HORNER ELECTRIC, INC
ORION-SERIES
GIU5xx
GRAPHICAL INTERFACE UNIT
USER'S MANUAL

Release 1.0

Horner Electric, Inc.
Indianapolis, IN 46201

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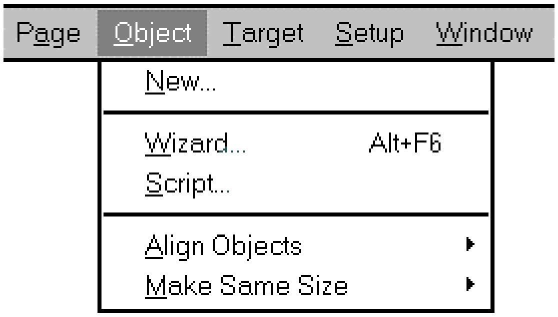
TABLE OF CONTENTS

CONVENTIONS USED IN THIS MANUAL

TYPOGRAPHICAL CONVENTIONS

Whenever possible, graphics have been used to indicate the actions to be taken. In the cases where this is not possible, the following conventions have been taken:

EX: This is the Object Menu



Menu Items, when referenced from text, are printed in Courier Type.

EX: `File`

When a series of menu items must be selected, the items are printed in Courier, and separated by a vertical bar.

EX: `File|Open`

Inputs typed by the User are also printed in Courier.

EX: "To select the third item, type `3`"

Special words, such as those peculiar to the GIU vocabulary, or words used in a new, different, or unique context, are set off with double quotes (" ").

EX: Multiple objects may be selected by "lassoing" them....

EX: Before use, a bitmap must be "tagged".

Buttons within Windows screens or dialog boxes are represented graphically, where possible.

EX: Press a to accept this variable, or press >> to configure a new one.

When given, NOTES indicate a point that the user should remain strongly aware of, as ignoring this information may cause The Editor to appear to fail, or the requested action will not complete. NOTES are set off by a heavy black border:

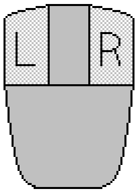
> **NOTE:** This is a note. You should watch for these, and pay close attention when they appear.

TIPS are included when possible to provide alternate methods for reaching a goal, or to provide a simpler method. TIPS are also set off by a heavy black border.

TIP: Tips are included to provide an alternate method of achieving a result.

OPERATIONAL CONVENTIONS

The Editor is a Windows-95 based program, and as such depends heavily on operation of the mouse. The following conventions are used herein to describe mouse actions.

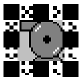


SINGLE CLICK or CLICK
Move the mouse cursor into a suitable position, and then press the LEFT mouse button ONCE.

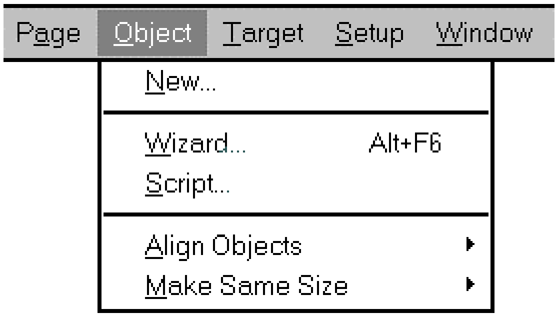
DOUBLE-CLICK
Move the mouse cursor into a suitable position, and then press the LEFT mouse button TWICE in quick succession.

RIGHT-CLICK
Move the mouse cursor into a suitable position, the press the RIGHT mouse button ONCE.

SELECT or HIGHLIGHT
Move the mouse cursor over a desired item, and then press the LEFT mouse button ONCE.



Graphical items (such as Objects) will be outlined.

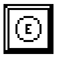


When using drop-down lists of items to be selected, the highlighting action is often automatic.

GRAPHICAL CONVENTIONS

Graphics are used in this manual as much as possible. Whenever possible, a graphical representation is designed to look as much as possible like it's real-world counter part.

COMPUTER KEYBOARD keys have a rounded, three-dimensional look



GIU KEYBOARD keys have a square, flattened look. Special graphics will match the GIU keyboard.

WINDOWS BUTTON have a rounded, flat look.

SYSTEM REQUIREMENTS

To load and run The Editor a system capable or running Microsoft Windows-95 is required:

Pentium 66 MHz processor (minimum) recommended
A Mouse is required.
16 Mbytes of RAM (minimum) is required.
10 Mbytes of free hard disk space is required.
An RS-232 compatible serial port is required.

INSTALLING THE EDITOR

Insert Disk 1 of the distribution package into Floppy Drive A.

At the prompt, type:

```
SETUP <enter>
```

Follow the simple instructions provided.

SPECIAL INSTRUCTIONS FOR UPGRADING TO A NEW VERSION OF THE EDITOR

If you are upgrading to a new version of The Editor, you *MUST* upgrade the Executor Firmware in the GIU-500. Refer *APPENDIX C - Powering Up a New GIU - Updating an Existing Unit*, Page 111 in this manual.

REQUIRED FILES

`GIU.EXE`	- The main program executable file.
`HECOM.DLL`	- The communications module to allows you to talk to an attached GIU.
`SNP.DLL`	- This module is necessary to allow The Editor to configure I/O points as existing on an SNP network.

These files must be present in the directory you assigned to The Editor. Other DLL files will be necessary to support future Device Drivers.

OPTIONAL FILES

There may also be several optional files:

- `BOOTLOAD.EXE` - A DOS-compatible executable used to load or re-load the GIU's BIOS.
- `BOOTLOAD.HEX` - A HEX-format files used by `BOOTLOAD.EXE`.
- `BOOT.HEX` - This is the GIU BIOS file, downloaded to the GIU by BOOTLOAD. Note that name of this file may change.
- `500.HEX` - This is the GIU "Executor", the code that actually runs the pages, scripts, and I/O that you require in the program you write. This is downloaded to the GIU using the `Tools|Write GIU Firmware` menu option in The Editor.

These files are included in the event that your GIU ever suffers from a catastrophic failure, which could result in the need to re-load these files. Under normal everyday operation, these files will not be needed.

CONCEPTUAL OVERVIEW

The Horner Electric Orion-Series Graphical Interface Units (GIU) are designed as stand-alone units to interrogate attached I/O points, then translate and display the results in a graphics-based format that is easier for you to understand and manipulate. Being a standalone unit dedicated to graphical displays, the GIU frees you from having to purchase or "tie up" a separate PC and PC programming languages and support packages. Instead of examining rows and columns of data, you can easily program changes in the visual display that respond to the status of different I/O points.

The GIU is also easier to program than a PC. You need not be concerned about programming graphics at all. All graphics are treated as objects. You simply select a graphic "object" (a Tank or Pump, for example) then place that item on the display screen. You then specify how the object is to perform by "attaching" various I/O points to the object's properties, and specifying how the object responds to the incoming data, in terms of color changes or other actions.

The GIU also contains its own programming language, GIU BASIC. It is not necessary to program in BASIC, but the skilled user can provide greater functionality by supplying his own programs. These programs allow you to provide a great deal of control from the GIU, without needing a full PLC.

Once the display objects are specified and programs written, the total is downloaded to the GIU through a specialized serial link. The program is stored in flash EEPROM, and is thus available any time the GIU is turned on. The GIU needs no disk drive support, which has proven to be susceptible to vibrations and contaminants.

Programming capabilities are provided by a PC-based EDITOR. The Editor provides all the programming features of the system, but doe not actually run the program. The GIU, on the other hand, runs the program, but offers no direct programming capabilities. Thus, the real programming power is maintained in the ubiquitous desk top PC, lowering the price of the GIU unit. The GIU unit contains the capability to execute the program, but since no programming features are available, the program is safe from unauthorized program changes.

THE HARDWARE

The Orion GIU5xx hardware consists of a 25 MHz Intel 386-based computer, a 320x240 passive LCD color display, an integrated high voltage power supply for the display, 512K bytes of RAM, and 1 Mbytes of EEPROM.

Also supported is a "flat" keypad that provides a 10-key numeric keypad, 12 system control keys, and 16 User-definable Function Keys.

Communications to the outside world is through a 9-pin RS-232 connector. This connector is used primarily for interface to the programming Editor. Also provided is a 15-pin RS-485 port, primarily used for GE SNP connections. Both the RS-232 and RS-485 ports are available to you for other programming such as serial printers.

Other miscellaneous points include a piezo-electric beeper and I/O connectors for up to two (2) network controller daughter boards.

THE SOFTWARE

The software package consists of two main parts:

1) The GIU Firmware, which is further broken down into:
    a) The graphics executable and BASIC executor
    b) Device Drivers
2) The PC-based EDITOR, which is further broken down into:
    a) The Display and Object Editor
    b) Host-to-GIU communication DLL
    c) GIU Network Definition DLL(s)

The GIU Firmware is totally flash EEPROM based. Because of this it is possible to easily upgrade an existing GIU with new version of software, should changes become necessary.

The **Graphics Executable** (also called the **Executor**) is the main controlling program. It looks for any downloaded programs and executes the “scripts” assigned to the “pages”, "objects”, “function keys”, and “globals”. The pre-defined graphical objects are drawn at run-time, not saved as bit patterns; thus storage memory requirements are reduced.

When information from a defined I/O point is requested, the Executor links to a software **Device Driver**. The Device Driver is then responsible for obtaining data from the desired device and passing it back to the Graphics Executable. This driver is down-loadable. New Device Drivers or updates to existing drivers are easily added.

The Editor is designed to run under Microsoft Windows-95. Using Windows, the programming interface is quick and intuitive, requiring few keyboard entries.

The Editor talks to the GIU device through a special communications protocol. This is called **HECOM**, and is provided in the form of a Windows DLL file. The exact operation of this DLL is not important. What is important is that Editor-to-GIU communications features may be added or updated simply by providing a new DLL.

It is also necessary for The Editor to know about the various networks supported by the GIU, like SNP. Again, this information is provided in the form of a DLL file, which may be easily changed as features are added or updated.

OBJECTS

GIU OBJECTS are visual, graphical devices you use to help build a control function, or program. Objects are placed on the GIU's screen (actually, The Editor's facsimile of it). The objects are then edited to "attach" them to variables or scripts. The object's visual appearance is pre-defined by the system, so you do not have to worry about creating bit-mapped graphics.

NOTE: There is a limit of 256 Objects per page.

By attaching objects to variables, you have the ability to perform simple but effective animations. These usually consist of changing the color of an object based on the variable’s value. For example, you may specify that a low range of values will turn an object yellow, a high range of values will turn the object red, and all other (mid-range) values will turn the object green.

Textual objects may have their text changed in the same manner. A text object could be attached to the same variable as above, with the low range reading "LOW", the high range reading "WARNING” and the mid-range reading "OK".

Underlying each object is a block of pre-written and tested code. By placing objects on the screen, the Programmer is in effect "hooking up" software subroutines that have been previously written and tested.

The programmer still has a great deal of control over the object, though the Object Wizard and Object Script. The Wizard allows the programmer to write scripts by simply answering a few simple questions. In fact, the Object Wizard will probably be used 90% of the time to write scripts that are associated with objects.

Using this combination of Objects and Wizards, the Programmer is relieved of much of the drudgery of programming, and the resulting code has far fewer "bugs, since most of the code has actually already been written and tested. The Programmer needs only to fill in a few simple points of data such as the variable to be accessed, ranges, Engineering Units, and such. The actual operation is performed by the pre-written and pre-tested code.

PAGES

The Display and Object Editor allows you to create "pages", or single GIU display screens. You then place graphical "objects" on the "page". Pages, objects, or both may then call other pages, in any order.

Each page may have its own control script. This is a user-written program that is run only when the page is being displayed.

Normally, a page will consist of one or more graphical objects. The object may be "static” or unchanging (like labels) or the object may be attached to variables or I/O points, and the object may change its features based on the value of that variable.

NOTE: There is a limit of 256 Objects per page.

Text Pages are also supported. Text Pages provide for easy display of text and tables such as instructions to the User, or fault tables. The display format is similar to a standard PC.

SCRIPTS

SCRIPTS are actual coded programs run by the GIU. Scripts may be global (system-wide), local to a Page, or local to an Object.

The CONTROL SCRIPT is a global script used to control the overall performance of the GIU. The INITIAL SCRIPT is run only once, when the GIU is reset. The ALARM SCRIPT is a logical grouping of code that can be run in response to incoming alarms.

Page Scripts are run *ONLY* when their associated Page is being displayed. Since any script may "call" any other Page, the page number is effectively unimportant, except as a reference point. The Page Number is not, strictly speaking, an indication of the order in which the pages are executed.

Object Scripts are run only when the associated object's Page is being displayed. In this case, the order of the Object Scripts is determined by the order in which the objects were placed on the screen, using The Editor.

In summary, this is the execution order of any and all possible scripts:

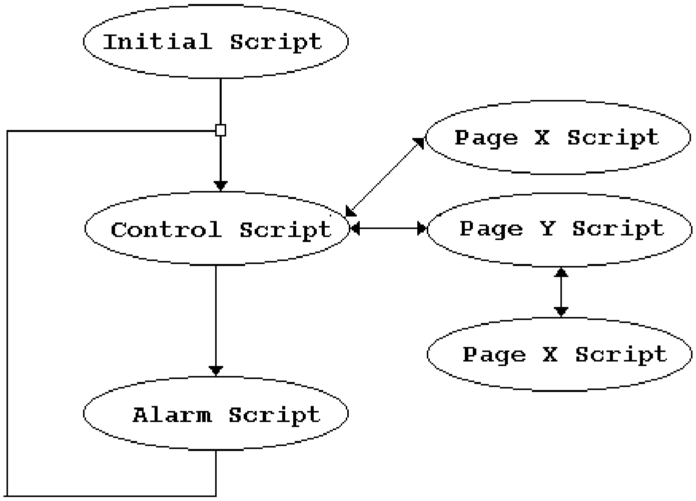


Figure 1 Script Execution Flow Chart

VARIABLES

Variables are important to any language, and especially so to the GIU Editor.

The normal usage of variables is still present -- to provide for storage of intermediate results from any programming code used by the system. There are eleven (11) eleven types of variables available to the GIU programmer, ranging from single bit (Boolean) to Long Doubles (64-bit floating point) to Variants (variables which change their type according to the type of data put in them).

Variables are assigned in one of several ways. They may be defined locally within a script, or globally before any scripts are written.

In the GIU, though, variables also provide the "gateway" to the hardware I/O system supplied by the end user. Any variable may be "attached" to a physical I/O point of a suitable type. Then, any access to this variable will cause an action such that the I/O points is read or written.

OPERATIONAL ORDER

The specific order of operations is not normally important to the End User. However, the Programmer may find this information of value.

After the GIU receives a power up RESET, or receives a RESTART PROGRAM command from either the serial port or from the front panel keypad, the following sequence is followed:

1) Initialization of the system proper
2) Initialization of all Global variables
3) Execute the Initialization Script
4) Service the I/O
   This does not actually perform physical I/O through any attached network.
   Rather, any incoming information read copied from the Device Driver into any "read" variables, and any "write" variables are copied into the Device Driver.
   The Device Driver actually determines when the physical update takes place.
5) Execute the Control Script
6) If necessary, change the Visible Page Number
7) Execute the Page Script
8) Execute any Object Scripts assigned to this page
9) Update visual changes to Objects, if necessary
10) Execute the Alarm Script
11) Loop to Step #4

Steps 4 through 11 are known as The Control Loop.

Note that the Initialization Script is performed *before* the first I/O update service. This has some implications when the GIU is used as a visual monitor attached to a PLC. In this case, most installations will NOT want the GIU to write new values to the PLC during the GIU's Initialization Phase. Because of this a special feature has been added to the I/O Variable Association dialog (see Page 43).

In other installations the GIU may have sufficient power to be the Main Controller in the system. In this case initialization of attached hardware values may be handled completely by the GIU.

FUNCTION KEYS

Function Key Scripts are handled asynchronously with the above sequence. Function Key Scripts are executed immediately, as soon as their associated key press is detected.

It is impossible to determine exactly *when* a key will be pressed, with relationship to the overall operational loop. This is because The User must press the Function Keys. Because of this, you must be aware of how other scripts might interact with the Function Key Script.

The best method for handling Function Keys is to avoid complicated logic functions within the Function Key Script. Instead, provide a Global Variable (usually Boolean) that is set by the Function Key. Examine this variable in the Control Script, and perform the necessary actions. This method will guarantee that the desired action is performed at a known time *with respect to the loop*, regardless as to when The User actually presses the key.

SHOWPAGE

The `ShowPage` command (page 97) is the statement used to switch between displayable pages. Its effects on a running program are … "interesting".

First, understand that the actual "page switch" takes place ONLY in Step #6, above. Any request for a `ShowPage` is "queued" until Step #6. However, `ShowPage` 's "queue" is only one layer deep. That is, the *most recently executed* `ShowPage` will take precedence.

For example, if from within the Control or Alarm Script you code:

```
     .
     .
     ShowPage 1
     .
     .
     ShowPage 3
     .
     .
     ShowPage 5
```

What will actually be seen on the display is Page 5.

The `ShowPage` effects when used from within a Page or Object Script are much different. `ShowPage`, when used within a Page or Object Script, causes an *immediate* EXIT from the script. Therefore, if from within an Object or Page script you code:

```
     .
     .
     ShowPage 3
         (subsequent code not executed)
     .
     .
     ShowPage 5
```

All instructions *after* the `ShowPage 3` will not be executed. In fact, if the `ShowPage` is executed from within an Object Script, *any subsequent Object scripts will not be executed*.

If the ShowPage is executed from within a Function Key script, operation can really get strange!

1) If a Function Key is pressed during *any* script, the script will run to completion.
2) If the Function key is pressed during an Object Script, the Object Script will run to completion. But the Page on which the Object is present will be exited as soon as the effected Object Script is complete.

NOTE: From within a Function key Script, the ShowPage command is issued by the Goto Home Page or Goto Page commands.

The interactions here can be very subtle:

1) If a Function Key interrupts any given script, and the script subsequently executes a ShowPage, the Script's ShowPage will override the Function Key ShowPage.
2) If a Function Key interrupts an Object Script, any subsequent Object Scripts will *not* be executed.

The visible effects of the above can be variables that do not get set (or get set to the wrong value) pages that do not get displayed, or Functions keys that need to be pressed twice (or more), or seem to not function at all.

It would almost appear that using the ShowPage statement from within a Function Key should be avoided. This is not the case, though, and using ShowPage from within *any* script is valid, expected, and normal.

If you experience symptoms that you believe might be caused by the above, try using a different method to switch pages. Consider that the problems can be caused by asynchronous events (Function Key presses) that occur at inopportune times. To better control this situation, use the function key to set a Global Variable (usually a Boolean) to some value, then examine this variable from with the Control Script:

Global Declaration

```
Boolean Key_1,Key_2
```

Function Key F1 Script

```
Key_1 = TRUE
```

Function Key F2 Script

```
Key_2 = TRUE
```

Control Script:

```
If Key_1 = TRUE then
     Key_1 = FALSE
     ShowPage 1
Endif
If Key_2 = TRUE then
     Key_2 = FALSE
     ShowPage 2
Endif
```

THE I/O SCAN

The I/O SCAN is the action necessary to move data between the Device Driver and the global variables.

There are two “tables” used for this operation: The Global Variables, and the “Data Table” inside the Device Driver. Your program (all scripts, either User written or generated by the Wizard) reads data from or writes data to the variables. The Device Driver takes data from it’s local table and writes it to the attached physical I/O, or reads the physical I/O and places the data in it’s local data table.

The I/O SCAN (Step 4, Page 11) is the section of code that actually transfers data between your program and the Device Driver. This would appears something like this:

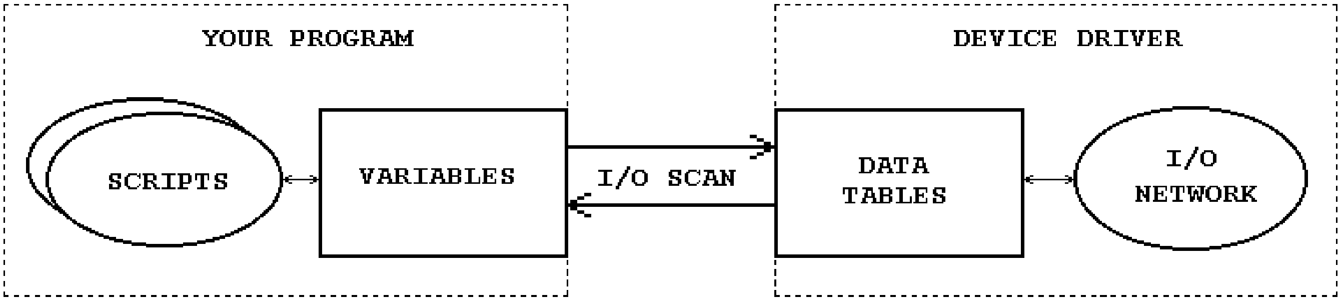


Figure 2 Your Program, The I/O Scan, and the Device Driver

There are two important points to notice here:

1) The I/O SCAN is normally done only once per Control Loop. The timing of the Control Loop is determined by the size of the Control, Alarm, and Page Scripts, the number and type of Objects being displayed, and if and when a Function Key is pressed. Depending on the above, the time between I/O SCANS can ranges from a few milliseconds to several seconds.

2) The Device Driver runs asynchronously to your program and the Control Loop. It is not possible to control this timing from within your program.

To help insure “instantaneous” updates, the `SERVICEIO` (See Page 102) command is included. This command forces the I/O SCAN to occur, thus updating the Device Driver’s Data Tables immediately.

This command will most often be found in Function Key Script. By forcing an immediate update of the Device Driver’s Data tables the GIU can be used as a Push Button Replacement Device.

However, because of #2, above, we can not actually guarantee the physical hardware will be updated “instantly”. The `SERVICEIO` command only transfers the data between the variables and the Data tables. It does not (and can not) cause a physical scan of the I/O network.

The actual physical scan of the I/O devices is timed by the Device Driver. This timing is set when the Device Driver is configured (See Page 38). Thus, even though the SERVICEIO command is used, the physical I/O will get updated only at the *next* scan of the network, as defined by the Device Driver.

NOTE: In Release 1 of the GIU Executor Firmware, the Device Drivers do not honor the TIME setting of the Device Driver setup. All Device Drivers run at their fastest possible speed.

THE MENUING SYSTEM

THE MAIN MENU

All features of The Editor may be accessed through this menu and it's associated sub-menus.

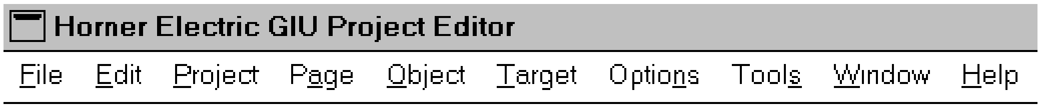


Figure 3 The Main Menu

THE FILES SUB-MENU

The File Options are used in the standard Windows manner -- `New`, `Open`, `Save`, and `Save As`. The options serve the purpose that a Windows user would expect.

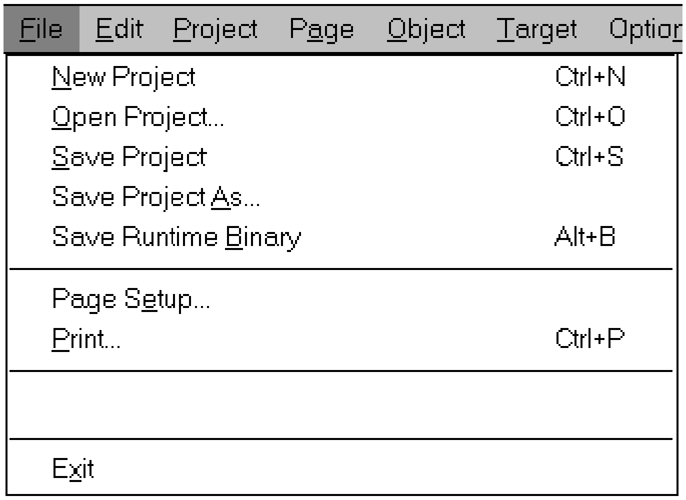


Figure 4 The File Sub Menu

NEW PROJECT

NEW PROJECT creates a new project workspace. All screens, objects, function keys, and scripts are cleared. Page 0, which has been cleared, is displayed.

> **TIP:** If the Toolbar is active, you may start a new project using the 🗋 Toolbar Button.

OPEN PROJECT

OPEN opens an existing project workspace. The Editor looks in the current working directory for files with the extension .GIU. You are presented with the standard Windows File Open dialog, so selecting projects from other directories should be second nature to you.

> **TIP:** If the Toolbar is active, you may open an existing project using the 📂 Toolbar Button.

SAVE PROJECT

SAVE PROJECT writes the current project workspace to disk. For the SAVE to be truly automatic, the project must have been "named" by first using the Save Project As option.

If the project is "unnamed" the SAVE option will automatically revert to the Save Project As option.

> **TIP:** If the Toolbar is active, you may save a project using the 💾 Toolbar button. If the project is previously unsaved, this option will automatically revert to Save As.

SAVE PROJECT AS

SAVE PROJECT AS allows a project to be saved under a User-specified name.

In the case of a new project, it is necessary to use Save Project As to add a "name" to the project. A project must be "named" in this manner before the Save option is functional.

SAVE RUNTIME BINARY

This option allows the project to be saved as a binary file, identical in format to that which is sent to the GIU using the Target|Write Program menu option.

This file could be used for possible stand-alone file loaders. Stand-alone file loaders are, however, not yet available.

PAGE SETUP

This option allows you to define the page size and margin parameters of paper you are using.

PRINT

This option allow you to print (make a hard copy) of your program. You have the option to print all or part of the program, including screens, scripts, and I/O definitions.

> **TIP:** If the Toolbar is active, you may print a project using the 🖨 Toolbar Button.

EXIT

`EXIT` causes The Editor to terminate.

MOST RECENTLY USED LIST

Between the PRINT and EXIT options there will appear a Most Recently Used list. This list will contain the eight (8) most recently accessed file paths.

THE EDIT SUB-MENU

The Edit Options allow access to Page-oriented editing features. Objects are first selected Objects that have been selected may be CUT, COPIED, PASTED, or DELETED.

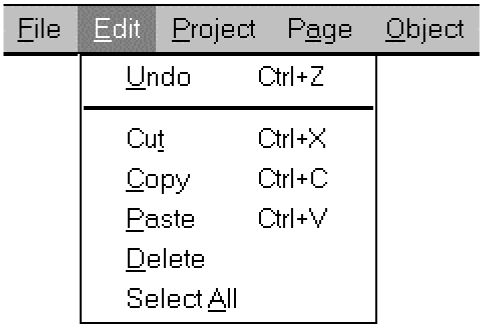


Figure 5 The Edit Sub-Menu

UNDO

The UNDO command is not presently functional. It is included here for compatibility with future releases of The Editor.

CUT

The selected object(s) is first moved to the Clipboard, then deleted from the page. Any item thus moved may be recalled later using the PASTE command.

> **TIP:** If the Toolbar is active, use the ✂ Toolbar Button to perform the CUT command.

COPY

The selected object(s) is moved to the Clipboard, and remains on the page. Any item thus moved may be recalled later using the PASTE command.

> **TIP:** If the Toolbar is active, use the ⧉ Toolbar Button to perform the COPY command.

PASTE

Any object(s) on the Clipboard are placed on the selected page. Their position on the screen is retained.

> **TIP:** If the Toolbar is active, use the 📋 Toolbar Button to perform the PASTE command.

DELETE

The selected object(s) is deleted. Such objects may not be recalled for later use.

SELECT ALL

All visible objects on the page are selected to be CUT, COPIED, or DELETED.

THE PROJECT SUB-MENU

The Project Options allows you to define certain items that will be used on a program-wide basis:

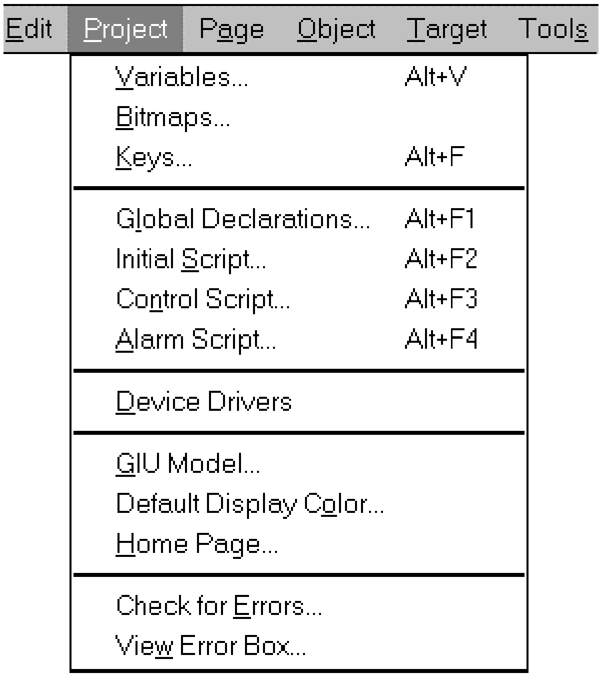


Figure 6 The Project Sub Menu

VARIABLES

Select this menu item to define Variables. Variables may also be "attached" to external hardware through one of the networks available to the GIU hardware.

BITMAPS

Select this menu item to assign Tag Names to any bitmapped files that you may be using. Bitmapped files may be used as wallpaper on a GIU Screen designated as "graphical".

KEYS

Select this menu item to program the available Function Keys (to the left, right, and below the display screen) on a project level (global) basis.

NOTE: Project Level (global) Function Keys are superseded Page Level Function Keys.

GLOBAL DECLARATIONS

Select this menu item to declare global (project level) variables and functions

INITIAL SCRIPT

Select this menu item to create or edit the program's Initialization Script

CONTROL SCRIPT

Select this Menu Item to create or edit the program's Main Control Script.

ALARM SCRIPT

Select this menu item to create or edit the program's Alarm Script.

DEVICE DRIVERS

Select this menu item to add or delete Device Drivers. During this process you will also be allowed to "attach" different or multiple I/O devices to a single network (if that is supported by the network), and to "attach" specific I/O points to system variables. Thus, a program variable may be assigned to a specific I/O point on a specific device on a specific network.

GIU MODEL

This item is included to allow compatibility with future products in the GIU line.

DEFAULT DISPLAY COLOR

This item is included to allow compatibility with future products in the GIU line. It is currently disabled.

HOME PAGE NUMBER/NAME

This item is included to allow compatibility with future products in the GIU line. It is currently disabled.

CHECK FOR ERRORS

Select this menu item to verify that any program you write is free from errors. Any errors are reported to you in the Error Box. You must correct them before downloading a program to a GIU.

TIP: If the Toolbar is active, use the ✓ Toolbar Button to check for errors.

VIEW ERROR BOX

This option will cause the Error Box to be displayed. Use this option to review the Error Box if it is not currently displayed.

TIP: If the Toolbar is active, use the 💡 Toolbar Button to recall the Error Box.

THE PAGE SUB-MENU

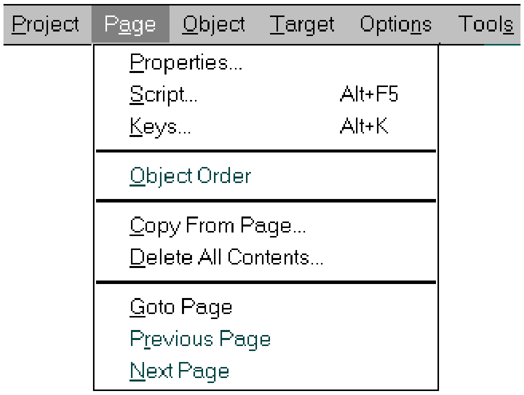


Figure 7 The Page Sub Menu

The Page Options allows you to define or select various items that are active on a per-page basis

PROPERTIES

Select this menu item to determine the properties of the page: graphical or textual, annunciator beep, caption, and associated bitmap.

FUNCTION KEYS

Select this menu item to program the available Function Keys (to the left, right, and below the display screen) on a per-screen basis.

NOTE: Page Level (local) Function Keys supersede Project Level (global) Function Keys.

SCRIPT

Select this menu item to create or edit a script for this page.

OBJECT ORDER

Select this menu item to view the object numbers assigned to any objects on the page. This information is useful for debugging.

COPY FROM PAGE

Select this function to copy the *entire* contents of any page to the currently displayed page. This is useful when a project requires multiple pages with are identical with only minor exceptions. Using this option the entire contents of the selected page are copied -- objects, scripts, and function keys.

DELETE ALL CONTENTS

Select this option to completely clear a page. All contents are "wiped" -- object, scripts, and function keys.

GOTO PAGE

This option allows you to select which “page” will be displayed in the selected window

> **TIP:** If the Toolbar is active, use the |▶ Toolbar Button to issue the Goto Page command.

PREVIOUS PAGE

The Editor keeps a Most Recently Used list for *each* currently visible window. `Use PREVIOUS PAGE` to select the previously viewed page in the selected window.

> **TIP:** If the Toolbar is active, use the ◀ Toolbar Button to select the previous page.

NEXT PAGE

The Editor keeps a Most Recently Used list for *each* currently visible window. Use `NEXT PAGE` to select the next page in the selected window.

> **TIP:** If the Toolbar is active, use the ▶ Toolbar Button to select the next page.

THE OBJECT SUB-MENU

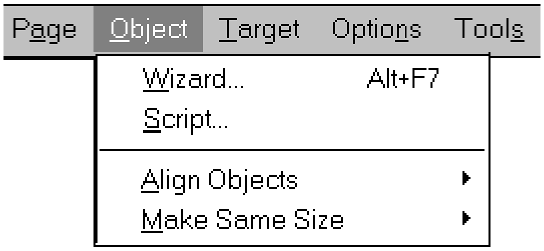


Figure 8 The Object Sub Menu

These options allow you to select and manipulate objects on the displayed page.

NOTE: There is a limit of 256 Objects per page.

WIZARD

Selecting this option brings up the Object Wizard. The Object Wizard allows variables to be attached to objects, allows the object to be "ranged", and allows the attached variable to manipulate certain object-dependent features (for example, color).

SCRIPT

Selecting this option to create or edit the script associated with the selected object.

ALIGN OBJECTS

Selecting this option allows *multiple* objects to be aligned with each other on a top, bottom, left, or right side manner. This allows you to easily create more pleasing displays.

Selecting this item will cause a popup menu to appear, giving you the available choices: Top, Bottom, Left, Right.

TIP: If the Toolbar is active, use the , , , or Toolbar Buttons to Align Left, Align Right, Align Bottom, or Align Top, respectively.

MAKE SAME SIZE

Selecting this object will force all selected objects to the same size. This allows you to easily create more pleasing displays.

Selecting this item will cause a popup menu to appear, giving you the available choices, Vertical, Horizontal, or Both.

TIP: If the Toolbar is active, use the , , or Toolbar Buttons to Make Same Size Vertical, Make Same Size Horizontal, or Make Same Size Both, respectively.

THE TARGET SUB-MENU

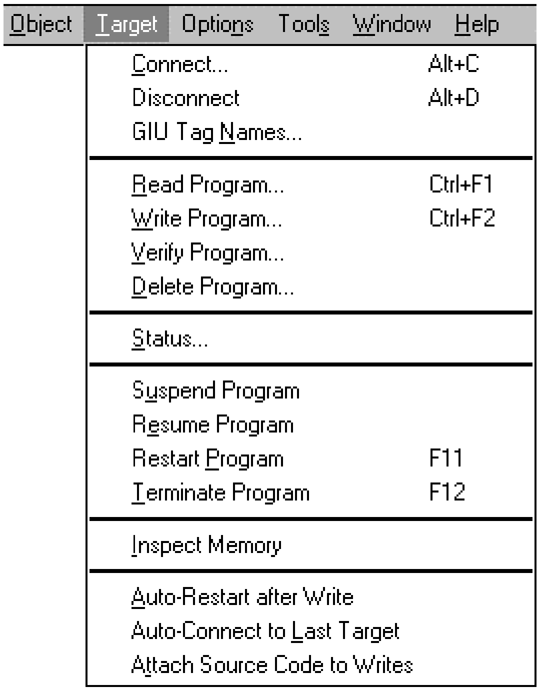


Figure 9 The Target Sub Menu

These options allow you to select, deselect, and manipulate an attached GIU device.

CONNECT

Selecting this option will cause The Editor to establish the connection between The Editor and a pre-defined GIU device (see `GIU TAG NAMES` below).

> **TIP:** If the Toolbar is active you may `CONNECT` using the Toolbar button.

DISCONNECT

Selecting this item will cause The Editor to release the connection between The Editor and the attached GIU Device

> **TIP:** If the Toolbar is active you may `DISCONNECT` using the Toolbar button.

GIU TAG NAMES

This option allows you to add, edit, or remove a GIU Tag Name. This tag will be associated with a particular unit having User-defined properties such as communications port, baud rate, etc. The Tag Name is used in the `CONNECT` function, above.

> **NOTE:** If the `Disconnect` menu item is *enabled*, this item will be disabled (grayed).

READ PROGRAM

Selecting this option allows you to upload a program from an attached GIU device into The Editor.

NOTE: The program *must* have been written using the ATTACH SOURCE CODE TO WRITES command, below.

TIP: If the Toolbar is active you may READ PROGRAM using the Toolbar button.

WRITE PROGRAM

Selecting this option allows you to download a program from The Editor into an attached GIU device. The program is first checked for errors in a manner identical to the Project|Check for Errors menu item. If the program is sizable, this could take several seconds.

TIP: If the Toolbar is active you may WRITE PROGRAM using the Toolbar button.

VERIFY PROGRAM

Selecting this option causes The Editor to read a program from the GIU, and perform a comparison between it and the one in The Editor's memory.

DELETE PROGRAM

Selecting this option causes The Editor to delete any program in the GIU.

STATUS

Selecting this option allows you to check on the operational status of an attached GIU device. Reported are the GIU firmware revision level, the loaded program's name and size, and the currently displayed page.

TIP: If the Toolbar is active you may get PROGRAM STATUS using the Toolbar button.

RESTART PROGRAM

Selecting this option will cause The Editor to send a RESTART command to the GIU device. This is similar in action to unplugging the power from the GIU. The currently running program will be terminated, the GIU will be reset, and any loaded program will be restarted.

TIP: If the Toolbar is active you may RESTART using the Toolbar button.

SUSPEND PROGRAM

This option causes any program running in the GIU to stop, but retaining the all information such that the program can be restarted exactly where it left off.

RESUME PROGRAM

This option causes a previously suspended program to resume operation. Note that this command can not be used on a program that has been terminated, or just downloaded to the GIU.

TERMINATE PROGRAM

This option causes any program running in the GIU to be terminated. Any network controls are stopped; all information is lost.

TIP: If the Toolbar is active you may TERMINATE PROGRAM using the Toolbar button.

INSPECT MEMORY

Selecting this option allows you to inspect certain memory locations inside the GIU.

AUTO-RESTART AFTER WRITE

This selection is a "switch". When ON (the item in the menu is checked) The Editor will issue a RESTART command after a program is downloaded. If the switch is OFF (the menu item is not checked) then the GIU will require that you manually issue the RESTART command.

AUTO-CONNECT TO LAST TARGET

This selection is a “switch”. When ON (the item in the menu is checked) The Editor will automatically re-connect to the unit that it was connected to when The Editor was last exited. Since most Users will be working with one unit, this can be quite convenient.

ATTACH SOURCE CODE TO WRITES

This selection forces The Editor to include Source Code when it downloads a program. This is useful, because a subsequent User can upload the file, including source code, for editing or examination. Refer to the READ PROGRAM command, above.

THE OPTIONS SUB-MENU

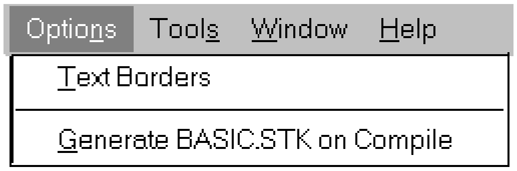


Figure 10 The Options Sub-Menu

This allows you to select certain features that determine how The Editor appears or acts, but these features have no direct effect on the GIU code generated.

TEXT BORDERS

The Text Objects have no inherent method to allow you to determine the limits of the object. During certain operation you may want to know exactly the boundaries of the Text Object, either to align the objects, or to avoid placing one object "on top of" another.

With the Text Borders option checked ☑ a dashed line will be used to indicate the extent of Text Objects. The dashed lines, however, can clutter the display. Mark the Text Borders unchecked ☐ to remove the dashed lines

GENERATE .STK ON COMPILE

This is a switch that, when checked ☑, will cause the compiler to generate a BASIC diagnostic file.

This file has no immediate use to you, the programmer. This switch should be unchecked ☐ for all normal operation of The Editor.

NOTE: Leaving this option checked could cause serious degradation of The Editor's performance, especially with large programs.

This option is included for the future possibility that you may need to contact Horner Electric Technical Support. Technical Support personnel may ask you to check this option, compile the program, then read certain information from this file.

THE TOOLS SUB-MENU

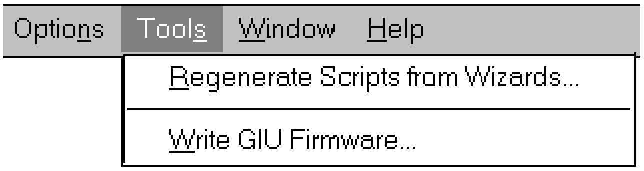


Figure 11 The Tools Menu

REGENERATE SCRIPTS FROM WIZARDS

This option allows you to "repair" scripts written using previous version of The Editor, which may not be fully compatible with the current version.

NOTE: Only scripts written using wizards will be repaired. Scripts created in the "manual edit" mode will require manual editing.

WRITE GIU FIRMWARE

Selecting this option allow you to update the graphical "executor" firmware on-board the GIU. This is different from the "BIOS", which is loaded in a separate step, using a DOS-based loader.

THE WINDOW SUB-MENU

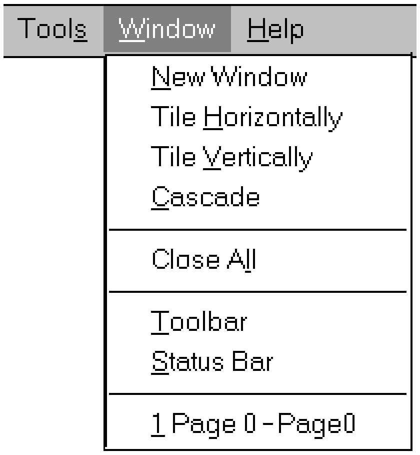


Figure 12 The Window Sub-Menu

Selecting these options allows you to select a new or previously assigned "page" in the program, to "tile" and displayed pages, or to select for display the Toolbar or Status Bar.

NEW WINDOW

This option opens a new window in the display area. You will be asked to select a GIU Page to be displayed in this window.

Any window may display any page, and multiple windows may display the same page.

TILE HORIZONTALLY

Selecting this option will cause all windows to be displayed in a horizontal manner.

TILE VERTICALLY

Selecting this option will cause all windows to be displayed in a vertical manner.

CASCADE

Selecting this option will cause all windows to be displayed in a cascading manner.

CLOSE ALL

Selecting this option will close all open windows.

TOOLBAR

This option is a switch to activate or de-activate the TOOLBAR that runs along the TOP of the display.

STATUS BAR

This option is a switch to activate or de-activate the STATUS BAR that runs at the bottom of the display.

VISIBLE WINDOW LIST

This selection allows you to select ONE of the windows that are currently loaded. The Page Number and Page Name displayed in up to nine (9) windows may be displayed. If more than nine windows are available, you have the option to select the desired window from a sub-menu.

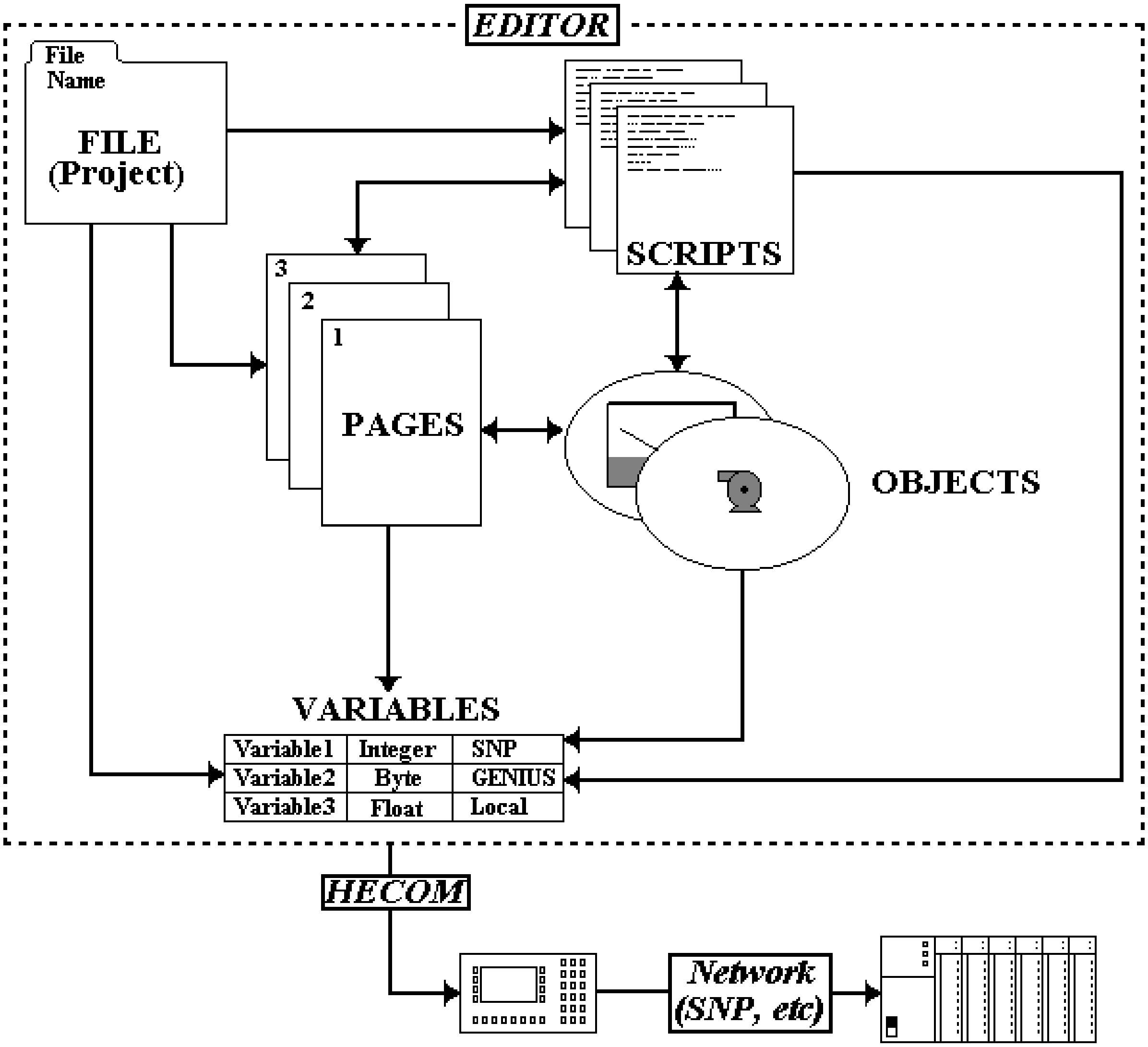
USING THE EDITOR

INVOCATION

Double-click the icon for the GIU editor. The Editor will begin execution.

A SIMPLE OVERVIEW

A block diagram will be helpful to describe different parts of a GIU program and their interactions:



Variable1	Integer	SNP
Variable2	Byte	GENIUS
Variable3	Float	Local

Figure 13 The Editor Flow Chart

The basic unit of storage is the PROJECT. The project contains all parts of the program. When a Project is opened, these parts become accessible. When a Project is closed, any changes made are saved.

The basic parts of a User Program are Pages, Objects, Scripts, and Variables.

PAGES are primarily used to describe the screen that is to be visible on the GIU. You may consider PAGES and SCREENS to be synonymous, but a screen is actually only one of the functions of a page. Pages may also contain scripts, function keys, and objects, and variables may be accessed from the page's objects, scripts, and function keys. It may be more correct to consider a page as a major subroutine called at the appropriate times from a major control program.

OBJECTS are the visible "items" displayed by the page. Typical of object oriented systems, OBJECTS are merely symbols representing more complex sections of code. An object may be used to read or write data from an attached PLC, or may perform some other task like updating or changing a variable.

NOTE: There is a limit of 256 Objects per page.

Objects often have ATTRIBUTES. Some attributes may be changed only by the programmer, using The Editor. Such attributes would be the physical size and position of the object on the screen. Other attributes may be changed under program control, at run time. These attributes might include the object’s value, color, or other displayable characteristics (like text).

SCRIPTS are User-defined sections of code that are executed at appropriate times. Scripts may be "globally" defined on a project-wide basis, or "locally" defined on a per-page basis. You may write or customize these scripts to perform specific actions.

There are three (3) "global" scripts: Initialization, Control, and Alarm. The Initialization Script is called only once, when the program first executes. In here, you may initialize certain variables, or perform other tasks that must be performed before the main program operates.

The Control Script is the "main" program. Normally, User-written Control Scripts are not necessary, as the simple act of creating a Screen of Objects is sufficient to produce all necessary control. However, the Control Script *is* available for those Users that need more or specific control functions.

The Alarm Script is logical grouping of GIU BASIC code. Although the GIU actually executes the Alarm Script during every pass, the code herein is designed to be used only during alarm situations. With the proper use of project-wide (global) variables as "flags", you can trap and control the systems Alarm response.

Page Scripts are executed only when the associated page is displayed. Since you also have control over when a page is displayed, you thus have control over when these scripts are executed.

NOTE: Objects also have scripts, but access to these scripts is normally through the Object Wizard. The Object Wizard will automatically create Object Scripts.

VARIABLES are as expected -- They are used to hold temporary values operated on by the various scripts. Variables may be GLOBAL (available to all parts of the program at all times) or LOCAL (available only from within the script that defines them).

Variables are also the "gateway" to the Device Drivers. A variable may be attached to a specific I/O device through the Device Driver. When this variable is accessed, this will causes appropriate activity by the device driver to read or write the variable's values to or from the hardware device.

The attachment process is simple. You are concerned only with *what* device is accessed, not *how* it is accessed. This level of isolation removes much of the drudgery of programming I/O.

CONNECTION TO THE GIU DEVICE

Once a program is constructed using The Editor, it is transmitted to the GIU device through a serial link. This link uses a proprietary protocol called HECOM, designed specifically for this purpose.

NOTE: HECOM is *NOT* an I/O network. The Editor itself has no direct nor indirect access to any I/O devices present in the system.

HECOM uses an RS232 serial link between the Host computer (running The Editor) and the GIU device. A 9-pin "straight through" cable is all that is required.

You must "tag" a device. In doing so, you are asked to determine the Host PC's Comm Port and baud rate. Once a unit is "tagged" you will not be asked for communications parameters for this tag.

The baud rate used to communicate to the GIU device is programmable. Other serial parameters (number of bits, stop bits, etc.) are fixed by The Editor and the GIU, so you have no need for control of these parameters.

INTERACTIONS BETWEEN THE EDITOR AND THE GIU DEVICE

Interaction between The Editor and the GIU Device are limited. Since the GIU Device is designed as a stand-alone unit, there is no need for complicated interactions between The Editor and the GIU. Interactions are limited to Program Reads and Writes, and Status.

The Editor compiles your program into a data table to be operated on by the GIU Device. This data table contains the pages, objects, scripts, defined variables, and any possible attachments to I/O devices. Once compiled, the data table is transmitted to the GIU device using the HECOM protocol.

Once the program is written to the GIU Device, you may only check the Device Status. This gives a general indication of whether the device is running, and what actions it is performing.

You can not directly access nor effect a running GIU program except to stop, start, read, or write the complete program. Neither can you access any points in attached I/O devices.

WRITING A PROGRAM

In its simplest form, writing a program takes only 5 major steps:

1) Define and setup Device Drivers.
2) Define any variables.
3) Create new page(s) by placing objects on the page(s).
4) Set the object's properties, including associated variables.
5) Attach the variables to I/O points
6) Write the program to the GIU

In most cases, the first five steps may be taken in any order!

DEFINING AND SETTING UP DEVICE DRIVERS

All programs have two things in common: They need some kind of input to operate on, and they produce some sort of useful output. One of the most important points of programming is to define where the input comes from and where the outputs go. Further more, when the GIU is involved we need to sub-divide inputs and outputs into two groups -- those intended for the GIU alone, and those intended for "real world" I/O devices, such as attached PLCs.

Once the I/O is defined, we should let The Editor and GIU know about these points early in the program design process. Primarily, this consists of defining and setting up the different Device Drivers available.

The following diagram shows how variables and Device Drivers interact:

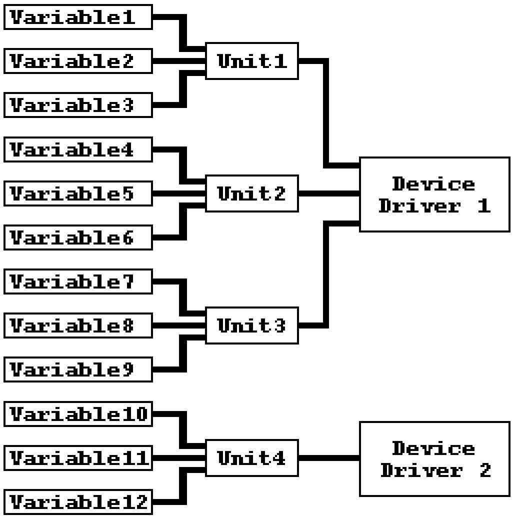


Figure 14 Variable to I/O Association

NOTE: This diagram should not be used to infer any limits on the number of variables, units, device drivers, nor the number or types of interconnections. There may, however, be limits placed by the actual device driver or unit attached.

A **VARIABLE** is a unit of storage defined by the GIU. Like any programming language, variables are used to store results of previous calculation. In the GIU, though, a variable may also be "attached" to a particular I/O point of a real hardware device. In this case, reads or writes of the variable will cause similar actions to be performed on the hardware device.

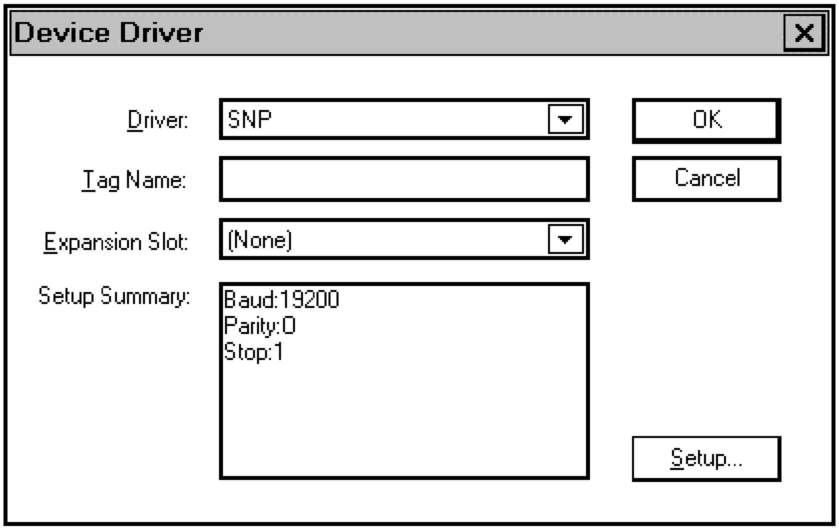
A **UNIT** is a logical grouping of I/O points. A Unit directly correlates to a specific hardware device, for example a single PLC. A Unit will contain information about the numbers and types of I/O points available to the device, as well as other pertinent information like Device IDs, Node Addresses, access passwords, etc.

A **DEVICE DRIVER** is the software that allows the GIU to communicate with the attached devices. The Device Driver looks at the Unit definition to determine which device to "talk" to.

Defining I/O, then, is a matter of defining the different Units available, including their number and type of I/O points, and which Device Driver they are attached to. The Device Driver itself may need definition in terms of communications parameter (baud rates, etc.). Finally, certain program variables are "attached" to the different I/O points available to a specific device.

ADDING A DEVICE DRIVER

From the `Project` sub-menu, select `Device Drivers`. In the resulting dialog, click Add. A new dialog pops up:



Driver: SNP

Tag Name:

Expansion Slot: (None)

Setup Summary:
Baud:19200
Parity:0
Stop:1

Figure 15 Device Driver ADD Dialog Box

The following functions are available to Add a New Unit to a specific Device Driver.

Driver
Select the desired Device Driver from the available list.

Tag Name

Type in an identifying name (a "tag") to be assigned to this iteration of this driver. Under certain circumstances, one Device Driver might be used to control 2 or more physical networks. The Tag Name identifies the network used. There is a limit of 32 characters for the Tag Name.

Expansion Slot

The GIU supports two Expansion Slots to support specialized hardware. Currently, no devices are available to use these slots. Leave this entry at NONE.

Setup Summary

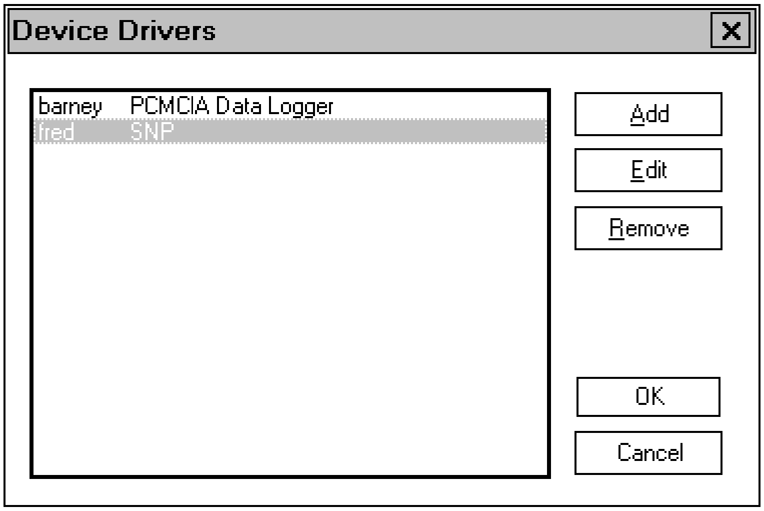
This box displays the current parameters for the selected device driver.

Setup

Once the desired Device Driver is selected, click the Setup... button to set the Driver's parameters. The appearance of the resulting dialog will depend on the driver selected.

EDITING OR REMOVING A DEVICE DRIVER

If the Driver has already been defined, it may be edited or removed. Select `Project|Device Drivers`:



Device Drivers

barney PCMCIA Data Logger
fred SNP

Figure 16 Device Driver Add/Remove Dialog Box

Highlight the desired Device Driver entry, then click either Edit... or Remove to complete the desired task. If Edit... is selected, you will be brought into Device Driver dialog described above.

SETTING UP THE DEVICE DRIVER

Setting up the Device Driver is peculiar to each different device. Once the Device Driver is selected, as above, refer to the Device Driver specific instructions given in the Appendices to this manual.

Setup for each individual device will be peculiar to that device. Therefore, setting up of the Device Driver is described in a separate Appendix to the manual for each Device Driver included. Refer to the specific Appendix for the Device Driver you wish to set up.

DEFINING (ADDING) VARIABLES

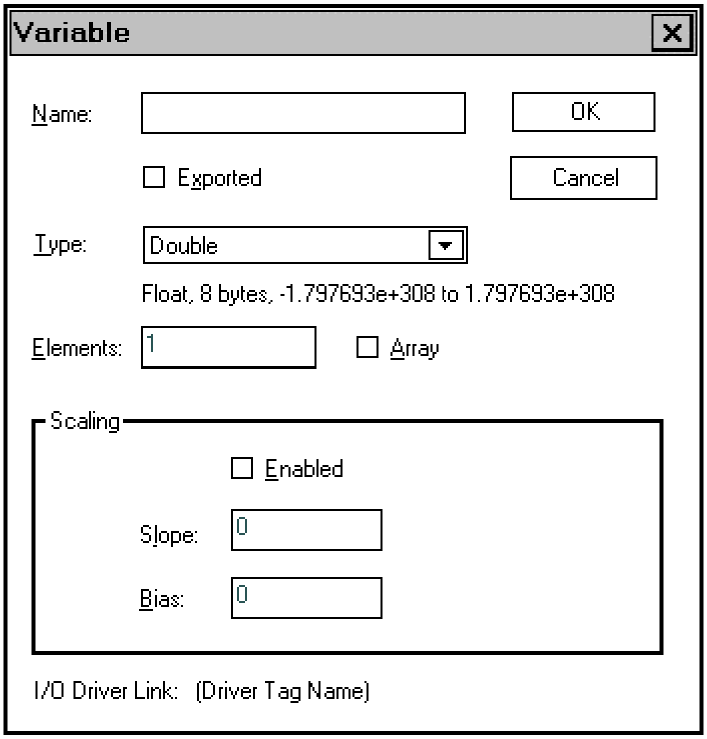
Good programming practice dictates that variables should be defined and created first, when possible. This helps prevent memory size "creep" that often occurs when programs are written "on the fly", without some forethought as to their use and operation. However, The Editor allows variables to be defined at any time, up to the time that a program is downloaded to an attached GIU.

When The Editor is first invoked, you are presented with a blank "page". For the time being, ignore the Page display.

TIP: If all pages are not blank, or you need to start over, or you just want to be sure, click on `File/New` to start over.

From the Main Menu, select `Project/Variables`. This will bring up a Dialog Box. The Dialog Box should be empty, since at this point no variables have been added.

Click Add to add a new variable. This will bring up the Variable Addition dialog:



Name:

□ Exported

Type: Double

Float, 8 bytes, -1.797693e+308 to 1.797693e+308

Elements: 1 □ Array

□ Enabled

Slope: 0

Bias: 0

I/O Driver Link: (Driver Tag Name)

Figure 17 Variable Add Dialog Box

The functions of this box are reasonably obvious.

Name

This is the variable's NAME, or "tag name", by which it will be accessed by the rest of the program. Variable names may be up to 32 characters in length. Only alphanumeric characters are acceptable, upper or lower case, and the '$' character.

Exported

This feature is for future enhancements. For now, leave it unchecked □.

Type

This is the type of variable. Possible types are :

TYPE	SIGN	SIZE	RANGE
Boolean	N/A	1 bit*	0 or 1
Char	signed	1 byte	-128 to +127
Byte	unsigned	1 byte	0 to 255
Integer	signed	2 bytes	-32768 to +32767
Word	unsigned	2 bytes	0 to 65535
Long	signed	4 bytes	-2147483648 to +2147483647
Dword	unsigned	4 bytes	0 to 4294967295
Float	signed	4 bytes	-3.402823e+038 to +3.402823e+038
Double	signed	8 bytes	-1.797693e308 to +1.797693e308
String	N/A	variable	user defined
Variant			Varies according to type

* In the case of ARRAYS, however, Boolean variables take 1 bit, rounded to the next byte. Therefore, an array of 2 Boolean variables take 1 byte, an array of 3 Boolean variables takes 1 byte…. An array of 8 Boolean variables take 1 bytes, an array of 9 Boolean variables take 2 bytes, etc.

Array / Elements

Click on Array to signify this variable as an array of variables of the specified TYPE. Enter a numeric value into the Elements box to specify the number of elements in the array. The required storage is then ELEMENTS * SIZE.

GIU BASIC arrays are “0”-based. For an array of “n” elements, the elements are:

```
element(0)
element(1)
.
.
element(n-1)
```

Scaling

This section allows a variable to be scaled between actual "raw" I/O values an "engineering units" (EU), which is a User-defined range of values.

To use Scaling, click the Enabled Box ☑ Enabled. With Scaling enabled, the SLOPE and BIAS boxes are available.

NOTE: Variables are scaled when they are assigned (written), but not when they are referenced (read). If ‘X’ is a scaled variable, then

```
X = RAW_TEMP
```

will cause a scaling action, but

```
RAW_TEMP = X
```

will not.

DEFINING (ADDING) VARIABLES: A PRACTICAL EXAMPLE

Here is a more real-life example of adding and defining a variable.

The situation is that a certain thermocouple device is used to read -200 °C to +200 °C. The thermocouple input card generates a 12-bit (0 - 4095) conversion. The card is adjusted such that -200 °C converts to 0 and +200 °C converts to 4095.

From the Main Menu, select `Project/Variables`. In the Variable Dialog Box set the NAME to "`Temp1`", set the TYPE to "`SHORT`", and enable the SCALING feature.

Scaling will be used to convert the "raw" reading of 0 to 4095 to 'engineering units" (EU) in Degrees Celsius. Scaling uses the following formula:

```
EU = (V * S) + B
Where: EU = Engineering Units
        V = Raw Input Value
        S = Slope
        B = Bias (offset)
```

Using the above temperature input as an example, we'll work out this equation to derive suitable values for SLOPE and BIAS to be input into the Variable Dialog Box.

First, declare the range of values acceptable for EU and the Input value:

	EUs	Input Value (V)
EU_Minus	-200	0
EU_Plus	+200	4095

Next, use these figures to determine the SLOPE value:

```
SLOPE = (EU_Plus - EU_Minus) / (V_Plus - V_Minus + 1)
```

BIAS is chosen experimentally to "move" the final result in the proper direction, as indicated below.

To check these values, plug in some expected input values, and see if they provided the expected Engineering Units.

TEST 1: Input: 4095 Expected EU: +200
EU = (SLOPE * INPUT) + BIAS
EU = (.0976 * 4095) + (-200)
EU = 399.672 + (-200)
EU = 199.672

TEST 2: Input: 0 Expected EU: -200
EU = (SLOPE * INPUT) + BIAS
EU = (.0976 * 0) + (-200)
EU = 0 + (-200)
EU = -200

TEST 3: Input: 2048 Expected EU: 0
EU = (SLOPE * INPUT) + BIAS
EU = (.0976 * 2048) + (-200)
EU = 199.884 + (-200)
EU = 0.115

TEST 4: Input: 2047 Expected EU: 0
EU = (SLOPE * INPUT) + BIAS
EU = (.0976 * 2047) + (-200)
EU = 199.7872 + (-200)
EU = -0.2128

We have therefore determined that the proper value for Slope is 0.0976, and the proper value for Bias is -200.

It might appear that there is an error here, in that 0.00 volts isn't recovered. A description of analog-to-digital conversion theory is outside the scope of this manual. Suffice it to say that these "errors" are in the conversion process used, and do not indicate an error in either The Editor software or the GIU. In fact, these are not really "errors" at all!

Once the name, type, and scaling of the variable is determined, it may be "attached" to a physical I/O location, in this case the values coming from the thermocouple input card.

ASSOCIATING VARIABLES TO I/O POINTS

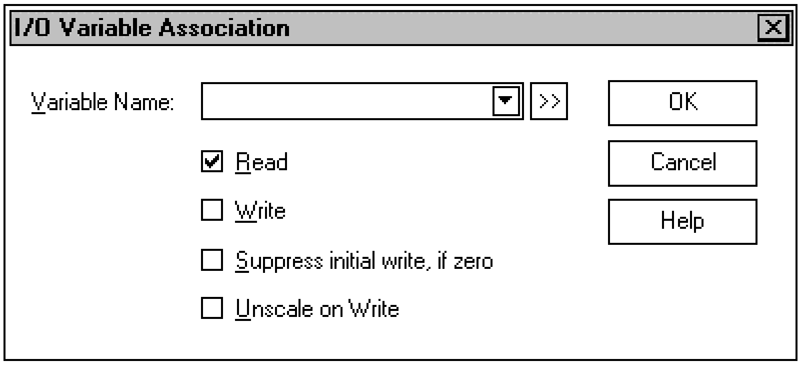
Many variables used values obtained from the I/O devices through an industrial network connected to the GIU. The Editor allows direct "attachment" of I/O points to any program variable of a suitable type (generally INTEGER or BOOLEAN).

The idea to cause a logical "attachment" between a pre-defined variable and a pre-defined I/O point, which exists somewhere on one PLC connected to one of one of [possibly] several industrial networks.

Variable are associated with I/O points through the Device Driver dialogs. Follow these steps:

1) From the Main Menu, Select `Project|Device Drivers.`
2) Double Click on the Device Driver on which the desired I/O point(s) are connected.
3) Click on Setup...
4) Follow the sequence as prescribed for the selected Device Driver to "attach" a variable to an I/O point.

After the above sequence is done, the following dialog should appear:



☑ Read
□ Write
□ Suppress initial write, if zero
□ Unscale on Write

Figure 18 Variable to I/O Association Box

Click on the ▾ button to drop down the list of previously defined variables, then double click the variable to be associated with this I/O point.

TIP: You can define a NEW variable at this time by clicking the >> button.

Read

This variable can be read through the associated Device Driver. This is the default setting. Although it can be turned off (the variable can not be read), this would seem to have little use.

Write

This variable can be written through the associated Device Driver. If you write to the variable from within your program, that value will be passed to the attached hardware through the Device Driver.

> **NOTE:** `Read` and `Write` can be set independent of each other.

Suppress Initial Write, If Zero

All variables are cleared (set to zero) when the GIU is reset, or the RESTART command is received. If the variable is marked as `Write`, the zero value will also be written to the attached hardware.

Under certain circumstances this action may not be desirable. Check ☑ this box to disable the writing of initialization zeros. Writing of this variable through the Device Driver will begin with the *first non-zero value* written to this variable by your program.

If you desire to initialize this variable *to some value other than zero* do so from within the Initialization Script.

If you wish to initialize the hardware to a value of zero, uncheck □ this box.

Unscale On Write

When the variable was first created, you had the option of SCALING the variable. [See *Defining Variables* - *Scaling* on Page 40]. In the case of I/O, however, it is rare that the scaled value will be written to the physical I/O. Usually, the “raw” value needs to be written. You may check ☑ the UNSCALE ON WRITE box to insure that the variable’s “raw” value is written to the I/O.

When you have selected and configured the variable, click OK. The GROUP dialog will be updated with the results. Continue this procedure until you have associated all desired variable and I/O points. "Back out" using OK until you reach the Main Menu.

CREATING PAGES

The PAGE is the basic organizational unit of the GIU. The visible objects are placed on the pages. Certain keystrokes can be assigned to pages. Pages have special scripts that are run only when the page is displayed.

When The Editor is first invoked, you are presented with an initial blank page - Page 0. The size of the page is determined by the setting of the `Project|GIU Model` setting. This page represents a single screen of the Target GIU.

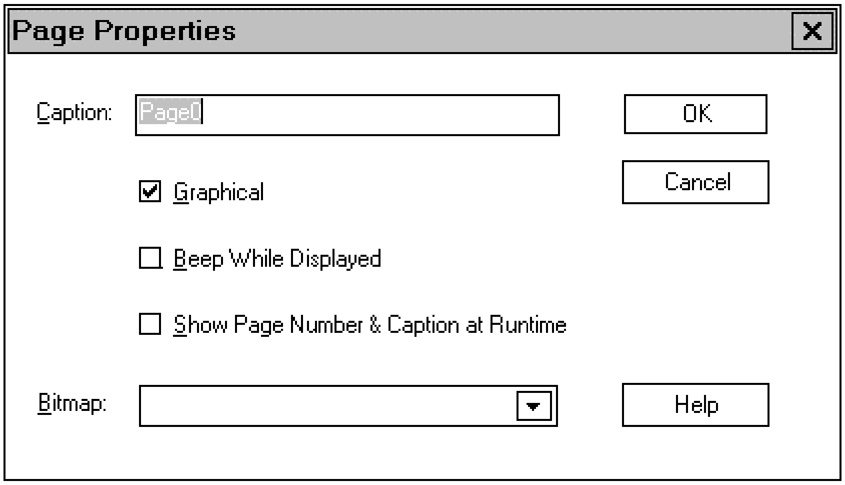
To create a *new* page, select `Window|New Window`. From the resulting Dialog Box, select a suitable empty page

> **NOTE:** You may select new pages in any numeric order. It is not required that all pages be selected or used numerically.

The newly selected page may overlap a previously selected page. Use the `Window|Tile Vertically` or `Window|Tile Horizontally` selections to "clean up" the display.

SETTING PAGE PROPERTIES

One the page is selected, you may set or re-define its properties. From The Editor Main Menu, select the `Page|Properties` option. This will bring up the following dialog:



Page Properties

Caption: Page0

☑ Graphical

□ Beep While Displayed

□ Show Page Number & Caption at Runtime

Bitmap:

Figure 19 Page Properties Dialog Box

Caption

The is the legend that is to appear in the Page's display window Title Bar.

Graphical

If checked☑, this signifies that this Page provides graphically oriented (rather than textual) information. This is the default mode of operation.

Some Pages may require text only output. In this case this box should be unchecked ☐. This will produce a text-only page, similar to an MS-DOS™ text display.

Beep While Displayed

If checked ☑ signifies that the GIU should beep, using its internal beeper, during the time this page is displayed.

Show Page Number & Caption at Runtime

If checked ☑ signifies that the Page Number and Caption are to be displayed on the GIU during the time this page is displayed.

Bitmap

If a Page is defined as Graphical, then the Page may used a user-defined bitmap as background "wallpaper". In this box, enter the TAG NAME of the desired bitmap. [See USING BITMAPS, Page 63.]

Use the pull-down list to see all currently defined bitmaps.

COPYING A PAGE

If an existing page already contains all or most of the objects you need, you may copy from one page to another. This can save considerable time, as opposed to recreating each page, object-by-object.

To copy a complete page from one page to another, follow these steps:

1) See that the DESTINATION page is active by clicking the mouse somewhere within its displayed area. The title Bar of the window is a good place.
2) Select the `Page|Copy from Page...` item.
3) From the displayed list, select the SOURCE Page, the Page that you wish copied *from.* All data will be copied form the SOURCE Page to the DESTINATION Page.

DELETE ALL CONTENTS FROM A PAGE

Deleting All Contents will do just that! All objects, variable, and scripts on the selected Page will be deleted, leaving you with a "clean slate" on which to work. Note, however, that Deleting All Contents can be potentially dangerous, as it *does* delete all contents.

To Delete All Contents of a page:

1) Select the Page by clicking the mouse somewhere within its displayed area. The title Bar of the window is a good place.
2) Select the `Page|Delete All Contents...` item.
3) You will be asked to verify the ensuing delete. Select YES or NO.

DEFINING FUNCTION KEYS

The GIU has sixteen (16) Function Keys available to the Operator. The Programmer may use any or all of these keys.

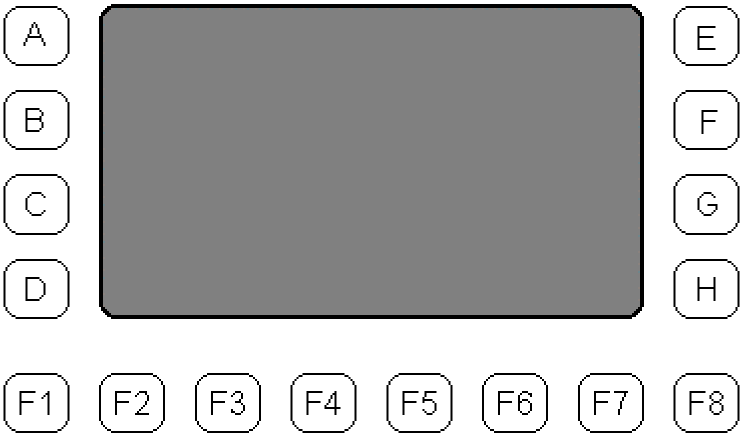


Figure 20 GIU Function Key Placement

NOTE: The *lettered* keys are NOT the alphanumeric entry keys!

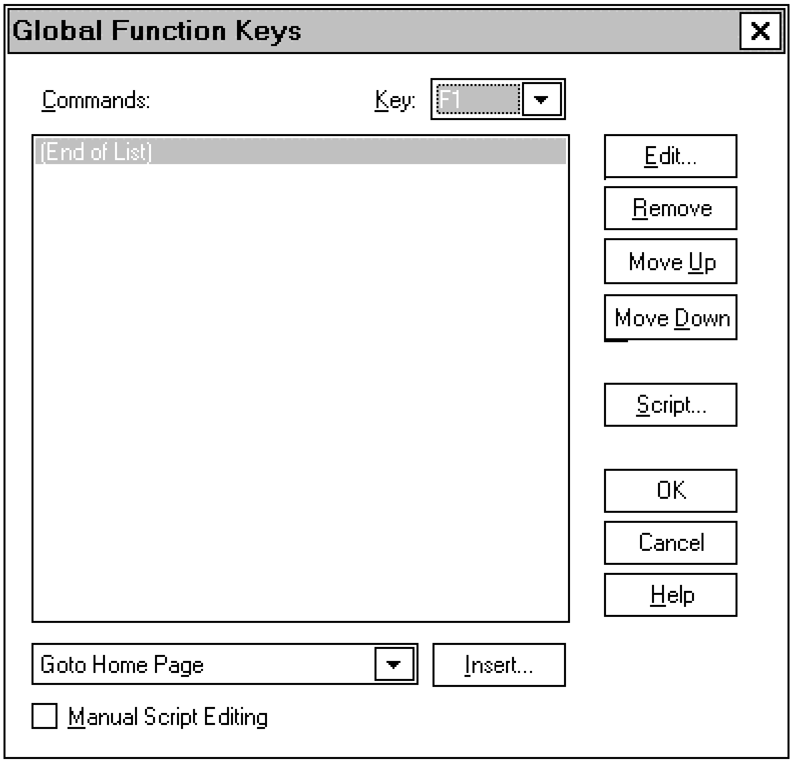
These keys may be made active by assigning a SCRIPT to them. Additionally, any key may be active at either the Project level or at the Page level. A key that is active will perform its script when the key is pressed

NOTE: If any key is assigned at *both* the Project and Page level, the Page level function key will take precedence.

To assign a key, first determine at what level, Project or Page, the key is to function. Select this level from The Editor's Main Menu, `Project` or `Page`.

TIP: A key may be assigned to *both* Page and Project levels.

From the resulting menu, select Function Keys... to bring up the following dialog:



Commands:

(End of List)

Key: F1

Goto Home Page

□ Manual Script Editing

Figure 21 Global Function Key Programming Dialog Box

This dialog indicates Global Function Keys. The Page Function Keys dialog is identical in function.

If the script is empty, the Edit, Remove, Move Up, and Move Down buttons are disabled.

SELECTING A FUNCTION KEY

First, select the Function Key to be edited using the Key box. Use the ▼ button to view the complete list of available keys.

NOTE: The this list may contain more keys than are available on the unit you are using. The extra keys are included for future expansion capabilities.

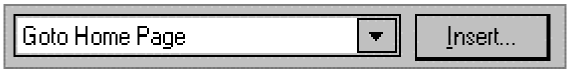
Key names which are display with an asterisk (*) have already been assigned. Selecting one of these keys will allow you to edit the key script.

When the desired key is selected, any available script will be presented in the Commands window. For the present assume that the key selected has no previously written script.

ADDING COMMANDS TO THE KEY'S SCRIPT

When an active Function Key is pressed, its associated script will be performed. A script may be as simple a list of commands to be performed, or may be as complex as a User-written GIU BASIC program.

The easiest way to write a script is to add pre-defined commands. Make sure the Manual Script Editing box is UNCHECKED ☐. At the bottom of the dialog you will find the Command Entry Box:



This box allows you to select pre-defined commands. Use the ▾ to select from the list of available commands:

COMMAND	EDITABLE
`Goto Page`	YES
`Set Variable to Fixed Value`	YES
`Momentary Value Assignment`	YES
`Prompt User for Variable Value`	YES
`Message Box`	YES
`Manual Statement`	YES
`Goto Home Page`	NO
`Previously-Viewed Page`	NO
`Prompt Goto Page`	NO
`Service I/O Table`	NO

Select a pre-defined command from this list by highlighting it, then clicking on the Insert... button. The command will be inserted into the script.

The selected command is always inserted *before* the highlighted line. If multiple commands are inserted, the highlight may be moved to the position where the new command is to be inserted. If a command is to be inserted at the end of the list, move the highlight to the `[End of List]` entry.

NON-EDITABLE COMMANDS

These commands have no properties which can be edited.

Goto Home Page

This command causes the GIU to go to the HOME page. ,In Release 1 of the GIU firmware, the Home Page is always Page 0

Previously Viewed Page

This causes the GIU to go to the previously viewed page.

Prompt Goto Page

This will display a dialog box asking the User to type in a Page Number to go to.

Service I/O Table

This command will cause the I/O table (the “interface” between the program and the Device Driver) to be updated. Any new values written to variables since the last I/O scan will be sent to the I/O Table.

This command is included so that the information in the Device Driver can be updated before its regular time. [See *Operational Order*, Page 11]. This is important, because the time before the next I/O scan can vary, based on the number of Objects remaining to be updated, and the complexity of any scripts involved. The Service I/O Table command causes the I/O Table to be updated now.

Note, however, that the actual physical update of the I/O points is determined by the Device Driver. Even though information is *sent* to the Device Driver immediately, the Device driver might not actually perform the required actions for some time. The Physical I./O will not get updated until the next physical scan from the Device Driver.

EDITING PRE-DEFINED COMMANDS

As indicated above, certain commands may be edited. In fact, they must be edited to produce predictable results.

To edit a pre-defined command, highlight the command line in the list, then click the [Edit...] button.

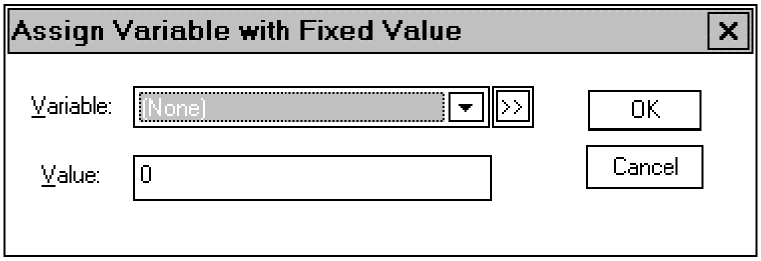
TIP: You may also double-click the desired command

You will be presented with a dialog box in which to enter the required information. This dialog box will vary according to the command selected.

GOTO PAGE

A list of available pages is presented. Select the desired page to go to by highlighting it and clicking [OK], or by double clicking on the desired page.

SET VARIABLE TO FIXED VALUE:



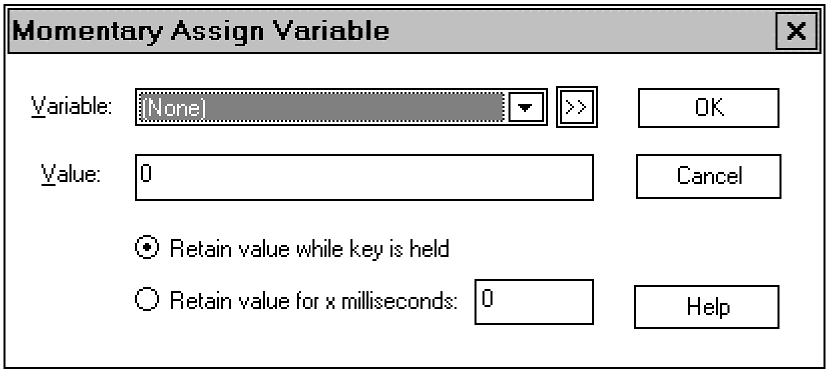
Variable: (None)
Value: 0

Figure 22 Assign Variable a Fixed Value Dialog Box

Select a variable from the `Variable` drop-down list. You may also ADD a new variable to the list using the [>>] button. Set that variable to the desired value using the `Value` box.

MOMENTARY VALUE ASSIGNMENT

This is the same as Set Variable to a Fixed Value [below], except that you also have the option to determine how long the variable is set to the prescribed value.



Momentary Assign Variable

Variable: (None)

Value: 0

● Retain value while key is held

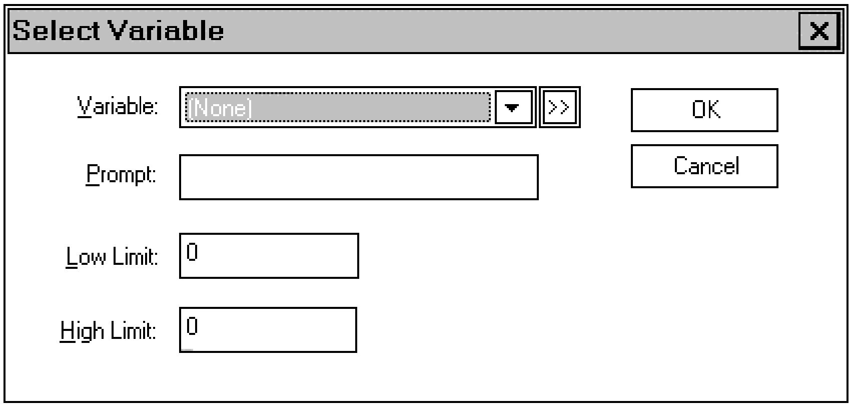
○ Retain value for x milliseconds: 0

Figure 23 Momentary Assign Variable Dialog Box

Select a variable from the Variable drop-down list. You may also ADD a new variable to the list using the >> button. Set that variable to the desired value using the Value box.

Next, determine if the value is to be held only while the key is down, or if the value is to be retained for 'x' milliseconds.

PROMPT USER FOR A VARIABLE VALUE



Select Variable

Variable: (None)

Prompt:

Low Limit: 0

High Limit: 0

Figure 24 Prompt User for Variable Value Dialog Box

Select a variable from the Variable drop-down list. You may also ADD a new variable to the list using the >> button.

In the Prompt box, enter the prompt string to be displayed.

In the Limit boxes, set the High and Low Limits within which your value must remain.

MESSAGE BOX

A dialog is presented asking for the message to be displayed

MANUAL STATEMENT

This entry allows you to input a single-line statement into the script. This can be useful, for example, to increment or decrement a variable by a fixed value, such as "`x = x + 1`".

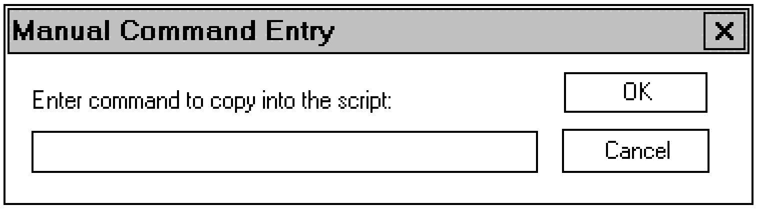


Figure 25 Manual Statement Dialog Box

ADDING MANUAL SCRIPTS

If more control over the Function Key's action is required, you can manually write and edit the script. First, make sure the Manual Script Editing control is CHECKED: ☑ Manual Script Editing

Next, click the Script... button. This will put you into the Manual Editing Mode.

Scripts are written as described elsewhere in this manual.

ADDING OBJECTS

To add an Object to a GIU page, first select the desired page by clicking anywhere within that page's displayed area.

NOTE: There is a limit of 256 Objects per page.

Next, find the Object Toolbar at the bottom of the screen:

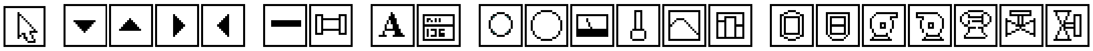


Figure 26 Object Toolbar

Select the desired object from the Toolbar. Move the cursor to the proper position on the desired Page, then click the left mouse button.

NOTE: The cursor will change to a Pointer Finger when a valid placement position is available.

TIP: The cursor indicates the UPPER LEFT HAND CORNER of where the object will be displayed.

Once the object is placed the cursor does not change. You may immediately place another object of the same type.

If you do not wish to place an other object of the same type, select a new object from the Toolbar, or double-click the ↖ button to clear the selection cursor.

SELECTING PREVIOUSLY PLACED OBJECTS

A previously placed object may be re-selected in order to re-position it, delete it, or to changes it's properties. The most common way to re-select an object is to single-click on the object.

DE-SELECTING A PREVIOUSLY PLACED OBJECT

Once an object is selected, you may de-selecting it by selecting another object. You can de-select all objects by clicking in the screen display area that does not contain an object.

DELETING A SINGLE OBJECT

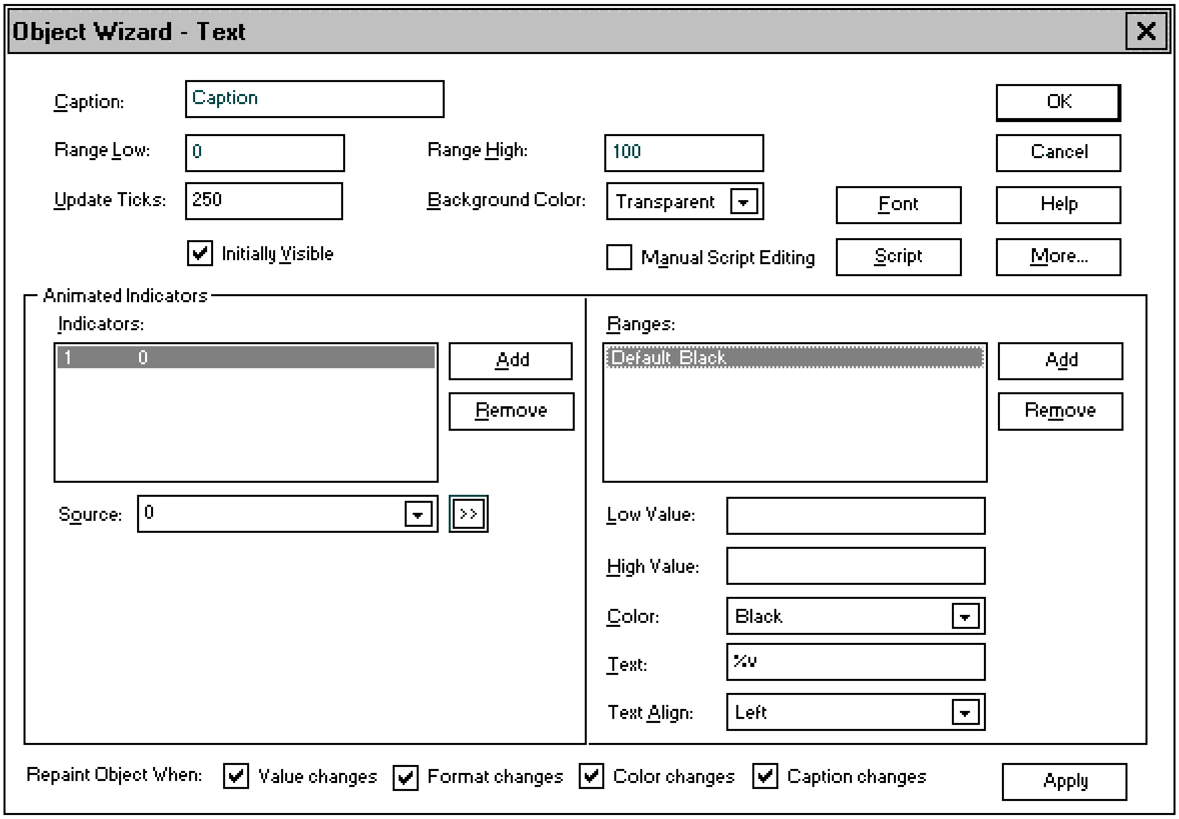
First, select the object as described above. Next, right-click on the selected object, then click the Delete item in the sub-menu.

TIP: You may also delete a single object by selecting the object, then pressing the Delete key on the computer keyboard.

DEFINING THE OBJECT

Once the object has been placed, you will need to define its properties. The available properties vary according to the object selected, but the procedure to get to them is the same for all objects.

1) Right-click on the desired object,
2) From the resulting pop-up menu, select `Object Wizard`



Object Wizard - Text

Caption: Caption

Range Low: 0

Range High: 100

Update Ticks: 250

Background Color: Transparent

☑ Initially Visible

☐ Manual Script Editing

Animated Indicators

Indicators: 1 0

Source: 0

Ranges: Default Black

Low Value:

High Value:

Color: Black

Text: %v

Text Align: Left

Repaint Object When: ☑ Value changes ☑ Format changes ☑ Color changes ☑ Caption changes

Figure 27 Object Wizard Main Dialog Box

TIP: You can edit an object's properties at any time, not just when the object is first added.

TIP: If the information in the dialog box does not seem to change, click on the Apply button to force it.

NOTE: The properties enabled in the Object Wizard dialog will vary depending on the object selected.

NOTE: You can not edit parameters of multiple objects. You must select a *single* object in which to define parameters.

Not all objects make use of all properties. In particular, STATIC objects like ARROWS have no user-programmable properties.

The Object Wizard is divided into three (3) main areas: Properties, Indicators, and Ranges.

SETTING OBJECT PROPERTIES

The properties, once defined, remain fixed, changeable only through the Object Wizard.

Caption

If an object (such as the Value Box) support a Caption, you may enter it here. The Caption is used to “label” the object with some text to be meaningful to the user, like “`TEMP`”, “`GALLONS`”, “`PERCENT`”, etc.

Range Low

This value determines the value that is considered the "minimum" setting for the object. At this value a Tank will appear empty, a Meter will be full left., etc.

NOTE: This does not place any limitations on the values assigned to the object.

Range High

This value determines the value that is considered the "maximum" setting for the object. At this value a Tank will appear full, a Meter will be full right, etc.

NOTE: This does not place any limitations on the values assigned to the object.

Update Ticks

This is how often, in milliseconds, this object's script will be executed. A setting of "`250`" indicates 250 milliseconds, or one-quarter second. By setting this value, objects can become self-timing.

Background Color

This is the color of any background that appears around this object. Normally, this is set to `TRANSPARENT`, allowing any background bitmap to show through.

Initially Visible

If this box is checked ☑ then the object will be visible as soon as the Page is run. If this box is unchecked □ then the object will be invisible when the page is first run.

In either case, the object script can set the object’s `Me.Visible` property to an appropriate value (TRUE or FALSE) at any time to determine if the object is to be displayed. It might be useful to have the object script reference Global (project-wide) variables, and set the `Me.Visible` property accordingly.

Manual Script Editing

If this box is checked ☑ then you may edit the object's script manually. However, if this box is *changed* from CHECKED ☑ to UNCHECKED □ the manual script will be lost.

Script

Clicking this button will take you to the script associated with this object.

Font

Clicking the FONT button (if available) will allow you to choose a font and style used in the *display* portion of the object.

> **NOTE:** The FONT setting does *not* effect the Caption Text.

More

Clicking the MORE button will take you to a variety of context-sensitive sub-dialogs that allow you to set additional features of the object that are otherwise unique to the object, for instance the increment markings placed on the Bargraph Object.

SETTING OBJECT INDICATORS

"Indicators" are the parameters that determine how an object will be displayed. At the least these will determine the object's Foreground Color. Depending on the object's capabilities, and indicator may also determine the TEXT displayed.

Normally, there is only one indicators available per object. However, objects like the Trend Box or Bargraph can support multiple indicators, each indicators controlling it's own colors.

Select (highlight) one of the available indicators in order to modify its operations.

ADD

If the object can support multiple indicators, the ADD button will be enabled. Click on this button to add another indicator.

> **NOTE:** Not all objects can support multiple indicators. In this case the ADD button will be disabled.

REMOVE

If the object has multiple indicators available, select (highlight) one, the click REMOVE to remove this indicator.

> **NOTE:** Not all objects can support multiple indicators. In this case the REMOVE button will be disabled.

SOURCE

For an indicator to be useful it must be “attached” to a variable. This is done through the SOURCE box.

Select (highlight) one of the available indicators, then select an existing variable from the drop-down list appearing in the SOURCE box.

Alternately, you may create a new variable by clicking the >> button. This will take you to the Add Variable dialog as described in *Defining (Adding) Variables*, Page 38

SETTING INDICATOR RANGES

Once an Indicators has been chosen, you may define it’s RANGES.

Any indicator may have more than one *range*. [It must have at least one, the *default* range.] A *range* tells the object how to respond when the values in the indicator fall within the define range.

For example, suppose that an indicator (variable) reads a process temperatures in the range of 0°C to 100°C. Anything outside of this range is "default". The normal operating temperature of the process is 25°C to 75°C. Below 25°C is too cold for the process to operate, and above 75°C is too warm, and is potentially dangerous.

Therefore, we have one *indicator* with FOUR (4) *ranges*:

0°C to 24°C	- Set the object's color to YELLOW
35°C to 75°C	- Set the object's color to GREEN
76°C to 100°C	- Set the object's color to RED
All Others	- Set the object's color to BLACK.

In objects that support it, the ranges can also define the TEXT displayed.

Select (highlight) one of the available ranges in order to edit it.

NOTE: If this is a new or previously unedited indicator then only the "Default" range will be available. In this case the Low and High ranges are disabled.

Add

Use this button to add a new indicator.

Remove

Use this button to remove the selected indicator.

NOTE: While it is possible to remove the DEFAULT indicator, you should think twice about the necessity of doing so.

Low Value

This entry set the low value acceptable for this range.

> **NOTE:** In the case of Boolean variables, TRUE is One (1) and FALSE is Zero (0). In the case of a Boolean variable, both the High Range and Low Range would be the same value, (-1) or (0).

High Value

This entry set the high value acceptable for this range.

> **NOTE:** In the case of Boolean variables, TRUE is One (1) and FALSE is Zero (0). In the case of a Boolean variable, both the High Range and Low Range would be the same value, (1) or (0).

Color

This entry sets the color to be displayed if the value of the attached variable falls within this range.

Format

If the selected object has text capabilities, this entry allows you to define the format of the text displayed when the attached variable falls within the defined range.

There are several text formatting codes that may be used in this entry. See *BASIC Object Properties*, Page 89. The default for most text is "`%v`", which prints the value of the attached variable.

Note that other text can be included herein. For example, "`The value is: %v`" is a valid entry for the Text field. If the value of the attached variable is 70, then the displayed text would read "`The value is: 70`".

In fact, the object's value does not have to be printed at all! Numeric values can be "translated" directly into text. For example, variable values could be ranged into "`LOW`", "`OK`", and "`HIGH`", with the default range reading "`ERROR`".

> **NOTE:** Do not use double quotes (") in the Text box. To do so will cause a compile error. If certain words or phrases need to be emphasized, use single quotes (') instead.

Text Align

This entry determines the positioning of the displayed text within the Objects display area. Select a setting from the drop-down box. Possible values are `Left`, `Right`, and `Center`.

REPAINT OBJECT WHEN

These switches allow you to determine if and when an object gets repainted (updated). An object should be updated ONLY when the important information changes. Proper selection and de-selection of these choice can effect the throughput of the associated Page, since the re-painting process can use a significant amount of processor time

Value Changes

If this switch is checked ☑ the object will be updated any time the VALUE changes

Format Changes

If this switch is checked ☑ the object will be updated any time the Format String changes

Color Changes

If this switch is checked ☑ the object will be updated any time the Color changes

Caption Changes

If this switch is checked ☑ the object will be updated any time the Caption String changes

APPLY

Use this button to force an immediate update to The Editor's internal database. The dialog box is immediately updated.

THE "DEFAULT" RANGE

The Default Range is always available to an indicator. As expected from its name, this is the range used when all other defined ranges have been checked and discarded. The Default High and Low Values are set indirectly, being defined as those value *not otherwise defined* in any Programmer-defined ranges. The features of the selected object determine the availability of other properties (color, text, etc.).

Under certain circumstances, it is possible to program several different ranges such that *all* possible values for a variable are covered. In such a case, the Default Range is will never be displayed. Once such circumstance is Boolean Variables, where it is easy to program two ranges, TRUE (1) and FALSE (0). Since the Boolean variable can be *only* TRUE or FALSE, the Default Range will never be seen.

Alternately, you could program only the TRUE range (`High Value = Low Value = 1`) and let the Default range handle the FALSE value.

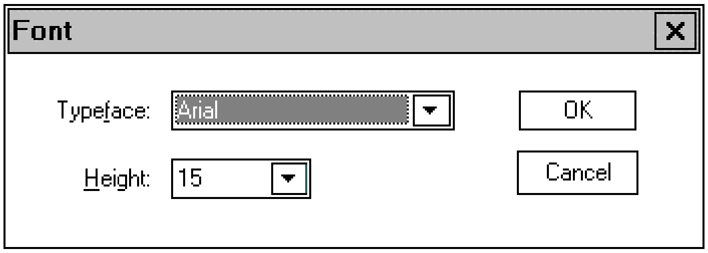
SELECTING FONTS

Objects, which display textual information, either strings (like the TEXT object) or numbers (like the VALUE BOX object), may use a programmer-defined font.

Select the object and it's wizard by right clicking on the desired object, then selecting `Object Wizard` from the pop-up menu. Click on the [Font...] button.

> **NOTE:** If the object does not have text properties, [Font...] will be disabled (grayed).

This will bring up the Fonts Dialog:



Typeface: Arial

Height: 15

Figure 28 Font Selection Dialog Box

Typeface
Select the desired typeface from the drop-down list.

Height
Select the desired height from the drop-down box

SELECTING MULTIPLE OBJECTS

There are two ways to select multiple items:

A) "Lasso" them:
   1) Move the cursor to an area *near but not on* the selected object(s).
   2) Press and hold the left mouse button.
   3) While still pressing the left mouse button, move the cursor diagonally towards the desired object(s). A dotted outline box (the "lasso") will be drawn.
   4) Make sure that the desired object(s) are *completely* within the "lasso".
   5) Release the mouse button. All objects entirely within the "lasso" will be selected.

B) Individually select them
   1) Press *and hold* the [Ctrl] key.
   2) click on the desired objects.
   3) release the [Ctrl] key

DELETING MULTIPLE OBJECTS

1) Select the desired object(s), as above.
2) Press the Delete key on the computer keyboard.

MOVING OBJECTS

Once an object or group of objects has been selected, move the mouse cursor to within the outline of any of the selected object(s). Click *and hold* the left mouse button. While still holding the left mouse button, move the object(s) to the desired position.

You may also move the select object(s) using the PC's ← → ↑ ↓ keys to move the selected object(s) one pixel at a time.

> **TIP:** Use the mouse to quickly move the object(s) into the general position, then use the arrow keys to "fine tune" the position.

ALIGNING OBJECTS

Two or more objects may be aligned according to their top, bottom, left or right edges. After selecting two or more objects as above, select `Object|Align Objects` From the Main Menu. A sub-menu will appear, asking for `Right`, `Left`, `Top`, or `Bottom` alignment. Select the desired alignment

> **TIP:** You may also perform an alignment by select the proper tool from the Toolbar: ⇤, ⇥, ⤒, or ⤓.

> **NOTE:** The actual alignment is an average of the original positions of the selected objects.

MAKE ALL OBJECTS THE SAME SIZE

Two or more objects may be forced to the same size, either vertically, horizontally, or both. After selecting two or more objects as above, select `Object|Make Same Size` from the Main Menu. From the subsequent sub-menu, select `Horizontal`, `Vertical`, or `Both`.

> **TIP:** Objects may be made the same size by selecting the proper tool from the Toolbar: ↔, ↕, or ✥.

> **NOTE:** The resulting sizes are an average of the original sizes of the selected objects.

DEFINING I/O POINTS

Defining I/O points requires three steps:

1) Define a variable for use by this I/O point.
2) Locate the physical I/O point with reference to the Device Driver, Station Number, Register Set, etc., according to the parameters of the device.
3) Attach the previously defined variable to this I/O point.

Defining a variable has already been described in the section *DEFINING (ADDING) VARIABLES* on Page 38.

Locating the physical I/O points is through the `Project|Device Driver` menu. This process is described beginning on Page 35. More specific information is given in the Appendices and Addendums to this manual concerning specific device drivers.

The exact sequence for attaching the variable to the I/O point varies, depending on the device. In all case, however, at some point during the Device Driver Setup there exists a sequence that will allow you to attach a variable to an I/O point. Refer to the sections about setting up the individual Device Drivers for more complete information.

USING BITMAPS

BITMAPS are pixel-for-pixel "photographs" of some subject. Bitmaps may be used as a "wallpaper" background on graphical GIU screens. Typical bitmaps would include a customer's logo, or some other fixed graphic representation. Visual Objects may be placed "on top of" the bitmap, if desired.

NOTE: The current version supports only 320x240, 16-color, single plane "`.BMP`" files. Format is bottom-to-top, no compression. This format is compatible with Windows PBRUSH files.

TIP: Set an objects background color property to TRANSPARENT to let the bitmapped wallpaper show through.

TAG THE BITMAP

First, the bitmap must be defined and "tagged".
Select the `Project|Bitmaps` dialog from the Main Menu. Click Add to get to:

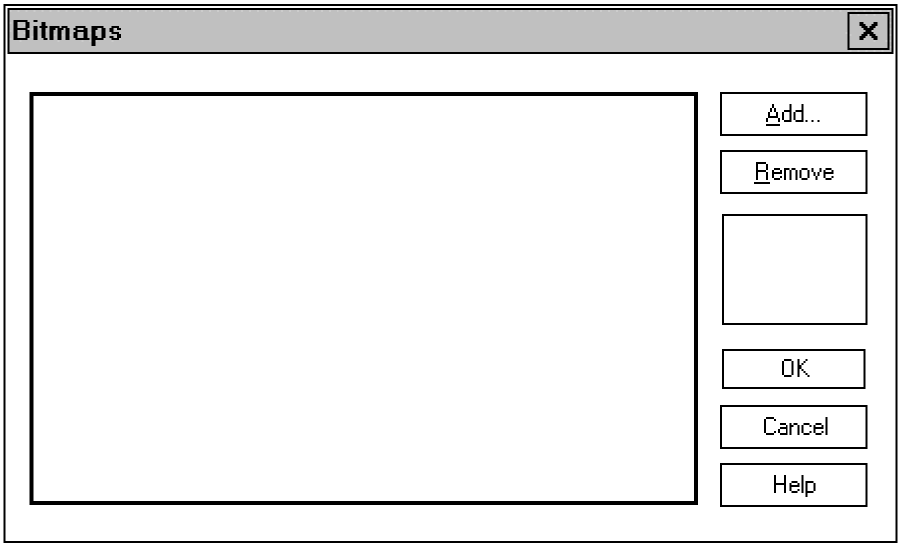


Figure 29 Bitmap Dialog Box

You may ADD a new bit map using the Add button. Clicking on this will bring you to:

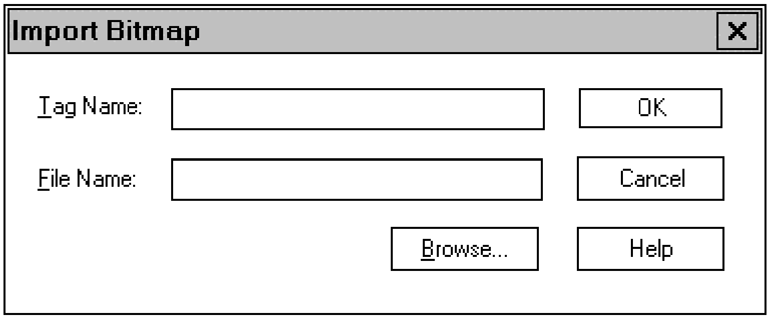


Figure 30 Bitmap Tag Name Dialog Box

Tag Name
This is a project-wide (global) name assigned to this particular bit map for purposes of reference

File Name
This is the filename or path name of the bitmap (`.BMP`) file to be used. Type in the path or name, or use the `Browse` option, below.

Browse
This will allow you to "browse" through the Windows file structure to locate the desired `.BMP` file. When you select the file, the path name will be placed into the `File Name` box.

Complete this dialog, then hit OK . If the File Name is not correct, you will be issued a warning and asked to try again.

REMOVING TAGGED BITMAPS

You may remove an existing "tag" by clicking the Remove button in the first dialog.

NOTE: If a Bitmap is not removed with the Remove button, the Bitmap will be downloaded to the GIU, *even though it is not specifically referenced*. Be sure that you Remove unused Bitmaps!

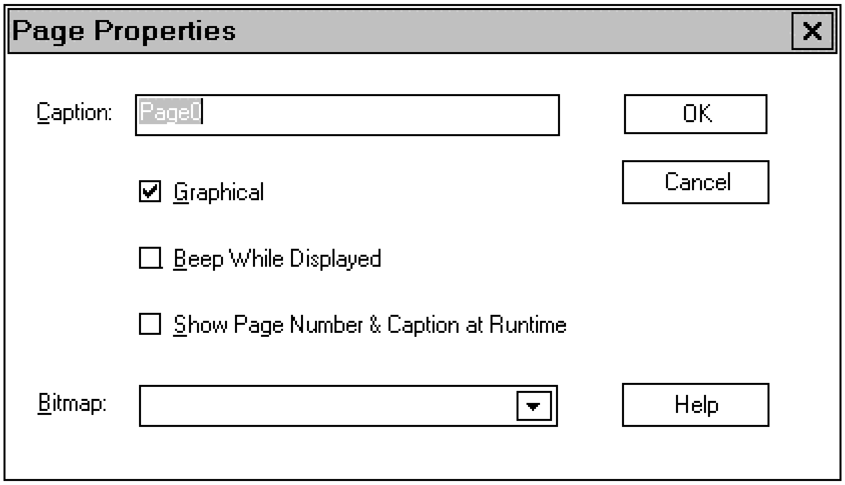
ASSOCIATING THE BITMAP TAG TO THE SCREEN

Once a "tag" is available, it may be used as "wallpaper" on a GIU Screen.

Select the desired GIU screen by clicking anywhere within its display area. If the desired screen is not presently displayed in The Editor, use the `Window|New` option to select it.

Next, under the `Page|Properties` menu, check ☑ the Graphical property for the selected page.

While still in the `Page|Properties` menu, enter the desired TAG (as defined above) into the Bitmap Box. Click OK to accept the entry and leave.



Caption: Page0

☑ Graphical

□ Beep While Displayed

□ Show Page Number & Caption at Runtime

Bitmap:

Figure 31 Page Properties Dialog Box

DE-ASSOCIATING THE BITMAP TAG

If the Bitmap is no longer required for the Page, clear the `Bitmap` box using the computer's BACKSPACE key.

If the Bitmap is not being used by *any* screen, remove it through the Main Menu's `Project|Bitmaps` dialog.

> **NOTE:** If a Bitmap is not removed with the Remove button, the Bitmap will be downloaded to the GIU, *even though it is not specifically referenced*. Be sure that you Remove unused Bitmaps!

WRITING SCRIPTS

SCRIPTS are sections of code that you will need to write tell the GIU how to behave in specific circumstances. Although you will need to write scripts, this job is made easier, almost to the point of being automatic, by using WIZARDS. To unlock the power of the GIU you will want to understand script programming and it's underlying language.

AVAILABLE SCRIPTS

The following scripts may need to be written or modified.

THE INITIAL SCRIPT

This script is run once, when the GIU is first started, or immediately after reset. This script should perform any actions necessary to initialize the GIU system

THE CONTROL SCRIPT

This script is run continuously, as long as power is applied to the GIU. This script is thus an "endless loop".

From this script, the programmer determines the order of operation of any other scripts, pages, or function keys.

THE ALARM SCRIPT

This script is a logical grouping of code that is used to "trap" alarm conditions. You should set up a system of project-wide (global) variables to use as "flags". These flags are set by other scripts (page scripts, object scripts, etc.), and can be set or cleared to tell the Alarm Script that an alarm has occurred.

THE PAGE SCRIPTS

These scripts are called whenever the associated PAGE is being displayed. From this script, the programmer controls the visible objects and the actions of any available Function Keys.

THE OBJECT SCRIPTS

These scripts are attached to the visible objects, and are thus called only when the Page containing the Object is being displayed.

NOTE: There is a limit of 256 Objects per page.

Under default circumstances, the Object Scripts will be called in the order in which the objects are placed on the screen. Keep this in mind, as the interaction between Objects and Page Variables can get quite complex.

TIP: You can see the order of the Objects by selecting the desired Page, then selecting `Page|Object Order` from the Main Menu.

Note, too, that the default calling of the Object scripts is automatic. If the Object is placed on the Page, and the Page is visible, the Object Script will be called.

THE FUNCTION KEY SCRIPTS

There are sixteen (16) Function Keys available to the programmer. The associated script is run whenever the key is pressed.

The Function Keys can be used on a program-wide (global) basis, or on a page-wide (local) basis. However, the same key can be programmed to be active at *both* the global and local level, and the potential for confusion results. Keep this rule in mind:

`Local Function Keys supersede Global Function Keys.`

The following example illustrates how the Function Key precedence works:

1) At the PROJECT level you assign Function Key F1 to perform FUNCTIONA.
2) On Page 2 you assign Function Key F1 to perform FUNCTIONB.
3) The program starts on Page 1
4) The program now displays Page 1. Press F1 on the GIU. FUNCTION A is performed.
5) The program now displays Page 3. Press F1 on the GIU. FUNCTIONA is performed.
6) The program now displays Page 2. Press F1 on the GIU. FUNCTIONB is performed.

ADDING OR EDITING A SCRIPT

The Initialization, Control, Alarm, and Page Scripts are created manually using the GIU BASIC language, Page 84.

The Function Key Scripts for both Page and Global modes may be edited manually using GIU BASIC or automatically using a wizard.

The Object Scripts are normally created or edited using the Object Wizards, although manual editing is possible. Object Scripts are written in GIU BASIC.

To create or edit a script, first select the script to be edited. From the Main Menu select the `Project` sub-menu, then select the desired script:

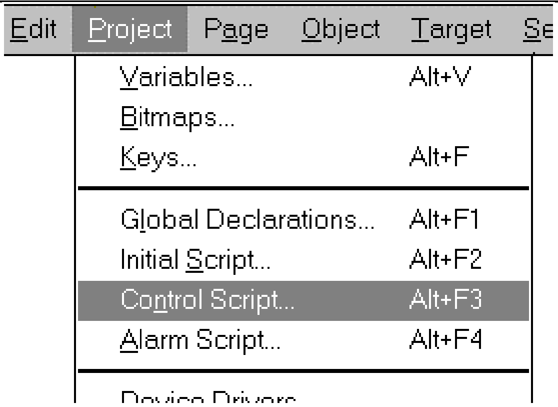


Figure 32 Selecting a Script

To select a Function key Script, first determine if the key is to be Global or Local. If the Function Key is to be Global, select it from the `Project|Keys` menu. If the Function Key is to be Local (per-Page) Select it from the `Page|Keys` menu.

In either case, you will be presented with the Function Key Dialog Box as described in the section *Defining Function Keys*, beginning on Page 46. Edit the Function Key Script is described therein.

Object Scripts are usually edited using the Object Wizard. The Object Wizard provides a quick and accurate method of writing GIU BASIC code. By making a few simple choices in a dialog box, a full script is created. This process is detailed in the section *Defining the Object's Parameters,* Page 54.

To edit an Object Script using the Object Wizard, right-click on the desired object, and select the `Object Wizard` from the pop-up menu.

To manually edit an Object Script, right-click on the desired object, and select the `Object Wizard` from the pop-up menu. In the wizard dialog box, select the `Manual Script Edit` option,

☑ Manual Script Editing

SCRIPT TEXT EDITING

If you choose to write the script in the Manual Mode (with the Initialization, Control, or Alarm Script you have no choice) you will always use the same Script Editing Dialog Box.

When writing scripts you have the following text editing options available to you:

`SELECT TEXT` - Use the cursor to select (highlight) any text to be edited. “Drag” the mouse cursor, or place the cursor then use `<shift><arrow>` keystrokes to highlight the text.

`<CTRL><C>` -- This will COPY the selected text. The text is placed onto the Windows Clipboard. The selected text remains in place.

`<CTRL><X>` -- This will CUT the selected text. The text is placed onto the Windows Clipboard, and it will be removed from the screen.

`<CTRL><V>` -- This will PASTE the selected text. The text is taken from the Windows Clipboard and placed on the screen at the current cursor position.

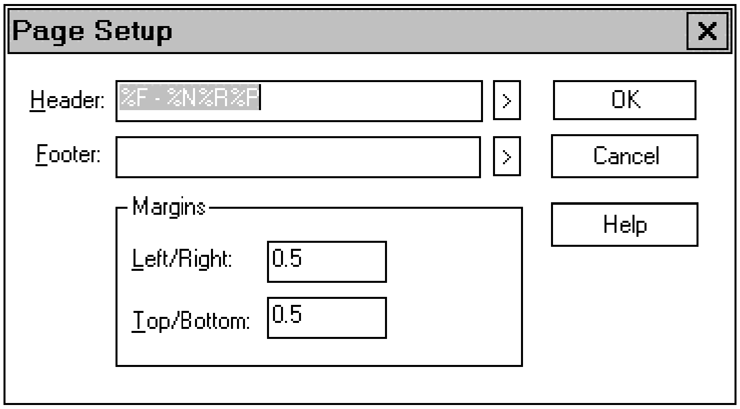
Note that using these commands it *is* possible to copy or move all or part of a script from one page to another.

PRINTING

Once your program is written you will probably want to keep a hard copy printout of the program for archival purposes. Although a backup diskette is a more compact choice, a hard copy would allow you to re-create the program in case of hardware failure.

PAGE SETUP

First set up the Printed Page Parameters. Select the `File|Page Setup` option:



Header: %F - %N%R%P
Footer:
Left/Right: 0.5
Top/Bottom: 0.5

Figure 33 Print Page Setup Dialog

HEADER

This is the string that is to appear as the HEADER on the printed page. You may insert any text you wish. Special Format Codes are available, see below.

FOOTER

This is the string that is to appear as the FOOTER on the printed page. You may insert any text you wish. Special Format Codes are available, see below.

If, when setting the Header or Footer, if you click the ≫ button, you will be presented with a list of formatting options:

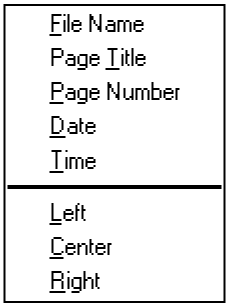


Figure 34 Printer Formatting Codes

Selecting any of these options will insert the associated format code into the Header or Footer String.

File Name

Inserts the `%F` code. When printing, the current file name is printed.

Page Title
Inserts the `%N` code. When printing, the current page title is printed.

Page Number
Inserts the `%P` code. When printing, the current page number is printed.

Date
Inserts the `%D` code. When printing, the current date is printed.

Time
Inserts the `%T` code. When printing, the current time is printed.

Left
Inserts the `%L` code. This forces the header or footer to be left justified.

Center
Inserts the `%C` code. This causes the header or footer to be centered.

Right
Inserts the `%R` code. This causes the header or footer to be right justified.

MARGINS
Use these entries to set the page margins

PRINT

Once the page format has been set, you may print. Select the `File|Print` Menu Item. From the resulting dialog, select the items you wish printed.

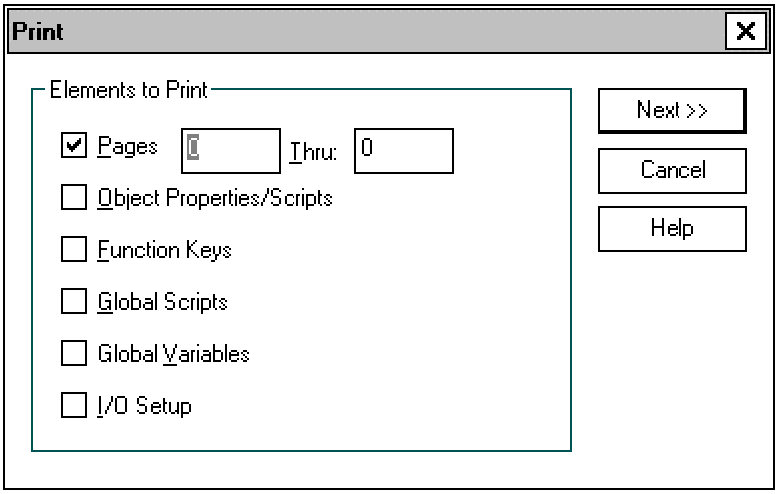


Figure 35 Print Selection Dialog

PAGES
Selecting this option causes the visible graphics page layouts to be printed. You also have the option to print selected pages.

OBJECT PROPERTIES / SCRIPTS

This option prints any properties and scripts assigned to the visible objects

FUNCTION KEYS

This option prints the Function Key script, both Global and Local (page).

GLOBAL SCRIPTS

This option prints the global scripts - Initialization, Control, and Alarm

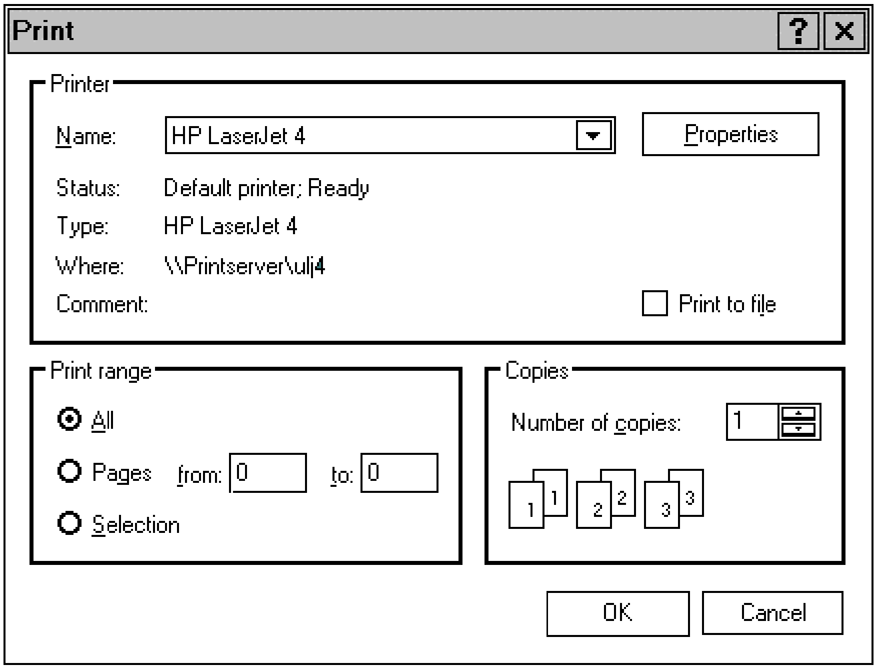
GLOBAL VARIABLES

This option prints a table of any globally assigned variables.

I/O SETUP

This prints a cross-reference table of I/O stations/groups versus variables. In other words, which physical I/O points are assigned to which variables, if any.

After you have made your selection, click the Next >> button. This will bring up a Windows-standard Print Control Dialog:



Name: HP LaserJet 4
Status: Default printer; Ready
Type: HP LaserJet 4
Where: \\Printserver\ulj4
Comment:
□ Print to file

● All
○ Pages from: 0 to: 0
○ Selection

Number of copies: 1

Figure 36 Printer Selection Dialog

The appearance and functions of this dialog box will vary, depending on what kind and how many printers you have installed on you system.

NOTE: The above dialog is for the Hewlett-Packard LaserJet 4. The appearance of this dialog will vary according to your system and any attached printer.

COMMUNICATING WITH THE GIU

Once the program is written, you must "download" it to the GIU. This requires that the GIU be "defined" and "attached". Also, the program should be checked for grammatical errors or omissions, and saved.

MENU SWITCHES

The Target menu has three (3) "switches" that are set to your needs. The switches do not actually perform an "action", but instead set a "switch" in memory to be used by other function on the menu.

AUTO-RESTART AFTER WRITE

If this item is checked ☑ the GIU will be re-started after a program is written. Otherwise, you must re-start the GIU manually.

AUTO-CONNECT TO LAST TARGET

If this item is checked ☑ The Editor will re-connect to the last target that was connected when The Editor was last exited. Since most people will be working with one unit, this can be quite convenient.

ATTACH SOURCE CODE TO WRITES

If this item is checked ☑ The Editor will also send Source Code to the GIU with every program write. This is required if you intend to use the `Read Program` option, but it increases the size of the program accordingly. Unless you intend to use `Read Program` you should leave this item unchecked ☐.

SAVING THE PROGRAM

Once the program has been written, it should be saved. From the Main Menu, select `File|Save` or `File|Save As...` .

TIP: You may also click the 💾 Toolbar Button.

CHECKING THE PROGRAM FOR ERRORS

After saving the file, it should be checked for errors using the built in checker.

From the Main Menu, select `Project|Check for Errors`. If any errors are present, they will be displayed in an Error Box. Any errors should be corrected, and the program saved, before the program is downloaded to the GIU.

TIP: You may also click the ✓ Toolbar Button.

GIU TAG NAMES

Like I/O points, The Editor may reference physical GIU's through "tags". A "tag" is a simple name used to reference a more complex set of data, in this case a table of communications parameters necessary to "talk to" a physical GIU. The physical devices is then referenced by using the 'Tag Name".

To create a GIU Tag, select `Target|GIU Tag Names` from the Main Menu.

> **NOTE:** If the `GIU Tag Names` is disabled (grayed) make sure that the `Target|Connect` item reads "`CONNECT`".

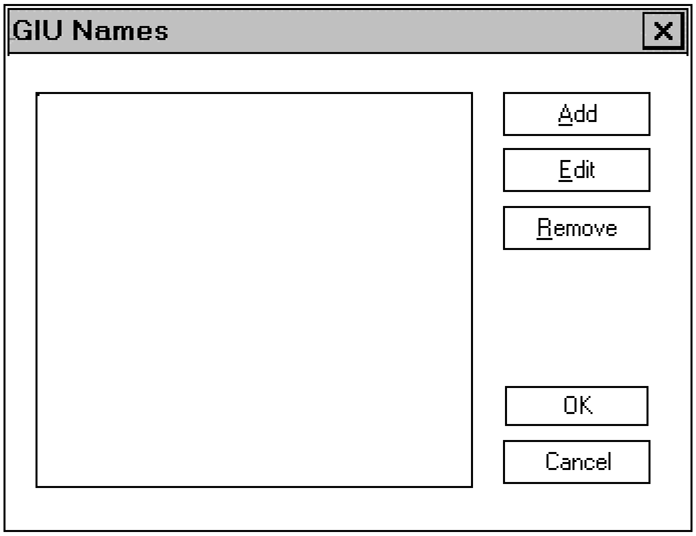
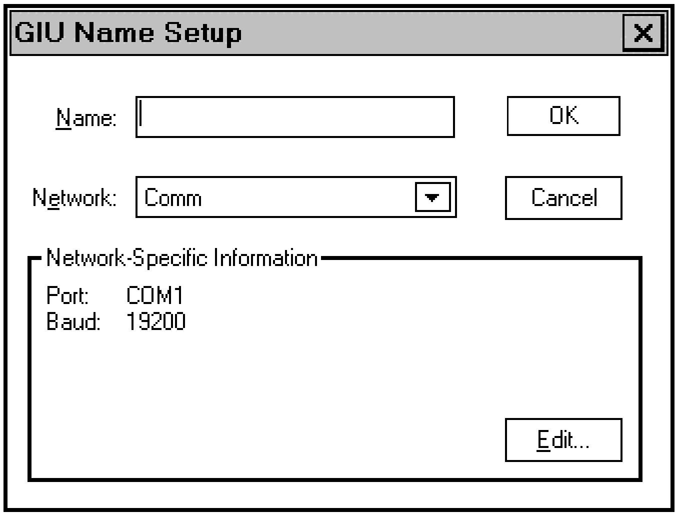


Figure 37 GIU Names Definition Dialog

> **TIP:** If NO Tag Names are present, then EDIT and REMOVE will be disabled (grayed).

Add

Use this function to ADD a NEW GIU Tag Name.



Name:

Network: Comm

Network-Specific Information

Port: COM1
Baud: 19200

Figure 38 GIU Name Setup Dialog

Name

Enter the desired Tag Name for this GIU here

Network

Enter the desired GIU Communications Network here. COMM refers to the HECOM driver.

> **NOTE:** Currently, there is only one GIU Communications Network, HECOM

Edit Network-Specific Information

EDIT allows you to edit the current or default COMM setting. Only PORT and BAUD RATE are programmable for HECOM

Edit

EDIT allows you to edit an existing GIU Tag Name. First, select (highlight) the desired Tag Name, then click Edit...

Remove

REMOVE allows you to REMOVE an existing GIU Tag Name. First, select (highlight) the desired Tag Name, then click Remove

CONNECTING TO A GIU

Once a Tag Name is defined, you may CONNECT to the GIU using the `Target|Connect` item from the Main Menu.

TIP: You may also connect to a GIU by using the Toolbar item.

NOTE: You must have defined at least one GIU Tag Name.

When you select this item you will be presented with a list of available Tag Names to choose from. Select (highlight) the one you wish to use, then click OK

TIP: You may also double-click on the desired Tag Name.

When you have finished selecting a Tag Name to be connected to, the `Target|Connect` item will change to `DISCONNECT`.

NOTE: You may connect to *only one* GIU at a time.

No errors are generated during the CONNECT sequence. Errors will, however, show up when you attempt any "serious" communications.

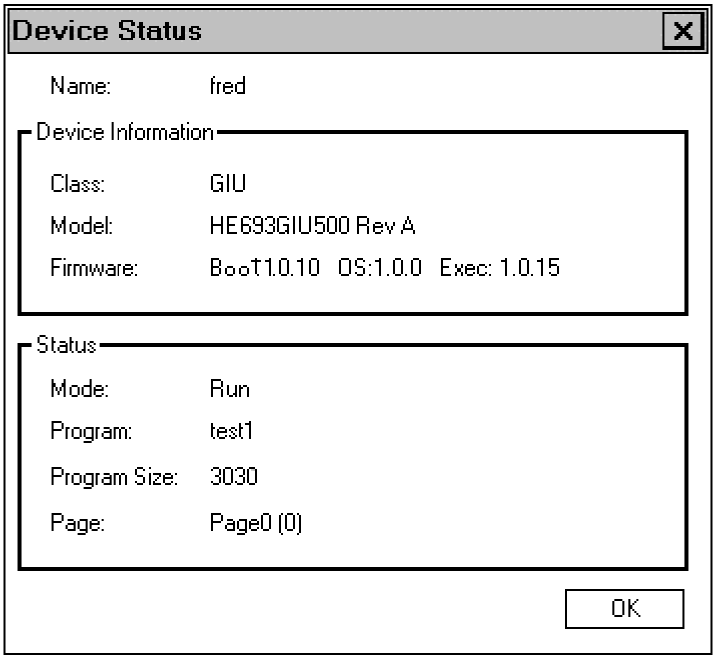
CHECKING GIU STATUS

Use the `Target|Status` item form the Main Menu to check an attached GIU's Status.

TIP: You may also check Status by using the ? Toolbar item.

NOTE: If a GIU Tag Names has not been previously connected, you will be asked to do so now.

The following dialog will be displayed.



Device Status

Name: fred

Device Information

Class: GIU
Model: HE693GIU500 Rev A
Firmware: BooT1.0.10 OS:1.0.0 Exec: 1.0.15

Status

Mode: Run
Program: test1
Program Size: 3030
Page: Page0 (0)

Figure 39 GIU Status Dialog

NOTE: If The Editor can not make reliable connections with the GIU, a TIMEOUT error will be displayed.

WRITE A PROGRAM TO THE GIU

One you have written a program using The Editor, you must write it to the GIU. Select `Target|Write Program` from the Main Menu.

> **TIP:** You may also Write a program to the GIU using the ⤓ Toolbar item, or the Ctrl F2 hotkey sequence.

Barring communications errors, writing (downloading) is automatic. You will be presented with a progress indicator box as the file downloads. If the AUTO-RESTART AFTER WRITE switch is checked ☑ the GIU will automatically begin execution of this program. Otherwise, you will be required to start the GIU manually.

READ A PROGRAM FROM THE GIU

A GIU program can be read (uploaded) from an attached GIU. This offers the advantage that you *always* have access to the *running* version of the program, by reading it directly from the GIU on which it is running.

Select `Target|Read Program` from the Main Menu. The connection and upload is automatic.

> **TIP:** You may also Read a program from the GIU using the ⤒ Toolbar item, or the Ctrl F1 hotkey sequence.

> **NOTE:** If The Editor can not make reliable connections with the GIU, a TIMEOUT error will be displayed.

VERIFYING A PROGRAM

Use this function to verify that the program installed in the GIU is the same as the one loaded into The Editor's memory.

Select `Target|Verify Program` from the Main Menu. Again, the action is automatic if the proper GIU Tag Name has been "connected".

> **NOTE:** If The Editor can not make reliable connections with the GIU, a TIMEOUT error will be displayed.

DELETING A PROGRAM

This function allows you to delete a program from the GIU's memory. Select Target|Delete Program from the Main Menu.

NOTE: If The Editor can not make reliable connections with the GIU, a TIMEOUT error will be displayed.

SUSPENDING A PROGRAM

This function allows you to temporarily stop (suspend) a program running in the GIU. When you issue a RESUME command, the program will begin exactly where it left off during a previous SUSPEND.

RESUMING A PROGRAM

If a GIU program has been SUSPENDED, it may be resumed by issuing this command. Select Target|Suspend Program from the Main Menu. Programs that have been TERMINATED, though, may not be resumed.

RESTARTING A PROGRAM

Use this command to start a program that has been terminated. Select Target|Resume Program from the Main Menu.

TIP: You may also Restart a program in the GIU using the Toolbar item, or the Ctrl F11 hotkey sequence.

This command is also used to start a program that has just finished downloading to the GIU. You may issue this command manually, though the Main Menu, or automatically by checking the Target|Auto-Restart After Write switch (see above)

TERMINATING A PROGRAM

Use this command to stop a program running in a GIU. Select Target|Terminate Program from the Main Menu.

TIP: You may also Terminate a program in the GIU using the Toolbar item, or the Ctrl F12 hotkey sequence.

If a program is terminated, it may only be RESTARTED, *not* RESUMED.

WHAT TO DO IF A COMMUNICATIONS ERROR IS PRESENT

If The Editor can not make reliable communications with the GIU, a TIMEOUT error will result. Should this happen, try the following:

1) Re-try the command. In many cases this will cure the problem.
2) Issue a TERMINATE command, then re-try your original command.
3) Manually terminate the program by *simultaneously* pressing the 🖳↵ keys on the GIU, then pressing F4. Now, re-try your command.

If these steps fail, check the following:

1) Is the cable connected?
2) Is the cable in good shape (i.e.: not damaged) ?
3) Is the GIU turned on?
4) Do the communications parameters in the GIU Name Setup dialog box match what is programmed into the GIU itself?
5) Does the Comm Port in the GIU Name Setup dialog box match the physical Comm Port used by the host processor to connect to the GIU?
6) Is the GIU operating properly, i.e.: Not locked up by some errant program or "endless loop"?

THE TOOLBARS

Several single-button functions are available in an optional TOOLBAR. As well, selecting an object is handled through an Object Toolbar

To enable the TOOLBAR, select `Window|Toolbar` from the main menu. Make sure that this item is ✓ Toolbar CHECKED. The Object Toolbar is always enabled.

The following items are available on the TOOLBAR:

FILE HANDLING TOOLS

NEW -- Opens a new Project file.

OPEN -- Opens an existing file.

SAVE -- Save the current Project. If the Project is 1) New and 2) Not yet saved, this will become the Save As command.

COPY -- Copies any selected items onto the Clipboard.

CUT -- Cuts (deletes) any selected items.

PASTE -- Pastes any items from the clipboard into the current screen

PRINT -- Prints a hard copy of the User's program

PROJECT TOOLS

CHECK FOR ERRORS – Checks the program in The Editor for any compiler errors.

VIEW ERROR BOX – Brings up the current Compiler Errors box.

GOTO PAGE – This command is used by the individual Page Windows to go to a page selected from a list of pages.

NEXT PAGE -- This command is used by the individual Page Windows to go to the next page in their Most Recently Used list.

PREVIOUS PAGE – This command is used by the individual Page Windows to go to the previous page in their Most Recently Used list.

OBJECT HANDLING TOOLS

ALIGN LEFT -- Aligns two or more objects to the left sides

ALIGN RIGHT -- Aligns two or more object to the right sides.

ALIGN TOP -- Aligns two or more objects to their top sides.

ALIGN BOTTOM -- Aligns two or more objects to the bottom ends

SAME SIZE HORIZONTAL -- Makes two or more objects the same size horizontally

SAME SIZE VERTICAL -- Makes two or more objects the same size vertically.

SAME SIZE BOTH -- Makes two or more objects the same size both vertically and horizontally.

TARGET HANDLING TOOLS

CONNECT TO TARGET -- This allows you to "connect" to a specific Target GIU.

DISCONNECT FROM TARGET – Any “connection” to a Target GIU is released.

WRITE PROGRAM TO TARGET -- Your program is written to the "connected" target.

READ PROGRAM -- Any program present in the "connected" GIU is read into The Editor, providing that the program was first saved with the `Attach Source Code to Writes` option.

TERMINATE PROGRAM -- Any program running in the "connected" GIU is terminated. All interim information (variables, etc.) is lost.

RESTART PROGRAM -- Any program present in the "connected" GIU is restarted, from the beginning. All variable are reinitialized to either their system-defined default values, or to their User-defined value as determined by the Initialization Script.

CHECK TARGET STATUS -- This queries the "connected" GIU and returns it's operational status.

OBJECT SELECTION TOOLS

At the bottom of the screen is the Object Selection Toolbar. Use these tools to select and place objects on the screen.

SELECTION TOOL -- Changes the cursor "mode" from Placement Tool to Selection Tool.

ARROWS -- Select on of four different Arrows

LINES -- Select Line Objects, vertical or horizontal

PIPES -- Select Pipe Objects, vertical or horizontal

TEXT -- Select the Text Object

VALUE BOX - Selects the Value Box Object

STATUS LIGHTS - Select the Small or Large Status Light.

METER -- Select the Meter Object

THERMOMETER - Select the Thermometer object

TREND BOX – Select the Trend Box Object.

BAR GRAPHS -- Select the Bar Graph Object

TANK -- Select the Tank Object

HOPPER -- Select the Hopper Object

MOTOR -- Select the Motor Object

VALVES -- Select either vertical or horizontal Valve Objects

GIU BASIC

The GIU contains its own BASIC executor for executing Scripts. The Editor is used to write or create scripts in GIU BASIC. Scripts are sections of code that are written, directly or indirectly, by the user. These scripts are then called at appropriate time by the GIU to perform the tasks defined by the programmer.

There are several different levels of scripts:

Initialization - This script is called once, when the program first begins to run after a reset or restart

Control - This is the main "loop". This script is called continuously until the program is terminated or power is removed

Alarm - This script is used to "trap" alarm conditions, as determined by other scripts.

Page - This script is called whenever the associated Page is being displayed

Object - This script is called on an object-by-object basis, according to the placement of the objects on the screen.

Function Key - This script is called when a Function Key is pressed. Function Key scripts are available from both the Global and Page levels

Object Scripts may be written indirectly (automatically) using WIZARDS. By using a wizard, writing a script is no more difficult that filling in a small table of values. Also, the code produced by a wizard is bug free, at least so far as the correct information is entered into the wizard. You may wish to first write an Object Script using the wizard, then add additional features manually.

Other Scripts, especially the important Initialization, Control, and Alarm scripts, are written manually by declaring variable and issuing statements.

PREDEFINED VALUES

These VALUES may be used as keywords within GIU BASIC scripts

Boolean Values

TRUE	1
FALSE	0

Colors

ColorBlack ColorDkBlue ColorDkGreen ColorDkCyan
ColorDkRed ColorDkMagenta ColorBrown ColorDkGray
ColorLtGray ColorBlue Colorgreen ColorCyan
ColorRed ColorMagenta ColorYellow ColorWhite
ColorTransparent

Alignment

AlignNone AlignLeft AlignTop AlignRight
AlignBottom AlignCenter

Data Types

These values are returned by the `Type()` and `VariantType()` functions

TypeBoolean TypeInt8 TypeUInt8 TypeByte
TypeInteger TypeInt16 TypeUInt16 TypeInt32
TypeUInt32 TypeDword TypeFloat TypeLongFloat
TypeDouble TypeString TypeVariant

MATH OPERATORS

Precedence	highest ────────		lowest
	ARITHMETIC	**COMPARISON**	**LOGICAL**
Highest	Exponentiation(^)	Equality(=)	Unary NOT
	Unary Negation(-)	Inequality(<>)	AND
	Multiplication and Division(*,/)	Less Than (<)	OR
	Integer Division(\)	greater Than(>)	XOR
	Modulo Arithmetic (MOD)	Less Than or Equal To(<=)	
Lowest	Addition and Subtraction(+,-)	Great Than or Equal to (>=)	

The String Concatenation Operator (&), while not an Arithmetic Operator, lies between Arithmetic and Comparison operators. When + is used with string operators, it becomes the concatenation operator.

When an expression contains operators from more than one category, Arithmetic Operators have highest precedence, Logical Operators have lowest precedence.

EX: `IF(3 + 5 AND 255) <> 7` is a TRUE statement

Given two operators of equal precedence, with no intervening operators of higher or lower precedence, they are operated on left-to-right.

Operators within parenthesis () are operated on before operators outside the parenthesis. Parenthesis may be used at any time to control the order or precedence.

```
EX:  3 * 7 - 5 = 16          * is higher than -
     3 * ( 7 - 5 ) =  6      () forces - higher than *
```

All comparison Operators yield TRUE or FALSE. TRUE is (1), FALSE is (0).

```
EX:  A = 5     given
     B = 6     given
     A < B     is TRUE
     B >= A    is TRUE
     B = A     is FALSE
     A >= B    is FALSE
```

Logical Operators work in a BITWISE fashion, but *not* in a TRUE/FALSE fashion.

```
EX: A = 8          [Binary 1000]
    B = 15         [Binary 1111]
    A AND B = 8
    NOT A = 7
    A XOR B = 7
```

CONSTANTS

Constants are numeric or string values that are not otherwise variables.

Numeric values may be expressed in decimal, floating point, scientific notation, hexadecimal, or octal format.

`10`	decimal constant
`1.2`	Floating Point constant
`-32`	Negated Decimal Constant
`3e10`	Scientific notation floating point
`&hff`	Hexadecimal constant (always unsigned)
`&77`	Octal Constant (always unsigned)

String Constants are placed between double quotes:

```
"This is a string constant"
```

VARIABLES

There are eleven (11) Data Types available:

TYPE	SIGN	SIZE	RANGE
Boolean	N/A	1 byte	0 or 1
Char	signed	1 byte	-128 to +127
Byte	unsigned	1 byte	0 to 255
Integer	signed	2 bytes	-32768 to +32767
Word	unsigned	2 bytes	0 to 65535
Long	signed	4 bytes	-2147483648 to +2147483647
Dword	unsigned	4 bytes	0 to 4294967295
Float	signed	4 bytes	-3.402823e+038 to +3.402823e+038
Double	signed	8 bytes	-1.797693e308 to +1.797693e308
String	N/A	variable	user defined
Variant			see below

* In the case of ARRAYS, however, Boolean variables take 1 bit, rounded to the next byte. Therefore, an array of 2 Boolean variables take 1 byte, an array of 3 Boolean variables takes 1 byte…. An array of 8 Boolean variables take 1 bytes, an array of 9 Boolean variables take 2 bytes, etc.

VARIABLE DECLARATION

Variables must be declared before they are referenced. Variables may be declared in several ways:

1) Using The Editor's `Project|Variables` option.
2) Declare the variable in a SCRIPT.
3) Attach a variable to an Object's indicator (which is eventually the same as 1 above).
4) Attach a variable to an I/O point through a Device Driver (which is eventually the same as 1 above).

Adding a variable using method 1 above is covered in the section entitled *Defining (Adding) Variables* on Page 38

Variable names may be up to 32 characters in length. Acceptable characters are 'A'-'Z', 'a'-'z','0'-'9', '_', and '$'. The '$' character may be used *only* as the last character of a string variable name.

Variables are declared within a script by preceding the variable name with a TYPE:

```
Integer counter
String MyString$
Float temperature
Integer A$              [BAD!! '$' allowed only for string variables]
```

Multiple variable of one type may be declared in a single statement.

```
Integer i,j
String MyName,YourName
```

Only single dimension arrays are allowed.

```
Integer x(10)           An array of 10 integers
String addr(32)         An array of 32 strings
```

Arrays are “0”-based. That is, for an array of ‘n’ elements, the elements are:

```
element(0)
element(1)
element(2)
.
.
.
element(n-1)
```

VARIABLE SCOPE

"SCOPE" refers to the visibility of a particular variable in any given script. A variable is said to be "visible" or "in scope" within a script if the script can access the variable.

All variables by default have "Private Temporary" scope; that is, the variable is created whenever the script in which it is declared is executed, and it is destroyed when this script exits. All temporary variables are set to zero (0) if type numeric, or empty if type string *every time* their script begins to execute. Also, the variable is visible *only* within the script that declared it.

A variable's scope is defined by its attributes. There are four (4) possible attributes:

STATIC - STATIC Attribute specifies that the variable is *not* temporary. STATIC variables are initialized only when the *program* begins to execute.

PUBLIC - PUBLIC Attribute indicates that the variable is visible in *all* scripts in the program. Only STATIC variables may be PUBLIC, therefore STATIC must be used with PUBLIC, else a compiler error will result.

PRIVATE - PRIVATE Attribute means that the variable is visible only within the script in which it is declared. All variables are by default PRIVATE, so the PRIVATE Attribute is not required. However, it may be useful for documentation purposes.

SHARED - SHARED Attribute specifies that this variable is visible to all Object on the same PAGE. Use of the SHARED Attribute is allowed only in Page Scripts.

Variable Attributes are declared at the time the variable is declared:

`Integer counter`	Variable is by default temporary private
`Char Static C`	C is created when program starts, but is available only in the script that created it.
`Char Static Public C`	C is created when the program starts, and is available to all scripts

THE VARIANT DATA TYPE

This data type is special to the GIU. A VARIANT data type can, at different times, hold a numeric value, a string value, a NULL, or an ERROR.

NULL means that the Type Variant variable holds no data. ERROR means that the Type Variant variable currently holds a numeric value, and that value is an numeric error code.

Variant variables are initialized to NULL.

The type returned by the VARIANT is context sensitive. For example, if a VARIANT is set to numeric value `123,`it will return a numeric value of `123`, or a string value of "`123`" (without the quotes). On the other hand, if the Variant is set to a string value of "`123`", it will return "`123`" in string contexts and `123` in numeric contexts.

If the variant is set to a string such as "`hello`", then it will return "`hello`" in a string context, but it will return 0 (zero) in a numeric context, because "hello" does not have a numeric equivalent.

NULL variants return `0` (zero) in numeric contexts and "" (an empty string) in string contexts.

Sometimes it is necessary to determine what type of data the variant is holding. For this the `VariantType()` function is provided. This will return a Data Type. See the section *Data Types* above.

NOTE: The `Type()` function, when used on a Variant variable, will return `TypeVariant`, which is not what might have been desired.

OBJECT PROPERTIES

Object properties are accessed using the "`Me.`" specifier. The "`Me.`" specifier is used in anticipation of future enhancements allowing one object to access the properties of another. Also, using the "`Me.`" specifier makes sense from a documentation standpoint.

NOTE: Object properties can be accessed only from within their associated object script.

Not all properties are used in every object. If a property is accessed, but that property is not implemented in the object, the action is still carried out with no error indication and no visible change to the object. For example TEXT objects do not have a CAPTION property. However, if a TEXT object script sets the value of the CAPTION property to "`HELLO`", then reads the property, "`HELLO`" will be returned.

Some properties are Read Only. Any attempt to WRITE these properties will result in a compiler error.

Available Object Properties

Caption

Function: Set the caption
Data Type: String
Syntax: `Me.Caption = "Caption"`

RangeLow

Function: Set the Low Range
Data Type: Numeric
Syntax: `Me.RangeLow = 6`

RangeHigh

Function: Set the High Range
Data Type: Numeric
Syntax: `Me.RangeHigh = 22`

UpdateTicks

Function: Set the Update Interval
Data Type: Numeric
Syntax: `Me.UpdateTicks = 250`
The Update Interval determines how often the script for this object is executed. The interval is expressed in MILLISECONDS.
EX: 250 = 250 mS = 1/4 second

BackgroundColor

Function: Set the Background Color
Data Type: Numeric
Syntax: `Me.BackgroundColor = ColorGray`
Color is typically one of the pre-defined color value (see above)

Value

Function: Set the Object's Value
Data Type: Numeric
Syntax: `Me.Value(1) = 10`
Sets the value for numeric based objects

Color

Function: Set the Foreground Color
Data Type: Numeric
Syntax: `Me.Color(1) = ColorRed`
Color is typically one of the pre-defined color value (see above)

Format

Function: Set the Object's Text and/or Display Formatting
Data Type: String
Syntax: `Me.TextValue = "%v Gallons"`
Sets the displayed text and or display formatting value for the object.

The string may contain *displayable* text or *formatting codes*. A typical format code takes the following format:

%{{-}*width*}{.*precision*}code.

NOTE: Format codes ***are*** case sensitive.

width is the minimum width of the conversion. If the number of converted characters (including any decimal point) exceeds *width* then all of the characters will be printed. If the number of converted characters is less than *width*, and *width* is positive, then the display is prefixed with spaces. If the number of converted characters is less than *width*, and *width* is negative, then the display is suffixed with spaces.

If the first digit of *width* is '0', and no '-' is specified, the '0' characters are prefixed.

precision determines the precision of any floating point conversion; that is, the number of digits to the right of the decimal point. *precision* is ignored for any other type of conversion. The default precision is 3.

Format Code	**Result**
d	Signed Integer of Object value (32 bits)
u	Unsigned Integer of Object's value (32 bits)
f	Float of Object's value. There is always a "`.0`", even if no fractional part exists. EX: Value = `12`, print = "`12.0`"

v	Float of Object's value. Same as "`%f`", except that if no fractional part exists the result appears as Integer.
	EX: Value = `12`, print = "`12`";
	Value = `12.1`, print = "`12.1`"

e	Float of Object's value in scientific notation. EX: "`1.23e-10`"
c	The Object's CAPTION
x	Hexadecimal of Object's Value. EX Value = `12`, print = "`000C`"
o	Octal of Object's value
D	Prints the date in mm/dd/yy format
T	Prints the current time in hh:mm:ss format (24 hour)
%	Outputs a literal '`%`'

Note: Format codes *are* case sensitive.

If %T or %D is used, Me.Value must be "attached" to some value *that is changing*. The Object's display is updated when Me.Value changes. If the Time and Date are the only information displayed, the Object can be made "self-timing" by inserting the following code into the Object:

```
Integer static x
.
.
.
x = x + 1
Me.Value(1) = x
```

Alignment

Function: Set the Text Alignment
Data Type: Numeric
Syntax: Me.Alignment = AlignLeft
Typically, this will be one of the Text Alignment Values defined above.

Indicators

Function: Set the number of indicators
Data Type: Numeric
Syntax: Me.Indicators = 3
See *Setting Object Indicators*, Page 56

Visible

Function: Set the VISIBLE status
Data Type: Boolean
Syntax: Me.Visible = TRUE
If the value of VISIBLE is FALSE the object is not displayed. For all other values the Object is displayed.

Pause

Function: If TRUE then the object's execution is PAUSED.
Data Type: Boolean
Syntax: Me.Paused = TRUE
This property is used *only* on the Trend Box Object.

Clear

Function: If TRUE then the object's display is cleared.
Data Type: Boolean
Syntax: Me.Clear = TRUE
This property is used *only* on the Trend Box Object.

Initialized

Function: Determine if the object has been initialized (READ ONLY)
Data Type: Boolean
Syntax: number = Me.Initialized

Extended

Function: Get Object's Extension Bits
Data Type: Numeric
Syntax: number = Me.Extended

SYSTEM EVENTS

Underlying the operation of the GIU is a cooperative multi-tasking kernel. By issuing GIU BASIC commands you indirectly initiate, schedule, and control System Events. In operation, the System Events are placed into a queue. During certain portions of the GIU's operation any available System Events are taken from the queue and executed. Typical System Events include updating the display screen, reading the keyboard, handling serial information to and from The Editor, handling I/O to and from the Device Drivers, and updating the watchdog timer..

You, the Programmer, have little control over the System Events. In fact, they are mentioned here only because under certain circumstances you may inadvertently effect the execution of System Events. For example, the following code in a Page Script will cause the system to appear to be locked up for short periods of time:

```
dword time
time = tickcount()
while tickcount() < time + 10000
wend
```

Example 1

This will cause the GIU to *appear* dead. Any objects on this page will not be displayed for 10 seconds after the program is started. The serial port attached to The Editor will not respond, nor will the keyboard, unless you hold the key(s) down for at least 10 seconds.

Worse, the following code will cause the GIU to automatically reset!

```
dword time
time = tickcount()
while tickcount() < time + 200000
wend
```

Example 2

These two programs "fail" because the timeout loops block the System Events, which get dispatched just before a Page is executed. Normally, the Page being displayed is executed several times per second, but the above two examples cause a significant delay in this process, thus "blocking" the System Events. In Example 2, the delay is long enough that the internal watchdog timer times out and causes the GIU to reset.

To prevents this, add the `DoEvents()` function inside the loop:

```
dword time
time = tickcount()
while tickcount() < time + 10000
     doevents()
wend
```

Example 3

Any time your GIU appears inexplicably "dead" or non-functional for long periods of time, or resets itself for no apparent reason, look for instances of similar loops or other code which might be blocking System Event operation, and insert the `DoEvents()` function to see if this will alleviate the problem.

AVAILABLE STATEMENTS

PROGRAM FLOW STATEMENTS

IF / THEN / ELSEIF / ELSE / ENDIF

Single Line Form

```
IF condition-true THEN do something {ELSE do something else}
```

Block Form

```
IF condition-true THEN                [NOTE: Carriage Return REQUIRED here]
        do something
ELSEIF condition-true THEN            [NOTE: Carriage Return REQUIRED here]
        do something
ELSE
        do default
ENDIF
```

WHILE/WEND

```
WHILE condition-true
        do something
WEND
```

DO WHILE/UNTIL

```
DO {WHILE/UNTIL condition-true}       [NOTE: While or Until is optional]
        do something
LOOP
```

EXIT

Causes a premature exit from a DO LOOP or WHILE WEND.

SELECT CASE

```
SELECT CASE expression
        CASE number
                do something
        CASE number
                do something
        CASE ELSE                     [NOTE:  Case Else is optional]
                do something
END SELECT
```

The CASES may also be ranged:

```
SELECT CASE expression
        CASE number  TO number
                do something
        CASE number  TO number
                do something
END SELECT
```

RETURN

Causes the current script to immediately terminate. This is in effect an "exit" for the script.

SLEEP n

Pauses for n milliseconds

MATH FUNCTIONS

ABS(*number*)

Returns the Absolute Value of a number

INT(*number*)

Returns the Integer portion of a number

ATN(*number*)

returns the Arctangent of a number.
Number must be expressed in RADIANS, where

```
RADIANS =   DEGREES * 3.14159 / 180
```

COS(*number*)

Returns the Cosine of a number
Number must be expressed in RADIANS, where

```
RADIANS =   DEGREES * 3.14159 / 180
```

SIN(*number*)

Returns the SIN of a number
Number must be expressed in RADIANS, where

```
RADIANS =   DEGREES * 3.14159 / 180
```

TAN(number)

Returns the Tangent of a number
Number must be expressed in RADIANS, where

```
RADIANS =   DEGREES * 3.14159 / 180
```

EXP(*number*)

Returns the Exponent of a number

LOG(*number*)

Returns the natural logarithm of a number

SQR(*number*)

Return the Square Root of a number

SNG(*number*)

Returns the Sign of a number:

If *number* = 0 then SNG(*number)* *= 0*
If *number* = <0 then SNG(*number)* *= -1*
If *number* = >0 then SNG(*number)* *= 1*

USER INTERFACE STATEMENTS AND FUNCTIONS

SHOWPAGE n

Selects the specified Page to be visible.

By forcing a New Page, you also force a new Page Script, and scripts for the Page's Objects and Function keys.

If used in an Initialization, Control, or Alarm Script, the `ShowPage` is "queued" until the next Control Loop. The "queue" for `ShowPage` is only one layer deep. That is, only the most recent `ShowPage` will be honored. Therefore, if the following code is included in a Control Script:

```
ShowPage 1
.
.
ShowPage 3
.
.
ShowPage 5
```

Then the Page actually displayed will be Five (5).

If used in a Page, Object, or Function Key Script, `ShowPage` causes an *immediate* exit from the script. If the following code is included in a Page Script:

```
if x = 3 then ShowPage 4
x = 6
ShowPage 5
```

when X is equal to 3 the X will remain at 3 and the `ShowPage 5` instruction will NOT get executed. Otherwise, X will be set to 6 and `ShowPage 5` *WILL* get executed.

MESSAGEBOX

`MESSAGEBOX(`*string*`)`

Displays a Dialog Box to the User. In this Dialog Box is *string*. The User must press ↵ on the GIU keyboard to continue.

INPUTSTRING$

`StringVariable = INPUTSTRING$(`*prompt,caption,initial-value*`)`
prompt, *caption*, and *initial-value* are strings or string variables.

INPUTNUMBER

Number = InputNumber(*prompt,caption,initial-value,*
low-range, high-range)

prompt and *caption* are string variables.
Initial-value, *low-range*, and *high-range* are numeric values.

When this command is executed, a dialog box is opened on the page. The User is asked to input a numeric value. When the User presses ↵ the numeric value is returned to the program.

prompt is a string to be displayed to the User, offering some short instructions about the data to be entered. For example: "Enter desired setpoint, 1 to 100"
caption is the "title" of the dialog box.
initial value is the value that will be assigned if the User does not otherwise enter a value**.**
Low range is the minimum value that the calling program will accept.
High range is the maximum value that the calling program will accept.
The User's input must be between *low range* and *high range*, inclusive.

BEEP

Sound the on-board beeper for a short time

PRINT

Output text in TTY (text screen) mode. There are several different "forms" available:

`Print "Item "`	Prints the text "Item " on the screen, then prints a line feed.
`Print "Item ";`	Prints the text "Item " on the screen, but does NOT issue a line feed.
`Print A,B,C`	Prints the value of three variables on the screen, separated by tabs, then issues a line feed.
`Print A;B;C`	Prints the value of three variables. The variables are not separated. Then issues a line feed.

NOTE: printing of numeric variables always includes a leading space.

SET CURSOR

Set Cursor *column,row*

column and *row* are numeric variables. Both values must be equal to or greater than zero. *Row* and *column* are referenced from the upper left corner of the screen (0,0).
Note the *required* SPACE between "Set" and "Cursor"

NOTE: If the values for row or column exceed the capabilities of the GIU an error will occur

SET TEXT n

Determines whether any text output using the PRINT statement has a transparent or opaque background. If the setting is TRANSPARENT, then any previously painted objects or bitmaps will "show through" the printed text. If the setting is OPAQUE, then the background area of the text will be the same color as the background color of the page.

```
Set Text transparent
```

LPRINT

Output to a Line Printer

Implementation of this command is platform dependent. For those platforms that DO NOT support this feature, this command does nothing.

```
Lprint "Hello, ";
Lprint "World!"
```

A line feed will be automatically issued unless the PRINT statement is followed by
a semi-colon (;)

CLS

Clear the screen.

The current page must be a "Text Mode" page

STRING ORIENTED FUNCTIONS

CHR$()

Get the string representation of an ASCII code.

```
String = Chr$(64)
```

HEX$()

Convert a numeric expression to a hexadecimal string.

```
String = Hex(128)
```

OCT$()

Convert a numeric expression to an octal string.

```
String = Oct$(128)
```

STR$()

Convert a numeric expression to a decimal string.

```
String = Str$(128)
```

LCASE$()

Returns a lower case representation of a string.

```
B$ = LCase$(A$)
```

UCASE$()

Returns the upper case representation of a string.

```
B$ = UCase$(A$)
```

SPACE$()

Returns a string containing 'n' spaces, where 'n' is an integer expression.

```
S$ = Space$(10)
```

LEFT$()

Returns the left-most 'n' characters of a string, where 'n' is an integer.

```
A$ = Left$(B$,10)
```

RIGHT$()

Returns the right-most 'n' characters of a string, where 'n' is an integer.

```
A$ = Right$(B$,10)
```

MID$()

Returns the middle 'n' characters of a string, starting at character 'x'

```
A$ = Mid$(B$,n,x)
```

Note: The first character of a string is at position one.

LEN()

Returns the number of characters in a string.

```
Number = Len(A$)
```

ASC()

Returns the ASCII Code of the first (or only) character in a string.

```
Number = Asc(A$)
```

VAL()

Converts a string to a number.

```
Number = Val(A$)
```

NOTE: Take care that the variable used to store the value is large enough to contain it. Failure to do so will cause GIU Fatal Script Faults..

MISCELLANEOUS FUNCTIONS

TYPE()

Returns the *type* of the referenced variable.

`X = Type(`*variable_name*`)`

> **NOTE:** If the specified variable is a `Variant` type, then `TYPE()` will return `TypeVariant`. To find the type of a `Variant` variable, use the `VariantType()` function instead.

VARIANTTYPE()

Returns the *type* of a Variant variable. This is the only way to find the true type of a `Variant` variable.

`X = VariantType(`variant *variable_name*`)`

ISNULL()

Returns a Boolean TRUE if the passed argument is NULL. Otherwise, this returns FALSE. The argument must be a `Variant` variable

`RESULT = IsNull(`variant *variable_name*`)`

ISERROR()

Returns a Boolean TRUE if the passed argument is an ERROR. Otherwise, this returns FALSE. Note that the variable may contain *any* value; this function only determines if the value is an ERROR. The argument must be a `Variant` variable

`RESULT = IsError(`variant *variable_name*`)`

TICKCOUNT()

Returns the number of milliseconds since the system started. The returned value is a DWORD (unsigned 4-byte) ranging from 0 to 4294967295. The counter will rollover in about 1193 hours, or just under 50 days.

```
Counter = TickCount()
```

RANDOMIZE

This "seeds" the random number generator for the `RND()` function.

`Randomize n` Set the random number generator using '`n`' as a seed.

`Randomize` Set the random number generator using the system timer as the seed.

If the same "seed" is always passed to `RANDOMIZE,` then `RND()` will always produce the same *series* of random numbers.

RND()

This returns a *floating point* random number between 0 and 1 (i.e.: `0.12345`)

```
X = Rnd()
```

The Programmer should call `RANDOMIZE()` first, before using `RND().`

If the same "seed" is always passed to `RANDOMIZE(),` then `RND()` will always produce the same *series* of random numbers. This can be useful for testing purposes.

Example:

```
    Randomize(12345)
    Print Rnd()
    Print Rnd()
    Print Rnd()
    Print Rnd()
```

Output is:

```
    0.231452
    0.584857
    0.787225
    0.675222
```

Random numbers between `0` and '`n`' can be generated by

```
      X = INT(n * RND())
```

DOEVENTS()

This command causes any queued System Events to be performed. This function may be needed inside certain loops to force the continued processing of I/O, keyboard, and serial ports.

`DoEvents()` This is the "expected" form of the command. No parameters are needed; no results are returned.

`Number = DoEvents()` This alternate form is for future releases. At the present, this function always returns zero (0).

CURRENTPAGE()

This returns the number of the page being current displayed.

```
X = CurrentPage()
```

SERVICEIO

Variables may be “attached” to physical I/O points through the Device Driver. When the `SERVICEIO` command is executed, variables with WRITE capability will be copied into the Device Driver to be updated during the next “scan” of the assigned I/O network. Variables with READ capability will be updated from the current information in the Device Driver.

Note that this command *does not* force a physical “scan” of the assigned I/O network. This is handled by the Device Driver. Data will be physically written to the I/O during the *next* network scan. Data read will be that received from the *most recent* network scan.

GetDriverProperty()

The function is a "wild card" which allows the Programmer to access Device Driver properties. The properties actually available are determined by the Device Driver used.

> **NOTE:** The available functions, *if any*, are determined by the Device Driver. Please reference the information about the Device Driver(s) to determine what, if any, properties are available using this call.

`Value = GetDriverProperty("`*DriverName","property"*`)`

"DriverName" is the Tag Name assigned to this iteration of the Device Driver (See Page 36). This value *must* be either a string or a string variable.

"Property" is the Device Driver Property to be obtained. The exact value entered here will depend on the property(s) of the Device Driver being accessed. This value *must* be either a string or a string variable

Strictly speaking, the returned value is of type `Variant.` (See *The Variant Data Type*, Page 89) Therefore, the returned value is promoted to the type of the variable to which it is assigned, including strings, and *errors*. Therefore, proper operation would be:

```
Variant returned_value

returned_value = GetDriverProperty("DriverName","property")
if  iserror(returned_value) = TRUE then
     ''Handle Errors Here
else
     '' Do what you want with the value
endif
```

Refer to the information included with the Device Driver for further information concerning what, if any, properties are available, and the correct syntax to use.

SetDriverProperty()

The function is a "wild card" function which allows the programmer to access Device Driver properties. The properties actually available are determined by the Device Driver used.

NOTE: The available functions, *if any*, are determined by the Device Driver. Please reference the information about the Device Driver(s) to determine what, if any, properties are available using this call.

GetDriverProperty(*"DriverName","property","Value"*)

"DriverName" is the Tag Name assigned to this iteration of the Device Driver (See Page 36). This value *must* be either a string or a string variable.

"Property" is the Device Driver Property to be obtained. The exact value entered here will depend on the property(s) of the Device Driver being accessed. This value *must* be either a string or a string variable

"Value" is the value to which the desired property is to be set. The exact value entered here will depend on the property being accessed. Strictly speaking, the *Value* is of type Variant. (See *The Variant Data Type*, Page 89) Value may therefore be any data type, including strings.

It is permissible to issue the command without checking errors, but the wise programmer will provide for error checking, as below:

```
Variant returned_value

returned_value = SetDriverProperty("DriverName","property","value")
if  iserror(returned_value) = TRUE then
      ''Handle Errors Here
else
      '' Do what you want with the value
endif
```

Refer to the information included with the Device Driver for further information concerning what, if any, properties are available, and the correct syntax to use.

APPENDIX A -- KEYBOARD SHORTCUTS

The following is a listing of Keyboard Shortcuts and Toolbar Buttons available when using The Editor.

Function	Key	Toolbar
Enter HELP	**F1**	
Restart a program in the GIU	**F11**	
Terminate a program in the GIU	**F12**	
Save File as Binary Image	**ALT-B**	
Connect selected Target GIU	**ALT-C**	
Disconnect from Selected Target GIU	**ALT-D**	☒
Assign Page-Level Function Keys	**ALT-K**	
Add or Edit Global Variables	**ALT-V**	
Define Global Declarations	**ALT-1**	
Create or Edit Initialization Script	**ALT-2**	
Create or Edit Control Script	**ALT-3**	
Create or Edit Alarm Script	**ALT-4**	
Create or Edit Page Script for selected Page	**ALT-F5**	
Enter Wizard for selected Object	**ALT-F7**	
Read the program in the connected GIU	**CTRL-F1**	
Write the current program to the connected GIU	**CTRL-F2**	
Copy selected Object or Text into Window’s Clipboard	**CTRL-C**	
Define Global Function Keys	**CTRL-K**	
Open a New Project File	**CTRL-N**	🗋
Open an existing Project File	**CTRL-O**	📂
Print the current Project File	**CTRL-P**	🖨
Save the current Project File	**CTRL-S**	💾
Delete selected Object or Text into Windows Clipboard	**CTRL-X**	✂
Paste from Windows Clipboard	**CTRL-V**	📋
Undo last Edit (depth = 1)	**CTRL-Z**	

Align All Selected Object Left

Align All Selected Objects Right

Align All Selected Objects Top

Align All Selected Objects Bottom

Make All Selected Objects same size horizontally

Make All Selected Objects Same Size Vertically

Make All Selected Objects Same Size Vertically and Horizontally

Check current program for errors

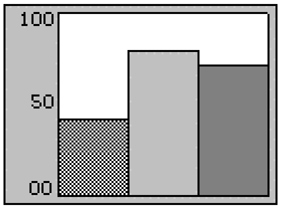
View Compiler Error Box

APPENDIX B - Available Objects

ARROWS

▼ ▲ ◀ ▶ Arrows are STATIC objects. They may be positioned or resized. They have no further capabilities

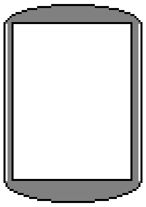
BAR GRAPH



CAPABILITIES:

Multiple Indicators, each with own colors
Range HI and LOW
Update Time
Overall Background Color

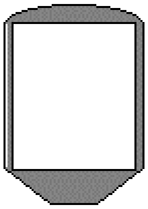
TANK



CAPABILITIES:

Range: HI and LOW
Update Time
Background Color
Fill Level and Color based on user defined variable

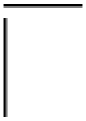
HOPPER



CAPABILITIES:

Range HI and LOW
Update Time
Background Color
Fill Level and Color based on user defined variable

LINES



CAPABILITIES:

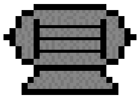
Update Time
Foreground Color based on user defined variable

METER

CAPABILITIES:

Range: HI and LOW
Update Time
Background Color
Pointer position based on user defined variable

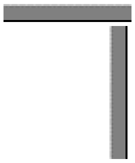
MOTOR



CAPABILITIES:

Update Time
Background Color
Foreground Color determined by a User-defined variable

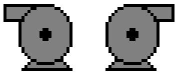
PIPES



CAPABILITIES

Update Time
Background Color
Foreground Color determined by a User-defined variable

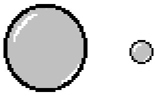
PUMPS



CAPABILITIES:

Update Time
Background Color
Foreground Color determined by a User-defined variable

STATUS LIGHTS (Large and Small)



CAPABILITIES:

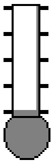
Foreground Color based on user defined variable
Update Time

TEXT

CAPABILITIES:

Update Time
Background Color
Displayed Text and Color determined by User-defined variable
Border On/Off
User selectable font

THERMOMETER

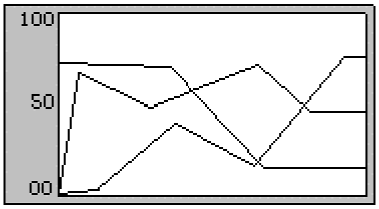


CAPABILITIES:

Range HI and LOW
Update Time
Background Color

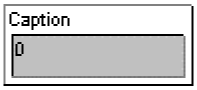
Foreground Color

TREND BOX



CAPABILITIES:
Multiple Indicators, each with own colors
Range HI and LOW
Update Time
Overall Background Color

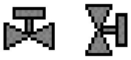
VALUE BOX



CAPABILITIES:

- User defined Caption
- Update time
- User selectable font
- Value displayed is based on User-defined variable

VALVES



CAPABILITIES:

- Update Time
- Background Color
- Foreground Color determined by a User-defined variable

APPENDIX C - Powering Up a New GIU

All firmware on the GIU is stored in flash EEPROM. Like a normal ROM, the code is instantly available for use the moment the GIU is turned on. Unlike a normal ROM, all firmware may be updated through a special serial link.

The firmware is in two parts, the BIOS and the EXECUTOR. The GIU contains JTAG technology that is used to download a small bootstrap loader. Once loaded, the bootstrap provides additional functionality to load the BIOS.

The EXECUTOR is responsible for loading and executing a program written by the User using the Windows-based Editor package.

To begin, you will need the following hardware and software:

1) A GIU Unit. It does not have to be "new"; the following process will erase any old BIOS or EXECUTOR.
2) A DOS-based PC with the COMM1 Serial Port Free.
3) WINDOWS-95. This is required to run the Editor, which is necessary to download a new EXECUTOR
4) `BOOTLOAD.EXE` a PC-based program used to download the new BIOS
5) `BOOTLOAD.HEX` An ASCII-HEX file containing the bootstrap loader
6) `BOOT.HEX.` AN ASCII-HEX file containing the BIOS loader
7) `500.HEX.` This is the EXECUTOR ASCII-HEX file

BOOTSTRAPPING A NEW UNIT

If you have a NEW UNIT, please follow the following steps:

1) Verify power operation by applying +24 VDC to the appropriate power connect. The screen should be lit, but blank.
2) **Install** the JTAG ENABLE jumper. The screen will go dark.

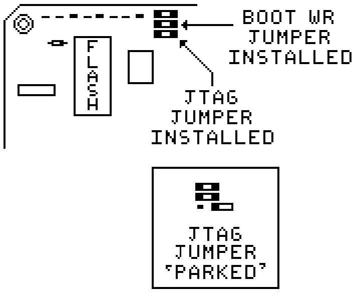


Figure 40 JTAG Enable Jumper Location

NOTE: The `BOOT WR` jumper should always be installed. Failure to do so will result in the BIOS *not* being written.

3. Locate the BOOTLOAD program files and BIOS files. They *must* all be in the same directory.

   ```
   BOOTLOAD.EXE
   BOOTLOAD.HEX
   BOOT.HEX
   ```

   If necessary, CD to that directory. Assuming that you used the default Setup Options, that would be C:\HEGIU, so at the DOS prompt:

   ```
   CD C:\HEGIU <enter>
   ```

4) From DOS, run the bootloader:

   ```
   bootload 40 BOOT.hex <enter>
   ```

> **NOTE:** BOOTLOAD.EXE works *only* through the Host PC's COMM1 port. BOOTLOAD is a DOS program, and does not honor any "port sharing" enforced by Windows. If you have *any* other PROGRAM or DEVICE attached to COMM1, you must remove it before BOOTLOAD will run.

5) Instruction on the bootloader screen will tell you when to **remove** the JTAG ENABLE jumper. "Park" it as shown in Step 2 above. This will causes the bootloader to complete its operations.
6) Exit DOS
7) Enter the GIU EDITOR. Select the TOOLS|WRITE GIU FIRMWARE item.
8) Select the desired version of the software to download. Follow the instructions to complete the download.

UPDATING AN EXISTING UNIT

If you are updating a unit on which the BIOS and EXECUTOR have been pre-loaded, please follow these steps:

1) Verify power operation by applying +24 VDC to the appropriate power connect. The screen should be lit. Any previously loaded User Program should be running.
2) Power down the GIU unit.
3) Press *AND HOLD* the ENTER KEY (↵), then re-apply power.
4) Continue to press *AND HOLD* the ENTER KEY (↵) until the cancel is acknowledged. The GIU screen will display the message "User canceled program run" on the last line of the display.
5) Look at the second line of the display. It will read

   "Firmware Exec x.x.xx Boot y.y.yy".

   "x.x.xx" is the Executable Revision Level. Make sure that the version you are about to download is GREATER than the version already in the machine.

   "y.y.yy" is the BIOS Revision Level. Make sure that the version you are about to download is GREATER THAN the version already in the machine.

6) If the NEW BIOS version is LESS THAN OR EQUAL TO the version currently in the GIU unit, you may skip directly to Step 7.
   Otherwise, perform the following steps to download a new BIOS:
   A) Turn off the power to the GIU unit, or unplug its power plug.
   B) Remove the back cover from the GIU unit. This may entail removing the GIU from any enclosure.
   C) Press AND HOLD the GIU Escape KEY (E). Re-apply power to the GIU unit. The GIU will respond with two single beeps, then two groups of three beeps. Release the Escape Key (E). The screen should remain lit, but empty.
   D) **Install** the JTAG ENABLE jumper. The screen will go dark.

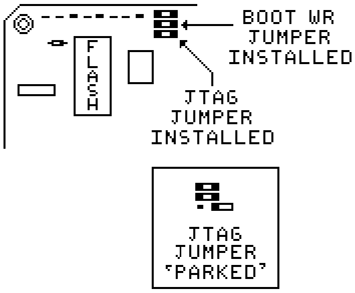


Figure 41 JTAG Enable Jumper Location

> **NOTE:** The `BOOT WR` jumper should always be installed. Failure to do so will result in the BIOS *not* being written.

   E) Locate the BOOTLOAD program files and BIOS files. They should be in the same directory.

```
BOOTLOAD.EXE
BOOTLOAD.HEX
BOOT.HEX
```

   If necessary, `CD` to that directory. Assuming that you used the default Setup Options, that would be `C:\HEGIU`, so at the DOS prompt:

```
> CD C:\HEGIU <enter>
```

   E) From DOS, run the bootloader:

```
> bootload 40 BOOT.hex <enter>
```

> **NOTE:** `BOOTLOAD.EXE` works *only* through the Host PC's COMM1 port. `BOOTLOAD` is a DOS program, and does not honor any "port sharing" enforced by Windows. If you have *any* other PROGRAM or DEVICE attached to COMM1, you must remove it before `BOOTLOAD` will run.

   F) Instruction on the bootloader screen will tell you when to **remove** the JTAG ENABLE jumper. "Park" it as shown in Step 2 above. This will causes the bootloader to complete its operations.
   G) Turn off the power to the GIU, or unplug its power plug.

7) If the NEW EXECUTABLE version is *less than or equal to* the EXEC version currently in the GIU, DO NOT download a new executable!

If the NEW EXECUTBLE version is *GREATER THAN* the version currently in the GIU unit, follow the following steps to download a new Executable:

A) Turn off the power to the GIU unit, or unplug its power plug.

C) Press AND HOLD the GIU Escape KEY (Ⓔ). Re-apply power to the GIU unit. The GIU will respond with two single beeps, then two groups of three beeps. Release the Escape Key (Ⓔ). The screen should remain lit, but empty.

D) Start The Editor from the Windows environment.

E) From The Editor's Main Menu, select `Tools|Write GIU Firmware`. This will bring up a File Selection Dialog Box. Select the desired file (usually `EXEC.HEX`).

F) You will then be asked to select a `COMM PORT` and `BAUD RATE`. Select the Comm Port on your PC to which the GIU is attached. Leave the Baud Rate at 115200.

G) Click the Write button. The Status Screen will appear, and the download will begin. A running total is displayed as the download completes.

H) When the download is complete, the GIU will reset. Any User Program in the unit will be automatically run.

IN CASE OF ERRORS

Several errors could occur during communications to the GIU:

`ERROR 0:  Could not find BOOTLOAD.HEX file`

This indicates that the `BOOTLOAD.HEX` file could not be found. Make sure that the `BOOTLOAD.HEX` file is present in the same directory as the `BOOTLOAD.EXE` file.

`ERROR 1:  Could not find user .HEX file`

This indicates that the `BOOT.HEX` file could not be found. Verify that `BOOT.HEX` is present in the same directory as the `BOOTLOAD.EXE` program.

Also, verify that `BOOT.HEX` is the proper name for the file to be downloaded. Check the instructions that come with the upgrade diskette(s) to verify the name of the BIOS file.

`ERROR 2:  Invalid HEX file record`

This indicates an error in the HEX File [`BOOT.HEX`]. Usually, this is caused by the first character of the line being something other than a colon [`:`].

`ERROR 3:  Invalid HEX file address range`

This indicates that a record in the HEX File contains an address that is not valid for the attached GIU. This may be caused by a corrupted file, or by an attempt to load a file that is not compatible with the attached GIU.

ERROR 4: Invalid HEX file checksum

This indicates that a HEX File record has a bad checksum. This is usually caused by a corrupted HEX File.

The JTAG CPU Chip Identifier is: 10000000000000000000000000000001
For Intel386 EX TC it should be: 00101000001001110000000000010011

This error is usually caused by the inability of BASIC to "capture" the PC's COM1 Serial Port. Another program may be using it. Terminate that program before invoking BOOTLOAD.EXE. This will happen if you do not terminate The Editor before attempting this procedure.

ERROR: JTAG port is not responding...

This error is usually caused by the JTAG Jumper *not* being installed. See above. If the JTAG jumper *is* installed, then this would indicate a hardware failure.

This error can occur due to slight timing variations. If this error occurs, try running BOOTLOAD again, *without* powering down the GIU. It may be necessary to repeat this step 4-5 times. However, once the GIU "connects" the resulting transfer is good.

ERROR: Verify failure at address xxxxH; wrote=xxxxH, read=xxxxH

This indicates that the GIU was unable to verify a WRITE operation at the specified address. The READ data may be useful for further troubleshooting by Horner Electric Technical Support.

ERROR: Block x erasure failed, Status is: xxxxH, should be xxxxH

This error can indicate that the Boot WR Jumper is *not* installed.

This error can also indicate a hardware failure. If installing the Boot WR jumper does not fix the problem, contact Horner Electric Technical Support

Flash Chip Intelligent ID reads: xxxxH * xxxxH
Flash ID for 28F400-T should be: xxxxH * xxxxH

This indicates a problem with the FLASH chip(s) [EEPROM]s error occurs, contact Horner Electric Technical Support.

No file specified, erase operation only...

This is not strictly an error. It indicates that there was no BOOT file specified on the command line used to invoke the bootloader. If no other errors occur then this is proper operation.

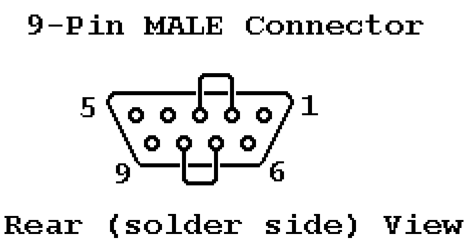
WARNING: Status indicates program failure, record address xxH

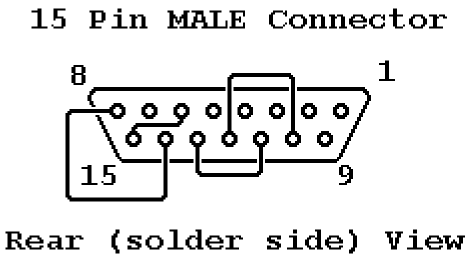
This indicates that a WRITE operation to the FLASH chip(s) [EEPROM] may not have completed successfully. You should power down the GIU and try the process again.

APPENDIX D - GIU SELF-TEST

Beginning with GIU BOOT Version 1.0.20, an extensive self-test program is built in to the GUI Firmware. With this firmware, the User can perform tests on the hardware to verify it's operation, and report the result to Horner Technical Support, if necessary.

To use this software you will first need to make two "Loop back Connectors" according to the following diagrams:





9-Pin Male Connector	15-Pin Male Connector
Pin 2-3	Pin 6-15
Pin 7-8	Pin 8-14
	Pin 10-12
	Pin 11-13

Install these connectors in the matching connector in the GIU.

Next, remove power from the GIU. Press *and hold* the ▣ key on the GIU. Re-apply power to the GIU.

The GIU should respond with two beeps, and the Self-Test Screen should appear. You may now release the ▣ key.

There are seven (7) tests, with an eighth button to run all tests sequentially. Press the appropriate button to start the desired test.

Note that ALL tests require user input, at least to the point of pressing ↵ to signify successful completion of the test. Some tests require that you visually examine the screen to see the results.

DISPLAY TEST

This test first asks you to set the contrast. Simultaneously pressing ↑ *and* ▼ or ▲ will adjust the contrast UP or DOWN. There should be *at least* 16 distinct levels of contrast control.

When you have verified that the contrast control works, set it such that the background is BLUE, with WHITE and YELLOW letters.

Press ↵ to indicate that the contrast is OK; press ▣ to indicate that the contrast is not OK.

If you press ↵ the GIU will proceed to the Color Test. This will ask you to press ↵. When you do the GIU will cycle through all eight (8) possible colors. The screen will display the color, and the name of the color will be displayed briefly in the middle of the screen. Press ↵ to see the next color.

NOTE: Contrast setting effects the displayed colors. If the colors seem wrong or "off", try repeating the Display Tests and using a new contrast setting.

After the Color Test, you will be asked to proceed to the Adjacent Pixel Test. This test writes alternate values to the video memory. You will be required to visually inspect the display.

This test requires four screens to properly check all possibilities. Press ↵ to select the next screen. After you have inspected all four screen, you will be asked to press ↵ if all screen are OK, or 🖳 if the screen are not OK.

KEYPAD TEST

This test asks you to press ALL keys on the keypad. When you do, the appropriate key on the diagram will change color and the key's legend will appear.

When you have pressed ALL keys, the GIU will return to the test menu

CLOCK TESTS

This test will test the CPU crystal speed, the Serial Interface crystal speed, and allow you to set the Real Time Clock values.

The correct CPU Clock Speed is 25 MHz. The corrects COM Clock Speed is 1.8432 MHz.

Set the Real Time Clock and watch the value change. Set the real Time Clock for the current time and date.

WATCHDOG TEST

This test checks the built-in watchdog function. After pressing the test key, the GIU will blank and then reset.

MEMORY TEST

This will test the on-board memory. The test is self-running and requires no User input. After the test is complete the GIU will report its success or failure.

SERIAL TEST

This will test the RS-232 and RS-485 ports. The Serial Loop Back connectors, previously described, *must* be installed for this test to work.

This test is very quick. Once completed, the GIU will report success or failure.

EXPANSION TEST

This will test the expansion tests. An Expansion Board must be installed.

ALL TESTS

This will cause ALL tests to be run, with User Input required as detailed above.

When all tests are complete, remove power from the GIU, the re-apply power to the GIU without pressing any keys.

APPENDIX E - GIU SYSTEM MENU

The Orion-Series GIU5xx has a built-in System Menu for setting such parameters as HECOM baud rate and the unit's date and time.

To reach this menu, *simultaneously* press the GIU's ↵🖵 keys. Continue to hold both keys until the GIU responds. [This may take 2-3 seconds, depending on the current activities being performed by the GIU.] the GIU's screen will clear, and revert to text mode operation.

You will be presented with a System Menu consisting of up to eight (8) entries. This menu is context sensitive; the exact functions available will depend on the state of the GIU at the moment you enter the System Menu.

F1 **UNUSED** -- This key is currently unused. In future releases this key may serve as a "wild card" for system-specific functions.

F2 **SUSPEND/RESUME** -- This key causes the currently running program to be "suspended". That is, the program is stopped but it's status and data are retained for further use. The program can be subsequently "resumed".

If this key is pressed you will be presented with a `Program Suspended` message. *Simultaneously* pressing ↵🖵 will return you to the System Menu, but now the F2 legend will read "`Resume`".

F3 **RESTART** -- This key causes any loaded program to be completely reinitialized. This would be similar to a hardware RESET, but without removing power from the GIU.

F4 **TERMINATE** -- This key will cause any running program to be terminated. Any data will be lost, and will require a `RESTART` to start the program.

Should you press `TERMINATE`, you will be given a termination message. To restart the program, first *simultaneously* press ↵🖵, (to obtain a new menu) then press F3 `RESTART`

F6 **SETUP** -- This key will causes you to go to the System Setup Utility, described below.

F7 **UNUSED** -- This key is currently unused. In future releases this key may serve as a "wild card" for system-specific functions.

F8 **VIEW LOG** - This key will take you to the System Event Log screen, described below.

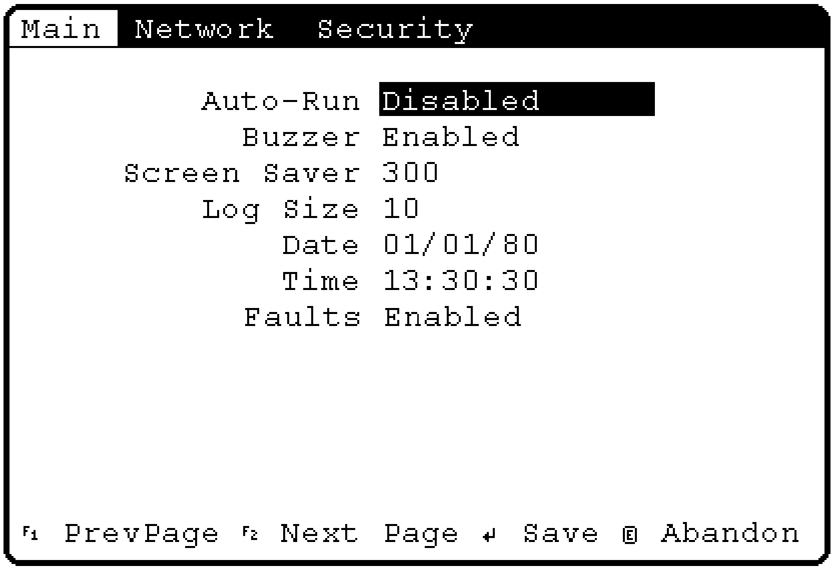
Ⓔ **EXIT SYSYEM SHELL** -- Pressing this key will return you to the running program.

THE SETUP UTILITY

The Setup Utility allows you to program the various internal features of the GIU, including the HECOM baud rate and port, the unit's Date and Time, etc.

The Main Screen

When you select the Setup Utility from the System Menu, you will be presented with the MAIN SCREEN:



```
   Auto-Run Disabled
     Buzzer Enabled
Screen Saver 300
   Log Size 10
       Date 01/01/80
       Time 13:30:30
     Faults Enabled
```

Figure 42 Setup Menu MAIN page

Use the ▼▲ keys to select the ITEM to edit. Press the ↵ key to accept all changes. Press the Ⓔ to refuse all changes.

AUTO-RUN - This determines if the User's program will start automatically when power is applied to the GIU. Available options are `DISABLED` and `ENABLED.` Use the ◀▶ keys to change the options.

BUZZER - This determines if the on-board piezo-electric buzzer will sound. Available options are `ENABLED` and `DISABLED.` Use the ◀▶ keys to change the options.

SCREEN SAVER - This sets the time, in SECONDS, before the GIU automatically blanks its screen. This serves to extend the lifetime of the fluorescent backlight. Set a new value using the GIU's number keys. The default value is 300 seconds (5 minutes). We suggest that this not be set longer than 600 seconds (10 minutes).

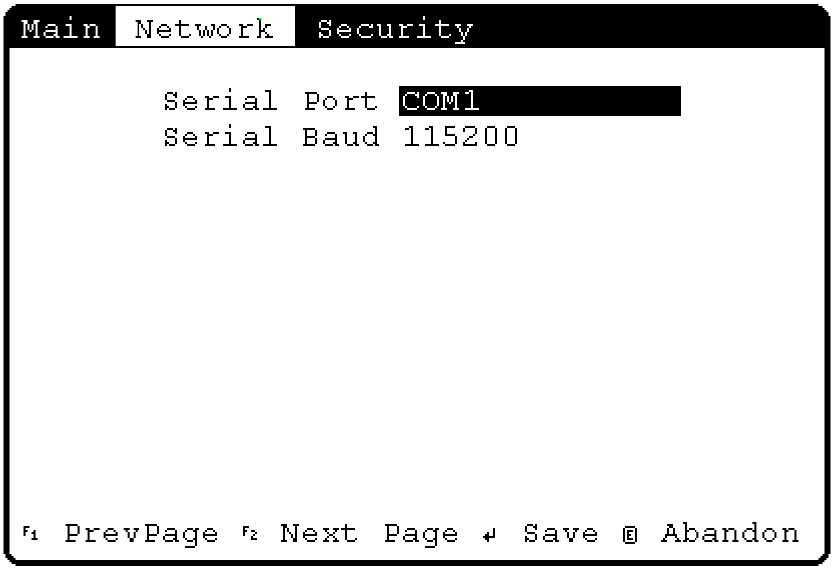
DATE -- This sets the calendar in the GIU. Use the GIU's number keys to enter new values.

TIME -- This sets the Time-of-Day clock in the GIU. Use the GIU's number keys to set new values.

FAULTS – This enables or disables the on-screen communications fault indicator

From the Main Screen, pressing F1 or F2 will select one of the two other pages available.

The Network Screen



```
Main  Network  Security

        Serial Port COM1
        Serial Baud 115200

F1 PrevPage F2 Next Page ↵ Save Ⓔ Abandon
```

Figure 43 Setup Menu NETWORK page

Use the ▼▲ keys to select the item to edit. Press the ↵ key to accept all changes. Press the Ⓔ to refuse all changes.

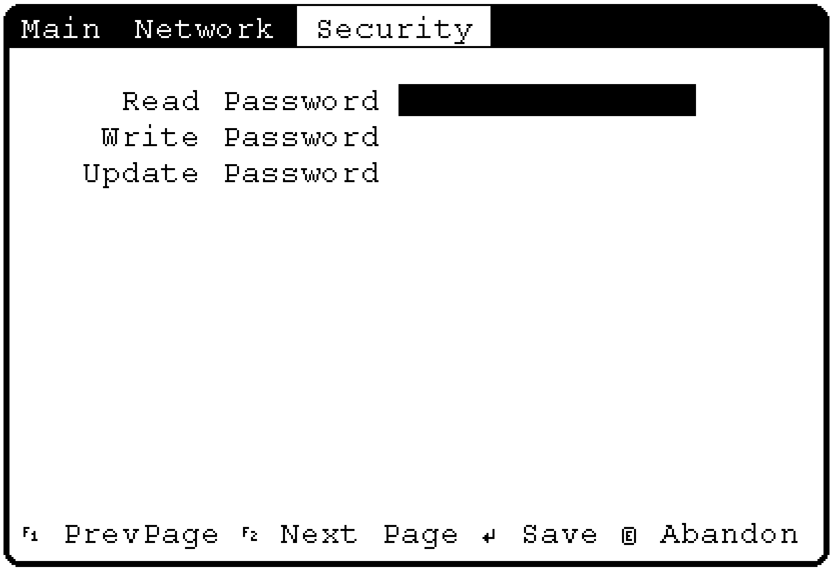
> **SERIAL PORT** -- This determines which port *on the GIU* which is used to talk to The Editor using HECOM. Available options are `COM1` (the 9-pin RS-232 port), `COM2` (the 15-pin RS-285 option), and `NONE`. Use the ◀▶ keys to edit the options.

NOTE: If the NONE option is selected, the GIU can not talk to The Editor!

> **SERIAL BAUD** -- This determines the baud rate used to talk to The Editor, using HECOM. Available options are `300`, `600`, `1200`, `2400`, `4800`, `9600`, `19200`, `38400`, `57600`, and `115200` baud. Use the ◀▶ keys to edit the options.

Obviously, the baud rate set here should match that set in The Editor, under the `Target` option.

The Security Screen



```
Read Password
Write Password
Update Password
```

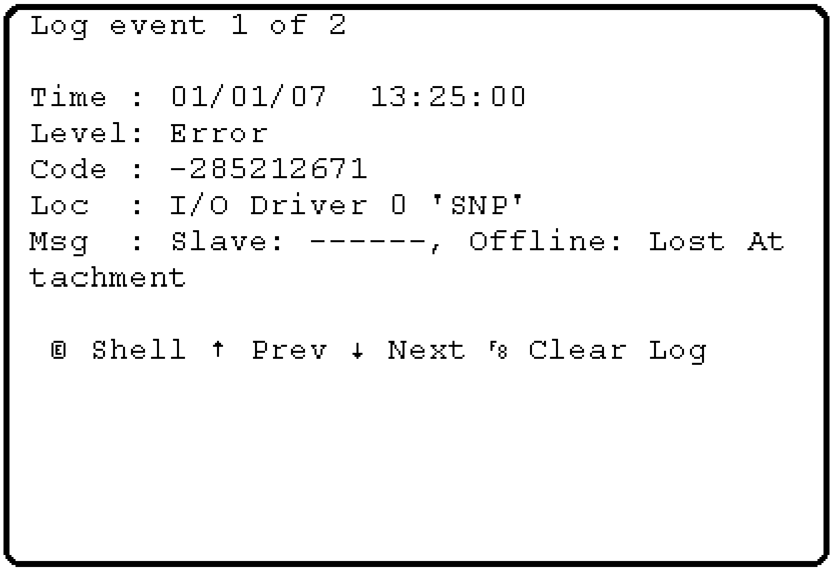
Figure 44 Setup Menu SECURITY page

Use the ▼▲ keys to select the item to edit. Press the ↵ key to accept all changes. Press the Ⓔ to refuse all changes.

Read Password -- This password allows access to READ functions. Currently, only NUMERIC passwords are accepted.
Write Password -- This password allows access to WRITE functions. Currently, only NUMERIC passwords are accepted.
Update Password -- This password allows access to UPDATE functions. Currently, only NUMERIC passwords are accepted.

NOTE: In Release 1.x of the GIU firmware the passwords are NOT functional.

THE EVENT LOG SCREEN



```
Log event 1 of 2

Time : 01/01/07  13:25:00
Level: Error
Code : -285212671
Loc  : I/O Driver 0 'SNP'
Msg  : Slave: ------, Offline: Lost At
tachment

 ⓔ Shell ↑ Prev ↓ Next F8 Clear Log
```

This screen allows you to view and clear Device Driver Faults. A typical Device Driver Fault would be an error on the network, or the re-attachment of a "lost" SNP device.

Time This is the time and date that the fault occurred

Level The is the "priority" of the fault. Possible values are:

- **Information** - No error is produced. This is for informational purposes only. A typical Information event would be when a "lost" SNP device returns on-line.
- **Warning** - This is a potential problem that the operator should know about.
- **Error** - The Device Driver produced an error, but the system kept on running. A typical Error event would be the loss of attachment to an SNP device.
- **Fatal** - The Device Driver produced an error so bad that the system could not remain running.

Code This is a numeric code associated with errors. This information may be useful the Horner Electric technical Support, if outside help becomes necessary.

Loc This is where the fault occurred, or the section of code causing the event.

Msg This is a description of the fault. In the case of an SNP error this will include the name of the attached slave causing the error, and the nature of the error.

Four control keys are available:

ⓔ	Return to the System Menu
▲	View the previous event log entry
▼	View the next event log entry
F8	Clear ALL entries in the event log

RESETTING THE GIU

In the event that no other options are available, the GIU may be reset by pressing ↑🖳Ⓔ keys *simultaneously*. This is, of course, providing that the keypad is responding!

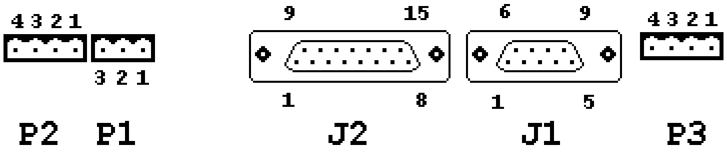
If NO other options are available, then the only other method to reset the GIU is to remove power.

APPENDIX F - ORION GIU500 SPECIFICATIONS

PROCESSOR:	Intel 80386EX Processor
CPU CLOCK SPEED:	25 MHz
MEMORY:	1 Mbyte Flash EEPROM (E^2PROM, or "flash")
	Up to 512K Zero Wait State Static RAM (256K standard)
DISPLAY:	320x240 ("Quarter VGA") Passive Color LCD Display
KEYPAD:	40 Key Tactile Feedback, Membrane Keypad
	16 User-programmable keys
COMMUNICATIONS:	(1) RS-232 and (1) RS-485/422 compatible Serial Ports
POWER	Single voltage supply
REQUIREMENTS:	14-30 VDC, 0.6A @24 VDC
	On-board +5VDC and +12 VDC generators for on-board circuitry
	On-board computer-controlled voltage generator for LCD display.
MISCELLANEOUS:	Battery backed real-time clock
	3KHz 100db Piezoelectric Buzzer
	(2) Dual-Port RAM Based Expansion Ports
	JTAG Test Interface for downloading of new/updated Executor.

APPENDIX G - I/O Connector Wiring Lists

I/O Port Location



J1 (RS-232) Pinout List

Pin	Function
1	DCD
2	RXD
3	TXD
4	DTR
5	Analog Ground
6	DSR
7	RTS
8	CTS
9	RI

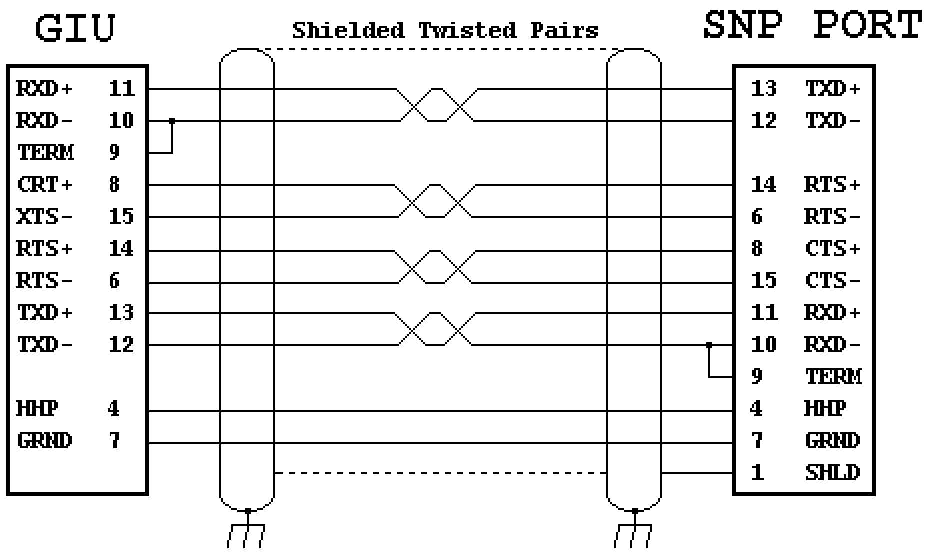
J2 (RS-484 / SNP) Pinout List

PIN	FUNCTION
1	Frame Ground
2	N/C
3	N/C
4	HHPE (Hand Held Programmer Enable)
5	+5VDC
6	RTS-
7	Analog Ground
8	CTS +
9	120Ω Termination Resistor
10	RXD-
11	RXD+
12	TXD-
13	TXD+
14	RTS+
15	CTS-

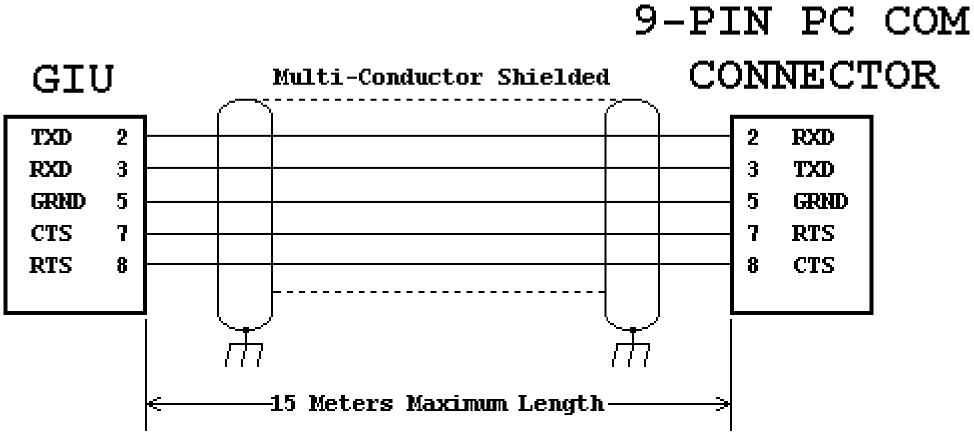
P1 - Power Connector

Pin	Function
1	14-30 VDC In
2	Analog Ground
3	Frame Ground

APPENDIX H – Cable Wiring

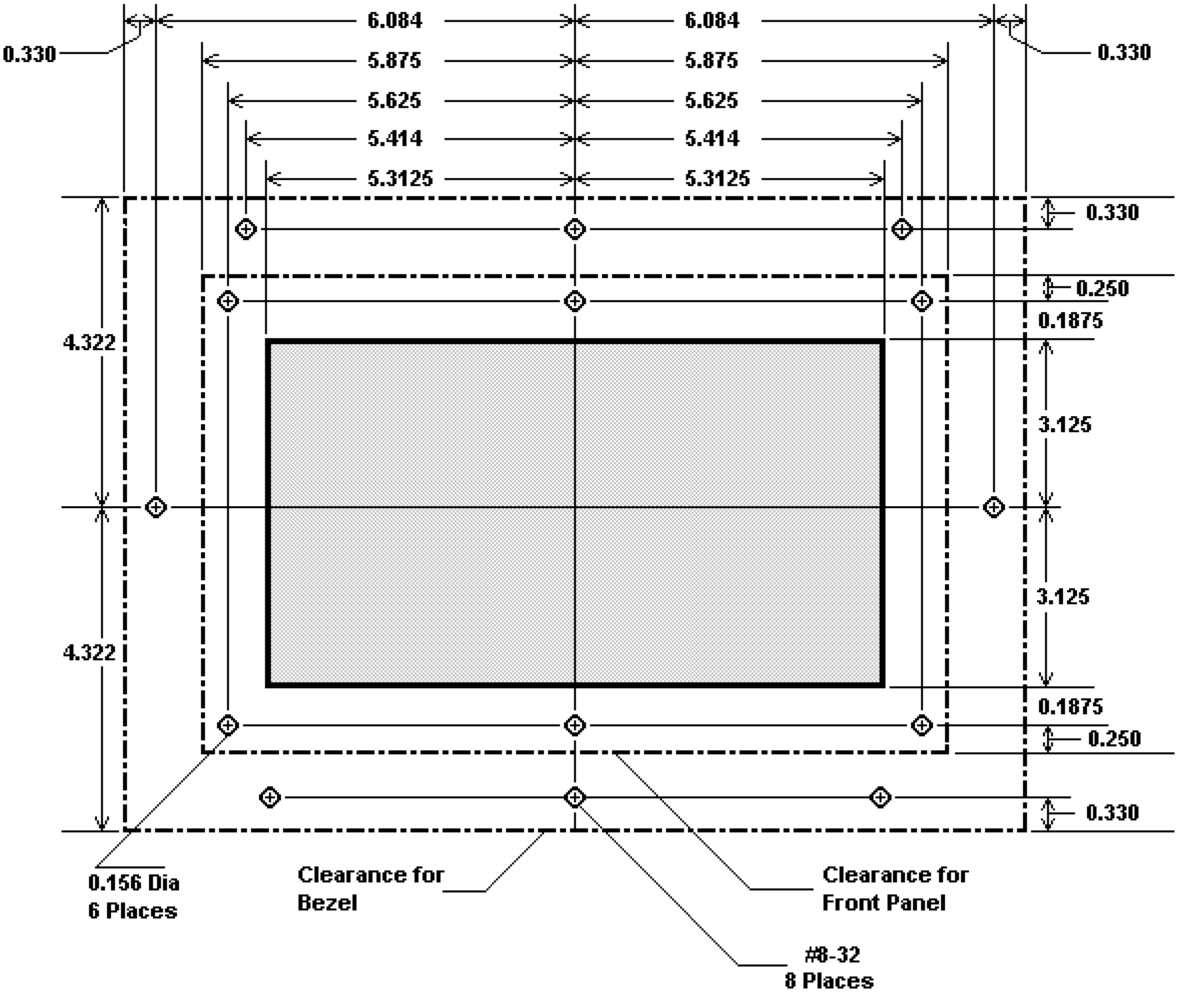


SNP Port Cable Wiring
Horner Electric Part Number HE693CBL150



Editor-to-GIU (RS-232) Cable Wiring
Horner Electric Part Number HE693CBL222

APPENDIX I – Panel Mounting Diagram



This drawing NOT to scale!

All measurements in INCHES.

Cut out shaded area.

Cutout: 6.25” H x 10.625” W

Front Panel Clearance: 7.125” H x 11.75” W

Optional Bezel Clearance: 8.644” H x 12.828” W

APPENDIX J - CREATING "WALLPAPER" FOR THE GIU-500 USING MICROSOFT PAINT FOR WINDOWS-95™

The current release of the GIU-500 firmware supports only 320x240, 16-color, single-plane "`.BMP`" format files. These files are easily created using the `MSPAINT` program for Windows-95™.

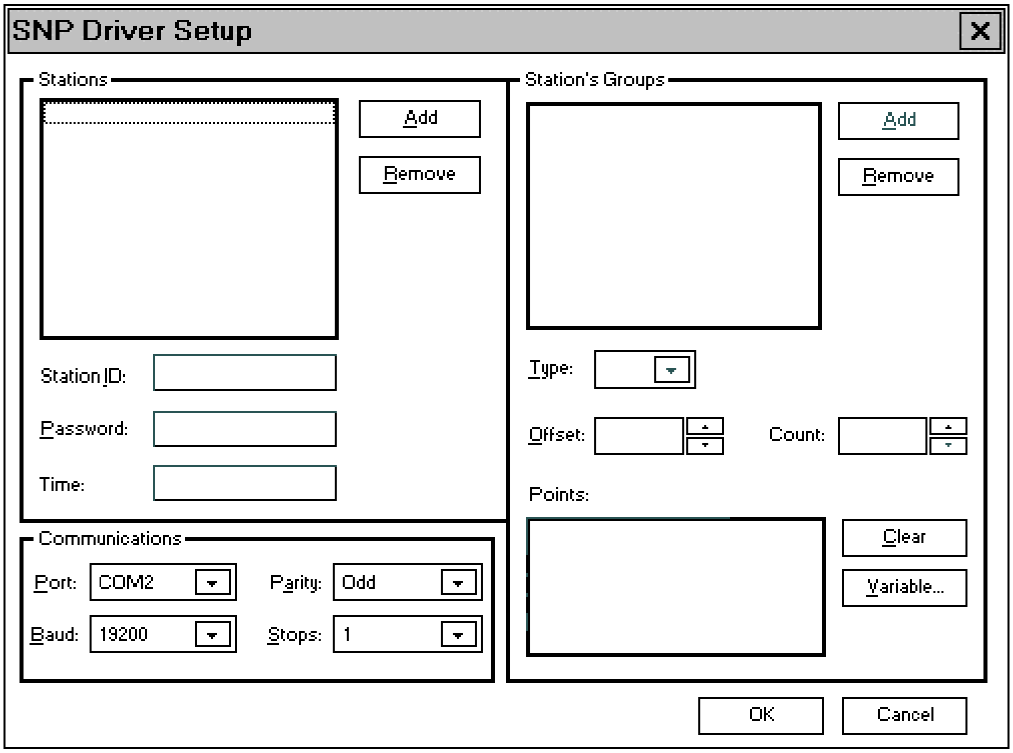
To create such files, follow these steps:

1) Run Microsoft PAINT.
2) From the Main Menu, select `Image|Attributes`
    a) Set UNITS to `PELS`
    b) Set COLORS to `COLOR`
    c) Set WIDTH to `320`
    d) Set HEIGHT to `240`
    e) Click OK
3) Using MS-PAINT, draw and paint the desired bit map within the 320x240 area
4) From the MS-PAINT Main Menu, select `File|Save As`…
    a) Make sure that `Save as Type` is set to `16-Color Bitmap`
    b) `Type in the desired File name`
    c) Click Save

APPENDIX K - SETTING UP THE SNP DEVICE DRIVER

CAUTION: Serial Ports on the Series 90 family are *not* isolated. Potential differences above 7 volts will cause damage. Isolators should be employed on long distance runs to guard against equipment damage.

From the `Project|Device Driver|Add` dialog, select the SNP DEVICE DRIVER, then click the Setup... button.



Port: COM2
Parity: Odd
Baud: 19200
Stops: 1

Figure 45 SNP Setup Dialog Box

The left half of this dialog allows you to select the operational parameters of this particular network, and the Stations attached to it. The right half allows you to define the I/O Groups and their attached variables.

ADDING STATIONS (DROPS)

A "station" or "drop" refers to a specific unit attached to a network. In an SNP Network, each station must have a unique ID assigned to it.

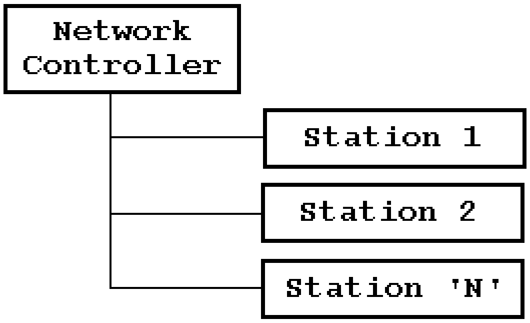


Figure 46 Network "Drop" Illustration

In the Stations area of the `SNP SETUP` dialog, click the Add button the add a new station.

Station ID

In the STATION ID box, enter the Identification String for the desired station. The number and validity of the characters available will depend on the PLC type attached.

> **NOTE:** The Editor will automatically insert the name "`(anonymous)`" into the `Station ID` box.

Password

On the SNP network, the PLCs have several different levels of access, each level requiring a different password. In the PASSWORD box, enter the password for the desired level of access.

> **NOTE:** The password is programmed into the PLC using one of the available programming tools for the PLC. The GIU does not set or change the PLC password!

Time

This is the time, in milliseconds, between I/O scans.

> **NOTE:** In the current release of the SNP Device Driver firmware this value is not used. The SNP Device Driver updated continuously (as fast as possible).

Port

This references the GIU's serial port.

COM1 - The 9-pin, RS-232 connector. This port is normally used for the connection to The Editor

COM2 - The 15-pin, RS-485 compatible port. This is the default port for SNP devices

> **TIP:** Once programmed, the GIU may use the RS232 port (COM1) for other RS232 compatible uses, such as serial printers or dumb terminals.

Baud

This should match the baud rate assigned to the SNP network. Possible values are 110, 150, 300, 600, 1200, 2400, 4800, 9600, and 19200.

Parity

This should match the parity assigned to the SNP network. Possible values are None, Even, and Odd.

Stop Bits

This should match the number of stops bits assigned to the SNP network. Possible value are 1 or 2.

REMOVING STATIONS (DROPS)

To remove a configured station, click the Remove button in the Stations Box.

ADDING REGISTER GROUPS TO DROPS

PLCs have different types of REGISTERS available -- Binary In, Binary Out, Analog In, Analog Out, etc. Network traffic can often be reduced by "grouping" sets of like registers together. In most cases it is more efficient to use one network call to read or write several registers with one call that it is to issue several calls, each reading or writing one register.

From the `Station's Group` box of the `SNP Setup` dialog, click the Add button to add a new set of register groupings.

For each group added you will need to specify the `Type`, `Offset`, and `Count` for the Group

Type

Enter the TYPE of the register(s) to be accessed, according to the types available to the attached PLC.

Offset

This is the stating point (within the PLC) of this group. Acceptable values are determined by the attached PLC.

Count

This is the number of points to be accessed in this one group. Acceptable values are determined by the network limitations and possibly the attached PLC.

Notice how the display in the `Points` box changes as the `Type`, `Offset`, and `Count` values are changed. This is a list of each individual I/O point now assigned to this group.

ASSOCIATING VARIABLES TO I/O POINTS

At this point you can begin to associate ("attach") variables and I/O points. First, select (highlight) a "point" to be associated to a variable, then click Variable...

When the "point" is selected the Assign Variable dialog box will be presented. You may select a variable from the drop-down list of pre-defined variables, or you may define a new variable using the >> button.

To add a new variable, refer to the section *DEFINING (ADDING) VARIABLES* on Page 38 in the main body of this manual.

DE-ASSOCIATING A VARIABLE

If a particular I/O-point-to-variable is no longer desired, select the "point", then click Clear.

INDEX