PULSE >= VALUE
 OFF PULSE >= VALUE
 PERIOD >= VALUE
 MOMO MATCH
- **Analog events:**
 COMMUNICATION WATCHDOG TIMEOUT
 ANALOG INPUT >= VALUE
 ANALOG INPUT <= VALUE
 ANALOG OUTPUT >= VALUE
 ANALOG OUTPUT <= VALUE

REACTION TYPE

Choose the type of reaction you wish to occur in response to the above event.
 Choices are:

- **Digital reactions:**
 NONE
 ENABLE SCAN FOR EVENTS
 DISABLE SCAN FOR EVENTS
 DISABLE SCAN FOR ALL EVENTS
 SET MOMO OUTPUTS
 START ON PULSE
 START OFF PULSE
 START COUNTER
 STOP COUNTER
 CLEAR COUNTER/TIMER
 CLEAR QUADRATURE COUNTER
 READ AND HOLD COUNTER VALUE
 READ AND HOLD QUADRATURE VALUE
 READ AND HOLD TOTALIZE ON VALUE
 READ AND HOLD TOTALIZE OFF VALUE
 READ AND HOLD ON PULSE VALUE
 READ AND HOLD OFF PULSE VALUE
 READ AND HOLD PERIOD VALUE
 READ AND HOLD FREQUENCY VALUE
- **Analog reactions:**
 NONE
 ENABLE SCAN FOR EVENT
 DISABLE SCAN FOR EVENT
 DISABLE SCAN FOR ALL EVENTS
 READ AND HOLD ANALOG INPUT DATA
 READ AND HOLD ANALOG OUTPUT DATA
 ACTIVATE PID LOOP
 DEACTIVATE PID LOOP
 SET PID SETPOINT
 SET ANALOG OUTPUT
 RAMP ANALOG OUTPUT TO ENDPOINT

CHARTS MENU

New

Use this command to create a new chart.

The ENTER NEW CHART NAME dialog box will appear. Enter a name of up to 30 characters, then press ENTER to create a chart of that name.

Any changes made to the chart displayed when you selected this command will be saved.

Select

Use this command to open an existing chart.

The SELECT CHART dialog box will appear. Use the mouse or the up or down arrow keys to highlight a chart name, then press ENTER to load the chart.

Any changes made to the chart displayed when you selected this command will be saved.

Change

Use this command to rename an existing chart.

The RENAME CHART dialog box will appear. Modify the existing name or enter a new name of up to 30 characters, then press ENTER to rename the chart.

Note that the POWERUP and INTERRUPT charts cannot be renamed.

Copy

Use this command to copy an existing chart to a new chart.

The COPY CHART dialog box will appear. Use the mouse or the up or down arrow keys to highlight the name of the chart to be copied, then press ENTER. This will open the COPY CHART TO NAME... dialog box. Enter a new chart name of up to 30 characters, then press ENTER. (You will be warned if the name already exists.) You may then copy another chart, or press ESC to close the COPY CHART dialog box.

Delete

Use this command to delete a chart.

The DELETE CHART dialog box will appear. Use the mouse or the up or down arrow keys to highlight the name of the chart to be deleted, then press ENTER. You will be warned that the chart deletion is a non-recoverable operation and asked if you are sure you want to delete the chart. Use the left or right arrow key to select YES and press ENTER to delete the chart permanently. You may then delete another chart, or press ESC to close the DELETE CHART dialog box.

Export

Use this command to save the currently loaded chart to a file.

The EXPORT NAME dialog box will appear. Enter a file name of up to eight characters, then press ENTER. This will save the existing chart to a file with the specified name plus an .XPT extension in your Cyrano directory.



Auto Import

Use this command to load a chart from an .XPT file, automatically assigning I/O units, points, variables, etc., as necessary. Auto Import is the preferred importing choice, although you may also use Manual Import to import a file (see below).

The IMPORT FILE LOAD dialog box will appear. Enter or select a file name and select ACCEPT. (See details for the LOAD FILE dialog box under File→Load.)

You will then be asked if you wish to import the chart from the file into an existing or new chart.

If you select EXISTING, the SELECT CHART dialog box will appear. Select a chart and you will be warned that the specified chart will be completely overwritten by the imported chart. If you select YES to continue, the imported chart will be loaded into the chart you have specified, and the previous chart contents will be lost.

If you select CREATE, the Enter New Chart Name dialog box will appear. Enter a name of up to 30 characters, then press ENTER to import the file you have selected into the new chart. Any changes made to the chart displayed when you selected this command will be saved.

Manual Import

Use this command to load a chart from an .XPT file. I/O units, points, variables, etc. will not be automatically assigned with this command. Manual importing is tedious because you must process every tag name individually. For this reason, Auto Import is the preferred importing choice (see above).

The IMPORT FILE LOAD dialog box will appear. Enter or select a file name and select ACCEPT. (See details for the LOAD FILE dialog box under File→Load.)

You will then be asked if you wish to import the chart from the file into an existing or new chart.

If you select EXISTING, the SELECT CHART dialog box will appear. Select a chart and you will be warned that the specified chart will be completely overwritten by the imported chart. If you select YES to continue, the imported chart will be loaded into the chart you have specified, and the previous chart contents will be lost.

If you select CREATE, the Enter New Chart Name dialog box will appear. Enter a name of up to 30 characters, then press ENTER to import the file you have selected into the new chart. Any changes made to the chart displayed when you selected this command will be saved.

SYSTEM MENU

Download Options

Use this command to allow several external files to be downloaded immediately before or after a program download. These files are user-created custom ASCII files used to enhance the Cyrano instruction set or to include application-specific functions.

The SUPPORT FILES dialog box will appear. Use the left or right arrow keys at each field to toggle between YES and NO. Files tagged YES will be searched for in the project directory upon a program download via the Debugger module. If the files are found, they will be downloaded immediately before or after the program is downloaded. If they are not found, you will be alerted.

Refresh Display

Use this command to repaint the drawing window.

Toggle Snap

Use this command to enable or disable the automatic snap function, as indicated by SNAP ON or SNAP OFF in the status bar.

With snap enabled, objects will be sized and positioned based on the grid. For example, at a zoom of 1.000, operation blocks will automatically snap to grid dots or to positions midway between grid dots, whether or not the grid is visible (see Grid command below). With snap disabled, objects may be drawn at any size and positioned anywhere without respect to the grid.

Grid

Use this command to toggle grid dots on or off in the drawing window. The grid is useful for visually aligning drawn objects.

Show Subroutines

Use this command to view and, if desired, print a list of all subroutines used in the current program.

The SUBROUTINE dialog box will appear, listing all currently referenced subroutine names along with the name of the file in which they are stored and the names of any charts in which they are called. (If no subroutines are currently used, you will be alerted to this fact and the SUBROUTINE dialog box will automatically close.) Note that only subroutines included within command blocks in a saved chart will be listed.

To print the subroutine list, select PRINT and, unless you have configured printing to a file, the PRINT DESTINATION dialog box will appear. Change print parameters as necessary (see details under Print→Configure Printer). Select PRINTER if you wish to change the destination printer. Select ACCEPT when you are ready to print the subroutine list to the printer as shown.

If you have configured printing to a file, selecting PRINT from the SUBROUTINE dialog box will open the SELECT FILE dialog box. Enter a file name of up to eight characters or accept the default file name, then select ACCEPT to print subroutines to the specified file in the project directory.

Find

Use this command to determine the usage of a variable, I/O unit or point, chart, PID loop, event/reaction, operation condition, subroutine, or no-exit block within the current chart or throughout all charts in the program.

The FIND USAGE dialog box will appear, displaying the following data fields:

TYPE Select the object type from the scrolling list (use left or right arrow keys to view options). Choices are: INTEGER, FLOAT, TIMER, INTEGER TABLE, FLOAT TABLE, STRING, STRING TABLE, I/O UNIT, DIGITAL POINT, ANALOG POINT, CHART, PID LOOP, EVENT/REACTION, OPERATION, CONDITION, and NO-EXIT BLOCKS. (To specify a subroutine, select OPERATION.)

NAME Enter the name of the object, or press ENTER immediately to select from a list of all objects of the type specified above.



SCOPE Choose whether the object should be searched for within the current chart only (LOCAL) or throughout all charts (GLOBAL). Select LOCAL (default) or GLOBAL from the scrolling list (use left or right arrow keys to toggle between the two).

After you select ACCEPT, the find operation will begin and the results will be reported in a STRATEGY REFERENCES dialog box. Results will include the name of each chart, block, and command in which the object is referenced. You will be alerted if the object was not found within the selected scope.

You may then highlight a reference and select GO TO to open the specified command block. You may also select PRINT to print the list to a file or configured printer. Or you may simply close the dialog box by selecting EXIT.

Center Block

Use this command to locate an operation or condition block and repaint the drawing window with the specified block at the center. Note that this does not move any object with respect to another; only the view is changed.

The CENTER BLOCK dialog box will appear, displaying the following data fields:

TYPE Choose between OPERATION BLOCK (default) or CONDITION BLOCK (use left or right arrow keys to toggle between the two).

NAME Enter the name of the block, or press ENTER immediately to select from a list of blocks of the type specified above.

Select ACCEPT and the specified block will appear in the center of the drawing window.

Debugger

Use this command to invoke the Cyrano Debugger using the currently loaded program.

If you have made changes to the program that have yet to be saved, you will be asked if you wish to save the strategy. In any case an "Are You Sure?" message will appear, allowing you to confirm the switch to the Debugger module.

OnLine

Use this command to invoke the Cyrano OnLine module using the currently loaded program.

If you have made changes to the program that have yet to be saved, you will be asked if you wish to save the strategy. In any case an "Are You Sure?" message will appear, allowing you to confirm the switch to the OnLine module.

Subroutine

Use this command to invoke the Cyrano Subroutine module using the most recently loaded subroutine (if any).

If you have made changes to the program that have yet to be saved, you will be asked if you wish to save the strategy. In any case an "Are You Sure?" message will appear, allowing you to confirm the switch to the Subroutine module.

PRINT MENU

Configure Printer

Use this command to configure a printer for use with Cyrano.

If no printer has been configured, a list of all supported printers will appear. Select a printer by highlighting the name using the mouse or the up or down arrow keys. To move up or down a page at a time, press PAGE UP or PAGE DOWN. Press HOME to highlight the first item in the list, or press END to highlight the last item in the list.

Once a printer has been configured, the PRINT DESTINATION dialog box will appear. This dialog box includes the following fields:

PORT	Specify the port to which the printer is connected. Select from the scrolling list (use left or right arrow keys to view options). Choices are: FILE, LPT1, LPT2, LPT3, COM1, and COM2.
FILENAME	<p>If you selected FILE above, enter a file name of up to eight characters in this field (default is CYRANO). Each time you print, you will be prompted to accept or change this file name. The file will be written to the project directory.</p> <p>If you did not select FILE under PORT, this field will not be accessible.</p>
ORIENT.	Choose whether to print text vertically (PORTRAIT) or horizontally (LANDSCAPE) on a page. Select PORTRAIT (default) or LANDSCAPE from the scrolling list (use left or right arrow keys to toggle between the two). Note that LANDSCAPE mode is preferred for printing screens.
HSCALE	<p>Specify the scaling or magnification factor for printing in the horizontal direction. Enter a number from 1 to 9 in each field. The scale can range from 1:9 (11% scaling) to 9:1 (900% scaling).</p> <p>For printing screens in LANDSCAPE mode, a setting of 3:2 will fill an 8.5"x11" page in the horizontal direction.</p>
VSCALE	<p>Specify the scaling or magnification factor for printing in the vertical direction. Enter a number from 1 to 9 in each field. The scale can range from 1:9 (11% scaling) to 9:1 (900% scaling).</p> <p>For printing screens in LANDSCAPE mode, a setting of 2:1 will fill an 8.5"x11" page in the vertical direction.</p>
PRINTER	This read-only field displays the name of the currently selected printer. To choose another printer, select the PRINTER button and choose a printer from the SELECT PRINTER dialog box.

Print Screen

Use this command to print the current screen image directly to a printer or file. This is equivalent to pressing PRINT SCRN on the keyboard.

If you have correctly configured printing to a printer, a PRINTING SCREEN... message will appear during the operation. (If printing is not correctly configured, you will be notified of an error. See Configure Printer above to change print configuration.)



If you have configured printing to a file, the SELECT FILE dialog box will appear. Enter a file name of up to eight characters or accept the default file name, then select ACCEPT. The PRINTING SCREEN... message will appear. When the message disappears, a file with the specified name plus an .SRN extension will appear in your project directory.

Print Chart

Use this command to print the contents of the current chart. You may choose to print text (block details), graphics (the flowchart), or both.

If you have configured printing to a printer, a PRINT DESTINATION dialog box will appear. Change print parameters as necessary (see details under Print → Configure Printer). Select PRINTER if you wish to change the destination printer. Select ACCEPT when you are ready to print the chart to the printer as shown. (If printing is not correctly configured, you will be notified of an error. See Configure Printer above to change print configuration.)

If you have configured printing to a file, the SELECT FILE dialog box will appear. Enter a file name of up to eight characters or accept the default file name, then select ACCEPT.

You will then be given a choice of what to print. Use the left or right arrow keys to toggle between BOTH GRAPHICS AND TEXT (default), GRAPHICS ONLY, and TEXT ONLY. Press ENTER to accept the choice.

If your print choice includes text, you will then be given a choice of how to print blocks of text. Use the left or right arrow keys to toggle between NO PG BRK BETWEEN BLOCKS (default) and PG BRK BETWEEN BLOCKS. Press ENTER to accept the choice.

Printing will then begin and the PRINTING CHART... message will appear. When printing to a file, a file with the specified name plus a .TSK extension will appear in your project directory when the message disappears.

Print Block

Use this command to print the contents of an operation or condition block.

If you have configured printing to a printer, a PRINT DESTINATION dialog box will appear. Change print parameters as necessary (see details under Print → Configure Printer). Select PRINTER if you wish to change the destination printer. Select ACCEPT when you are ready to print the chart to the printer as shown. (If printing is not correctly configured, you will be notified of an error. See Configure Printer above to change print configuration.)

If you have configured printing to a file, the SELECT FILE dialog box will appear. Enter a file name of up to eight characters or accept the default file name, then select ACCEPT.

You will next be allowed to specify the block. In the TYPE field, use the left or right arrow keys to toggle between OPERATION BLOCK and CONDITION BLOCK. In the NAME field, enter the name of the block, or press ENTER immediately to select from a list of blocks of the specified type.

Select ACCEPT and the PRINTING BLOCK... message will appear (perhaps briefly). When printing to a file, a file with the specified name plus a .BLK extension will appear in your project directory when the message disappears.

Print Program

Use this command to print the contents of all charts in the program. You may choose to print text (block details), graphics (the flowchart), or both.

If you have configured printing to a printer, a PRINT DESTINATION dialog box will appear. Change print parameters as necessary (see details under Print→Configure Printer). Select PRINTER if you wish to change the destination printer. Select ACCEPT when you are ready to print the chart to the printer as shown. (If printing is not correctly configured, you will be notified of an error. See Configure Printer above to change print configuration.)

If you have configured printing to a file, the SELECT FILE dialog box will appear. Enter a file name of up to eight characters or accept the default file name, then select ACCEPT.

You will then be given a choice of what to print. Use the left or right arrow keys to toggle between BOTH GRAPHICS AND TEXT (default), GRAPHICS ONLY, and TEXT ONLY. Press ENTER to accept the choice.

If your print choice includes text, you will then be given a choice of how to print blocks of text. Use the left or right arrow keys to toggle between NO PG BRK BETWEEN BLOCKS (default) and PG BRK BETWEEN BLOCKS. Press ENTER to accept the choice.

Printing will then begin and the PRINTING PROGRAM... message will appear. When printing to a file, a file with the specified name plus a .PGM extension will appear in your project directory when the message disappears.

Print Database

Use this command to print the global database of variables, I/O units, I/O points, PID loops, and event/reactions.

If you have configured printing to a printer, a PRINT DESTINATION dialog box will appear. Change print parameters as necessary (see details under Print→Configure Printer). Select PRINTER if you wish to change the destination printer. Select ACCEPT when you are ready to print the chart to the printer as shown. (If printing is not correctly configured, you will be notified of an error. See Configure Printer above to change print configuration.)

If you have configured printing to a file, the SELECT FILE dialog box will appear. Enter a file name of up to eight characters or accept the default file name, then select ACCEPT.

The PRINTING DATABASE... message will appear (perhaps briefly). When printing to a file, a file with the specified name plus a .DBS extension will appear in your project directory when the message disappears.



Cross Reference

Use this command to print a cross-reference indicating which blocks reference which variables, I/O units, I/O points, PID loops, and event/reactions. Be aware that generating a cross-reference is often slower and more tedious than printing other elements.

If you have configured printing to a printer, a PRINT DESTINATION dialog box will appear. Change print parameters as necessary (see details under Print→Configure Printer). Select PRINTER if you wish to change the destination printer. Select ACCEPT when you are ready to print the chart to the printer as shown. (If printing is not correctly configured, you will be notified of an error. See Configure Printer above to change print configuration.)

If you have configured printing to a file, the SELECT FILE dialog box will appear. Enter a file name of up to eight characters or accept the default file name, then select ACCEPT.

The program will be analyzed and the PRINTING XREF... message will appear (perhaps briefly). When printing to a file, a file with the specified name plus an .LST extension will appear in your project directory when the message disappears.

DEBUGGER

OVERVIEW

This chapter describes the Cyrano Debugger module, which is used to compile programs and download them to the Mystic controller.

Use the Debugger to monitor the execution of your program using sophisticated stepping functions. You can also use this module to monitor I/O points, variables, PID loops, and event/reactions within a watch window.

The Debugger screen appears below.

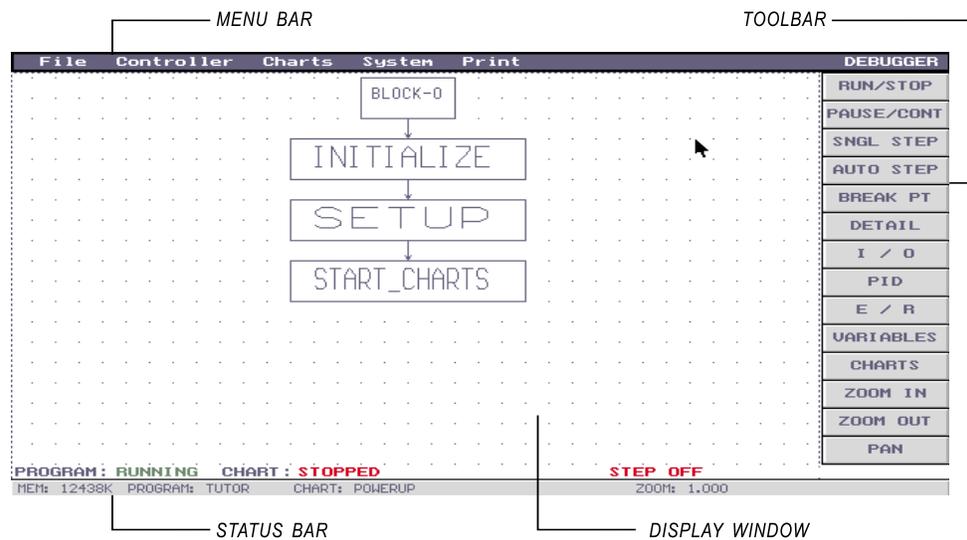


Figure 4-1: Debugger Screen

DEBUGGER TOOLBAR

Debugger tools are located in a toolbar at the right of the display window. To select a tool, position the cursor over the tool and press ENTER or the left mouse button. The selected tool will be highlighted in blue. To release a tool, press ESC or the right mouse button.

RUN/STOP

Use this tool to run a stopped program or stop a running program. The status bar indicates the current status of the program.

PAUSE/CONT

Use this tool to pause a running chart or continue a paused chart. The status bar indicates the current status of the chart.

If the chart is running, this tool will stop the chart at the end of the current block. The next block to be executed will be highlighted.

If the chart is paused, this tool will continue the chart from the point at which the break occurred.

The status bar displays the message STEP ON when a chart is paused. The status bar also includes a time display, indicating the time elapsed since the last break.

SNGL STEP

Use this tool to step through a chart one block at a time. This is called single stepping.

If STEP ON appears in the status bar, this tool will cause a paused chart to advance to the next block. Note that this tool is functional only when STEP ON is displayed.

The elapsed time displayed in the status bar will be updated to indicate the time spent executing the block.

To leave single-step mode and continue running, use the PAUSE/CONT tool.

AUTO STEP

Use this tool to toggle auto stepping on and off.

Enabling auto stepping is equivalent to using the SNGL STEP tool continuously. Auto stepping is handy for viewing execution flow quickly.

When auto stepping is active, STEP AUTO appears in the status bar.

Note that if you select a menu item, auto stepping will stop running until the menu item is released.

BREAK PT

Use this tool to mark an operation or condition block at which you wish the program to stop. When the program runs, execution will stop just before the block is executed. Once the break occurs, STEP ON will appear in the status bar.

After selecting the tool, position the cursor over a block. Press the left mouse button and the block will appear in a dotted outline, indicating it is set as a break point.

To remove a break point, select the tool, position the cursor over a block with a dotted outline, and press the left mouse button. Break points can only be removed from blocks that are not currently highlighted.

When any block is tagged as a break point, BREAK ON appears in the status bar.

A program may include up to 16 break points.

DETAIL

Use this tool to view commands in an operation or condition block.

After selecting the tool, position the mouse cursor over the block you wish to view or edit. Press the left mouse button to bring up the block's detail window.

(Note: Double-clicking the left mouse button directly over a block is equivalent to selecting the DETAIL tool and then selecting a block. Note that the DETAIL tool will be selected and the detail window will open.)

The detail window displays the block's operations or conditions. A small cursor bar at the right of the detail window shows where the highlight bar is relative to the block's entire list of instructions.

Use the mouse or the up and down arrow keys to move through the command list. Press HOME to position the highlight bar at the beginning of the list, or END to position the highlight bar at the first instruction on the last page of the list.

Press ESC to close the detail window.

I/O

Use this tool to analyze or manipulate the behavior of I/O points.

After selecting this tool, the SELECT I/O UNIT dialog box will appear, displaying a list of all configured I/O units. Select a unit and the DEBUG POINT DISPLAY dialog box will appear, displaying information on all channels of the selected unit.

At the top of the display, general information on the I/O unit, including any error message, appears. At the bottom of the display, a point detail window appears, providing detailed real-time information on the highlighted I/O point. Use the mouse or the up or down arrow keys to highlight other configured I/O points (if any).

The information displayed in the point detail window depends on the I/O type selected, as indicated below:

Non MF Digital I/O Point

STATE Displays the internal (IVAL) and external (XVAL) values of the digital channel. The values are represented as ON or OFF.

Digital MF I/O Point

STATE Displays the internal and external values of the digital channel. The values are represented as ON or OFF.

If the point is configured as a feature, additional fields will appear below the STATE field to indicate the IVAL and XVAL of the feature. These values may be floats or state values depending on the feature.

Analog MF I/O Point

IVAL/XVAL Displays the internal/external external values of the analog channel. The values are represented as floats.

Enabling or disabling a point is equivalent to connecting or disconnecting the link between the IVAL and the XVAL.

IVAL is what the Cyrano program uses as a value. XVAL is the real-world value at the I/O unit. If an I/O point is enabled and was referenced at least once within a command that was executed at least once in the program, the following information on IVALs and XVALs applies:

- I/O unit enabled, I/O point enabled: IVAL equals XVAL for outputs. For inputs, IVAL may not equal XVAL since the XVAL may be changing rapidly.
- I/O unit enabled, I/O point disabled: IVAL may not equal XVAL.
- I/O unit disabled, I/O point enabled or disabled: IVAL may not equal XVAL.

If the above does not appear to hold true, it may be that the point was not referenced in the Cyrano program first. Out-of-range or unknown values are displayed as "*****".

To change modifiable entries in this dialog box, press ENTER. This will freeze the display and cause two new buttons to appear at the bottom of the dialog box: UNIT and POINT.

Selecting UNIT will position the cursor on the ENABLE field for the I/O unit, allowing you to change the status by using the left or right mouse buttons.

Selecting POINT will place the cursor on the first accessible field in the point detail window and cause the ACCEPT and CANCEL buttons to appear. Modify entries as desired and select ACCEPT to write the new values to the I/O unit.

If the I/O unit is not responding, an error message will appear on the display. The message includes the error code and a brief description. If there is an error with a specific channel, the corresponding error code will appear in the point detail window. If an I/O unit is not responding or configured, the XVALs will not appear on the screen. You can still change the IVALs to force values in your Cyrano application.

Note: If an I/O unit is not responding, the controller's delay time may exceed the delay time used by the Debugger. In this case, a dialog box will appear on the screen indicating a Mystic controller timeout error. To prevent this from happening, insert the SET TURNAROUND DELAY and SET NUMBER OF RETRIES operations in your program. The turnaround delay should be set smaller than that specified in the CONFIGURE MISTIC COMMUNICATIONS dialog box (0.25 seconds is a good value). Set the number of retries in your program to 0.

PID

Use this tool to analyze or manipulate the behavior of PID loops.

After selecting this tool, the SELECT I/O UNIT dialog box will appear, listing analog units to select from. Select a unit and, if PID loops have been defined for the unit, the DEBUG PID DISPLAY dialog box will appear, displaying information on those PID loops.

At the top of the display, general information on the I/O unit, including any error message, appears. Just below is a list of PIDs and their associated SETPOINT, INPUT, and OUTPUT external values. Out-of-range or unknown values are displayed as "*****".

Further information on the highlighted PID loop appears in the detail window at the bottom of the display. This information includes the NAME, INPUT, OUTPUT CH., SETPOINT, and ENABLE fields. The detail window also displays internal and external values for the SCAN RATE, INPUT, OUTPUT, SETPOINT, GAIN, INTEGRAL, DERIVATIVE, MAX CHANGE RATE, and LOOP parameters. These parameters are explained in detail in Chapter 3 under the Configurator's Configure→PID command.

To change modifiable entries in this dialog box, press ENTER. This will freeze the display and cause two new buttons to appear at the bottom of the dialog box: UNIT and PID.

Selecting UNIT will position the cursor on the ENABLE field for the I/O unit, allowing you to change the status by using the left or right mouse buttons.

Selecting PID will place the cursor on the first accessible field in the detail window and cause the ACCEPT and CANCEL buttons to appear. Modify entries as desired and select ACCEPT to write the new values to the I/O unit. Modifications to XVAL PID parameters take effect at the end of the current PID scan interval.

E/R

Use this tool to analyze or manipulate the behavior of event/reactions.

After selecting this tool, the Select I/O Unit Type dialog box will appear, listing I/O unit types to select from. Make a selection and all I/O units of that type will appear in another dialog box. Select an I/O unit and, if event/reactions have been defined for the unit, the EVENT/REACTION FOR I/O UNIT dialog box will appear. Highlight an event/reaction and select ACCEPT. The DEBUG ANALOG EVENT/REACTION dialog box will appear. At the top of the display, general information on the I/O unit, including any error message, appears. Just below is information on the event/reaction, including its name and the event and reaction types. Other fields include parameters related to the event and reaction, plus internal and external values for EVENT OCCURRING, EVENT OCCURRED, SCAN STATUS, and INTERRUPT. Out-of-range or unknown values are displayed as "*****".

Further information on the event/reaction appears in the bottom detail window. This information includes the name of the I/O channel plus its internal and external values for both the event and the reaction.

To change modifiable entries in this dialog box, press **ENTER**. This will freeze the display and cause two new buttons to appear at the bottom of the dialog box: **E/R** and **E/R I/O**.

Selecting **E/R** will position the cursor on the **ENABLE** field for the I/O unit and cause the **ACCEPT** and **CANCEL** buttons to appear. You can now change the communication **ENABLED** status as well as the **I/VALs** and **XVALs** in the **EVENT OCCURRING**, **EVENT OCCURRED**, **SCAN STATUS**, and **INTERRUPT** fields. Modify entries as desired and select **ACCEPT** to write the new values to the I/O unit.

Selecting **E/R I/O** will place the cursor on the first accessible field in the lower detail window and cause the **ACCEPT** and **CANCEL** buttons to appear. Modify entries as desired and select **ACCEPT** to write the new values to the I/O unit.

VARIABLES

Use this tool to analyze or manipulate the values of variables.

After selecting this tool, the **VARIABLE TYPES** dialog box will appear, listing the variable types to select from. Choose from **NUMERIC VARIABLE**, **STRING VARIABLE**, **NUMERIC TABLE**, and **STRING TABLE**.

Select a type and, if variables of that type have been defined, a dialog box listing those variables and their types will appear. Below this list appears a detail window with information on the highlighted variable, including **NAME**, **TYPE**, **INIT.**, **SECURITY**, and **VALUE** fields. These fields are explained in detail in Chapter 3 under the Configurator's **Configure→Variables** command.

To change modifiable entries in the detail window, press **ENTER**. This will cause two new buttons to appear at the bottom of the dialog box: **CHANGE** and **EXIT**.

Selecting **CHANGE** will place the cursor on the first accessible field in the detail window and cause the **ACCEPT** and **CANCEL** buttons to appear. Modify entries as desired and select **ACCEPT** to write the new values to the Mystic controller.

The fields that can be modified are described below for each variable type:

Numeric Variables

VALUE Displays the current value of the numeric variable.

String Variables

VALUE (*unlabeled field*) Displays up to 32 characters of the current string value. You can view the characters of a longer string by using the left or right arrow keys. You can also use the following keys to view or edit the string:

- **HOME** — Positions cursor at beginning of string.
- **END** — Positions cursor at end of string.
- **DELETE** — Deletes character highlighted by cursor.
- **BACKSPACE** — Deletes character to the left of cursor.
- **INSERT** — Toggles between insert and overwrite mode.
- **CTRL-HOME** — Deletes entire line.

Numeric Variable Tables

INDEX	Displays the index of an element of the table. Use the left or right arrow keys to change this value.
VALUE	Displays the current numeric value of the table at the indicated index.

String Variable Tables

INDEX	Displays the index of an element of the table. Use the left or right arrow keys to change this value.
VALUE	Displays the current string value of the table at the indicated index.

CHARTS

Use this tool to analyze or manipulate the status of all program charts.

After selecting this tool, the CHART STATUS dialog box will appear, listing all charts in the program along with their status, step mode, and break point status.

A bottom detail window also appears, providing further information on the chart highlighted in the list above. The information includes the name of the chart plus the following fields:

STATUS	Status can be one of the following: <ul style="list-style-type: none"> • STOPPED — The chart is stopped. When restarted, it will begin execution from block 0. • SUSPENDED — The chart is suspended. When restarted, it will resume execution from the point at which it was last suspended. • RUNNING — The chart is running.
MODE	Mode can be either STEP ON or STEP OFF. STEP ON indicates auto or single step mode is on. In this case using the SNGL STEP tool will cause the chart to advance to the next block.
BREAK POINT	This field can contain BREAK ON, BREAK OFF, or CLEAR. <ul style="list-style-type: none"> • BREAK ON — A break point is defined and enabled in the chart. • BREAK OFF — A break point is defined but disabled in the chart. • CLEAR — No break points are defined in the chart.
PAUSED AT	The point at which a chart last stopped for a break point.

To change the status or other parameters of a chart, press ENTER. This will place the cursor on the STATUS field in the detail window and cause the ACCEPT and CANCEL buttons to appear. Modify the STATUS and other entries as desired and select ACCEPT to write the new values to the Mistic controller.

Note that changing the STATUS from STOPPED to SUSPENDED or changing the MODE to STEP ON or STEP OFF will not be reflected in the top part of the CHART STATUS window until the chart is set to RUNNING.

ZOOM-IN

Use this tool to magnify the display window by a factor of two.

Click the left mouse button over the tool to enlarge the window and all objects within it to twice their size. The ZOOM displayed in the status bar at the bottom of the display window will be cut in half each time down to a minimum of .125 (one-eighth of the normal display window is in view).

ZOOM-OUT

Use this tool to shrink the display window by a factor of two.

Click the left mouse button over the tool to reduce the window and all objects within it to half their size. The ZOOM displayed in the status bar will double each time up to a maximum of 32 (32 times the normal display window is in view).

PAN

Use this tool to move to other areas of the display window.

After selecting this tool, position the cursor anywhere in the display window, then press and hold the left mouse button as you move (drag) the cursor in the direction you wish the display window to move. Release the left mouse button and the display window will appear in its new position.

It is advisable to pan by small amounts until you become familiar with this tool.

To select a new center point for the display window, select the tool, position the cursor where you want the new center to be, and press the left mouse button. The display window will immediately shift so that the spot you have selected is at the center.

Note: The PAN tool will be selected automatically if you click the left mouse button on an empty area of the display window when no other tool is selected.

DEBUGGER MENU BAR

FILE MENU

Load

Use this command to load an existing program.

This command is identical to the Configurator's File→Load command. See Chapter 3 for details.

Version

Use this command to view the Debugger's version number, release date, and copyright information.

Quit

Use this command to exit the Debugger and return to the Cyrano Environment Manager.

If any charts have break points when you selected this command, you will be asked if you wish to save or clear these break points. Also, if any charts are paused or being stepped through, you will be asked which charts you wish to continue. An "Are You Sure?" message will then appear to allow you to confirm the exit.

CONTROLLER MENU

Mistic Controller

Use this command to configure the parameters needed for downloading a file to the proper Mistic controller.

This command is identical to the Configurator's Configure→Mistic command. See Chapter 3 for details.

Mistic Information

Use this command to view current information about the Mistic controller.

The MISTIC INFORMATION dialog box will appear, displaying the following information:

EPROM VERSION	Version of EPROM or Flash kernel currently installed in the Mistic controller.
AVAILABLE MEMORY	Remaining free memory available in the Mistic controller.
STRATEGY	Name of the program loaded into the Mistic controller.
FILE TIME STAMP	Date and time when the program was compiled. This corresponds to the creation date and time of the .GML file.

REAL TIME VALUE Date and time according to the real-time clock of the Mystic controller. This clock is synchronized with the time of the host PC workstation each time a run file is downloaded. Therefore, it is important to make sure the host PC's time is correct before downloading.

OF ERRORS Number of errors currently in the Mystic controller's error queue.

CURRENT ERR Error code of the current error in the error queue.

Three buttons appear at the bottom of the MISTIC INFORMATION dialog box:

CONTINUE Closes the dialog box.

CLR ERRS Clears all program errors.

VIEW Opens the Error Queue dialog box, listing the number, code, and description of each error as well as the chart and block in which each occurred.

From the Error Queue dialog box, select **CLEAR ALL** to clear the error queue, **POP ERROR** to delete the top (oldest) error, **GOTO** to enter the block in which the highlighted error occurred, or **HELP** for generic information on the highlighted error type. Press **ESC** to close the dialog box.

Clear Mystic Memory

Use this command to clear all memory from the Mystic controller. This is useful for clearing the program as well as any previously downloaded library.

An "Are You Sure?" message will appear to allow you to confirm the action.

To clear controller and communication registers, cycle power to the controller after clearing memory.

Store Strategy Into Flash

Use this command to store the program, library, and include file currently stored in the Mystic controller's RAM into the controller's Flash EEPROM. This prevents these elements from being lost in the event of a battery failure.

An "Are You Sure?" message will appear to allow you to confirm the action.

This command has no effect if you are using an older controller that does not include Flash EEPROM.

Reset Mystic ISA

Use this command to perform a power-up reset on a Mystic G4LC32ISA controller located in a PC. This is equivalent to cycling power on the controller without having to cycle power on the PC.

This command has no effect on other Mystic controllers.

Turn Reset I/O ON (OFF)

Use this command to enable or disable resetting of the I/O units when the program is run.

Resetting the I/O will cause the I/O unit configuration — features, event/reactions, and PID loops — to be cleared from memory in the I/O unit. This will also cause I/O unit configuration to be downloaded to each I/O unit. For this reason, you should always enable I/O resetting after changing an I/O unit configuration.

I/O resetting is disabled (off) by default.

Clear/Store I/O Unit Cfg

Use this command to clear or store I/O unit configuration on an individual I/O unit. Configuration includes features, event/reactions, and PID loops.

The SELECT I/O UNIT dialog box will appear. Highlight an I/O unit and select CLEAR to reset the I/O unit EEPROM to the factory default settings, or select STORE to save the current configuration to the I/O unit EEPROM. A message will appear to allow you to confirm either action.

Once saved in EEPROM, the I/O unit configuration will be retained after power is cycled.

Turn Sub Stepping ON (OFF)

Use this command to toggle subroutine stepping on or off.

With subroutine stepping enabled, step functions (auto step and single step) will display and step through each block of a subroutine when it is encountered during program execution.

With subroutine stepping disabled, step functions will treat each subroutine as one command, rather than jumping into a subroutine chart and stepping through each of its commands.

Subroutine stepping is disabled (off) by default.

Open (Exit) Watch Window

Use this command to open or close the watch window. This window enables you to examine the internal and/or external values of I/O points, PID loops, event/reactions, variables, and charts. Up to 16 items may be entered in the window. These items will be saved when you exit the Debugger.

Select Open Watch Window to open the window. Once it is open, you can use the Add Watch Item, Delete Watch Item, and Delete All Watch Items commands from the Controller menu.

Open Watch Window changes to Exit Watch Window when the watch window is open. Select this command to close the window, saving all changes.

Add Watch Item

Use this command to add an item to be examined in the watch window. This command has no effect unless the watch window is open (see Open Watch Window above).

The ADD WATCH ITEM dialog box will open. Select from the following items to watch:

- I/O — Select this choice to examine an I/O point. The SELECT I/O UNIT dialog box will appear; select a unit and, if I/O points are defined for the unit, the SELECT I/O POINT dialog box will appear. Highlight an I/O channel from the list and press ENTER. If only one value can be watched for the selected item, it will be added immediately to the watch window. Otherwise, you will be given a choice of values to watch. Select one and press ENTER to add the watch item.
- PID LOOP — Select this choice to examine a PID loop. The SELECT I/O UNIT dialog box will appear, listing all analog I/O units; select a unit and, if PID loops are defined for the unit, the SELECT PID LOOP dialog box will appear. Highlight a PID loop from the list and press ENTER. The SELECT WATCH ITEM dialog box will then appear, allowing you to select one of the following items to watch: SCAN RATE, INPUT, OUTPUT, SETPOINT, GAIN, INTEGRAL, DERIVATIVE, MAX CHANGE RATE, and LOOP MODE. Select one and press ENTER to add the watch item.
- EVENT/REACTION — Select this choice to examine an event/reaction. The Select I/O Unit dialog box will appear; select a unit type and all I/O units of that type will appear in the SELECT I/O UNIT dialog box. Select a unit and, if event/reactions are defined for the unit, the EVENT/REACTION FOR I/O UNIT dialog box will appear. Highlight an event/reaction from the list and press ENTER. The SELECT WATCH ITEM dialog box will then appear, allowing you to select one of the following items to watch: EVENT OCCURRING, EVENT OCCURRED, SCAN STATUS, and INTERRUPT. Select one and press ENTER to add the watch item.
- VARIABLE — Select this choice to examine a variable. The VARIABLE TYPES dialog box will appear; select the variable type and, if variables of that type are defined, a dialog box listing them will appear. Highlight a variable from the list and press ENTER. Numeric and string variables will be added immediately to the watch window, but if you select a numeric or string table, an INDEX field will appear. Use the left or right arrow keys to select the table index to watch, then press ENTER to add the watch item.
- CHART — Select this choice to examine the status of a chart. The SELECT CHART dialog box will appear; select a chart and press ENTER to add the watch item.

Note that each new watch item is added above the highlighted item in the watch window.

Delete Watch Item

Use this command to delete the highlighted watch item from the watch window. This command has no effect unless the watch window is open (see Open Watch Window above).

An “Are You Sure?” message will appear to allow you to confirm the action.

Delete All Watch Items

Use this command to clear all watch items from the watch window. This command has no effect unless the watch window is open (see Open Watch Window above).

An “Are You Sure?” message will appear to allow you to confirm the action.

CHARTS MENU

Select

Use this command to display another chart.

The SELECT CHART dialog box will appear. Use the mouse or the up or down arrow keys to highlight a chart name, then press ENTER to load the chart.

If any charts have break points when you selected this command, you will be asked if you wish to save or clear these break points. Also, if any charts are paused or being stepped through, you will be asked which charts you wish to continue. The selected chart will then appear in the display window.

SYSTEM MENU

Compile

Use this command to compile the current program. This is usually unnecessary, since a program is compiled automatically whenever the Debugger is started if the current program differs from the program running on the Mystic controller.

Download

Use this command to download the compiled program to the Mystic controller. This is usually unnecessary, since a program is downloaded automatically whenever the Debugger is started if the current program differs from the program running on the Mystic controller.

Refresh Display

Use this command to repaint the display window.

Show Subroutines

Use this command to view and, if desired, print a list of all subroutines used in the current program.

This command is identical to the Configurator's System→Show Subroutines command. See Chapter 3 for details.

Find

Use this command to determine the usage of a variable, I/O unit or point, chart, PID loop, event/reaction, operation condition, subroutine, or no-exit block within the current chart or throughout all charts in the program.

This command is identical to the Configurator's System→Find command. See Chapter 3 for details.

Center Block

Use this command to locate an operation or condition block and repaint the drawing window with the specified block at the center.

This command is identical to the Configurator's System→Center Block command. See Chapter 3 for details.

Configurator

Use this command to invoke the Cyrano Configurator using the currently loaded program.

If any charts have break points when you selected this command, you will be asked if you wish to save or clear these break points. Also, if any charts are paused or being stepped through, you will be asked which charts you wish to continue.

In any case an "Are You Sure?" message will appear to allow you to confirm the switch to the Configurator module.

OnLine

Use this command to invoke the Cyrano OnLine module using the currently loaded program.

If any charts have break points when you selected this command, you will be asked if you wish to save or clear these break points. Also, if any charts are paused or being stepped through, you will be asked which charts you wish to continue.

In any case an "Are You Sure?" message will appear to allow you to confirm the switch to the OnLine module.

Subroutine

Use this command to invoke the Cyrano Subroutine module using the most recently loaded subroutine (if any).

If any charts have break points when you selected this command, you will be asked if you wish to save or clear these break points. Also, if any charts are paused or being stepped through, you will be asked which charts you wish to continue.

In any case an "Are You Sure?" message will appear to allow you to confirm the switch to the Subroutine module.

PRINT MENU

All Print menu commands in the Debugger are identical to those in the Configurator. See Chapter 3 for details on each command.

Configure Printer

Use this command to configure a printer for use with Cyrano.

Print Screen

Use this command to print the current screen image directly to a printer or file. This is equivalent to pressing PRINT SCRN on the keyboard.

Print Chart

Use this command to print the contents of the current chart. You may choose to print text (block details), graphics (the flowchart), or both.

Print Block

Use this command to print the contents of an operation or condition block.

Print Program

Use this command to print the contents of all charts in the program. You may choose to print text (block details), graphics (the flowchart), or both.

Print Database

Use this command to print the global database of variables, I/O units, I/O points, PID loops, and event/reactions.

Cross Reference

Use this command to print a cross-reference indicating which blocks reference which variables, I/O units, I/O points, PID loops, and event/reactions. Be aware that generating a cross-reference is often slower and more tedious than printing other elements.

OTHER MODULES AND TOOLS

OVERVIEW

This chapter describes the OnLine and Subroutine modules; the Init, Backup/Restore, ChartDXF, and Bill of Materials tools; the Flash200 utility; and the Enable/Disable NULOGIC option.

ONLINE MODULE OVERVIEW

Cyrano's OnLine module is a stripped-down version of the Configurator that allows you to change program logic or commands.

The OnLine module screen appears below.

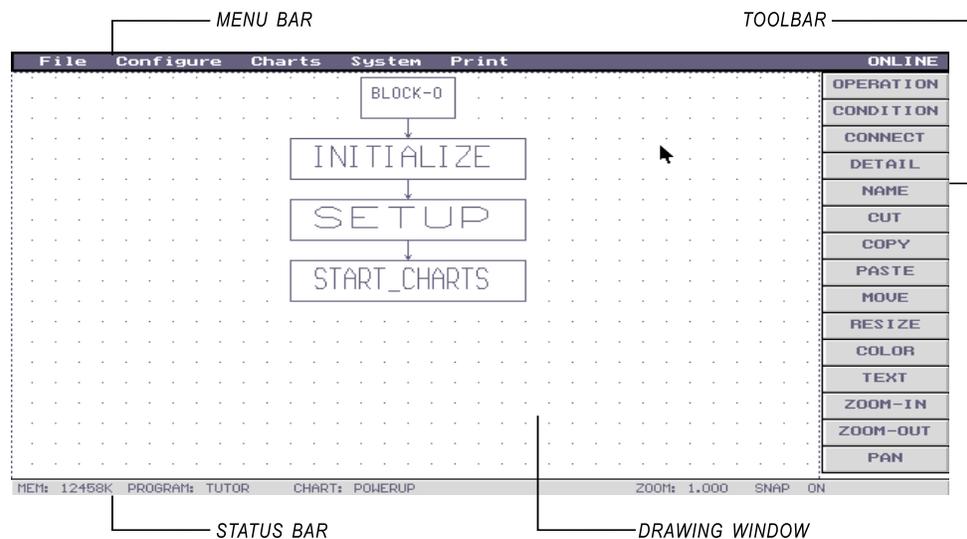


Figure 5-1: OnLine Module Screen

The primary advantage of the OnLine module is that you can make changes to a program without recompiling and downloading the entire program. When you exit the OnLine module to enter the Debugger, only charts that have been changed will be recompiled and downloaded to the Misti controller. Besides the obvious time-saving advantage, especially for large programs, this also enables the program to run uninterrupted on the controller until one of the modified charts is activated.

The only limitation of the OnLine module is that you cannot define or configure variables, I/O units, I/O points, event/reactions, or PID loops. For example, if you attempt to add a command that requires a variable of a type that you did not configure within the Configurator, you will be alerted with a beep or a message that the selection is not valid in this module. You will then need to select a new variable type or command.

Once you have made changes in the OnLine module, warning messages will appear upon entering the Debugger and Configurator modules until the changes have been downloaded.

In the Debugger you will be alerted that only the changes made in the OnLine module will be downloaded. You will then be asked if you wish to continue. Select YES to begin the partial download or NO to avoid the download and select a Debugger menu command instead.

In the Configurator you will be alerted that by saving changes through the Configurator you will force the entire program to be downloaded when you enter the Debugger. You will then be asked if you wish to continue. Select YES to enter the Configurator or NO to exit to the Environment Manager.

Note: You cannot enter the OnLine module if your program contains changes that have not been downloaded. Thus, if you have made program changes in the Configurator, you cannot enter the OnLine module until you first enter the Debugger to compile and download the modified program.

ONLINE TOOLBAR

The OnLine toolbar contains the same set of tools found in the Configurator: OPERATION, CONDITION, CONNECT, DETAIL, NAME, CUT, COPY, PASTE, MOVE, RESIZE, COLOR, TEXT, ZOOM-IN, ZOOM-OUT, and PAN. These tools behave exactly as they do in the Configurator.

For detailed information on these tools, see “Configurator Toolbar” in Chapter 3.

OPERATION

Use this tool to add an operation block to the chart.

CONDITION

Use this tool to add a condition block to the chart.

CONNECT

Use this tool to draw connection lines between blocks.

DETAIL

Use this tool to view or change existing commands or add new commands in an operation or condition block.

Note: Double-clicking the left mouse button directly over a block is equivalent to selecting the DETAIL tool and then selecting a block.

NAME

Use this tool to rename a block.

CUT

Use this tool to cut (delete) one block or a group of blocks along with any associated connection lines. You can also use this tool to cut individual connection lines.

Blocks that are cut can immediately be pasted back into the drawing window, although any associated connection lines will be lost. Connection lines, once cut, cannot be restored.

COPY

Use this tool to copy one block or a group of blocks along with any associated connection lines. You can later decide to paste the copied objects anywhere in the drawing window.

PASTE

Use this tool to retrieve objects that were most recently cut or copied into the cut buffer.

MOVE

Use this tool to move one block or a group of blocks along with any associated connection lines to another area of the drawing window.

RESIZE

Use this tool to change the size of a block.

COLOR

Use this tool to change the color of the drawing window or objects within the window.

TEXT

Use this tool to place text anywhere in the drawing window. You can also use this tool to edit existing text blocks.

ZOOM-IN

Use this tool to magnify the drawing window by a factor of two.

ZOOM-OUT

Use this tool to shrink the drawing window by a factor of two.

PAN

Use this tool to move to other areas of the drawing window.

Note: The PAN tool will be selected automatically if you click the left mouse button on an empty area of the drawing window when no other tool is selected.

ONLINE MENU BAR

The OnLine menu bar includes the same five menus found in the Configurator: File, Configure, Charts, System, and Print.

With one exception, all OnLine menu commands are also found in the Configurator and behave exactly as they do in the Configurator. (The exception is that Configurator replaces OnLine in the System menu.)

For detailed information on these commands, see “Configurator Menu Bar” in Chapter 3.

FILE MENU

This menu contains the same set of commands found in the Configurator.

Load

Use this command to load an existing program.

Save

Use this command to save the current program to a new or existing file name.

Version

Use this command to view the OnLine module’s version number, release date, and copyright information.

Quit

Use this command to exit the OnLine module and return to the Cyrano Environment Manager. If you have made changes to the program strategy that have not been saved, you will be asked if you wish to save your strategy.

CONFIGURE MENU

This menu contains only one command, **Mistic**. All other Configure menu commands found in the Configurator (**I/O Unit**, **I/O Point**, **Variables**, **PID**, and **Event/Reaction**) are unavailable in this module.

Mistic

Use this command to configure the parameters needed for downloading a file to the proper Mistic controller.

CHARTS MENU

This menu contains only one command, **Select**. All other Charts menu commands found in the Configurator (**New, Change, Copy, Delete, Export, Auto Import, and Manual Import**) are unavailable in this module.

Select

Use this command to open an existing chart.

SYSTEM MENU

This menu contains all System menu commands found in the Configurator except **Download Options** (eliminated) and **OnLine** (replaced with **Configurator**).

Refresh Display

Use this command to repaint the drawing window.

Toggle Snap

Use this command to enable or disable the automatic snap function, as indicated by SNAP ON or SNAP OFF in the status bar.

Grid

Use this command to toggle grid dots on or off in the drawing window.

Show Subroutines

Use this command to view and, if desired, print a list of all subroutines used in the current program.

Find

Use this command to determine the usage of a variable, I/O unit or point, chart, PID loop, event/reaction, operation condition, subroutine, or no-exit block within the current chart or throughout all charts in the program.

Center Block

Use this command to locate an operation or condition block and repaint the drawing window with the specified block at the center. Note that this does not move any object with respect to another; only the view is changed.

Configurator

Use this command to invoke the Cyrano Configurator module using the currently loaded program.

If you have made changes to the program that have yet to be saved, you will be asked if you wish to save your changes. In any case an "Are You Sure?" message will appear, allowing you to confirm the switch to the Configurator module.

Debugger

Use this command to invoke the Cyrano Debugger using the currently loaded program.

If you have made changes to the program that have yet to be saved, you will be asked if you wish to save your changes. In any case an “Are You Sure?” message will appear, allowing you to confirm the switch to the Debugger module.

Subroutine

Use this command to invoke the Cyrano Subroutine module using the most recently loaded subroutine (if any).

If you have made changes to the program that have yet to be saved, you will be asked if you wish to save your changes. In any case an “Are You Sure?” message will appear, allowing you to confirm the switch to the Subroutine module.

PRINT MENU

This menu contains all Print menu commands found in the Configurator.

Configure Printer

Use this command to configure a printer for use with Cyrano.

Print Screen

Use this command to print the current screen image directly to a printer or file. This is equivalent to pressing PRINT SCRN on the keyboard.

Print Chart

Use this command to print the contents of the current chart. You may choose to print text (block details), graphics (the flowchart), or both.

Print Block

Use this command to print the contents of an operation or condition block.

Print Program

Use this command to print the contents of all charts in the program. You may choose to print text (block details), graphics (the flowchart), or both.

Print Database

Use this command to print the global database of variables, I/O units, I/O points, PID loops, and event/reactions.

Cross Reference

Use this command to print a cross-reference indicating which blocks reference which variables, I/O units, I/O points, PID loops, and event/reactions. Be aware that generating a cross-reference is often slower and more tedious than printing other elements.

SUBROUTINE MODULE OVERVIEW

Cyrano’s Subroutine module allows you to define special subroutines that can be used like commands within operation blocks. You can draw subroutine charts in the Subroutine drawing window just as you would regular charts in the Configurator drawing window. However, each subroutine must be drawn as a single chart.

Note that you can define and configure local variables in this module, but you cannot define or configure I/O units, I/O points, PID loops, event/reactions, or charts.

Once created, subroutines appear in bright red within the command list for the command group you have selected.

Note that upon entering the Subroutine module, the subroutine file that was most recently loaded in the module, if any, will be loaded automatically into the module. Upon exiting the Subroutine module, the main program loaded when you entered the Subroutine module will be loaded when you enter the Configurator, Debugger, or OnLine modules.

The Subroutine module screen appears below.

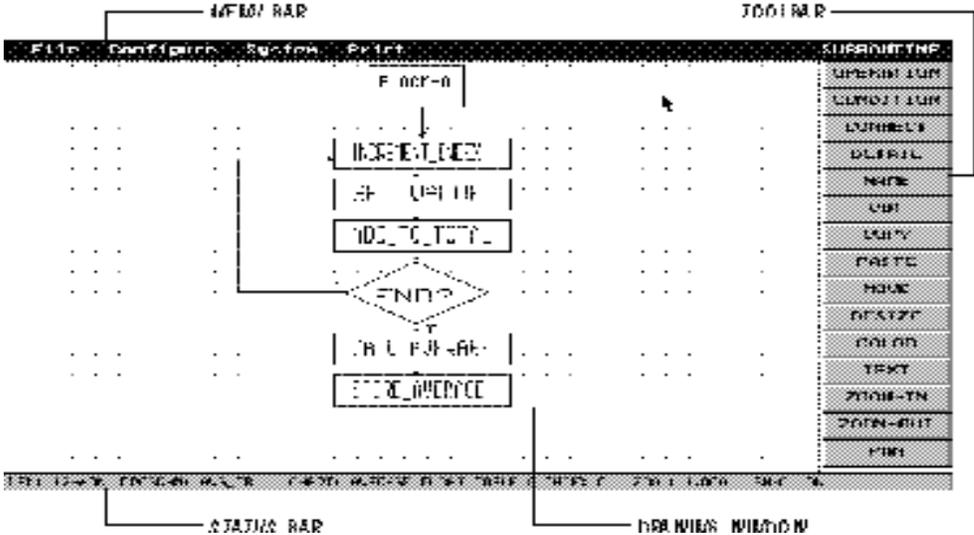


Figure 5-2: Subroutine Module Screen

SUBROUTINE TOOLBAR

The Subroutine toolbar contains the same set of tools found in the Configurator: OPERATION, CONDITION, CONNECT, DETAIL, NAME, CUT, COPY, PASTE, MOVE, RESIZE, COLOR, TEXT, ZOOM-IN, ZOOM-OUT, and PAN. These tools behave exactly as they do in the Configurator.

For detailed information on these tools, see “Configurator Toolbar” in Chapter 3.

OPERATION

Use this tool to add an operation block to the chart.

CONDITION

Use this tool to add a condition block to the chart.

CONNECT

Use this tool to draw connection lines between blocks.

DETAIL

Use this tool to view or change existing commands or add new commands in an operation or condition block.

(Note: Double-clicking the left mouse button directly over a block is equivalent to selecting the DETAIL tool and then selecting a block.)

NAME

Use this tool to rename a block.

CUT

Use this tool to cut (delete) one block or a group of blocks along with any associated connection lines. You can also use this tool to cut individual connection lines.

Blocks that are cut can immediately be pasted back into the drawing window, although any associated connection lines will be lost. Connection lines, once cut, cannot be restored.

COPY

Use this tool to copy one block or a group of blocks along with any associated connection lines. You can later decide to paste the copied objects anywhere in the drawing window.

PASTE

Use this tool to retrieve objects that were most recently cut or copied into the cut buffer.

MOVE

Use this tool to move one block or a group of blocks along with any associated connection lines to another area of the drawing window.

RESIZE

Use this tool to change the size of a block.

COLOR

Use this tool to change the color of the drawing window or objects within the window.

TEXT

Use this tool to place text anywhere in the drawing window. You can also use this tool to edit existing text blocks.

ZOOM-IN

Use this tool to magnify the drawing window by a factor of two.

ZOOM-OUT

Use this tool to shrink the drawing window by a factor of two.

PAN

Use this tool to move to other areas of the drawing window.

Note: The PAN tool will be selected automatically if you click the left mouse button on an empty area of the drawing window when no other tool is selected.

SUBROUTINE MENU BAR

The Subroutine menu bar includes four of the five menus found in the Configurator: File, Configure, System, and Print. There is no Charts menu in this module, since each subroutine must be drawn within a single chart.

Most Subroutine menu commands are also found in the Configurator and behave exactly as they do in the Configurator. For detailed information on these commands, see "Configurator Menu Bar" in Chapter 3.

The most important difference between Subroutine and Configurator menu commands is the addition of Configure→Definition, used to define the subroutine. Another difference is that File→Load and File→Save are used to load and save subroutines, not main programs. The final difference is that Configurator replaces Subroutine in the System menu.

FILE MENU

This menu contains the same set of commands found in the Configurator.

Load

Use this command to load an existing subroutine or to create a new subroutine through the LOAD FILE dialog box. You cannot load a main program through this command.

Note that below the LOAD FILE dialog box, the name you have defined for the subroutine will appear whenever you highlight a file in the directory box. This makes it easy to determine the name of the subroutine contained in each file, since subroutine names and file names do not need to correspond.

Save

Use this command to save the current subroutine to a new or existing file name.

Version

Use this command to view the Subroutine module's version number, release date, and copyright information.

Quit

Use this command to exit the Subroutine module and return to the Cyrano Environment Manager. If you have made changes to the subroutine that have not been saved, you will be asked if you wish to save the subroutine.

CONFIGURE MENU

This menu contains two commands: **Definition**, which is unique to the Subroutine module, and **Variables**, which can also be found in the Configurator.

Definition

Use this command to define the subroutine's name, arguments, and command group.

The CREATE SUBROUTINE DEFINITION dialog box will appear, displaying the following fields:

OPERATION Enter a descriptive name of up to 30 characters to represent this subroutine, then press ENTER. You must enter a unique name for this subroutine.

The next three fields relate to the each argument passed to or from the subroutine. You may define up to four arguments.

TYPE Select an argument type from the scrolling list (use left or right arrow keys to view options). An argument can be an I/O unit, I/O point, I/O point feature, PID loop, event/reaction, or chart. Choices are: DIGITAL IN, COUNTER, ON LATCH, OFF LATCH, ON PULSE MEAS., OFF PULSE MEAS., FREQUENCY, PERIOD, DIGITAL OUT, TIME PROP. OUTPUT, ANALOG IN, ANALOG OUT, CONSTANT FLOAT, CONSTANT INTEGER, CONSTANT STRING, FLOAT TABLE, INTEGER TABLE, STRING TABLE, VARIABLE FLOAT, VARIABLE INTEGER, VARIABLE STRING, DIGITAL NMF I/O UNIT, DIGITAL MF I/O UNIT, ANALOG MF I/O UNIT, CHART, PID LOOP, VARIABLE TIMER, SMART DIGITAL OUT, QUADRATURE COUNTER, ON TIME TOTALIZER, OFF TIME TOTALIZER, DIGITAL E/R, ANALOG E/R, and REM SMPL I/O UNIT.

PROMPT	Enter a prompt of up to 15 characters to identify the argument (for example, <i>Lower limit</i>). This prompt will help you understand what type of argument to enter when using the subroutine within a command block.
NAME	Enter a tag name of up to 30 characters to identify the argument within the subroutine. This name will appear in red within argument lists throughout the subroutine.
GROUP	Select the command group in which you wish the subroutine to appear (use left or right arrow keys to view options). The default is SUBROUTINES, but you may select any group you wish. (You may also create your own group by defining a new group in the GROUP.DEF file.) The subroutine name will appear in red within the group's command list.

Once you have defined as many arguments as you need, press the down arrow from the TYPE field to skip past remaining argument fields. If you inadvertently press ENTER in the TYPE field of an argument you do not need, use the up arrow to return to the TYPE field and press ALT-DELETE. (You may also use ALT-DELETE to delete a completely defined argument.) *Do not attempt to clear a field by pressing ESC*, as this will close the dialog box without saving changes.

Select ACCEPT at the bottom of the dialog box to save your changes, or CANCEL to ignore them.

Variables

Use this command to configure local variables to be used *within the current subroutine only*. Note that any variables configured in the main program or in other subroutines will not be accessible within the subroutine.

Configure variables as you would in the Configurator. See Chapter 3 for details.

Note that subroutine variables are always initialized to zero (numeric variables) or empty (string variables).

SYSTEM MENU

This menu contains all System menu commands found in the Configurator except **Download Options** (eliminated), **Show Subroutines** (eliminated), and **Subroutine** (replaced with **Configurator**).

Refresh Display

Use this command to repaint the drawing window.

Toggle Snap

Use this command to enable or disable the automatic snap function, as indicated by SNAP ON or SNAP OFF in the status bar.

Grid

Use this command to toggle grid dots on or off in the drawing window.

Find

Use this command to determine the usage of a variable, I/O unit or point, chart, PID loop, event/reaction, operation, condition, or no-exit block within the subroutine.

Center Block

Use this command to locate an operation or condition block and repaint the drawing window with the specified block at the center. Note that this does not move any object with respect to another; only the view is changed.

Configurator

Use this command to invoke the Cyrano Configurator module using the most recently loaded program.

If you have made changes to the subroutine that have yet to be saved, you will be asked if you wish to save your changes. In any case an "Are You Sure?" message will appear, allowing you to confirm the switch to the Configurator module.

Debugger

Use this command to invoke the Cyrano Debugger using the most recently loaded program.

If you have made changes to the subroutine that have yet to be saved, you will be asked if you wish to save your changes. In any case an "Are You Sure?" message will appear, allowing you to confirm the switch to the Debugger module.

OnLine

Use this command to invoke the Cyrano OnLine module using the most recently loaded program.

If you have made changes to the program that have yet to be saved, you will be asked if you wish to save your changes. In any case an "Are You Sure?" message will appear, allowing you to confirm the switch to the OnLine module.

PRINT MENU

This menu contains all Print menu commands found in the Configurator except **Print Chart** (replaced with **Print Subroutine**) and **Print Program** (eliminated).

Configure Printer

Use this command to configure a printer for use with Cyrano.

Print Screen

Use this command to print the current screen image directly to a printer or file. This is equivalent to pressing PRINT SCRN on the keyboard.

Print Subroutine

Use this command to print the contents of the subroutine. This is analogous to the Configurator's Print Chart command. You may choose to print text (block details), graphics (the flowchart), or both.

Print Block

Use this command to print the contents of an operation or condition block.

Print Database

Use this command to print the global database of variables, I/O units, I/O points, PID loops, and event/reactions.

Cross Reference

Use this command to print a cross-reference indicating which blocks reference which variables, I/O units, I/O points, PID loops, and event/reactions. Be aware that generating a cross-reference is often slower and more tedious than printing other elements.

CYRANO TOOLS

The following tools are available from the Cyrano Environment Manager's Tools menu:

- Init
- Backup/Restore
- ChartDXF
- Bill of Materials

Additional user-supplied tools may be added to the Tools menu by editing the TOOLS.DEF file provided with Cyrano. To incorporate additional tools, add the desired menu display name, followed by a comma, followed by the name of the .BAT, .COM, or .EXE file to execute, followed by another comma. For example, to add the Flash200 utility, add the entry "Flash200,FLASH200.EXE," to TOOLS.DEF.

Up to 20 tools may be added to the Tools menu. The maximum path size for the executable name is 80 characters.

INIT

This utility initializes Cyrano string and table data.

The utility creates a MISTIC.INC file containing all user-specified initialization data. The MISTIC.INC file can be downloaded to the Mystic controller after the program has been downloaded, thereby initializing variables within the program with the data included in the MISTIC.INC file.

To initialize data:

1. In the Configurator:
 - a. Configure desired strings, string tables, and numeric tables. Be sure to set the Init option to NO in the Cyrano Configurator so that the tables and strings are accessible to the Init utility.
 - b. Select System → Download Options and set MISTIC.INC to YES.

2. In the Init utility:
 - a. Select File→Load and select the path and name of the desired program.
 - b. From the Initialization menu, select String, Numeric Table, or String Table to gain access to the variables defined in the program that need to be initialized.
 - c. Provide values for strings, numeric tables, and string tables. To do so, highlight a variable and press ENTER. The buttons INIT and EXIT will appear at the bottom of the window. Highlight INIT and press ENTER, then enter the initial value for the variable and press ENTER twice to accept the value.

If in the Cyrano Configurator you selected the option to download the MISTIC.INC file (step 1B), tables and strings will be initialized to the given values after the program is downloaded.

*Note: The initialization values are applied to the program only after the program is initially downloaded. The values are **not** applied upon subsequent selections of the RUN/STOP command in the Debugger (the previous value is used instead). In addition, if you have elected to boot the controller from ROM, MISTIC.INC initialization is **not** performed, since the program is being loaded from ROM.*

BACKUP/RESTORE

This utility backs up all files that comprise a Cyrano program. Once backed up, the program files may be restored to the original location or to a different directory or computer.

To backup a program strategy:

1. Select File→Backup.
2. In the BACKUP STRATEGY - SOURCE dialog box, select the path and name of the program to be backed up.
3. In the BACKUP STRATEGY - DESTINATION dialog box, select the path and name to which the program will be backed up. This may be on a PC, a network, or floppy disk.

You will be notified that all files with the program name as a prefix will be deleted from the destination directory. Choose YES to continue or NO to abort the operation.

The following files will be backed up:

- From the source directory:
 - all files with the program name prefix (e.g., for the program TEST, all TEST.* files)
 - all files with the prefix MISTIC (MISTIC.LIB, MISTIC.001, etc.)
- From the Cyrano executable directory:
 - all subroutines used by the program (*.SUB and *.CDL files)
 - MISTICA.DEF and MISTICC.DEF, if they exist

You will be prompted to change disks if more than one disk is required to complete the backup.

Support files are created and copied to the backup destination for later use when restoring program files. These files have the program name as a prefix and .BK# (.BK1, .BK2, etc.) as an extension. For example, if you are backing up the program TEST, the file TEST.BK1 will be copied to the first piece of media required for backup, TEST.BK2 will be copied to the second, and so on.

To restore a program strategy:

1. Select File→Restore.
2. In the RESTORE STRATEGY - SOURCE dialog box, select the path and name of the program to be restored.
3. In the RESTORE STRATEGY - DESTINATION dialog box, select the path and name to which the program will be restored.

You will be notified that all files with the program name as a prefix will be deleted from the destination directory. Choose YES to continue or NO to abort the operation.

The following files will be restored:

- To the destination directory:
 - all files with the program name prefix (e.g., for the program TEST, all TEST.* files)
 - all files with the prefix MISTIC (MISTIC.LIB, MISTIC.001, etc.)
- To the Cyrano executable directory:
 - all subroutines used by the program (*.SUB and *.CDL files)
 - MISTICA.DEF and MISTICC.DEF, if they exist

You will be warned if files are to be overwritten. Choose YES to continue or NO to abort the operation.

CHARTDXF

This utility converts Cyrano chart and subroutine files into AutoCAD.DXF (drawing interchange format) files. Because Cyrano print functions do not directly support plotters, this utility allows you to print large multi-page charts on a plotter.

After the Cyrano chart or subroutine has been converted, it can be loaded into any paint or CAD package that has the ability to input .DXF files. The CAD package can then be used to provide plotter output.

To convert Cyrano files to .DXF format:

1. Select File→Load Strategy or File→Load Subroutine.
2. From the LOAD FILE dialog box, select the path and name of the program/subroutine to be processed.
3. If processing a program, select the desired chart from the SELECT CHART dialog box.
4. Enter a name of up to eight characters for the .DXF output file. The .DXF suffix will automatically be appended to the file name.

Once a file name has been entered, conversion will begin and another window will appear informing you of the conversion status. Press any key to continue and the .DXF file will be saved to the project directory.

To plot the .DXF file:

1. Start AutoCAD and begin a new drawing.
2. Enter the command DXFIN, and enter the name of the .DXF file generated above (do not include the .DXF suffix).
3. Enter the command ZOOM E. This will cause the Cyrano chart to fill the screen.
4. Use the PLOT command to plot the chart on any AutoCAD-supported plotting device.

For more information on these AutoCAD commands, please refer to your AutoCAD User's Manual.

BILL OF MATERIALS

This utility allows you to print out a complete list of all parts comprising the Opto 22 hardware suite configured in a given program.

To obtain a bill of materials:

1. Select File→Load Strategy.
2. From the LOAD FILE dialog box, select the path and name of the program to be processed.
3. If a printer has not been previously configured, select a printer from the PRINTER SELECTION dialog box.
4. Enter print parameters in the PRINT DESTINATION dialog box (see Print→Configure Printer in Chapter 3 for details).

The utility will then process the selected program and output a bill of materials to the printer/file selected. If you elected to print to a file, the utility will create the file CYRANO.BOM in your project directory.

In addition to the printed output, the utility creates a text file, PROGRAM.DAT, which contains the parts information in a format that can be read into any spreadsheet application.

Note: To print a bill of materials to a file that can later be printed to the screen, select EGA DISPLAY as the printer type from the PRINTER SELECTION dialog box.

FLASH200 UTILITY

Flash200 is a separate Visual Basic application utility used to download Flash memory (kernel files) from a PC to a Mystic 200 controller or a Mystic M4RTU.

Flash memory is the virtual equivalent of an EPROM chip. It is the software (or firmware) for the internal workings of the Mystic controller.

Advantages of Flash memory over EPROM chips are:

- It is less expensive than EPROMs.
- It is easier for the end user to upgrade.
- It can be sent electronically via modem.

New Flash memory upgrades are required as features are added to Mystic products or as bugs are fixed. The Flash200 utility downloads new firmware to non-volatile Flash EEPROM in a Mystic controller.

To use the utility, double-click the Flash200 icon in the OPTO 22 program group, or run FLASH200.EXE from a DOS prompt in your firmware directory. The utility supports conventional Windows navigation keys as well as a mouse, although a mouse is not required.

The Flash200 utility will work with:

- the G4LC32ISA
- newer versions of the G4LC32 and G4LC32SX that have Flash EEPROM
- the Mystic M4RTU controller and its I/O brain board processor (two Flash memory files are required for the M4RTU)

To determine if your G4LC32 has Flash EEPROM, try downloading Flash firmware to your G4LC32 using the Flash200 utility. If your controller is not the correct type, an error will occur during initialization for the download (no damage will occur to the controller). After the Flash download, your program will need to be downloaded through the Cyrano Debugger.

ENABLE NULOGIC

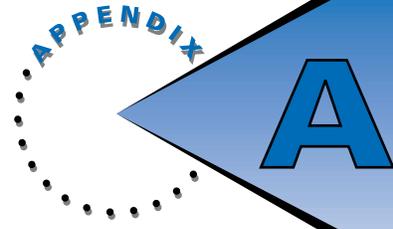
Select this command from the Environment Manager's System menu to enable motion control operations and conditions. These commands are used for the nuLogic® single-axis servo controller and multi-axis servo/stepper controller. When NULOGIC is enabled, the menu command changes to Disable NULOGIC to allow you to disable this option.

With NULOGIC enabled, you will be able to add operations and conditions from three new command groups: NULOGIC MOTION CTL-COMMON, NULOGIC MOTION CTL-SERVO, and NULOGIC MOTION CTRL-STEP. All commands in these groups apply specifically to motion control. With NULOGIC disabled, these command groups are not available.

Unless you are using nuLogic motion controllers, this command should remain disabled (the default).

For more information on motion control commands, contact nuLogic at 617/444-7680.

HARDWARE AND FIRMWARE



Cyrano can be used without an Opto 22 controller and hardware to create original program logic. However, once you are ready to download and debug your application using the Cyrano Debugger, you will need the hardware and firmware described in this appendix.

HARDWARE

To download your application, the following hardware is required in addition to the hardware required to run Cyrano alone (see Chapter 1):

- Opto 22 Controller
- Digital and Analog I/O Units
- G4 Type I/O Modules, as required by your application

For multidrop applications that require several Opto 22 controllers to be connected to digital and analog I/O bricks, the following hardware is required:

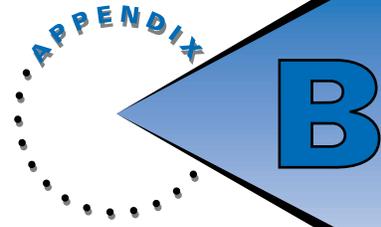
- An IBM-compatible PC workstation
- An Opto 22 AC24, AC422 RS-485/422, or AC37 (115-KBd) Adapter Card, or an SMC PC-130 ARCNET card
- An Opto 22 system with:
 - Opto 22 Controllers, as required by your application
 - Opto 22 Digital and Analog I/O Units, as required by your application
 - Opto 22 G4 Digital and Analog I/O Modules as required by your application
- Serial cables, or coaxial cables and hubs, to multidrop-connect the PC to the Opto 22 controllers

FIRMWARE

Cyrano also requires compatible firmware to be installed on various hardware components, as detailed below:

	Current Version	Minimum Version Required
Analog Brick		
Single-Point Local (G4A8L)	R3.0a	LA 117
Single-Point Remote (G4A8R)	R3.0a	RA 117
HRD High-Density Local (G4HDAL)	R3.0a	LAM 105
HRD High-Density Remote (G4HDAR)	R3.0a	RAM 105
Digital Brick		
Local Multifunction Digital (G4D16L)	R3.0a	LD 109
Remote Multifunction Digital (G4D16R)	R3.0a	RD 109
Local Simple Digital (G4D16LS)	LS 101	LS 101
Remote Simple Digital (G4D32RS)	R3.0a	R3.0a
Mistic Controllers		
G4LC32ISA	R3.1h	R3.0a
G4LC32ISA-LT	R3.1h	R3.0a
G4LC32SX	R3.1h	R3.0a
G4LC32	R3.1h	R3.0a
M4	R3.1h	R3.0a
M4 I/O	R3.1h	R3.0a
M4RTU/DAS	R3.1h	R3.0a

CYRANO FILES



This appendix provides a list of Cyrano file types and special files. Use this information as a reference when you are looking through your Cyrano or project directory.

The following conventions are used in this list:

- * (asterisk) Wildcard representing any number of characters of any type. For example, *.DAT represents all files with a .DAT extension, such as A.DAT, CYRANO.DAT, MISTIC24.DAT, etc.
- # (pound sign) Wildcard representing a number. The number may include letters as well as numerals. For example, MISTIC.### represents all files beginning with MISTIC and ending with a three-digit extension, such as MISTIC.001, MISTIC.002, MISTIC.00A, etc.

PROJECT FILES

The following files are specific to each Cyrano project. Most of these files are located in your project directory, which may or may not be the same as your Cyrano installation directory.

- *.### Temporary file that keeps track of parameter data used to step through a subroutine in the Debugger
- *.B## Backup chart files, created by the CYRFIX utility
- *.BK# List of files in a backup location, generated by the Backup/Restore utility
- *.BLK Output generated by a Print Block command printed to a file
- *.BML Backup .GML files, created by the CYRFIX utility
- *.BOM Bill of materials output file for printing
- *.CDL Compiled subroutine file
- *.DAT Output generated by the Bill of Materials utility, comma-delimited for use in a spreadsheet program
- *.DBS Output generated by a Print Database command printed to a file
- *.DLS List of all subroutines used in a program
- *.DXF Plotter data file generated by the ChartDXF utility for use in a CAD program

*.G##	Chart files
*.GML	List of all objects and other global information used in a program, including I/O units, I/O points, variables, PID loops, event/reactions, constants, and charts. Also includes Mystic controller configuration information.
*.GZZ	INTERRUPT chart
*.LST	Output generated by a Print→Cross Reference command printed to a file
*.PGM	Output generated by a Print Program command printed to a file
*.RUN	Compiled program strategy (in Forth)
.S##	Parameter information for subroutines referenced in each chart. The last two digits correspond to the last two digits of the chart file (.G##) in which the subroutines are called.
*.SRN	Output generated by a Print Screen command printed to a file
*.SUB	Subroutine source code file
*.TSK	Output generated by a Print Chart or Print Subroutine command printed to a file
*.WW	Watch window contents
*.ZZZ	Temporary file that keeps track of the number of subroutine calls in the block currently being stepped through in the Debugger
MISTIC.###	Custom Forth code containing commands specific to a Mystic controller. The extension corresponds to the address of the controller (e.g., MISTIC.127 is used for a controller at address 127).
MISTIC.INC	Output generated by the Init utility
MISTIC.LIB	Custom Forth code containing a library of commands
MISTIC.TRM	Forth code used for the front panel of the G4LC32 Mystic controller
MISTICA.DEF	Definitions of additional (external) operations
MISTICC.DEF	Definitions of additional (external) conditions
PRT.TOC	Program table of contents, output to a printer or included within a file during a Print Block, Print Chart, or Subroutine command



CYRANO FILES

The following files are located in your Cyrano installation directory.

*.DEF	Command and menu definitions
*.EXE	Executable program files
BD.PDT	Printer drivers
BGI16.DLL	Support code required for Cyrano
CYR200.CFG	Cyrano configuration file
CYRANO.PIF	Cyrano program information file
CYRANO3.ICO	Cyrano program icon
DPMI16BI.OVL	Support code required for Cyrano
ERRORS.HLP	Information on Cyrano errors
ERRSTUP.HLP	Support file required for ERRORS.HLP
EZGRPEZG	Special file used to create Cyrano program icon
EZI.HST	Cyrano installation history
LCOM.CHR	Font file for the Cyrano Environment Manager
SUB200.CFG	Configuration file for the Cyrano Subroutine module
TOOLS.DOC	Description of Cyrano tools (in Microsoft Word format)

In most cases, you can use the key combinations within a dialog box to change the display immediately. However, when adding or changing a command, you will need to press the key combination from the command block's detail window *before* pressing ADD or CHANGE.

If there is insufficient room within a dialog box to display a binary value, a YES or NO will appear instead to inform you whether there is a value to display. If you wish to view the value, you can change to decimal or hex mode.

CONTROLLER COMMUNICATION

CTRL-C Controller Communication: Displays a window showing the last data sent to and from the controller. Data sent to the controller appears in the XBUF fields; data from the controller appears in the RBUF fields. The last two lines are a hexadecimal representation of the first two lines.

To close the window, press ESC.

This key combination, valid only in the Debugger, provides a valuable debugging tool by allowing you to view the most recent communication to and from the Mystic controller.

For example, if a download has failed, you can use the CTRL-C function to find the command that failed, since that will be the last data sent to the controller. Figure C-4 shows an example of such usage, with the controller communication window shown at the bottom of the screen.

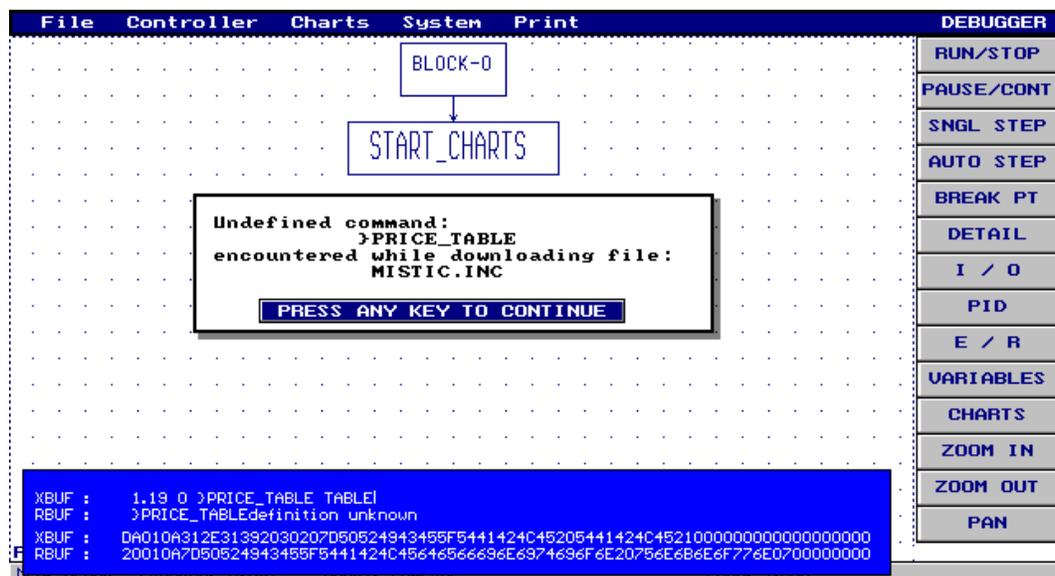


Figure C-4: Controller Communication Window

PRODUCT SUPPORT



If you have any questions about this product, contact Opto 22 Product Support Monday through Friday, 8 a.m. to 5 p.m. Pacific Time.

Phone: 800-TEK-OPTO (835-6786)
951-695-3080

Fax: 951-695-3017

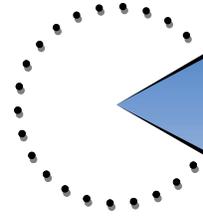
E-mail: support@opto22.com

Opto 22 Web site: www.opto22.com

When calling for technical support, be prepared to provide the following information about your system to the Product Support engineer:

- Software and version being used
- Controller firmware version
- PC configuration
- A complete description of your hardware and operating systems, including:
 - jumper configuration
 - accessories installed (such as expansion daughter cards)
 - type of power supply
 - types of I/O units installed
 - third-party devices installed (e.g., barcode readers)
- Specific error messages seen

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