Allen-Bradley

GML Ultra
(Cat. No. 1398-5.10)

Getting Started Manual

Important User Information

Because of the variety of uses for the products described in this publication, those responsible for the application and use of this control equipment must satisfy themselves that all necessary steps have been taken to assure that each application and use meets all performance and safety requirements, including any applicable laws, regulations, codes, and standards.

The illustrations, charts, sample programs and layout examples shown in this manual are intended solely for purposes of example. Since there are many variables and requirements associated with any particular installation, Allen-Bradley office does not assume responsibility or liability (to include intellectual property liability) for actual use based upon the examples shown in this publication.

Allen-Bradley publication SGI-1.1, *Safety Guidelines for the Application, Installation, and Maintenance of Solid-State Control* (available from your local Allen-Bradley office), describes some important differences between solid-state equipment and electromechanical devices that should be taken into consideration when applying products such as those described in this publication.

Throughout this manual we use notes to make you aware of safety considerations:

ATTENTION: Identifies information about practices or circumstances that can lead to personal injury or death, property damage or economic loss.

Attention statements help you to:

- Identify a hazard
- Avoid the hazard
- Recognize the consequences

Important: Identifies information that is critical for successful application and understanding of the product.

Preface

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Preface

Read this preface to familiar yourself with this manual. This preface covers the following topics.

- Who should use this manual
- The purpose of this manual
- The contents of this manual
- How to find help
- Technical support
- Common techniques used in this manual

Who Should Use this Manual

Use this manual if you are responsible for installing and setting up GML Ultra®, and for connecting your PC to the Ultra Plus®. GML Ultra is a member of the GML™ family. You will also find procedures for preparing to draw your first diagram.

Purpose of this Manual

This manual provides information and step-by-step instructions for preparing GML Ultra for drawing diagrams.

Contents of this Manual

Chapter	Title	Contents
	Preface	Describes the audience, purpose, background, and scope of this manual.
1	*Getting Started*	Provides the requirements for running GML Ultra, and the procedures for installing and starting it.
2	*Setup Overview*	Provides an overview of the setup process, including a one page setup quick reference.
3	*Setting System Preferences*	Provides step-by-step procedures for setting parameters that customize the GML Ultra menu options for your system.
4	*Setting Required Definitions*	Provides step-by-step procedures for customizing GML Ultra menu options based on your controller, axis, and operator interface.

Chapter	Title	Contents
5	*Setting Optional Definitions*	Provides step-by-step procedures for setting parameters that are specific to the diagram you are creating or changing.
	Index	Provides alphabetical listing and page locations of manual topics.

Where to Find Help

GML Ultra provides two types of help:

- A set of user manuals.
- Online help.

Using the Manual Set

This manual is part of a documentation set for GML Ultra:

- *GML Ultra Getting Started* (publication 1398-5.10).
- *GML Ultra User Manual* (publication 1398-5.11).
- *GML Ultra Reference Manual* (publication 1398-5.12).

Use this manual	To find information on this topic
GML Ultra Getting Started	• Installing the software • Starting the software • Setting up the system • Connecting the hardware • Saving a diagram and closing GML Ultra
GML Ultra User Manual	• Basic features and functions • Screen, menu, and toolbar functions • The process of defining the values that the controller uses to control motion and I/O • The mechanics of working with blocks, modules, and diagrams • Basic block definitions
GML Ultra Reference Manual	• Setup details • Expression Builder details • Block function details

Using Online Help

You have access several types of online help:

Type of online help	How to get the help
GML Help: • Detailed descriptions of all menus and screens. • Guidelines for creating a diagram. • Error messages. • Troubleshooting information. • How to start up the ULTRA Plus	Select **Help** from the menu bar.
Block descriptions: • The block's dialog box. • The Diagram Block Library.	In a diagram, double-click on a block to open its dialog box. In a diagram, click on the Library Browser block to open the Diagram Block Library.
Definition descriptions of definitions you are configuring.	From the Definitions menu, select an option.

Rockwell Automation Support

Rockwell Automation offers support services worldwide.

Local Product Support

Contact your local Allen-Bradley representative for:

- Sales and order support
- Product technical training
- Warranty support
- Support service agreements

Technical Product Assistance

If you need technical assistance, first review the information in the *Troubleshooting* chapter of the *GML Ultra User Manual*. If you need more information, call your local Allen-Bradley representative.

For the quickest possible response, we recommend that you have the catalog numbers of your products available when you call. Refer to *Where to Find Help* for the publication numbers related to this product.

The Rockwell Automation Technical Support number is **(216) 646-6800.**

Common Techniques Used in this Manual

The following conventions are used throughout this manual:

- Bulleted lists provide information, not procedural steps.
- Numbered lists provide sequential steps.
- Words that you type or select and keys that you press appear in **bold.**
- Field names and references appear in *italics*.
- Warnings appear with the following symbol:

ATTENTION: This warning identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. This symbol indicates a situation that requires immediate attention for personnel safety or for preventing harm to machinery .

- **IMPORTANT:** Identifies information that is critical for successful application and understanding of the product.
- The term “select” means that you use your mouse cursor to point to the value, then click-and-release the left mouse button to mark your choice. Depending on the field, you can select one or more options for a field. The options appear in various formats:
  - Sometimes you must browse through a list to find the value you want. Clicking an option in the list highlights your selection.
  - Sometimes you can select several values in one area. A check in a box  is used when you can choose more than one option.
  - Sometimes only one value is allowed. A radio button  is used when you can choose only one option.
  - When you select a block in your diagram, the block is highlighted. You can now:

- Move the block by clicking and dragging, rather than clicking and releasing.
- Open the dialog box by double-clicking.

In all cases, the term indicates your choice to GML Ultra.

Getting Started

Before you draw your first diagram, you must perform the procedures in this chapter. The following information gets you started:

- System requirements
- Prerequisite knowledge
- Backing up the GML Ultra diskette
- Installing GML Ultra
- Starting GML Ultra
- Connecting your controller to your computer

System Requirements

GML Ultra, a member of the GML family, is a Microsoft® Windows™-based interface to the ULTRA Plus series of controllers. GML Ultra is designed to run on Windows 3.1, but can also run on Windows 95 and Windows NT™. To ensure that the program works as it should, we recommend at minimum, the following hardware:

- Personal computer (PC) with 25 MHz 486 microprocessor
- 4 Mbyte RAM (8 Mbyte or greater recommended)
- Microsoft Windows 3.1 operating system
- MS-DOS® 5.0 operating system (6.0 recommended)
- EGA monitor (VGA or Super VGA recommended)
- One diskette drive; 3.5 inch high density (1.44 Mbyte)
- Windows-compatible mouse and mouse driver
- Two serial ports (COM1 and COM2)

Prerequisite Knowledge

To use GML Ultra, you should be familiar with the operation of Microsoft Windows 3.1 and your motion controller. For more information, refer to your *Microsoft Windows User's Guide, MS-DOS Operating System Guide*, and the installation and setup manual for the motion controller you are using.

Making a Backup Copy of GML Ultra

We recommend that you make a backup copy of the GML Ultra diskette before you install the software.

 **ATTENTION:** It is a violation of the Federal Copyright Law to copy GML Ultra except for backup purposes to guard against accidental loss or damage. No part of the software contained on your diskette can be reproduced, transmitted, or transferred without prior written permission of the Allen-Bradley Company.

To make a backup:

1. Insert the GML Ultra diskette into drive A.
2. Type the following at the DOS command line:

   diskcopy a: a:

   You are prompted when to insert the SOURCE diskette and when to insert your blank diskette (TARGET diskette). DOS messages prompt you through the copy process. (As an alternative, copy the disk to your hard drive, and then from the hard drive to another floppy disk.)
3. Remove the duplicate diskette and label it the same as the original GML Ultra diskette.
4. Put the original diskette in a safe, dry place, and use it only if the copy is damaged or destroyed.

Installing GML Ultra

GML Ultra is a self-installing executable file on one 3.5-inch high-density (1.4 MB) diskette. You need to install it on your hard disk and run it using Windows 3.1.

To install GML Ultra on your PC:

1.

If Windows is	Do this
Not running	Type **win** at the DOS prompt.
Running	Close all open applications.

2. Insert your copy of GML Ultra in the diskette drive and close the drive door.

3. From the menu bar select **File**. The File menu appears.

4. Select **Run**. A command window appears.

5. Type the following:

   a:setup

6. Press **Enter**. A dialog box appears notifying you that the setup is initializing.

   When initialization is done, a system message asks you to confirm that you want GML Ultra installed on your hard drive.

7.

To:	Do this:
Accept the path that Setup proposes	Select **Continue**. Installation progress appears in the status bar.
Choose your own directory	1. Type a new path in the *Install To* field. Note: Type carefully because you do not have an opportunity to confirm your entry. 2. Select **Continue**. Installation progress appears in the status bar.

8. When setup is complete, select **OK**. The installation process places all GML Ultra files in a GML Ultra directory and creates the following Windows program icon:

ReadMe File

In the GML Ultra directory is a ReadMe file that contains the latest information about GML Ultra. You can open and read this file with a text editor such as Write.

Starting GML Ultra

When installation is complete, double-click on the GML Ultra icon. The GML Ultra application window appears, displaying a new, active diagram window named New Diagram. You can save it with a new name.

Connecting Your PC to Your Controller

When you are developing your GML Ultra diagram, your computer does not need to communicate directly with an ULTRA Plus. However, when you are using the Online Manager for controller setup and debugging, the motion controller and PC must be connected.

An RS-232C serial link using a standard RS-232C cable allows communications between your PC and an ULTRA Plus. RS-232C cables are available at computer stores or from Allen-Bradley.

To connect an ULTRA Plus to your PC:

1. Turn off both the PC and the ULTRA Plus.
2. Connect the PC's COM1, COM2, COM3, or COM4 serial port (depending on the Preferences setting in GML Ultra) to Serial Port B on the front panel of the ULTRA Plus.

   Note: You can use COM1, COM2, COM3, or COM4, depending on the Preferences setting in GML Ultra.

Setup Overview

This chapter includes a summary of the complete setup process. Before you begin this chapter, make sure the procedures in the *Getting Started* chapter are complete.

Understanding the Setup Process

Before you start to diagram, you need to give GML Ultra information about your system and your controller. GML Ultra setup includes three phases:

At this time	Set up
Before you start the first diagram	System preferences.
Before each new diagram, including the first	Required control options.
As needed	Optional control options.

Before You Start the First Diagram

During system setup, you define parameters about your computer and the GML Ultra interface. In most cases, you provide this information only once—after software installation. Read the *Setting System Preferences* chapter for this setup.

Before You Start a New Diagram

When you are setting up the required control setup, you identify the following required control information:

Option	Description
Controller configuration	The options available for the ULTRA Plus
Axes use	The type (servo or master) of axis
Operator interface configuration	• The operator interface configuration • The terminal serial communication parameter • A terminal address • The generic terminal option

GML Ultra needs this information for each new diagram. You can either define the parameters when you start a new diagram or copy a diagram with the configuration you want to use.

Refer to the *Setting Required Definitions* chapter for step-by-step instructions for performing this setup.

As Needed

Other options are available that you can define as you need them.

Option	Description
User variable and flags	User variables and flags are used for data storage, calculations, and operator interface.
I/O configuration	Define an input or output for use with a system function.
General purpose I/O	Any digital input 1-16 or output 1-8 that is not assigned a dedicated (user-defined) function can be used as a general purpose input or output.
Watch item	The data available for real-time monitoring by way of the Online Manager Watch option.
Define Function Keys	You can program function keys for the Operator Terminal that perform predefined functions.
Document Your Diagram	Use this feature as a notepad to document the program, make notes to yourself and others, and keep track of changes to the program.

Refer to the *Setting Optional Definitions* chapter for step-by-step instructions for performing this setup.

Setup Quick Reference

The table below provides a snapshot view of the setup process.

At this time	Do this	Purpose	From the main menu	Instruction location in this manual
Before you build the first diagram	System Setup	To define required information about your computer and the system interface.	From the main menu of GML Ultra, do the following: • Select **File**. • Select **Preferences**.	The *Setting System Preferences* chapter
Before you build any new diagram (including the first one after software installation)	Required control setup	To define required control information for a new diagram: • Control Options • Axes use • Operator Interface Configuration	From the main menu of GML Ultra, do the following: • Select **Definitions**. • Select the appropriate menu item.	The *Setting Required Definitions* chapter
As needed	Optional control setup	To define optional control information: • User variable flags • I/O configuration • General purpose I/O • Watch item • Function keys • Documentation	From the main menu of GML Ultra, do the following: • Select **Definitions**. • Select the appropriate menu item.	The *Setting Optional Definitions* chapter

Setting System Preferences

Before you start a new diagram, GML Ultra needs information about your system—your computer and the interface. You only need to define system information once, but you can change it if your system changes.

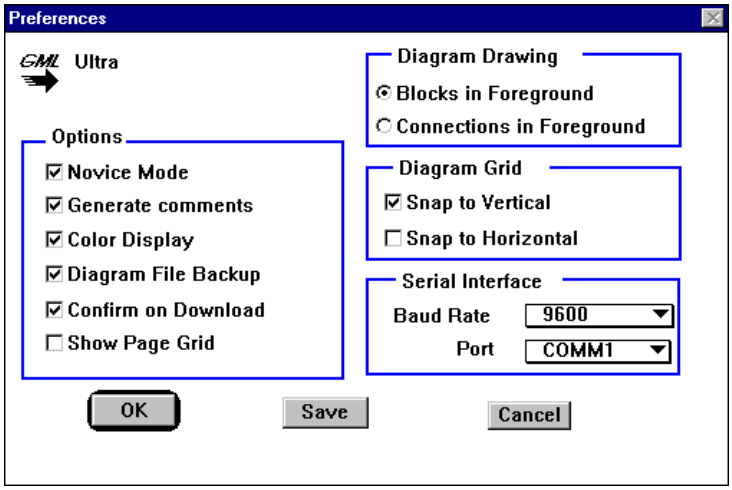
This chapter provides step-by-step instructions for defining this information.

Setting Preferences

To set user interface and other computer-related features, such as the communication baud rate:

1. From the menu bar, select **File**. The File menu appears.

2. Select **Preferences**. The Preferences dialog box appears:



3. Make entries in the following fields in the *Options* area:

Field	Description
Novice Mode  Keep Novice Mode on unless you are very experienced with GML Ultra and the associated control family.	Prompts you to set up diagram definitions when creating a diagram. Displays warnings and error messages.
Generate Comments	Includes the block name and the block function when translating a diagram to script.
Color Display	Turns the color display of blocks on or off. Note: If you have a black and white monitor, clear this check box.
Diagram File Backup	Automatically creates a backup file when you save a GML Ultra diagram. Note: The file has the current diagram name with a **.**BAK extension instead of **.**ULT.
Confirm On Download	Displays a warning when you are about to change a diagram that resides in the controller.
Show Page Grid	Displays the current printer driver's page grid in the diagram window. Only those pages that have blocks are printed.

4. Make entries in the following fields in the *Diagram Drawing* area:

Field	Description
Blocks in Foreground	Blocks are drawn on top of connecting lines.
Connections in Foreground	Connecting lines are drawn on top of blocks.

5. Make entries in the following fields in the *Diagram Grid* area:

Field	Description
Snap to Vertical	The diagram snaps to the corresponding vertical grid to keep the blocks aligned.
Snap to Horizontal	The diagram snaps to the corresponding horizontal grid to keep the blocks aligned.

6. Make entries in the following fields in the *Serial Interface* area:

Field	Description
Baud Rate	Select the baud rate at which your system communicates with the ULTRA Plus. Default baud rate is 9600.
Port	Select the appropriate port your system uses for serial communication with the ULTRA Plus. Default port is COMM1.

7. Select one of the following to save the settings:

Option	Description
Save	Save the settings for the current diagram and as the default for future diagrams. The GML Ultra window appears.
OK	Save the settings for the current diagram only. The GML Ultra window appears.
Cancel	To cancel any changes and close the dialog box.

8. Before starting a new diagram, you need to set up control information. Do this by completing the procedures in the *Setting Required Definitions* chapter.

Setting Required Definitions

Before you begin a new diagram, you need to define several control options. GML Ultra uses this information to customize the menu options based on the controller you are using.

This chapter provides step-by-step procedures for defining the following Definitions menu options:

- Control Options
- Axis Use
- Operator Interface Configuration

Use the procedures in the *Setting Other Definitions* chapter to define other optional settings from the Definitions menu.

Defining a Diagram's Configuration

To define a diagram's configuration, you can either copy a diagram that has the configuration you need, or select from the GML Ultra menu options. Procedures for both follow.

Using an Existing Diagram

An easy way to configure your new diagram is to copy an existing diagram file with the configuration you need.

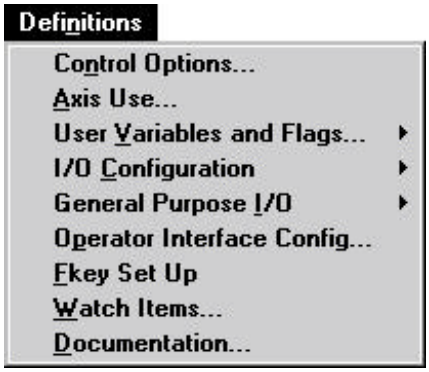
To copy an existing diagram for your new diagram:

1. Open the diagram by selecting **File** from the menu bar. The File menu appears.
2. Select **Open Diagram.**
3. Select the diagram you want to copy for the new diagram. GML Ultra diagrams have a .ULT extension.
4. When the diagram opens, select **Save As** from the File menu.
5. In the *File name* field, type the file name for your new diagram.
6. Select **Save**.

You can now proceed to create or edit the new diagram. The original diagram file remains unaltered.

Selecting Diagram-Specific Options

You can also set up a configuration by selecting the parameters from the Definition menu, as shown below.



All options on this menu are part of the setup procedure. You can use these options later during testing and monitoring processes to make changes or to specify items to watch.

Begin the setup process by completing *Setting Control Options.*

Precedence of Changing Setup Parameters

You can change setup parameters in a diagram block or from the Definitions menu, depending on the extent of the change.

- If a parameter pertains to only the current diagram, set the new or modified parameter in the diagram block.
- If you want to change a parameter for the default control configuration, change it using the Definitions menu.

IMPORTANT: A parameter set in the diagram block overrides those set in the Definitions menu.

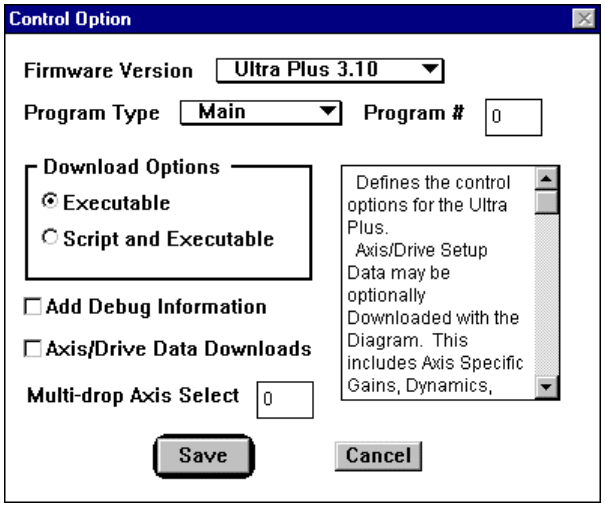
Setting Control Options

You configure the control options for the ULTRA Plus controller from the Control Options dialog box.

To set control options:

1. From the menu bar, select **Definitions**. The Definitions menu appears.

2. Select **Control Options**. The Control Option dialog box appears:



3. Make entries in the following fields:

Field	Description
Firmware version	Select the firmware version of your ULTRA Plus. To determine the firmware version, select **Online** from the Diagram menu. The installed firmware version appears on the Online Manager window.
Program Type	Select the type of program that your diagram becomes: Main — Numbered 0-31 in the Program Directory. Auto — Stored in program 0 of the System Directory. Runs automatically when the ULTRA Plus is powered up. Error — Stored in location 27 of the System Directory. It runs when the ULTRA Plus detects an error. System — Numbered 1-24 in the System Directory. Define functions for the operator terminal F-keys.
Program #	Type the program number that determines where the diagram is stored in the ULTRA Plus.

4. In the *Download Options* area, select the type of information to be downloaded:

Field	Description
Executable	Select this to download to the ULTRA Plus diagram without the script.
Script and Executable	Select this to download to the ULTRA Plus diagram and the script.

5. Make an entry in the following field:

Field	Description
Add Debug Information	To add debug information to your translated diagram: 1. Identify if debug information is added to the translator diagram so that the Breakpoint, Stop, Auto, or Trace functions can be used in the Online Manager. 2. Select the check box when you are debugging your diagram. Note: The program runs slower with the check box selected. 3. After you are satisfied that your diagram works correctly, clear the Add Debug Information check box. 4. Download the diagram to the ULTRA Plus.

6. Make an entry in the following field:

Field	Description
Axis/Drive Data Downloads	Identify the information to be downloaded: • Select the box to download the diagram and the data. • Clear the box to only download the diagram.

7. Make an entry in the following field:

Field	Description
Multi-drop Axis Select	Type the address of a single ULTRA Plus when it is communicating in RS-422 multi-drop or daisy-chained mode. The valid address range is 0 through 63: Address 0 — The ULTRA Plus does not wait to be selected before transmitting. This can cause garbled communication if on a multi-drop link. Address 1-63 — Select the address of the ULTRA Plus drive to communicate with. The address is set using DIP switch SW1 on the drive.

8. Select **Save**. Your settings are stored as part of the current GML Ultra diagram. The dialog box closes and the GML Ultra window appears.

9. Go to *Configuring Axis Use.*

Configuring Axis Use

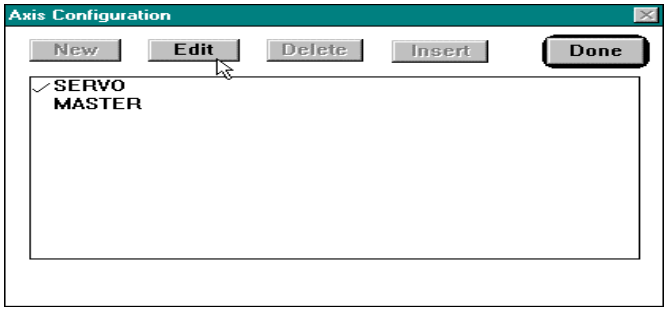
You can define the use of either the Master axis or the Servo axis.

Configuring the Servo Axis

Use the following procedure to configure the Servo axis:

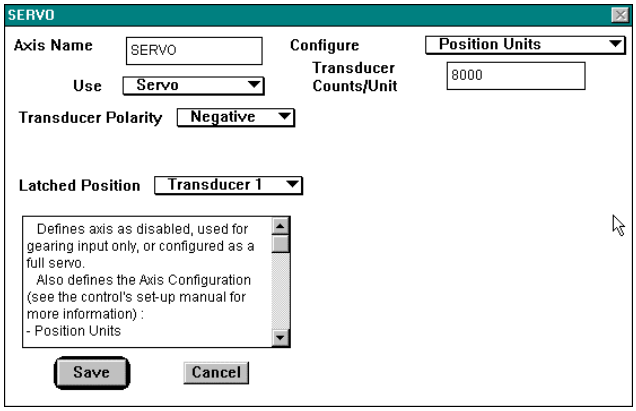
1. From the menu bar, select **Definitions**. The Definitions menu appears.

2. Select **Axis Use**. The Axis Configuration dialog box appears.



3. Select **SERVO**. A check mark appears in front of the selection and the Edit button becomes active.

4. Select **Edit**. The SERVO dialog box appears.



5. Make entries in the following fields:

Field	Description
Axis Name	Type a descriptive name or accept the system name. The default name is SERVO. This name is then appended to a Watch Items variable if there is a choice between axes. For example, if you select Encoder_Position from the Defined Items window, the variable name is Encoder_Position_NAME, where NAME is the Axis Name you specified.
Use	Select **Servo** for a fully-closed loop servo operation.

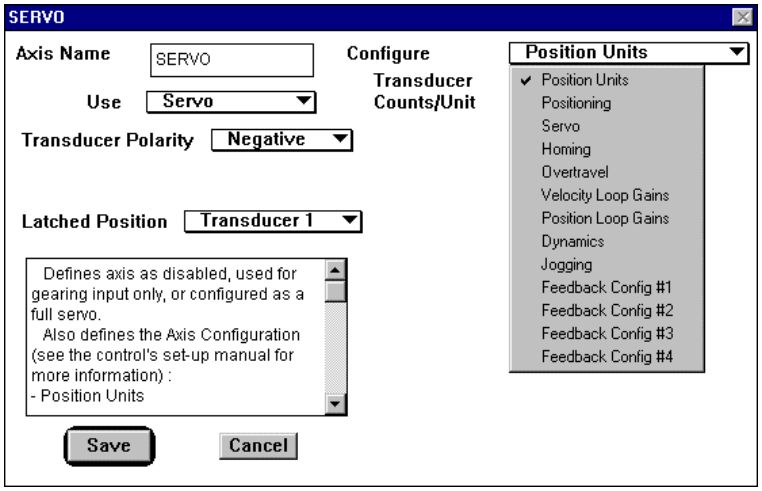
Field	Description
Transducer Polarity	Select one of the following to identify the positive direction of the motor: Positive — Clockwise rotation of the motor, as viewed from the shaft end, is the positive direction. Negative — Counterclockwise rotation of the motor, as viewed from the shaft end, is the positive direction.
Latched Position	Select Transducer 1 (the default) or Transducer 2 as the Transducer you want to use as the input to the hardware position latch: If you change the *Latched Position* field, the change takes effect at the next power-up.

6. Go to *Using the Configure* field for information about selecting an option in the *Configure* field and the fields that display for each option.

Using the Configure field

Use the *Configure* field to select the different configuration options for each available axis.

To view the list of options you can configure, select **Position Units**. A list appears that is similar to the one below:

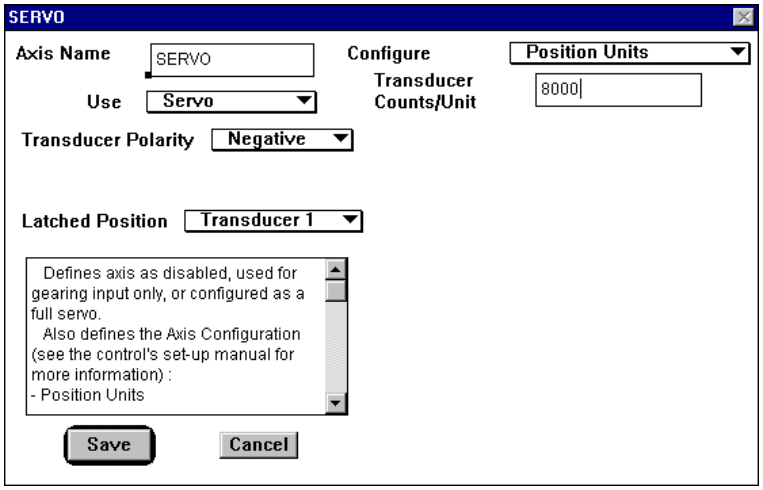


Use the procedures on the following pages to select and modify these options to suit your system.

Configuring the Position Units Option

To configure the Position Units option:

1. From the *Configure* field, select **Position Units**.



2. Make an entry in the *Transducer Count Units* field*:*

Field	Description
Transducer Counts/Unit	Type the number of feedback counts for one user unit. The feedback counts can be generated from either Transducer 1 or Transducer 2, as specified under Feedback Configuration. (Refer to *Setting the Feedback Configuration Options*.) The encoder counts per revolution is four times the number of encoder lines. For example, if a particular machine has an encoder with 2,000 lines and a leadscrew with 5 turns per inch, the proper scale factor for user units of inches is 4 X 2,000 X 5 = 40,000 counts per user unit. For user units of encoder counts, set Transducer Counts/Unit to 1.

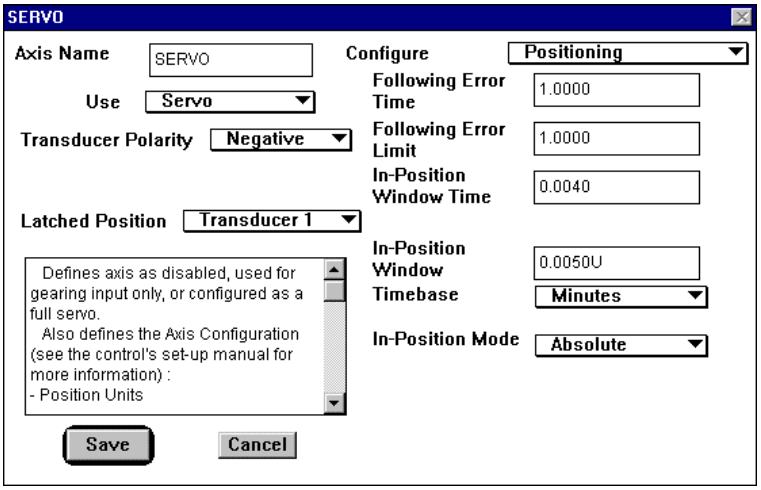
3. To save your selections, select **Save**. The SERVO dialog box closes and the Axis Configuration dialog box becomes the active window.

4. Select **Done**. The GML Ultra diagram window appears.

Configuring the Positioning Option

To configure the Positioning option:

1. From the *Configure* field, select **Positioning.**



2. Make entries in the following fields:

Field	Description
Following Error Time	Type a value in seconds. The following information applies to the *Following Error Time* field and the *Following Error Limit* field that follows: Following Error Time and Following Error Limit set the maximum allowable following error and time for fault recognition. Following error equals the difference between commanded position and actual position. If the following error exceeds the limit for the amount of time defined by the following error time, then a fault occurs and the ULTRA Plus is disabled. This allows peak following error values greater than the limit to exist without generating a fault condition.
Following Error Limit	Type a value in user units. following error limit is the maximum position error that is used to generate an excessive following error fault. (See the explanation above.)

Field	Description
In-Position Window Time	Type a value in seconds. In-Position Window and In-Position Window Time set the following error and time used to determine of the axis is in position. Following error equals the difference between commanded position and actual position. The three parameters associated with In-Position are window, time and mode. In-Position Mode determines if the axis can be considered in position while moving or when motion is not commanded. If the Following Error is less than the In-Position Window for the amount of the time defined by the In-Position Window Time, the axis is in position.
In-Position Window	Type a value in user units. In-Position Window is the maximum position error that is used to determine if the ULTRA Plus is in position.
Timebase	Select one of the following: Seconds — To set velocity units to user units per second. Minutes — To set velocity units to user units per minute. Timebase is the velocity time unit.
In-Position Mode	Select one of the following: Relative — The In Position output is activated any time the system is within Following Error Limit Size of commanded position, even if it is in motion. Absolute — The In-Position output is activated only when the system is within Following Error Limit Size of commanded position and not in motion. The default setting is Absolute. In Position Mode determines the operation of the In-Position output (07), and the In_Position_Flag System flag.

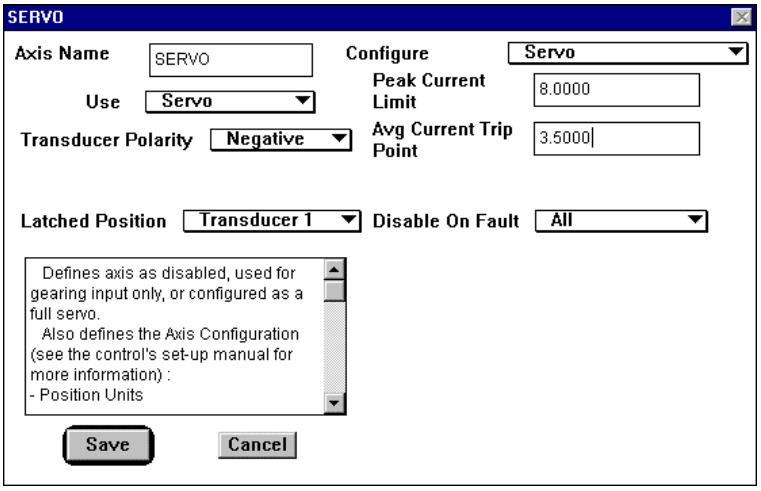
3. To save your selections, select **Save**. The SERVO dialog box closes and the Axis Configuration dialog box becomes the active window.

4. Select **Done**. The GML Ultra diagram window appears.

Configuring the Servo Option

To configure the Servo option:

1. From the Configure list box, select **Servo**.



2. Make entries in the following fields:

Field	Description
Peak Current Limit	Type the maximum current limit in amps. The commanded current to the motor does not exceed this value.
Avg Current Trip Point	Type the average current trip point for the ULTRA Plus in amps. If the average current to the motor exceeds this value, the ULTRA Plus disables (unless Disable On Fault is set to Partial) and indicate an excessive average current fault. This value can be set as high as 150% of the rated current of the motor or the ULTRA Plus continuous rate current, whichever is lower.

Field	Description
Disable on Fault	Select one of the following to identify which fault causes the ULTRA Plus to disable: All — When any fault is detected. Partial — All faults except the **lavg** (Average Current Trip Point) fault **IMPORTANT**: Use caution when setting the value to Partial because it defeats the fault safety protection of the ULTRA Plus. For example, if Disable On Fault is set to Partial and the ULTRA Plus exceeds the Avg Current Trip Point value for an extended period of time, the amplifier could be damaged because it does not disable due to the fault. This feature is for use on machines where disabling the amplifier unexpectedly could result in damage to expensive tooling or workpieces. The error output acts as an alarm so the machine can be put in a safe state before disabling the ULTRA Plus.

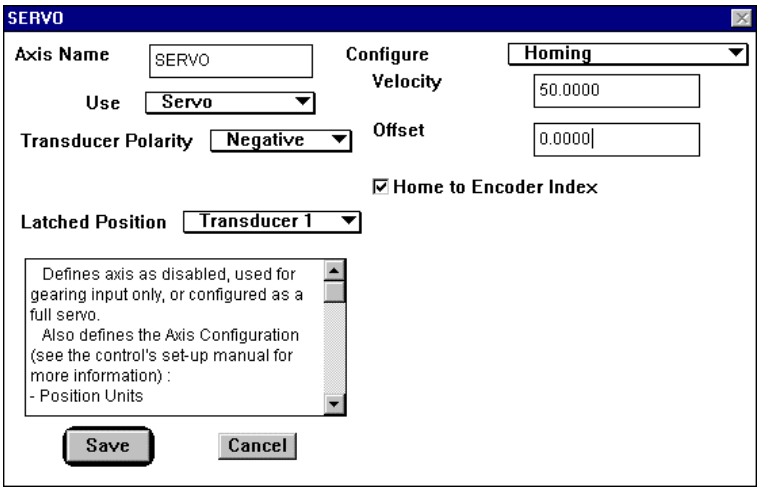
3. To save your selections, select **Save**. The SERVO dialog box closes and the Axis Configuration dialog box becomes the active window.

4. Select **Done**. The GML Ultra diagram window appears.

Configuring the Homing Option

To configure the Homing option:

1. From the *Configure* field list box, select **Homing**.



2. Make entries in the following fields:

Field	Description
Velocity	Type a value in user units per timebase that defines the velocity used in the standard home program. The sign of the parameter determines the initial direction used when the home sequence starts. The Velocity is also used when moving to the home offset position after home is found.
Offset	Type a value or expression in user units that specifies a distance to be moved once home is found. The sign of the offset determines the direction of the offset position after home is found. After moving the distance of the offset, the current position is defined as home.

Field	Description
Home to Encoder Index	Select one of the following to indicate home position during a home operation: • Enabling Home To Encoder Index forces the ULTRA Plus to use the input (encoder index) defined by Define Home to indicate home. The default setting is Enabling. • Disabling Home To Encoder Index forces the ULTRA Plus to use the input (encoder index) defined by Define Home to indicate home. In this case, an input must be defined for Define Home or else the ULTRA Plus does not home correctly.

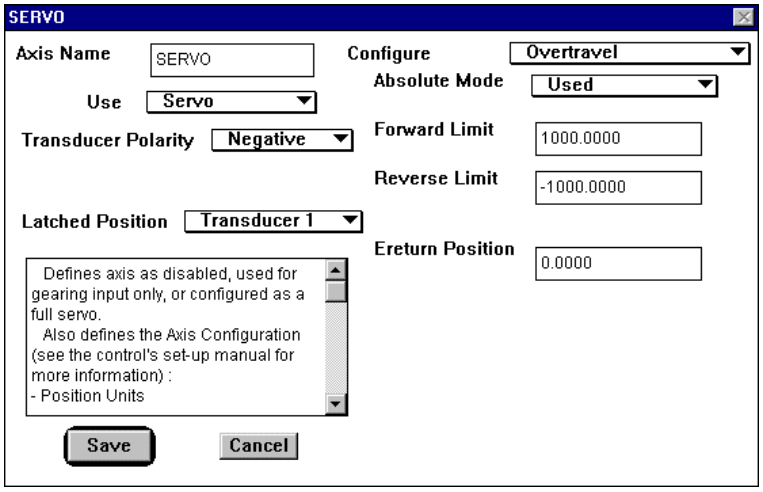
3. To save your selections, select **Save**. The SERVO dialog box closes and the Axis Configuration dialog box becomes the active window.

4. Select **Done**. The GML Ultra diagram window appears.

Configuring the Overtravel Option

To configure the Overtravel option:

1. From the *Configure* field, select **Overtravel**.



2. Make entries in the following fields:

Field	Description	
Absolute Mode	Select one of the following to indicate which moves are linked to the Home position:	
	Used	Enable software overtravel limits and the emergency return function (Ereturn Position). Absolute moves do not execute until home position is established. If you select this option, the *Forward Limit*, *Reverse Limit*, and *Ereturn Position* fields appear. You must type values in these fields.
	Not Used	Disable software overtravel limits and the emergency return function. This setting implies incremental mode.
Forward Limit	Type a value in user units that sets the forward software overtravel limit. If travel exceeds this value in the forward direction, a fault occurs and the ULTRA Plus is disabled. This field appears only when Used is selected in *the Absolute Mode* field.	
Reverse Limit	Type a value in user units that sets the reverse software limit. If travel exceeds this value in the reverse direction, a fault occurs and the ULTRA Plus is disabled. This field appears only when Used is selected in *the Absolute Mode* field.	
Ereturn Position	Type a value in user units that specifies the position the system moves to when the Emergency Return input is activated. This field appears only when Used is selected in *the Absolute Mode* field.	

3. To save your selections, select **Save**. The SERVO dialog box closes and the Axis Configuration dialog box becomes the active window.

4. Select **Done**. The GML Ultra diagram window appears.

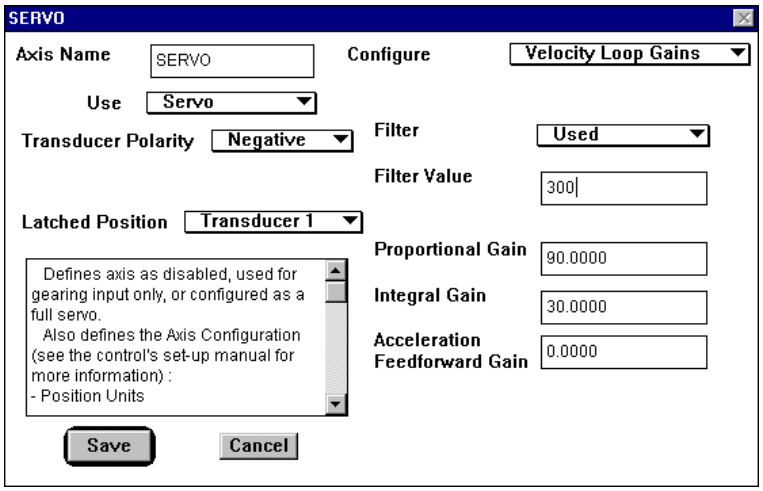
Configuring the Velocity Loop Gains Option

The ULTRA Plus uses gains to adjust both the velocity and position loop performance. Use this dialog box to type values for both options. The Velocity Loop Gains option must be set before setting the Position Loop Gains option.

ATTENTION: Change gains with care. Excessive settings on any gain can result in motor instability.

To configure the Velocity Loop Gains option:

1. From the *Configure* field, select **Velocity Loop Gains**.



2. Make entries in the following fields:

Field	Description
Filter	Select one of the following: Used — Enable the low pass filter on the output of the velocity regulator. Not Used — Disable the low pass filter on the output of the velocity regulator.

Field	Description
Filter Value	If you selected Used in the *Filter* field, type the bandwidth in hertz (Hz) of the low pass filter on the output of the velocity regulator. The maximum value is 300 Hz. Reducing the filter value reduces noise from high frequency torque pulsations. This field is displayed only when the Used parameter is selected in the *Filter* field.
Proportional Gain	Type a value to increase the Proportional Gain to reduce dynamic velocity errors and to increase the velocity loop bandwidth.
Integral Gain	Type a value to improve the stiffness of the velocity loop and to reduce the effects of load disturbances. **IMPORTANT**: Excessive integral gain results in velocity overshoot and could cause instability.
Acceleration Feedforward Gain	Type a value in percent.

3. To save your selections, select **Save**. The SERVO dialog box closes and the Axis Configuration dialog box becomes the active window.

4. Select **Done**. The GML Ultra diagram window appears.

Configuring the Position Loop Gains Option

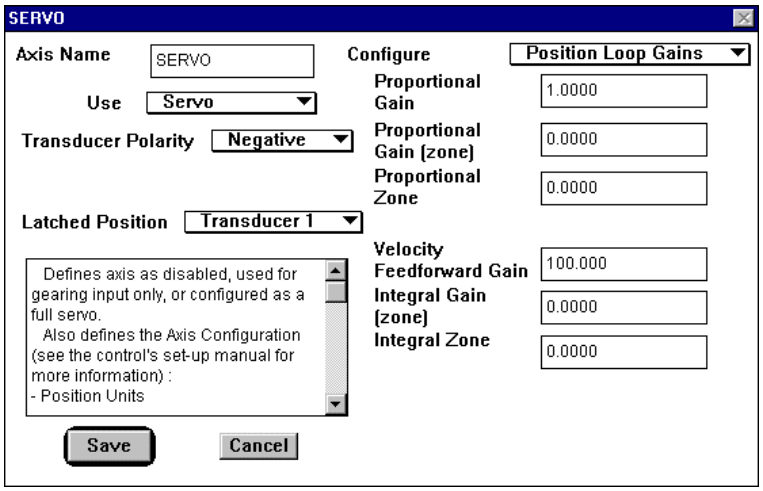
The ULTRA Plus uses gains to adjust both the velocity and position loop performance.

ATTENTION: Change gains with care. Excessive settings on any gain can cause motor instability.

To configure the Position Loop Gains option:

1. Make sure you set the Velocity Loop Gains option before you set the Position Loop Gains option.

2. From the *Configure* field, select **Position Loop Gains**.



3. Make entries in the following fields:

Field	Description
Proportional Gain	Type a value in inches per minute per mil (the same as meters per minute per millimeter). Proportional gain adjusts the bandwidth of the position loop—the higher the value of the proportional gain (Kp), the stiffer the system response.
Proportional Gain (zone)	Type a value or expression in inches per minute per mil (the same as meters per minute per millimeter). If proportional zone (see the next field) is set to zero, the proportional gain value is used, and the value of proportional gain (zone) is irrelevant. Proportional gain (zone) is the position loop proportional gain used when the system is within the region of the commanded position defined by proportional zone.
Proportional Zone	Type a value in user units as defined by the *Transducer Count/Units* field. Proportional zone is the region around the commanded position where the position loop proportional gain is changed to the gain set by the proportional gain (zone) parameter.
Velocity Feedforward Gain	Type a value in percent. The velocity feedforward gain adjusts the following error of the position loop.

Field	Description
Integral Gain (zone)	Type a value in user units. The position loop integral gain is used to bring the system into the desired position more quickly and increase the stiffness of the positioner.
Integral Zone	Type a value or expression in user units as defined by the *Transducer Counts/Unit* field. The *Integral Zone* field determines the region around the commanded position where the integral gain (zone) is active.

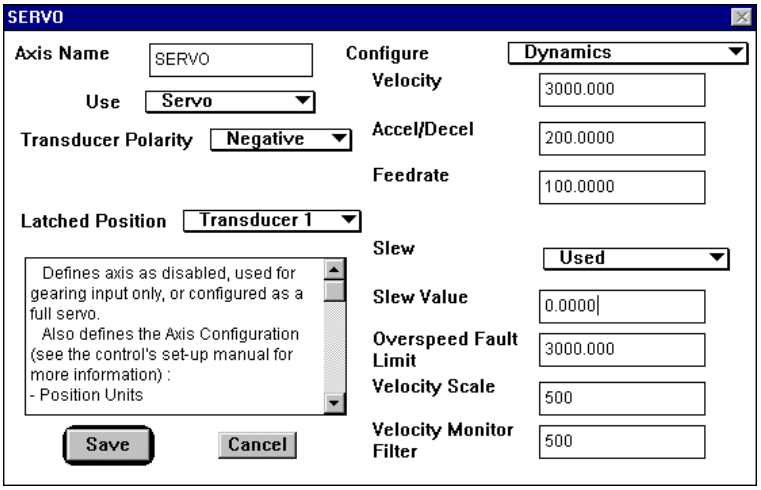
4. To save your selections, select **Save**. The SERVO dialog box closes and the Axis Configuration dialog box becomes the active window.

5. Select **Done**. The GML Ultra diagram window appears.

Configuring the Dynamics Option

To configure the Dynamics option:

1. From the *Configure* field, select **Dynamics**.



2. Make entries in the following fields:

Field	Description
Velocity	Type a value or expression in user units per timebase unit. It must be a positive number. Velocity is the default velocity used to calculate motion profiles. Move Axis blocks without a velocity value for the move use this default velocity to form the motion profile unless the velocity is specified by one of the following • A different Programmed_Velocity system variable is specified by an Equation Block in a diagram. • A Change Motion Settings block is used to specify a new default velocity of moves.
Accel/Decel	Type a value in user units per second. Acceleration is the default acceleration for all motion generated by the ULTRA Plus. Acceleration and deceleration rates for the home program and motion profiles are specified by this parameter.
Feedrate	Type a percent from 0% to 200%. To perform the functions listed below, set the value at the suggested percentage 100% To have velocities and dwells set at programmed rates. Less than 100% To slow down the process. More than 100% To speed up the process. Feedrate is the timebase for motion. Note If the analog input Adc1 is selected as a feedrate input, the feedrate is determined by the analog input instead of the *Feedrate* field.

Field	Description
Slew	Select one of the following Used — If the change rate of the gear output exceeds the limit. The command generated by the ULTRA Plus is limited to the slew value. This results in the ULTRA Plus not tracking the master input exactly because the follower system cannot respond as quickly as the master when changing velocity. If you select Used for this field, you need to complete the *Slew Value* field. Not Used — No limit set on the change rate of the command generated by the ULTRA Plus. Slew enables the slew rate limit for the gear input.
Slew Value	Type the Slew value in user units per second per second. If you selected Not Used in the *Slew* field, this field does not appear.
Overspeed Fault Limit	Type a value in user units per timebase for the system. If this speed is exceeded, the ULTRA Plus disables and indicates that a fault has occurred.
Velocity Scale	Type a value in velocity units per volt. This is used for the Command_Velocity and Feedback_Command variables for the Monitor Output.
Velocity Monitor Filter	Type a value to average the display update time for the Filtered_Feedback_Velocity variable. The range is 0 to 32,767. A value of 32,767 does not provide filtering (quickest change of the variable) while a value of 0 provides maximum filtering (slowest change).

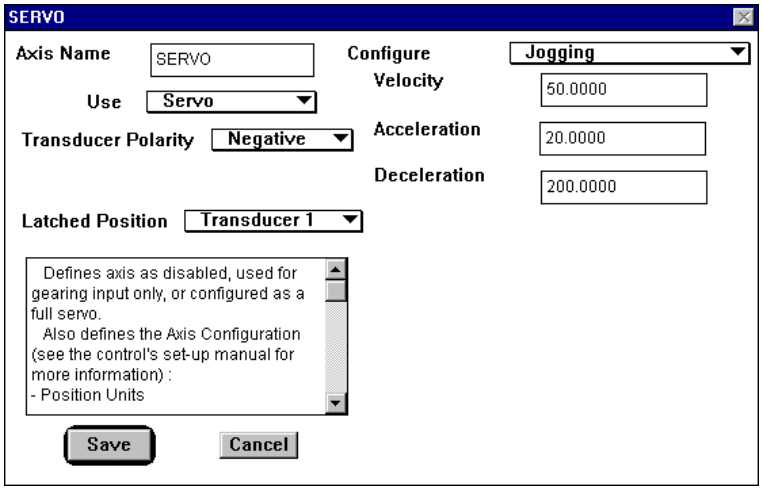
3. To save your selections, select **Save**. The SERVO dialog box closes and the Axis Configuration dialog box becomes the active window.

4. Select **Done**. The GML Ultra diagram window appears.

Configuring the Jogging Option

To configure the Jogging option:

1. From the *Configure* field, select **Jogging**.



2. Make entries in the following fields:

Field	Description
Velocity	Type a value in user units per timebase that represents the default velocity used for jog commands.
Acceleration	Type a value in user units per second per second that represents the default acceleration used for jog commands.
Deceleration	Type a value in user units per second per second that represents the default deceleration used for jog commands.

3. To save your selections, select **Save**. The SERVO dialog box closes and the Axis Configuration dialog box becomes the active window.

4. Select **Done**. The GML Ultra diagram window appears.

Setting the Feedback Configuration Options

Use the Feedback Configuration options to do the following:

- Set up the source of the feedback signals.
- Set up the gear input.
- Set up the P4 Connector as output Encoder 1 signals, input Encoder 2 signals, or an indexer (Step/Direction) input.

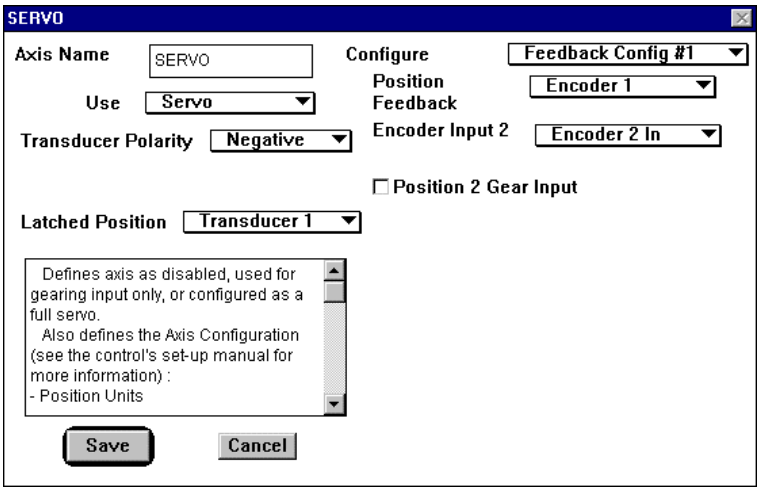
You can store up to four different configurations in the ULTRA Plus. These are Feedback Configurations 1, 2, 3, and 4. On power up, the ULTRA Plus defaults to Configuration Menu # 1.

Changing a Feedback Configuration

You can change the active configuration either in a diagram or in Online Manager mode. Also, you can change the configuration at any time, even from within a diagram. However, changing the configuration when the ULTRA Plus is enabled could result in unexpected motion.

To change a feedback configuration:

1. From the *Configure* field, select one of the Feedback Configuration options. A sample screen is shown below.



2. Make entries in the following fields:

Field	Description
Position Feedback	Select Encoder 1 (default) or Encoder 2. Position Feedback selects the source for the position feedback.

Field	Description
Encoder Input 2	Select one of the following: Encoder 1 Out — Outputs the Encoder 1 signals on P4. Encoder 2 In — Uses P4 to input Encoder 2 signals (default). Step/Direction — Allows step and direction inputs on P4 to be used as input (indexer input). To use Step and Direction as the command for motion, you must do both of the following: • Set a gear ratio. The Gear Axes block enables the gear function and sets the number of step commands per encoder count of motion with the Follower:Master Ratio. • Select a source for the gear input. Encoder Input 2 selects signals on connector P4 as outputs for Encoder 1, as inputs for Encoder 2 In (default), or Step and Direction.
Position 2 Gear Input	Select this check box to enable Encoder 2 as the source for the gear input.

3. To save your selections, select **Save**. The SERVO dialog box closes and the Axis Configuration dialog box becomes the active window.

4. Select **Done**. The GML Ultra diagram window appears.

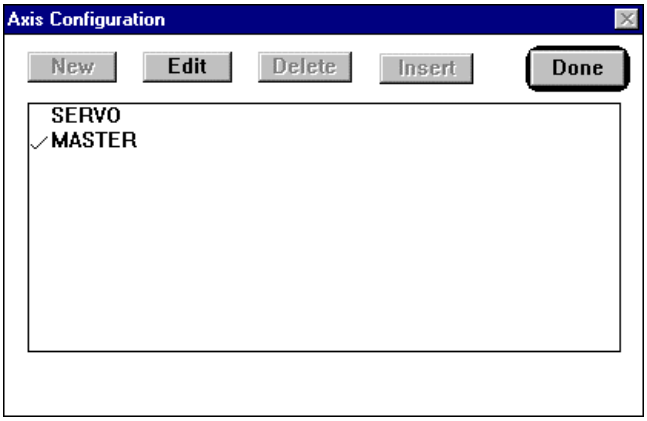
5. After changing a Feedback Configuration option, you can set the active configuration by changing the Feedback_Configuration variable from an Equation block either in a diagram or the Online Manager window.

Configuring a Master Axis

To configure a master axis:

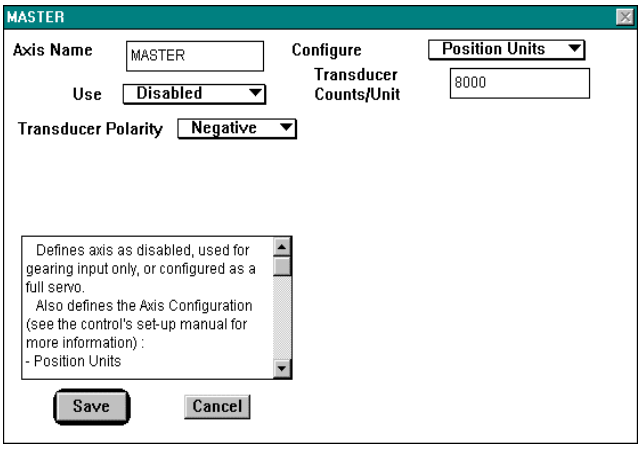
1. From the menu bar, select **Definitions**. The Definitions menu appears.

2. Select **Axis Use**. The Axis Configuration dialog box appears.



3. Select **MASTER.** A ✓ appears in front of the selection and the Edit button becomes active.

4. Select **Edit**. The MASTER dialog box appears.



5. Type values in the following fields:

Field	Description
Axis Name	Type a descriptive name or accept the default name, MASTER.
Use	Select one of the following: Disabled The axis is disabled Master Gearing input only

Field	Description
Transducer Polarity	Select one of the following to define the positive direction of the motor: Positive — Clockwise rotation of the motor as viewed from the shaft end is the positive direction. Negative — Counterclockwise rotation of the motor as viewed from the shaft end is the positive direction.
Latched Position	Select the Transducer you want to use as the input to the hardware position latch. Transducer 1 is the default.
Configure	Select Position Units. Type the number of Transducer Counts in user units.

6. To save your selections, select **Save**. The MASTER dialog box closes and the Axis Configuration dialog box becomes the active window.

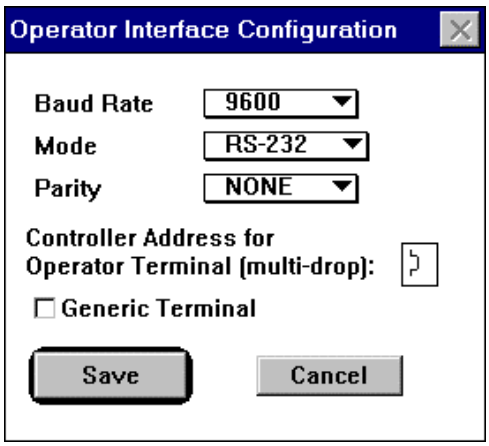
7. Select **Done**. The GML Ultra diagram window appears.

Configuring Your Operator Interface

To define your operator interface:

1. From the menu bar, select **Definitions**. The Definitions menu appears.

2. Select **Operator Interface Configuration**. An Operator Interface Configuration dialog box like the following appears:



3. Make entries in the following fields:

Field	Description
Baud Rate	Select one of the following: 1200, 2400, 4800, 9600 (default), or 19200.
Mode	Select one of the following: RS-232 — Single axis applications with cable lengths less than 35 feet. RS-422 — Multi-drop applications or cable lengths longer than 35 feet.
Parity	Select one of the following: None — Not set/not used (the default) Even — Always be an even number of bits Odd — Always be an odd number of bits
Controller Address for Operator Terminal (multi-drop)	Specify a unique address from 0 through 9. This address is used when the operator terminal is used in a multi-drop application. To use the operator terminal in multi-drop mode, the operator terminal and the ULTRA Plus must be wired for RS-422 and Port A must be set to RS-422 mode. Address 0 is automatically selected on power up. To communicate with a different ULTRA Plus from the operator terminal, press the NO key on the operator terminal. Then press the desired address (0-9).
Generic Terminal	If you select this check box, operator terminal control codes are not sent to the terminal when using print commands. You can send control codes to your terminal using the Print to Display ^**code** block.

4. Select **Save**. The dialog box closes, the parameters are set, and the diagram editor window appears.

5. To save your selections, select **Save**. The Operator Interface Configuration dialog box closes, and the GML Ultra diagram window becomes the active window.

The configuration of required options is complete. Configure the options in the *Setting Optional Definitions* chapter as you need them for each diagram.

Setting Optional Definitions

This chapter describes the following Definitions menu options and features that you define:

- User variables and flags
- User-defined inputs and outputs
- General purpose input and output
- Watch items
- Function keys
- Documentation

Defining User Variables and Flags

A variable is memory allocated to store a number (integer). GML Ultra uses system and user variables:

- System variables have predefined meanings and are determined in the program setup. These settings become the system default values. You can change these values in the diagram but when the program ends the value returns to the default value.
- User variables are general purpose variables that can be used in your program. You can set or modify these values during run-time.
- You can test and/or set variables in your program. A variable can be tested for greater than (>), less than (<), or equal (=) conditions.

A flag is also a variable, but is limited to a binary or Boolean value: ON or OFF, 1 or 0, or TRUE or FALSE.

- System flags have predefined functions and represent conditions in the controller's native language.
- You can test and/or set flags in your program. A flag can be tested for TRUE or FALSE.

You can elect to make variables and flags effective:

- For the current usage only.
- For all future uses of the program.

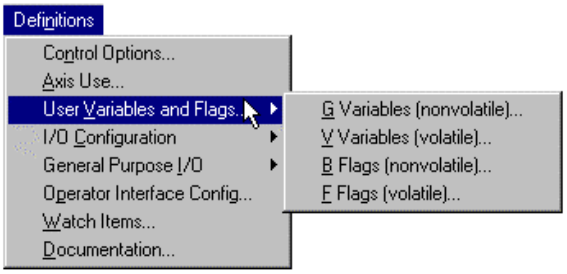
Variables provide different capabilities based upon whether you want a variable value to be retained regardless of the power to a controller or to respond in a defined way to a power change:

State	Characteristics	Use
Nonvolatile	Do not change when power is removed. Maintain their values when power is removed.	To store data that does not change frequently.
Volatile	Variables that are reset to a known state (0 or OFF) each time power is applied to the controller or each hard reset.	When you want to know that power has been removed. To force the operator to do some initialization. For temporary use in calculation.

To define or modify user-defined variables and flags:

1. From the menu bar, select **Definitions**. The Definitions menu appears.

2. Select **User Variables and Flags**. A submenu appears.

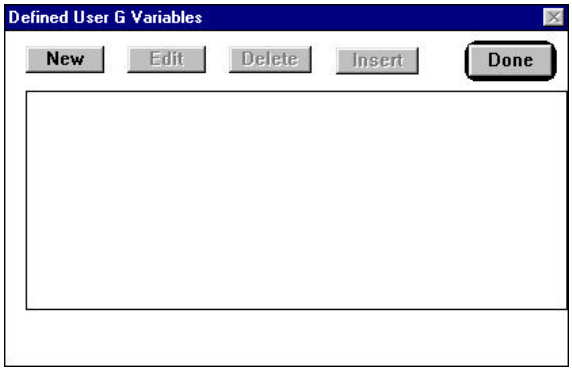


3. Select the variable or flag you want using the table below:

Use	To	Changes made to this variable or flag
G Variables (G1 - G64)	Define a nonvolatile user-defined variable (integer or decimal) with the following: A value from another variable A value or expression A timer An analog input	Remain in effect after the power is turned off. In one program are seen by other programs.

Use	To	Changes made to this variable/flag
V Variables (V1 - V64)	Define a volatile user-defined variable with any of the following: A value from another variable A value or expression A timer An analog input	Are volatile and lose their value when power is removed. On power-up, V variables are set to zero. If a value needs to be maintained during a power failure, use a G variable. In one program are seen by other programs.
B Flags (B1 - B8)	Define a nonvolatile flag that sets a flag ON or OFF with another flag or constant and remains in effect when power is turned off.	Remain in effect after the power is turned off. In one program are seen by other programs.
F Flags (F1 - F64)	Define a volatile flag that sets a flag ON or OFF with another flag or constant and remains in effect when power is turned off.	Remain in effect as long as power is maintained. On power-up or reset, all F flags are set off to OFF. If a value needs to be maintained during a power failure, use a B flag. In one program are seen by other programs.

4. A dialog box appears that is similar to the one below:



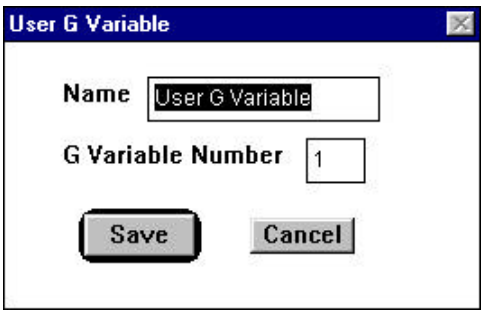
5. Using the table below, go to the correct section for information showing you how to add, edit, delete, or insert a variable:

To:	Go to:
Add a variable	*Creating a Variable.*
Edit an existing variable	*Creating a Variable by Editing an Existing Variable.*
Delete a variable	*Deleting a Variable.*
Insert a variable	*Inserting a Variable.*

Creating a Variable

To create a new variable and add it to the list of variable names:

1. In the dialog box for the defined variable, select **New**. A dialog box appears that is similar to the one below:



2. Make entries in the following fields:

Field	Description
Name	Type the name for the new variable.
G Variable Number	Type a variable number. Note: The range is 1 to 64 for G and V variables and F flags. The range for B flags is 1 to 8.

4. Select **Save**. The new variable is added to the end of the variable list.

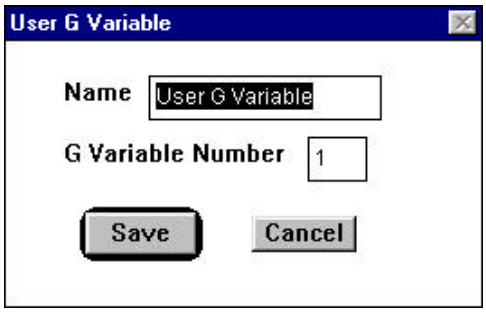
5. In the defined variables dialog box, select **Done**. The variables are entered into the diagram and the diagram window appears.

Creating a Variable by Editing an Existing Variable

To create a new variable by editing and replacing an existing variable:

1. In the dialog box for the defined variable, select a variable name from the defined variable list that you want to replace. A check mark appears to its left.

2. Select **Edit**. A dialog box appears that is similar to the one below. The variable name you selected is in the *Name* field with the system I/O address displayed in the *G Variable Number* field:



3. Make entries in one or both of the following fields:

Field	Description
Name	Type the name for the new variable.
G Variable Number	Type a variable number. Note: The range is 1 to 64 for G and V variables and F flags. The range for B flags is 1 to 8.

4. Select **Save**. The edited variable, with its new name or address number, replaces the original variable in the variable list.

5. In the dialog box of the defined variable, select **Done**. The variables in the list are entered into the diagram and the diagram window appears.

Deleting a Variable

To delete a variable from the variable list:

1. In the defined variable list, select the variable name that you want to delete. A check mark appears to its left.

2. Select **Delete**. The variable you selected is removed from the list.

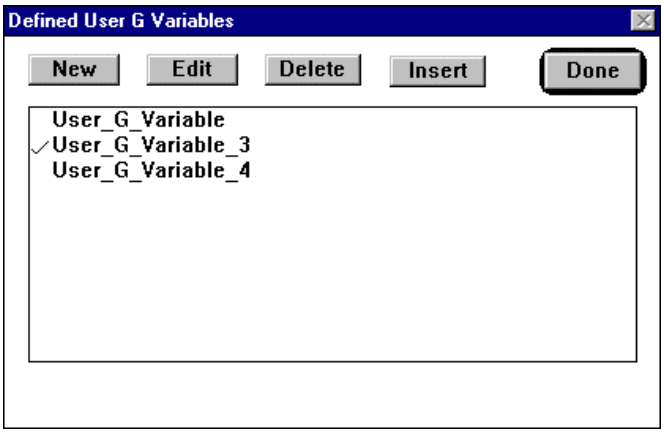
3. In the dialog box of the defined variable, select **Done**. The variables remaining in the list are entered into the diagram and the diagram window appears.

Inserting a Variable

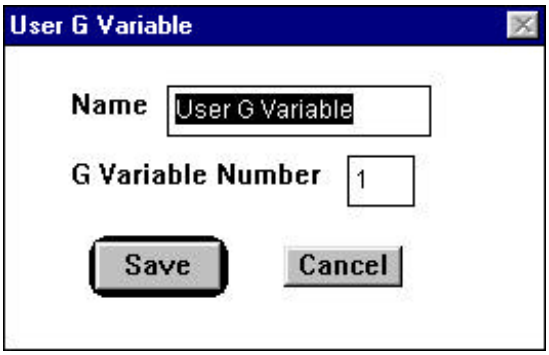
You can change the sequence of the variables on the list.

To insert a variable in the variable list:

1. In the defined variable list, select the variable where you want to insert the new variable.



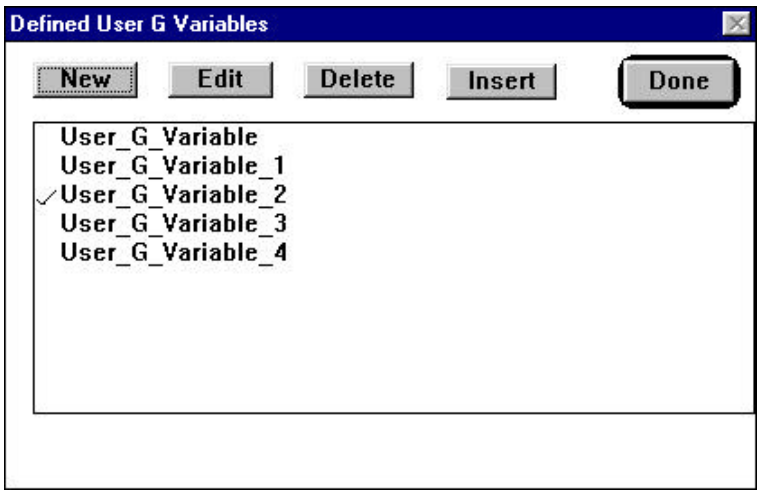
2. Select **Insert**. A dialog box appears that is similar to the one below:



3. Make entries in the following fields:

Field	Description
Name	Type the name for the new variable.
G Variable Number	Type a variable number. Note: The range is 1 to 64 for G and V variables and F flags. The range for B flags is 1 to 8.

4. Select **Save**. The new variable appears on the variable list. The inserted variable is assigned the number of the next available variable with the name you just selected.



5. In the dialog box of the defined variable, select **Done**. The variables are entered into the diagram and the diagram window appears.

Defining I/O Configuration

Inputs and Outputs are either ON or OFF.

Configuring User-Defined Input

Digital inputs 1 through 16 are used as a general purpose inputs. You must select the inputs you want to be user-defined. Some inputs have system functions assigned to them. Inputs are used as the condition for any conditional instruction.

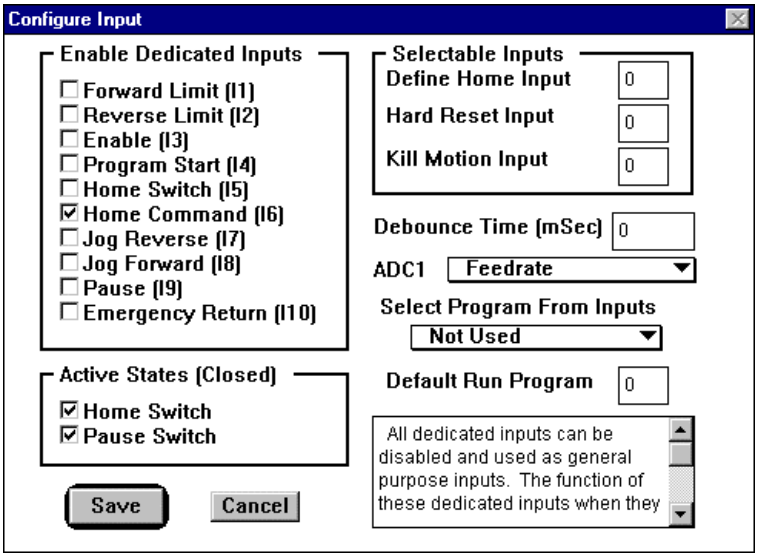
All dedicated inputs can be disabled and used as general purpose inputs.

To configure an input:

1. From the menu bar, select **Definitions**. The Definitions menu appears.

2. Select **I/O Configuration**. A submenu appears.

3. Select **Inputs**. The Configure Input dialog box appears:



4. In the *Enable Dedicated Inputs* area, select the inputs you want to assign. A check mark appears when the input is selected.

   The table below describes the inputs.

Input	If you do this to the check box	This is the result
Forward Travel Limit (I1)	Select the box	If a program is running, and the forward limit is activated, the program is aborted. Once all motion has stopped, system program 27 (Error program) is executed. Use travel limit switches to help avoid safety hazards or equipment damage. **IMPORTANT:** An open travel limit input indicates a fault condition.
	Clear the box	The edge is ignored. The current flows through this switch and the switch has no effect.
Reverse Travel Limit (I2)	Select the box	If a program is running, and the reverse limit is activated, the program is aborted. Once all motion has stopped, system program 27 (Error program) is executed. Use travel limit switches to help avoid safety hazards or equipment damage. **IMPORTANT**: An open travel limit input indicates a fault condition.
	Clear the box	The edge is ignored.

Input	If you do this to the check box	This is the result
Enable (I3)	Select the box	Enables the ULTRA Plus (default).
	Clear the box	Enables the ULTRA Plus on power up and can be enabled and disabled only by the FEEDBACK block in a diagram.
Program Start (I4)	Select the box	The program start input can be used to start a user program. Select a program by entering a default run program or by selecting a series of inputs to designate the program number from the Select Program From Inputs pop-up menu.
	Clear the box	A diagram is started only from the operator terminal or by selecting Go in the Online Manager window.
Home Switch (I5)	Select the box	The home switch input can be used by the supplied home program (system program 25) to identify the home position. The input can be defined in the Home Switch check box as active OPEN, or active CLOSED.
	Clear the box	Home Switch has no effect. If neither the Home Switch or Home to Encoder Index is ON, the current position becomes Home when the ULTRA Plus executes the home program.
Home Command (I6)	Select the box	The home command input is used to start system program 25. When the Home command turns on, system program 25 is started. This input is ignored if another main program is running.
	Clear the box	When the Home command is off, the edge is ignored.
Jog Forward (I7)	Select the box	A forward jog position command is generated and added to any gear, incremental move, or absolute move that could be in progress. The jog forward input causes motion in the forward direction (position increasing).
	Clear the box	The jog position command is ramped down from its present velocity to zero using the assigned deceleration rate.
Jog Reverse (I8)	Select the box	A reverse jog position command is generated and added to any gear, incremental move, or absolute move that could be in progress. The jog reverse input causes motion in the reverse direction (position decreasing).
	Clear the box	The jog position command is ramped down from its present velocity to zero using the assigned deceleration rate.
Pause (I9)	Select the box	The pause input function is enabled.
	Clear the box	The pause input function is disabled.
Emergency return (I10)	Select the box	If a program is running, it is aborted. Once all motion has stopped, system program 26 (emergency return) is executed.
	Clear the box	The edge is ignored by the controller.

5. In the *Selectable Inputs* area, make entries in the following fields:

Field	Description
Define Home Input	Type one of the following: • A value from 1 through 16 to assign an input to a function. Note: If an input value is in use for another dedicated function, do not choose that input for this input. • A 0 to disable a function. Define Home Input selects an input that is used to define the home position for the system.
Hard Reset Input	Type one of the following: • A value from 1 through 16 to assign an input to a function. Note: If an input value is in use for another dedicated function, do not choose that input for this input. • A 0 to disable a function. Hard Reset Input assigns an input to the hardware reset function. When the input is on, the ULTRA Plus resets faults and does power-up diagnostic tests.
Kill Motion Input	Type one of the following: • A value from 1 through 16 to assign an input to a function. Note: If an input value is in use for another dedicated function, do not choose that input for this input. • A 0 to disable a function. Kill Motion Input enables and selects a stop input. The input halts program execution and holds position when turned on. This input does not stop Jog input motion.

6. In the *Active State (Closed)* area, make entries in the following fields to indicate the active state for the switch:

Field	Description
Home Switch	Select the Home Switch check box to indicate active closed. Clear the Home Switch check box to indicate active open.
Pause Switch	Select the Pause Switch check box to indicate active closed. Clear the Pause Switch check box to indicate active open.

7. Make an entry in the following field:

Field	Description
Debounce Time	Type a value in milliseconds from 0 through 255. The default value is 0. Debounce time is the time an input must remain stable after it has changed so the change is recognized.

8. Make an entry in the following field:

Field	Description	
ADC1	General Purpose	To use the analog-to-digital converter 1 as a general purpose input. The voltage rate can range from -10 to +10 volts.
	Feedrate	To use the analog-to-digital converter 1 to set feedrate. The voltage rate can range from 0 to 10 volts, corresponding to 0%-200% feedrate.

9. Make an entry in the following field:

Field	Description	
Select Program from Inputs	Not Used	When GML Ultra receives a Start input, the default program number is run.
	I16	When GML Ultra receives a Start input, the program number to be run is determined by these input lines. You can use up to five inputs to select programs. You can select program numbers #0 to #1.
	I15 through I16	When GML Ultra receives a Start input, the program number to be run is determined by these input lines. You can use up to five inputs to select programs. I16 is always the most significant and I12 is always the least significant. You can select program numbers #0 to #3.
	I14 through I16	When GML Ultra receives a Start input, the program number to be run is determined by these input lines. You can use up to five inputs to select programs. I16 is always the most significant and I11 is always the least significant. You can select program numbers #0 to #7.

Field	Description	
	I13 through I16	When GML Ultra receives a Start input, the program number to be run is determined by input lines. You can use up to five inputs to select programs. I16 is always the most significant and I12 is always the least significant. You can select program numbers #0 to #5.
	I12 through I16	When GML Ultra receives a Start input, the program number to be run is determined by these input lines. You can use up to five inputs to select programs. I16 is always the most significant and I12 is always the least significant. You can select program numbers #0 to #31.
	Input I12	This input is also used as interrupt input INT2. If the interrupt line is also used in a program, make sure to set the input to the proper state after selecting the program to be run. The ULTRA Plus can handle up to 32 programs.

10. Make an entry in the *Default Run Program* field:

Field	Description
Default Run Program	Type a number to indicate the program you want to use as the default program. The range of valid numbers is from 0 through 31. The *Select Program from Inputs* field must be set to Not Used to type a default run program number.

11. Select **Save**. The dialog box closes, the selections are saved, and the diagram window appears.

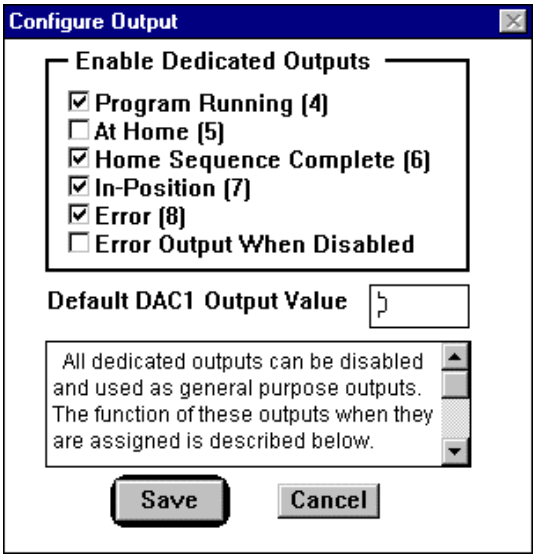
Configuring User-Defined Output

To configure an output:

1. From the menu bar, select **Definitions**. The Definitions menu appears.

2. Select **Configure I/O**. A submenu appears.

3. Select **Output**. The Configure Output dialog box appears.



Note: All dedicated outputs can be disabled and used as general purpose outputs.

4. In the *Enable Dedicated Outputs* area, select the check boxes next to outputs that you want to enable:

Field	Description
Program Running (O4)	The Program Running output is ON when a program other than an Fkey program is running, otherwise Program Running is OFF.
At Home (O5)	The At Home output indicates when the system is at the home position. The At Home output uses the In-Position Window size, but not the In-Position Window Time to determine if it should turn ON. Note: Home position must have been defined and the system must be in Absolute mode to use the At Home output.

Field	Description
Home Sequence Complete (O6)	The Home Sequence Complete is ON when the ULTRA Plus has been homed.
In-Position (O7)	The In-Position output is ON when the feedback position has been within the In-Position window of the commanded position for the time set by the window time. In-Position is valid during motion and while stopped, but only if the drive is enabled.
Error (O8)	The Error output indicates a system error. In addition to errors, you can set this output to turn ON when the drive is disabled by selecting the Error Output When Disabled check box. This output turns OFF when the error is cleared by: • Disabling and enabling the drive • Issuing a reset • Cycling power OFF and ON • In the case of a travel limit, by jogging OFF the limit switch If the fault condition remains, the Error output turns ON again.
Error Output when Disabled	Selects whether the Error Output turns on when the ULTRA Plus is disabled. The ULTRA Plus can disable due to: • The Enable input • A FEEDBACK OFF block • A fault detected in the system The default setting is disabled.

Field	Description
Default DAC1 Output Value	The default value for the 12-bit Digital to Analog Converter (DAC1) output (P3-6) in volts. This is the value the DAC1 output is set to on power-up and when a program is not running. The range is +/- 10 volts, with about 5 mV resolution. The default is 0 volts.

5. Select **Save**. The dialog box closes, the selections are saved, and the diagram window appears.

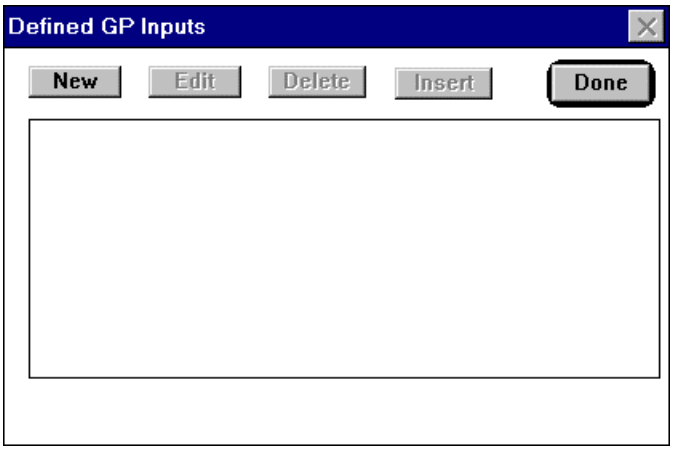
Defining General Purpose I/O

Any digital input 1 through 16 that is not assigned a dedicated (user-defined) function can be used as a general purpose output.

Defining a General Purpose Input

To define a general purpose input:

1. From the menu bar, select **Definitions**. The Definitions menu appears.
2. Select **General Purpose I/O**. A submenu appears.
3. Select **Inputs**. The Defined GP Inputs dialog box appears:



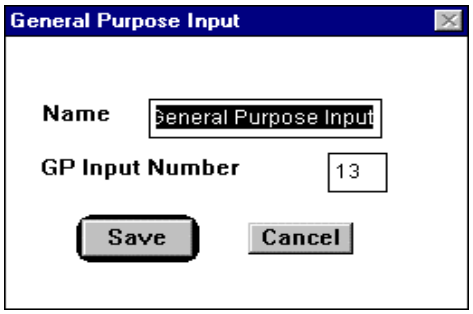
4. Using the table below, go to the correct section for information showing you how to add, edit, delete, or insert a general purpose input:

To:	Go to:
Add an input	*Creating a General Purpose Input.*
Edit an existing input	*Creating an Input by Editing an Existing Input.*
Insert an input	*Inserting a General Purpose Input.*
Delete an input	*Deleting an General Purpose Input.*

Creating a General Purpose Input

To create a new general purpose input and add it to the list of general purpose inputs:

1. In the Defined GP Inputs dialog box, select **New**. The General Purpose Input dialog box appears:



2. Make entries in one of the following fields:

Field	Description
Name	Type the name for the new general purpose input.
GP Input Number	Type a new input number. Note: The range is 1 to 16.

3. Select **Save**. The new input is added at the end of the input list in the Defined GP Inputs dialog box.

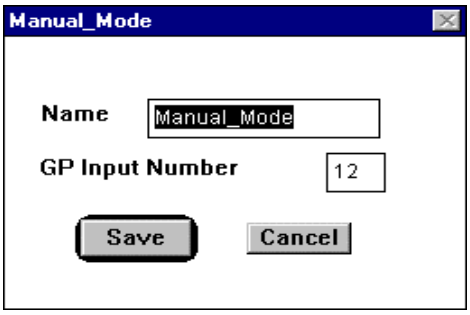
4. Select **Done**. The diagram window appears.

Creating a General Purpose Input by Editing an Existing Input

To create a general purpose input by editing and replacing an existing general purpose input:

1. In the Defined GP Inputs dialog box, select an input name from the defined input list that you want to replace. A check mark appears to its left.

2. Select **Edit**. A dialog box appears that is similar to the one below:



3. Make entries in the following fields:

Field	Description
Name	Type the name for the new general purpose input.
GP Input Number	Type a new input number. Note: The range is 1 to 16.

4. Select **Save**. The edited input, with its new name or address number, replaces the previously selected input in the Defined GP Inputs dialog box.

5. Select **Done**. The diagram window appears.

Deleting a General Purpose Input

To delete a general purpose input:

1. In the Defined GP Inputs dialog box, select the input name from the defined input list that you want to delete. A check mark appears to its left.

2. Select **Delete**. The input you selected is removed from the list.

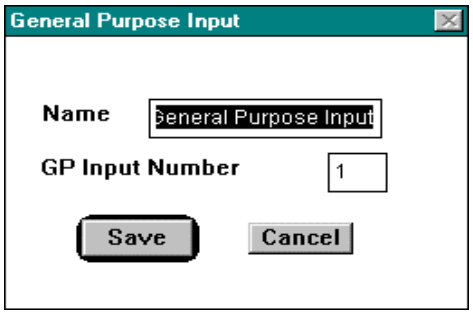
3. In the dialog box for the defined input, select **Done**. The diagram window appears.

Inserting a General Purpose Input

To insert a general purpose input:

1. In the Defined GP Inputs dialog box, select an input from the list. A check mark appears to its left. When you insert an input, it is placed in front of this input.

2. Select **Insert**. The General Purpose Input dialog box appears:



3. Make entries in the following fields:

Field	Description
Name	Type the name for the new general purpose input.
GP Input Number	Type a new input number. Note: the range is 1 to 16.

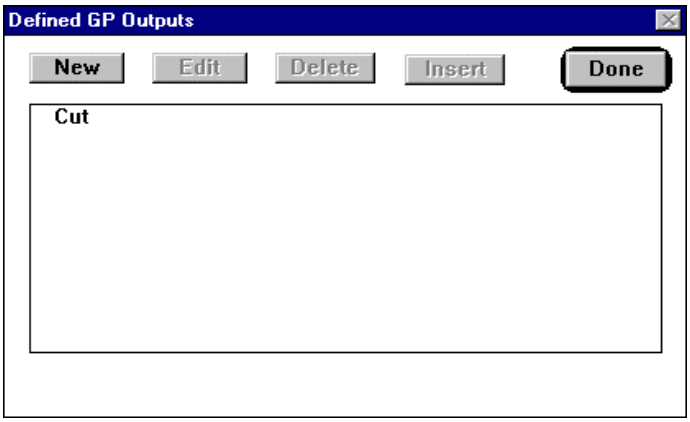
4. Select **Save**. The inserted input is assigned the number of the next available input with the name you just selected. The Defined GP Inputs dialog box appears with the new inserted input.

5. Select **Done**. The diagram window appears.

Defining a General Purpose Output

To define a general purpose output:

1. From the menu bar, select **Definitions**. The Definitions menu appears.
2. Select **General Purpose I/O**. A submenu appears.
3. Select **Outputs**. The Defined GP Outputs dialog box appears:



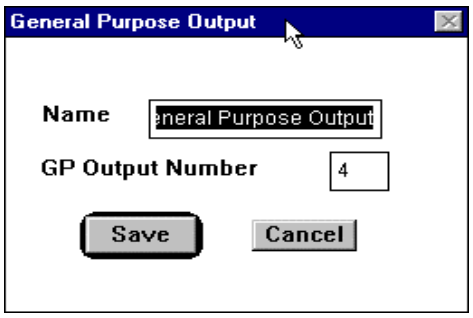
4. Using the table below, go to the correct section for information showing you how to add, edit, delete, or insert a general purpose output:

To:	Go to:
Add an output	*Creating a General Purpose Output.*
Edit an existing output	*Creating an Output by Editing an Existing Output.*
Delete an output	*Deleting a General Purpose Output.*
Insert an output	*Inserting an General Purpose Output.*

Creating a General Purpose Output

To create a new general purpose output and add it to the list of general purpose outputs:

1. In the Defined GP Outputs dialog box, select **New**. The General Purpose Output dialog box appears:



2. Make entries in the following fields:

Field	Description
Name	Type the name for the new general purpose output.
GP Output Number	Type a new output number. Note: The range is 1 to 8.

3. Select **Save**. The new output is added at the end of the output list in the Defined GP Outputs dialog box.

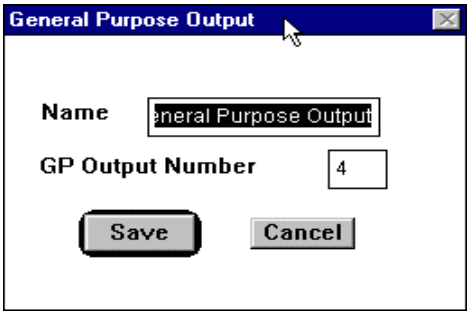
4. In the Defined GP Outputs dialog box, select **Done**. The diagram window appears.

Creating a General Purpose Output by Editing an Existing Output

To create a general purpose output by editing and replacing an existing general purpose output:

1. In the Defined GP Outputs dialog box, select an output name from the defined output list that you want to replace. A check mark appears to its left.

2. Select **Edit**. A dialog box appears that is similar to the one below:



3. Make entries in one or both of the following fields:

Field	Description
Name	Type the name for the new general purpose output.
GP Output Number	Type a new output number. Note: The range is 1 to 8.

4. Select **Save**. The edited output, with its new name or address number, replaces the previously selected output in the Defined GP Outputs dialog box.

5. In the Defined General Purpose Outputs dialog box, select **Done**. The diagram window appears.

Deleting a General Purpose Output

To delete a general purpose output:

1. In the Defined GP Outputs dialog box, select the output name from the defined output list that you want to delete. A check mark appears to its left.

2. Select **Delete**. The output you selected is removed from the list.

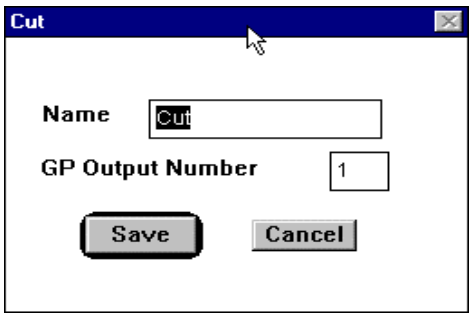
3. In the dialog box for the defined output, select **Done**. The diagram window appears.

Inserting a General Purpose Output

To insert a general purpose output:

1. In the Defined GP Outputs dialog box, select an output from the list. A check mark appears to its left. When you insert an output, it is placed in front of this output.

2. Select **Insert**. The General Purpose Output dialog box appears:



3. Make entries in the following fields:

Field	Description
Name	Type the name for the new general purpose output.
G Output Number	Type a new output number. Note: The range is 1 to 8.

4. Select **Save**. The inserted output is assigned the number of the next available output with the name you just selected. The Defined GP Outputs dialog box appears with the new inserted output displayed.

5. Select **Done**. The diagram window appears.

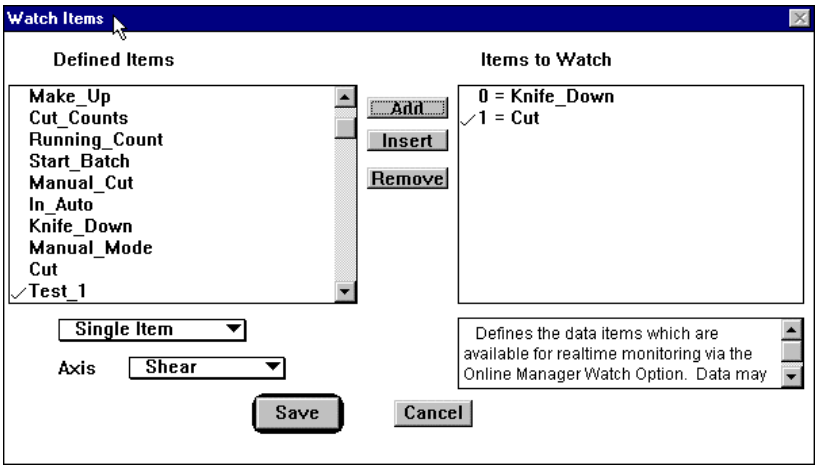
Defining Watch Items

Watch Items are the data that is available for real-time monitoring by way of the Online Manager Watch Option. You can identify watch items during setup or later, when you go online to test your diagram or monitor your program as it runs.

To define the items you want to monitor:

1. From the menu bar, select **Definitions**. The Definitions menu appears.

2. Select **Watch Items**. A Watch Items appears that is similar to the one below:



Note: The items in the Defined Items list are the user-defined and system-defined items for this program.

3. Using the table below, go to the correct section for information showing you how to add, edit, delete, or insert an item:

To:	Go to:
Add one item	*Adding One Item to the Items to Watch List.*
Add more than one item	*Adding Multiple Items to Watch.*
Delete an output	*Deleting an Output.*
Insert an output	*Inserting an Output.*

Adding One Item to the Items to Watch List

To add one item to the list:

1. From the drop down list box below the Defined Items list box, select **Single Item**.

2. In the Defined Items list, select the item you want to add to the Items to Watch list. A check mark appears next to the item.

3. Select **Add**. The item is added to the Items to Watch list.

4. In the *Axis* field, select the axis you want to watch.

5. Select **Save**. The dialog box closes. The new item to watch is defined and the diagram window appears.

Adding Multiple Items to the Items to Watch List

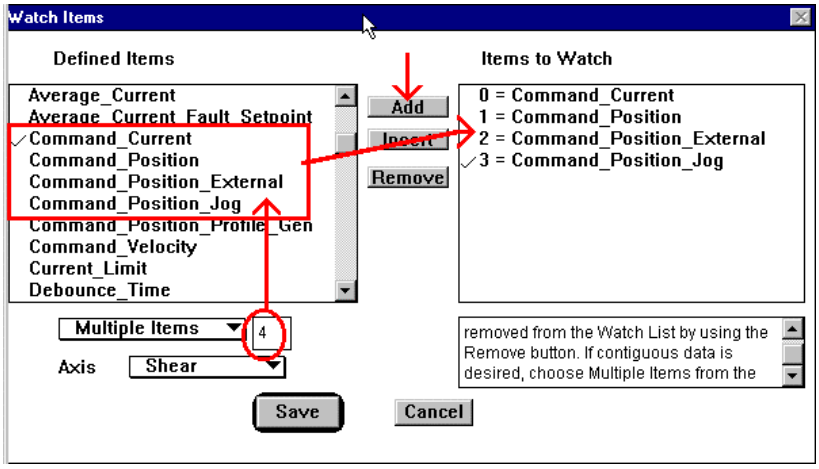
To monitor multiple items listed contiguously in the Defined Items list:

1. From the drop down list box below the Defined Items list box, select **Multiple Items**. A value entry box appears to the right of the Multiple Items selection.

2. In the value entry box to the right of the Multiple Items selection, type the number of consecutive defined items you want to add to the Items to Watch list. The maximum you can enter is 99.

3. In the Defined Items list, select the first item you want to add. A check mark appears in front of the item.

4. Select **Add**. The items are added to the Items to Watch list.



5. In the *Axis* field, select the axis you want to watch.

6. Select **Save**. The dialog box closes. The items to watch are defined, and the diagram window appears.

Inserting One Item in the Items to Watch List

To insert one item in the list:

1. From the drop down list box below the Defined Items list box, select **Single Item**.

2. In the Items to Watch dialog box, select an item from the list. A check mark appears to its left. When you insert an item, it is placed in front of this item.

3. In the Defined Items list, select the item you want to insert. A check mark appears in front of the item.

4. Select **Insert**. The item from the Defined Items list is inserted in front of the item previously selected in the Items to Watch list.

5. In the *Axis* field, select the axis you want to watch.

6. Select **Save**. The dialog box closes. The items to watch are defined and the diagram window appears.

Inserting Multiple Items in the Items to Watch List

To monitor multiple items listed contiguously in the Defined Items list:

1. From the drop down list box below the Defined Items list box, select **Multiple Items**. A value entry box appears to the right of the Multiple Items selection.

2. In the value entry box to the right of the Multiple Items selection, type the number of consecutive defined items you want to add to the Items to Watch list. The maximum you can enter is 99.

3. In the Items to Watch dialog box, select the location where you want the defined items inserted.

4. In the Defined Items list, select the first item you want to insert. A check mark appears in front of the item.

5. Select **Insert**. The items from the Defined Items list box are inserted in the Items to Watch list.

6. In the *Axis* field, select the axis you want to watch.

7. Select **Save**. The dialog box closes. The items to watch are defined and the diagram window appears.

Deleting One Item from the Watch List

To delete one item from the list:

1. Select an item that you want to delete from the Items to Watch list. A check mark appears in front of the item.
2. Select **Remove**. The item you selected is deleted from the list.
3. Select **Save**. The dialog box closes, the items to watch are defined, and the diagram window appears.

Deleting Multiple Items from the Watch List

To delete multiple consecutive items from the list:

1. In the drop down list box below the Defined Items list box, select **Multiple Items.** A value entry box appears to the right of the Multiple Items selection.
2. In the box to the right of the Multiple Items selection, type the number of consecutive defined items that you want to delete from the Items to Watch list. The maximum number you can delete is 99.
3. In the Items to Watch list, select the first item you want to delete from the list. A check mark appears in front of the item.
4. Select **Remove**. The items are deleted from the Items to Watch list.
5. Select **Save.** The dialog box closes. The items to watch are defined and the diagram window appears.

Naming the Axis to Watch

In the *Axis* field, select the name of the axis you want to watch.

This name is appended to a Watch Items variable, if there is a choice between axes. For example, if you select Encoder_Position from the Defined Item window, the variable name that is used is Encoder_Position_NAME, where name is the Axis Name you specified.

Setting Up Function Keys

The only setup required for the operator terminal is for the function keys (or Fkeys) F1 through F4. You can program these keys to perform pre-defined functions, such as Jog Axis or monitor a variable on the operator terminal. It is not necessary to assign a function to every Fkey.

You can define up to six sets (modes) of function keys. You can assign to the keys a description that display on the operator terminal screen.

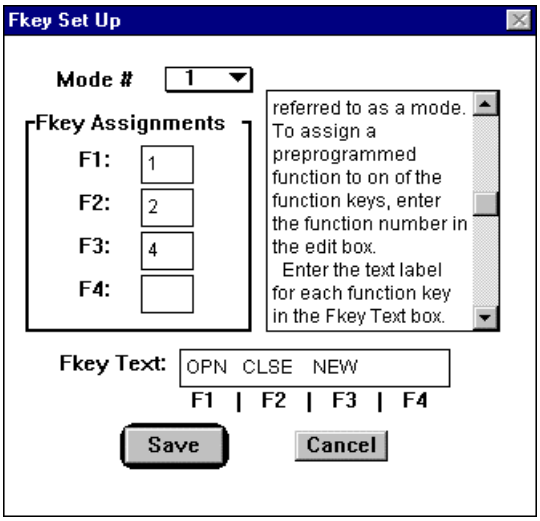
To enable the operator terminal status display, connect the operator terminal to serial port A (P7).

Assigning a Set of Function Keys

To define one set (mode) of function keys:

1. From the Definitions menu, select **Definitions**.

2. Select **Fkey Setup** A dialog box appears that is similar to the one below:



3. Make entries in the following fields:

Field	Description
Mode #	Select the number of the mode that you want to define.
F1 - F4	Type the function number (1-24 or 0 for none) for each function key you want to define in the *Fkey Assignments* fields of the Fkey Assignments area. This assigns a preprogrammed function to one of the function keys. The Fkey programs are a subset of the programs (programs 1-24) in the System Directory. Main Programs are in the Program Directory. Some program numbers are blank when the ULTRA Plus is shipped. You can assign the blank program numbers to a function key. This allows function key assignments to be made and the program created later.
Fkey Text	Type the text label for each function key—up to five characters per key—in the Fkey Text box. The text labels appear above the function keys on the operator terminal.

4. After entering the function numbers and text for that mode, select another mode using the *Mode #* field.

5. Repeat steps 3 and 4 for each mode that you want to define.

6. Select **OK** to save the new function key assignments.

Selecting the Fkeys for Display on the Operator Terminal

Once the Fkey modes are set, you can select a mode to appear on the operator terminal.

1. Use one of the following methods to select the mode:

In this location	Do this
On the operator terminal	Repeatedly press the Mode key to display the *Mode#* values. The Fkeys appear on the operator terminal.
In a program	To set the Fkey mode to appear on the operator terminal from a program, use a Print to Display block with ^C*n* in the message, where *n* corresponds to the Fkey mode number. The number *n* is zero-based—that is, 0 corresponds to Fkey Mode #1, 1 corresponds to Fkey Mode #2, and so on.

2. Clear the labels from the screen by either pressing the **CLEAR** key or by pressing the **STATUS** key which displays one of the status displays.

Note: The Fkeys that monitor a variable appear until you press the same Fkey a second time.

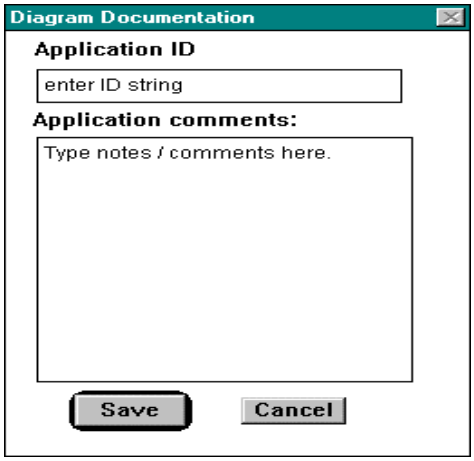
Documenting Your Diagram

Use this feature to document the program, make notes to yourself and other users, keep track of changes to the program — anything you want. The text you type appears in the *Comments* area at the start of the translated script.

You can access this feature at any time.

1. From the menu bar, select **Definitions**. The Definitions menu appears.

2. Select **Documentation**. The following dialog box appears.



3. Type your comments.

4. Select **Save**. The text is saved. The diagram window appears.

A

B

C

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