Horner Electric

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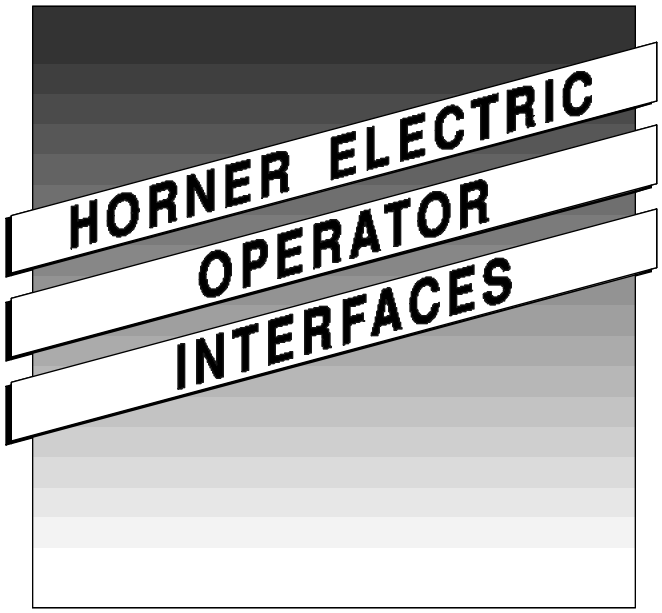
Advanced Products Group

Horner Electric's Operator Interface Unit for the GE Fanuc GENIUS™ Network

User's Manual, for

HE693OIU900



Horner Electric Advanced Products Group

12-10-97 **MAN0191-03**

FOR NORTH AMERICA ONLY!

MODEL NUMBER: HE693OIU900

SERIAL NUMBER: _____

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PREFACE

This manual explains how to use the Horner Electric Operator Interface Unit for use with the GE Fanuc Genius I/O Network.

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Third Edition

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To obtain warranty service, return the product to your distributor after obtaining a "Return Material Authorization". Include a description of the problem, proof of purchase, post paid, insured and in a suitable package.

ABOUT THE PROGRAM EXAMPLES

The example programs and program segments in this manual are included solely for illustrative purposes. Due to the many variables and requirements associated with any particular installation, Horner Electric cannot assume responsibility or liablity for actual use based on the examples and diagrams. It is the sole responsibility of the system designer utilizing this software to appropriately design the end system, to appropriately integrate the Operator Interface Unit and to make safety provisions for the end equipment as is usual and customary in industrial applications as defined in any codes or standards which apply.

TABLE OF CONTENTS

CHAPTER 4: THE MAIN MENU

CHAPTER 5: AUTORUN MODE

CHAPTER 6: GENIUS DATA TYPES

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CHAPTER 1: INTRODUCTION

Congratulations on your purchase of the Horner Electric Operator Interface Unit! This module has been designed using state-of-the-art electronic components and incorporates a sophisticated firmware package that gives the Original Equipment Manufacturer (OEM) the ability ot customize the module for virtually any application.

1.1 What You Have

The Horner Electric Operator Interface Unit (OIU) comes complete with the following items:

A. Assembled OIU module and mounting hardware, including the Genius™ Network Interface board (GENI).

B. Optional back panel shroud.

C. Optional IBM/PC configuration kit.

D. This manual.

1.2 Operator Interface Unit Features

The Horner Operator Interface Unit provides the following features:

A. Large, 2 line by 20 character dot-matrix vacuum-fluorescent display, brightness is adjustable via the keypad.

B. 32 position metal dome tactile feel keypad with full numeric support

.

C. 12 function keys, each can be programmed with two separate user programmable sequences.

D. 12 user-programmable LED's that can be configured to reflect the state of references on the network.

E. Up to 250 "custom" display screens can be defined by the OEM, each screen can contain descriptive text and up to four items of data to be read/written from/to devices on the Genius network.

F. Integrated Genius Network Interface board (GENI), allows access to all Genius data on the network (discrete I/O blocks, analog I/O blocks, PowerTRAC blocks, high-speed counter blocks and Series 90-70 register data).

G. 9-pin RS232 communications port, used by the IBM/PC configuration utility.

H. Gasketed NEMA 4-12 panel with Lexan overlay, mounting hardware included.

I. When configured in AUTORUN mode, configuration options can be password protected, and users can be "locked out" of selected screens.

J. A "trigger" register allows an "intelligent" Genius block to force display of any of the 250 custom screens.

1.3 Hardware Description

The Operator Interface Unit is a microprocessor-based high-performance communications device. The core of the module is the Intel 80C152 microprocessor running at 11.0592 MegaHertz. The "firmware" memory is contained in a 27C512 EPROM device. The module is also equipped with 32K bytes of high-speed static RAM memory, as well as 32K bytes of non-volatile memory (EEPROM or Flash EPROM). Data retention is specified to be greater than 100 years. There is no battery-backed memory on the module. The OIU module incorporates a Genius Network Interface board (GENI) that provides the link to the Genius network. The OIU power supply accepts a wide AC input range.

1.4 Specifications

Mounting Requirements:	Panel Mounting, NEMA 4-12
Communications:	Genius Network Interface (GENI)
Additional Communications:	RS232 for remote configuration.
Power Requirements:	90-240 VAC, 50-60 Hz, 1 Amp (max)
Operating Environment:	0 to 60° C. (32 to 140° F). 0 to 95% humidity (non-condesing).

Non-Volatile Memory:	EEPROM	Flash EPROM
Device Number	X28C256	AT29C256
Data Retention:	100 yrs.	100 yrs.
Number of write cycles:	10,000	1,000

CHAPTER 2: INSTALLATION

2.1 Mounting Requirements

The OIU module is designed for permanent panel mounting. To install the OIU module:

A. Cut the host panel as described by the drawing in Appendix B.

B. If the rear panel shroud option is installed, remove the shroud by removing the five #6-32 screws on the extreme rear of the OIU module.

C. Remove the six #6-32 hex nuts and washers from the outer mounting studs on the rear of the OIU panel.

D. Insert the OIU module through the front panel cutout (be VERY careful not to pinch or stress the keypad cable). The gasket material should lie between the host panel and the OIU panel.

E. Install the six #6-32 nuts and lock-washers on the six mounting studs of the OIU. Tighten these nuts until the gasket material forms a tight seal, do not overtighten.

F. If the rear panel shroud option is present, install the shroud over the mounting standoffs and secure with the five #6-32 screws included. This completes the mechanical installation of the OIU module.

2.2 Power Requirements

The OIU module requires an AC supply voltage between 90 and 240 volts, 50 to 60 Hertz. A maximum of 1 amp will be drawn by the OIU module. The OIU module is supplied with an AC mating connector and insertable pins. See figure 2-1 for connector location. The pinout for this connector is as follows:

Pin	Signal
1	AC Hot
3	AC Neutral
LUG	Earth Ground

Table 2-1. AC connector pinout

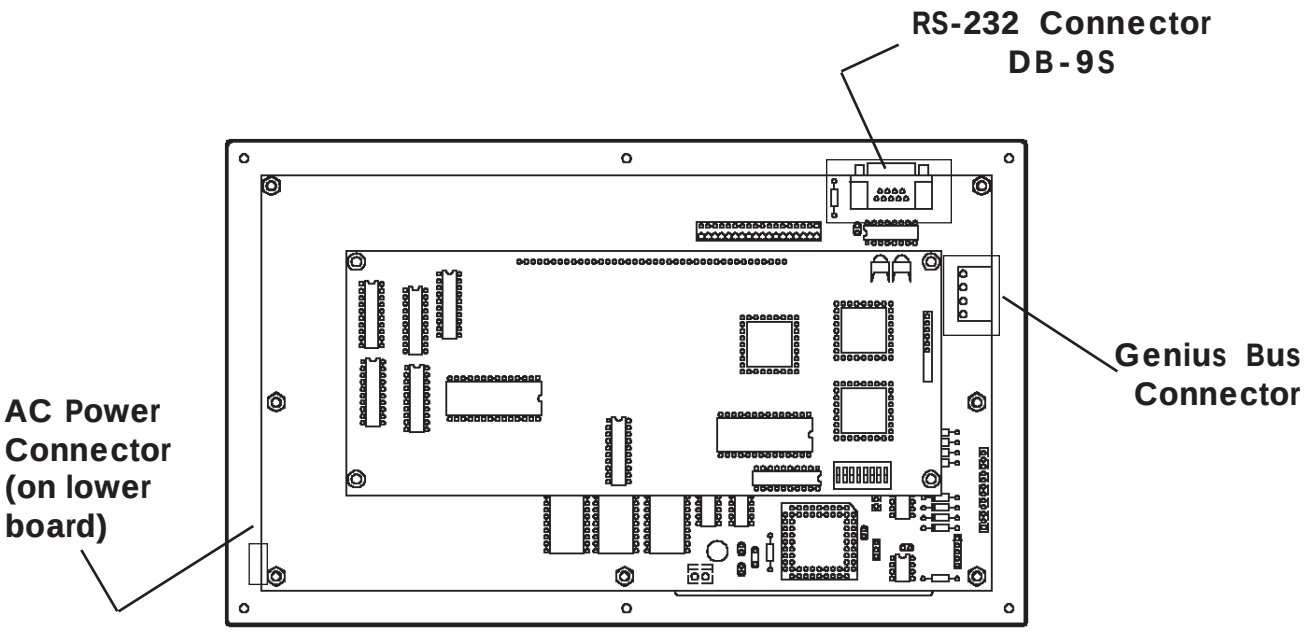


Figure 2-1. Connectors

2.3 Genius Network Connector

The OIU is also equipped with a 4-pin Genius bus connector. The mating connector provides screw terminals for each circuit. The pinout for this connector is as follows:

Pin	Signal
1	Serial 1
2	Serial 2
3	Shield Out
4	Shield In

Table 2-2. Genius Network Connector Pinout

2.4 RS232 Connector

The 9-pin “D” connector provides the RS232 interface to an IBM PC/XT or AT computer. Using the optional “host programming kit”, the OIU module configuration can be created, stored on disk, and downloaded to the OIU. See Appendix C for cable diagrams for commonly used computers. The pinout for this connector is shown in Table 2-3.

Pin	Signal
1	DCD
2	TXD
3	RXD
4	DTR
5	GND
6	DSR
7	CTS
8	RTS
9	RI

Table 2-3. RS232 Connector Pinout

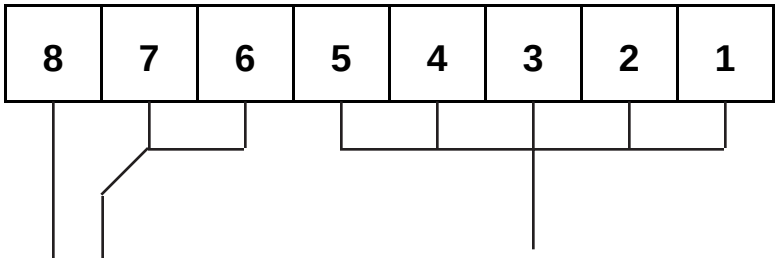
2.5 GENI configuration

The GENI board (located on the rear of the OIU module) is equipped with a bank of 8 “DIP” switches. DO NOT CONFUSE THIS DIP SWITCH WITH THE 6-POSITION DIP SWITCH ON THE MAIN CIRCUIT BOARD DESCRIBED LATER. These switches are used to configure the Genuis “bus” address or “Device Number” for the OIU module, and to set the module’s Genius baud rate.

Each device on the Genius network must have a unique “Device Number” (0 to 31). The OIU may be configured for any device number, however the following conventions should be followed when chosing the device number for the OIU:

A. The bus controller is usually configured as device number 31.
B. The redundant bus controller (if any) is usually configured as device number 30.
C. The Hand-Held monitor is usually configured as device number 0.

When shipped from the factory, the OIU dip switches are configured for device number 29, and for communication baud rate of 153.6K standard. Multiple OIUs may reside on the network, provided that they have unique device numbers.



5	4	3	2	1	address	5	4	3	2	1	address
CLOSD	CLOSD	CLOSD	CLOSD	CLOSD	0	OPEN	CLOSD	CLOSD	CLOSD	CLOSD	16
CLOSD	CLOSD	CLOSD	CLOSD	OPEN	1	OPEN	CLOSD	CLOSD	CLOSD	OPEN	17
CLOSD	CLOSD	CLOSD	OPEN	CLOSD	2	OPEN	CLOSD	CLOSD	OPEN	CLOSD	18
CLOSD	CLOSD	CLOSD	OPEN	OPEN	3	OPEN	CLOSD	CLOSD	OPEN	OPEN	19
CLOSD	CLOSD	OPEN	CLOSD	CLOSD	4	OPEN	CLOSD	OPEN	CLOSD	CLOSD	20
CLOSD	CLOSD	OPEN	CLOSD	OPEN	5	OPEN	CLOSD	OPEN	CLOSD	OPEN	21
CLOSD	CLOSD	OPEN	OPEN	CLOSD	6	OPEN	CLOSD	OPEN	OPEN	CLOSD	22
CLOSD	CLOSD	OPEN	OPEN	OPEN	7	OPEN	CLOSD	OPEN	OPEN	OPEN	23
CLOSD	OPEN	CLOSD	CLOSD	CLOSD	8	OPEN	OPEN	CLOSD	CLOSD	CLOSD	24
CLOSD	OPEN	CLOSD	CLOSD	OPEN	9	OPEN	OPEN	CLOSD	CLOSD	OPEN	25
CLOSD	OPEN	CLOSD	OPEN	CLOSD	10	OPEN	OPEN	CLOSD	OPEN	CLOSD	26
CLOSD	OPEN	CLOSD	OPEN	OPEN	11	OPEN	OPEN	CLOSD	OPEN	OPEN	27
CLOSD	OPEN	OPEN	CLOSD	CLOSD	12	OPEN	OPEN	OPEN	CLOSD	CLOSD	28
CLOSD	OPEN	OPEN	CLOSD	OPEN	13	OPEN	OPEN	OPEN	CLOSD	OPEN	29
CLOSD	OPEN	OPEN	OPEN	CLOSD	14	OPEN	OPEN	OPEN	OPEN	CLOSD	30
CLOSD	OPEN	OPEN	OPEN	OPEN	15	OPEN	OPEN	OPEN	OPEN	OPEN	31

7	6	baud rate
CLOSD	CLOSD	153.6K extended
CLOSD	OPEN	38.4K
OPEN	CLOSD	76.8K
OPEN	OPEN	153.6K standard

ALWAYS OPEN

Figure 2-2. GENI DIP Switch Assignments

2.6 OIU DIP Switches

The MAIN circuit board is equipped with a bank of 6 “DIP” switches. These switches are accessable by removal of the optional rear panel shroud. These switches are used to configure the following OIU options:

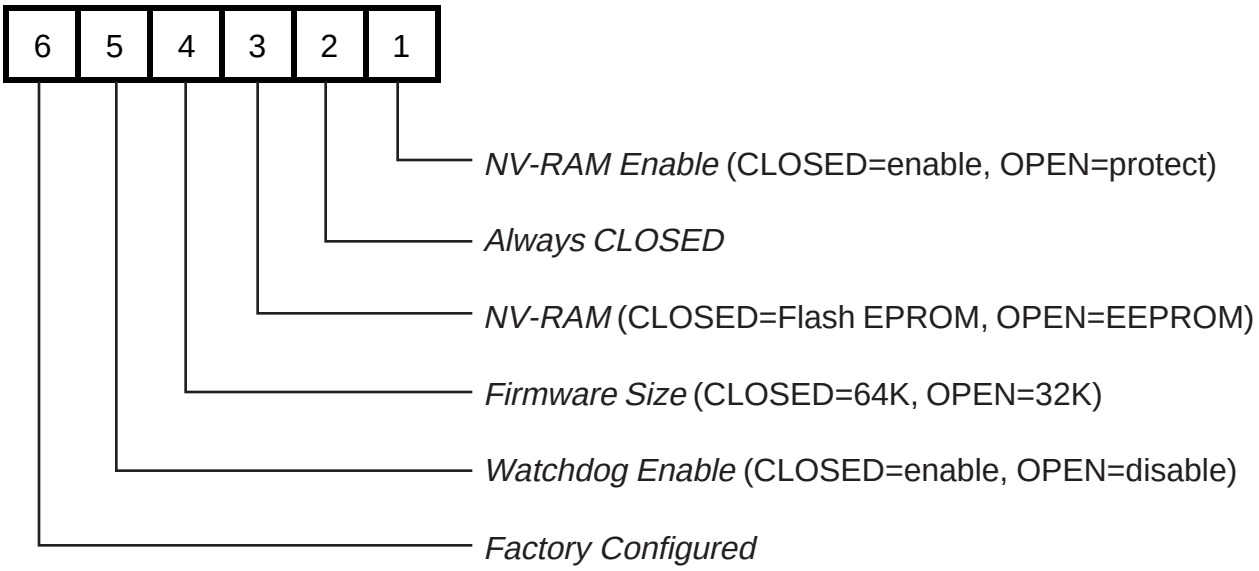


Figure 2-3. MAIN board DIP Switch Assignments

Except for switch number 1, the user should not change the default settings. The OIU configuration cannot be modified while switch number 1 is set to the ON position.

2.7 Logicmaster 90-70 Configuration

In addition to the hardware setup (on the Geni dip switches) for baud rate and drop number, the 90-70 be configured to accept global data from the OIU900. This configuration is accomplished via the Logicmaster 90-70 configuration package.

The procedure for configuration of the 90-70 for communications with the OIU900 through Genius follows on the next page.

Logicmaster 90-70 Configuration Procedure

1) Invoke the Logicmaster 90-70 Configuration Package.

2) Select I/O Configuration (<F1>).

3) Cursor over to the slot containing the Genius Bus Controller to which the OIU900 is connected.

4) Press Zoom (<F10>).

5) Cursor over to the genius bus address of the OIU900. Press Other (<F7>).

6) A listing of available Genius blocks will be displayed. Select "Geni Based Device" by pressing <ENTER> (It is the first device listed and is highlighted by default).

7) A list of parameters will be displayed. The only one listed will be "Config Mode". The default is none. Cursor down to this parameter and type "manual".

8) Two more parameters will now be displayed. The first of which is "To:", this represents the 90-70 register address in which Genius data is written from the OIU to the 90-70. There is only one register of global data written by the OIU, and that is "current screen number (0-249)". Type in an available %R address.

9) The second of the additional parameters is "Input Length". This should be set to the default value of 1.

10) Logicmaster configuration for the OIU900 is now complete.

CHAPTER 3: INITIAL OPERATION

This chapter assumes that the OIU module has been mounted and that the power cable has been properly connected. Power can now be applied to the OIU and (although not necessary for configuration) the Genius network connection can be made. The following sign-on message will appear:

```
HORNER  GENIUS OIU
HE693OIU900   Vx.yz
```

This message will remain on the display for approximately 3 seconds. After the sign-on message has been displayed for 3 seconds, the first two lines of the “MAIN MENU” will be displayed on the display;

```
>Define Display
 Define Text Table
```

3.1 Running the Self Test

At this point, the module is in a mode whereby the operator may select a MAIN MENU item. Navigation through the OIU module’s menu system is discussed in detail later in this manual, however the SELF TEST should be executed during the initial operation in order to verify that the OIU module is properly connected and fully functional. To do this, press the “UP” arrow key once. The display will “scroll” down to reveal the “Self Test” menu item. The menu pointer will appear next to this selection. Now press the ENTER key and the self test will commence. The following tests will be performed.

1. System RAM Memory Test
2. Keypad / Display Test
3. GENIUS I/O Test
4. RS232 Port Loopback Test
5. Display Brightness Test
6. LED Test
7. Watchdog Reset Test

3.1.1 System RAM Memory Test

The system memory test will display the amount of memory (in "K" bytes) present. This value should be 32K bytes. If a value other than 32K is displayed following the completion of the RAM test, a serious hardware problem exists.

3.1.2 Keypad / Display Test

When the keypad/display test is running the message "Press a key..." is displayed. Each time the user presses a key on the keypad, the key's value is displayed. If a key is pressed and it's value is not displayed on the display, a keypad problem exists. the keypad test is terminated by pressing the "SHIFT" and "ENTER" keys simultaneously,

3.1.3 Genius I/O Test

This test simply checks the status of the Genius Network Interface board. If the GENI board status is OK, this test will pass. If this test fails, consult the factory.

3.1.4 RS232 Port Loopback Test

This test requires the installation of a "loopback" connector on the 9-pin RS232 connector. This connector simply shorts pin 2 to pin 3, and pin 7 to pin 8. If no loopback connector is available, simply press the ENTER key to skip the RS232 test and continue. If the loopback connector is installed, the OIU module will send data out the RS232 TXD line, and the data will return to the OIU module on the RXD line (through the loopback connector). Two values are displayed on the OIU's display: the first value represents the number of characters sent out the transmitter and the second value represents the number of ERRORS in reception of the data.

3.1.5 Display Brightness Test

The vacuum fluorescent display is capable of displaying data at 4 different brightness levels. This test allows testing of that circuitry. During execution of this test, simply press the UP or DOWN arrow keys to increase/decrease the display's brightness level. Press the ENTER key when all levels have been tested. Note that the level selected when the ENTER key is pressed will remain active (even through power failure) until changed by an operator.

3.1.6 LED Test

During this test, the 12 LEDs are simply energized in sequence. When all LEDs have been verified, press the ENTER key to continue to the next test.

3.1.7 Watchdog Reset Test

This test will test the “watchdog” reset circuitry. After a delay of approximatly 2 seconds, the module should behave as though the power had just been applied. If the module “locks up” check the state of the watchdog enable switch (described in the previous chapter).

3.2 Operating Modes

The OIU module operates in two modes: SETUP and AUTORUN mode. When shipped from the factory, the module will enter the SETUP mode when powered up. The module can be customized and configured while in SETUP mode and then placed in AUTORUN mode. Both modes are breifly discussed below.

3.2.1 Set-up Mode

SETUP mode is designed for use by the OEM for configuration and customization of the OIU module. When in SETUP mode, the OEM can configure the module’s 250 custom “screens”, define sequences for the function keys, configure the RS232 serial port and perform other OIU configuration operations. All of these configuration functions can be accomplished either from the keypad directly, or using the Horner Electric OIU Host Programming Package, HE600IBMOIU-900. If the OIU is to be configured using the offline personal computer program, the OIU must be in set-up mode to accept the configuration download. After the configuration is complete, the OIU module can be placed in the AUTORUN mode, and the module will remain in AUTORUN mode (even through power failures) until placed back into SETUP mode. An optional password can be configured to prevent unauthorized access to SETUP mode once the module has been placed in AUTORUN mode.

3.2.2 Autorun Mode

AUTORUN mode is designed for use by the OEM’s end customer. Once the module has been placed into the AUTORUN mode, only the 250 custom “screens” (or a subset of them) are available to the user. Once the OIU module has been placed into the AUTORUN mode, it will remain in that mode (even through power failures) until manually placed into the SETUP mode. An optional password can be configured to prevent unauthorized access to SETUP mode once the module has been placed in AUTORUN mode.

These modes are discussed in detail in the following chapters.

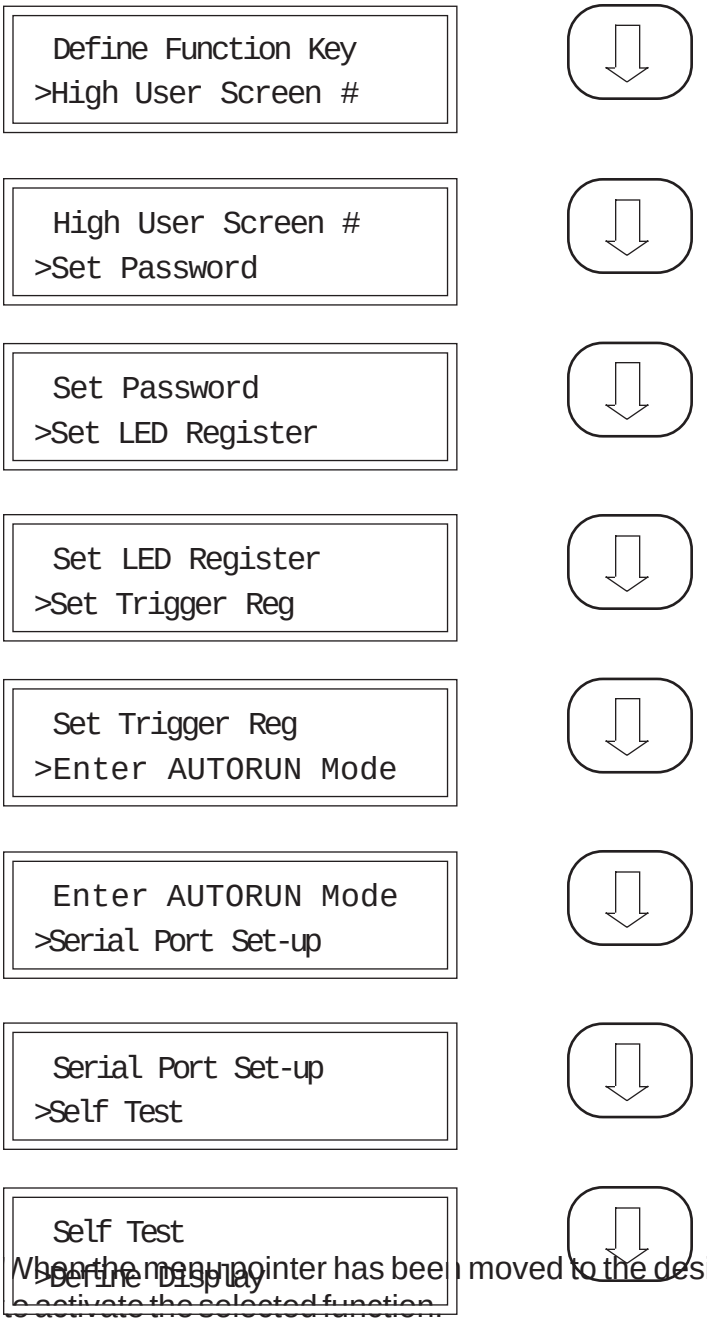
When shipped from the factory, the OIU module will display the sign-on message for approximately 2 seconds following power-up, followed by the display of the MAIN MENU. The MAIN MENU consists of 10 items;

Define Display
Define Text Table
Define Function Key
High User Screen #
Set Passwords
Set LED Register
Set Trigger Reg
Enter AUTORUN Mode
Serial Port Set-up
Self Test

Since the vacuum fluorescent display only provides two lines, only two of the menu items will be displayed at a time. A flashing "pointer" is displayed in the leftmost display column to designate which menu item is currently "active". The menu pointer is positioned using the UP and DOWN arrow keys on the front panel keypad. If the pointer is on the bottom line of the display and the DOWN arrow key is pressed, the display will "scroll" to reveal the next menu item and the pointer will point to the newly displayed selection. When the end of the menu is reached, the menu will start over from the beginning.

Display	Key(s)	Comments
>Define Display Define Text Table	⇩	When the first two lines are displayed, the pointer is moved down.
Define Display >Define Text Table	⇩	The down pointer key will continue to move the pointer.
Define Text Table >Define Function Key	⇩	

Display **Key(s)** **Comments**



When the menu pointer has been moved to the desired menu item, the ENTER key is pressed to activate the selected function.

4.1 Define Display

The function keys play a major part in screen configuration. The function key "insert" provided with the unit is printed on both sides, the front side contains the legends "F1" through "F12". The reverse side contains the screen programming legend. It is advisable to reverse the insert during screen programming (so that the screen programming legend is visible).

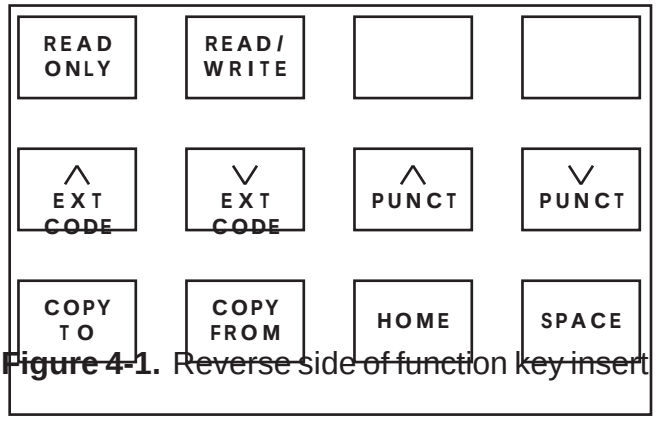


Figure 4-1. Reverse side of function key insert

As stated previously, the OIU module can be programmed with up to 250 custom display "screens". Each screen can be configured with virtually any user-defined text, and can contain up to four "data fields". To simplify this explanation, we will first discuss the textual configuration.

Selecting the "Define Display" menu item from the main menu will cause the following message to appear on the display;

```
Enter Display #
(0 to 249):    0
```

At this point the user must numerically enter a screen number (0 through 249) that represents the screen number to be configured. The numeric entry is echoed on the display. The LEFT arrow key can be used to perform a backspace operation on the numeric entry and the CLEAR key can be used to erase the entire numeric entry. The user should press the ENTER key when the desired numeric entry is complete. The OIU module will display the text for the selected screen. When shipped from the factory, all of the 250 screens are space-filled and will appear "blank".

Each custom screen can be configured with up to 40 text, punctuation or extended characters. The text for each screen is defined one character at a time. Each character position

is equipped with a comma segment to the right of the character block. The comma segment will flash to reflect the current "cursor" position (the position at which the next character will be entered). The arrow keys (UP, DOWN, LEFT and RIGHT) can be used to move the cursor in the desired direction. Cursor movement does not affect the characters on the display. The cursor will "wrap" from end of one line to the beginning of the next.

4.1.1 Text Character Entry

ALPHANUMERIC CHARACTER ENTRY

Alphanumeric characters are inserted using the numeric keypad. Each key (except the "0" key) is labelled with both a numeral and a series of letters (similar to the keypad of a telephone). To enter the letter "A" at the current cursor position, the "2" key is pressed. If the "2" key is pressed again, the letter "B" appears. A third time yeilds a "C" and a fourth generates a "2". Press it again and the sequence starts over with "A". To change the case (for example, to change a "B" to a "b"), simply press the SHIFT key after choosing the desired letter. The cursor must be moved using the arrow keys after selection of the desired character.

PUNCTUATION CHARACTER ENTRY

Entering punctuation characters involves the use of two of the function keys. Keys F7 and F8 are labelled "PUNCT UP" and "PUNCT DOWN" on the programming insert. These keys are used to sequence through the available puntuation character set (see the chart in Appendix C).

EXTENDED CHARACTER ENTRY

The vacuum fluorescent display is capable of displaying many symbols and signs. We refer to these characters as the "extended" character set. Entering characters from the extended character set also involves the use of two of the function keys; F5 and F6. These keys are used to sequence up and down through the extended character set (see the chart Appendix C).

Function key F11 is used as the "home" key. Pressing this key will simply move the cursor to line 1, column 1.

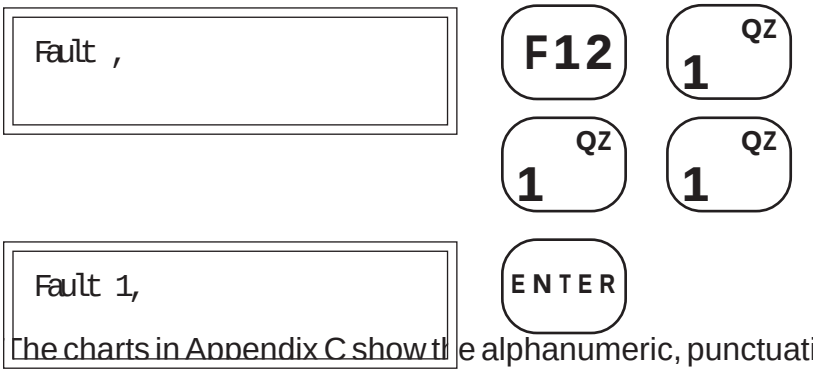
Function key F12 is used to enter a "SPACE" character at the current cursor position AND move the cursor one space to the right.

At any time during text entry, the MODE key can be pressed to cause the OIU to display the number of the current screen.

When finished with character entry, the user presses the ENTER key. The OIU module will then return to the "Enter Display #" mode, allowing the user to select a new display for configuration or editing.

The following example reviews the character entry process. In the example, screen #200 is to be used to enunciate a machine failure condition.

Display	Key(s)	Comments
Enter Display # (0 to 249): 0	2 ABC, 0 DEL, 0 DEL, ENTER	The "Define Screen" option has already been selected from the main menu. In this example, screen number 200 is selected...
,	3 DEF, 3 DEF, 3 DEF, ⇨	A "blank" screen is displayed. Only the cursor is visible on the screen in the first character position. The text characters "Fault 1" is to be displayed on the first line of the screen. For an "F" to to be programmed on the display, the F key must be pressed three times. The right arrow key is pressed to move the cursor to the next position so the next character can be entered. A lower-case "a" is programmed by pressing the A key once, and then pressing the shift key. The remainder of the letters are programmed accordingly.
F ,	2 ABC, SHIFT, ⇨	
Fa ,	8 TUV, 8 TUV, SHIFT, ⇨	
Fau ,	5 JKL, 5 JKL, 5 JKL, SHIFT, ⇨	
Faul ,	8 TUV, SHIFT, ⇨	



To insert a space between two characters, the F12 key is pressed (See the function key insert mentioned earlier in the chapter). It inserts a space and moves the cursor over one space. To enter the character "1", the 1 key must be pressed three times. Pressing the ENTER key after the text completes this screen's configuration.

The charts in Appendix C show the alphanumeric, punctuation and extended character sets.

4.1.2 Defining I/O Data Fields

When defining a custom screen, the user may also define up to four “data fields” to be filled with data obtained from the Genius network. A “data field” is a group of one or more adjacent characters on the display. A field can be one character in length or as long as 20 characters (an entire display line). Data fields have several configurable properties.
A data field is defined by placing special characters in the custom screen during the screen definition process. Two different types of data fields exist; “read only” and “read/write”. These characters are inserted into the custom screen by pressing the F1 (read only) and F2 (read/write) function keys. A data field character is represented by a flashing “R” or “W” (note that when these characters flash, the character cell is illuminated, not darkened).
During AUTORUN mode, a “read only” field will continually update the display with the specified data item(s). The data in a “read only” field can not be modified by the OIU. A “read/write” field behaves exactly like the “read only” field, except that the OIU operator can “write” a new value to the data source.

After the custom screen has been defined with one or more data fields, the user must further configure the data fields. Each data field must be configured with a data “source”, including the block number (0 to 31), the register “type” and the register “number”. The OIU is capable of accessing the following “types” of data from Genius blocks on the network:

Displayed Data Type	Register type Description	Default Number of Bits Per Reference

%R	90-70 Register		16
%AI	90-70 Analog Input		16
%AQ	90-70 Analog Output	16	
%I	90-70 Discrete Input		1
%Q	90-70 Discrete Output		1
%T	90-70 Discrete Temporary		1
%M	90-70 Discrete Internal		1
%S	90-70 System Discrete		1
%SA	90-70 System Discrete		1
%SB	90-70 System Discrete		1
%SC	90-70 System Discrete		1
%G	90-70 Global Data		8
BIO	Discrete Block Digital I/O		1
BAI	Analog Block Input		16
BAQ	Analog Block Output	16	
PWR	PowerTRAC Block Data		16
HSC	High Speed Counter Block Data		16
CFG	Block Configuration Data		8
FLT	Block Diagnostic Data		8

Table 4-1. Available Register Types

See chapter 6 for more information regarding the data types.

When the user presses the “ENTER” key following configuration of the screen text, the OIU will display the following prompt:

```
Select type, field 1
BLK00 %R
```

The displayed block number and the register type will flash to indicate to the user that these items are configurable. The block number is selected by pressing the RIGHT or LEFT arrow keys. Pressing the RIGHT arrow key will cause the displayed block number to increment, pressing the LEFT arrow key will cause it to decrement.

The register “type” is selected by pressing the UP or DOWN arrow keys. Pressing the DOWN arrow key will cause the displayed register type to change from %R to %AI. Pressing the DOWN arrow key again will cause the register type to change to %AQ. The sequence of register types accessible is shown in table 4-1. The register “number” is entered numerically via the numeric keypad. If an error is made in the numeric entry, the user may press the CLEAR key to erase the numeric entry and start over. The register type selected for

a data field with, by default, a number of the number of data "bits" defined in table 4-1. For example, a %R register will be displayed with it's 16-bits intact, and a %I register will display the single bit representing the discrete input specified. The number of bits displayed by the OIU can be changed during configuration of the data field. For example, let's assume that the user wants to display the value of CFG0004, but only bits 2, 3 and 4 of that register. By default, the OIU will display all 8 bits of the specified CFG register. The user can "mask off" the unwanted bits (0, 1 and 5-8) by pressing the "DOT" key (.) on the OIU. The display will change to the ollowing:

```
Select type, field 1
BLK00 CFG00004.00-07
```

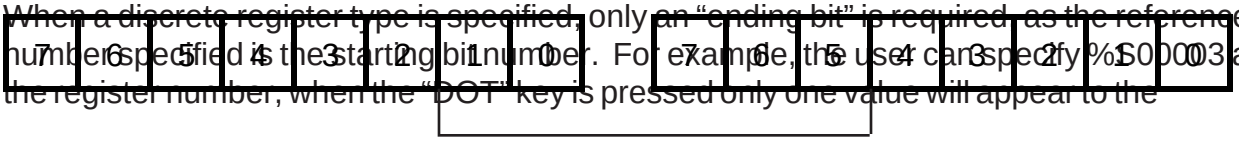
Two new values will appear on the display to the right of the register number. These values represent the "starting" bit and the "ending" bit of the reference to be accessed. The starting bit value will flash and the user may numerically enter a starting bit number (0 to 7 for an 8-bit type). When the numeric value has been entered for the starting bit number, the ENTER key is pressed and the ending bit value will flash. The user may now enter a value for the ending bit number (0 to 15 for an 8-bit type). For our example, the user would enter a "02" for the starting bit number and a "04" for the ending bit number.

When an 8 or 16-bit register type is selected, the starting bit number can be in the range of 00 to 15. The ending bit must be greater than or equal to the starting bit number, and may also be in the range of 00 to 15.

For 8-bit types, when the starting bit number or the ending bit number are greater than 7, the "next" sequencial 8-bit register is accessed. For example, if CFG0001.05-09 is configured, the following "bit extraction" is invoked:

CFG0002 CFG0001

CFG0001.05-09



When a discrete register type is specified, only an "ending bit" is required, as the reference number specified is the starting bit number. For example, the user can specify %S00003 as the register number, when the "DOT" key is pressed only one value will appear to the right of the register number. To configure a field to display %S0003 through %S00006, the user would enter the following:

```
Select type, field 1
BLK31 %S 00003.00006
```

Discrete registers are 1-bit quantities that are internally "grouped" into 8-bit bytes. If an ending bit is specified for a discrete register, it may extend into, but not beyond the next sequential 8-bit group of discrete registers. For example, the %I registers start at reference number 1. The first 8-bit group contains %I0001 through %I0008 and the second 8-bit group contains %I0009 through %I0016. If the starting bit is configured in the first group, then the ending bit must be configured in the first group or the second group, but NOT in the third group. The starting and ending bits must not span more than two 8-bit groups.
This means that the reference %I0003.0016 is valid because it spans two groups. The reference %I0003.0017 is not, because it attempts to span 3 groups. The following example, %Q0167.0173 is valid, as it spans only two groups.

%Q %Q

%Q 0167.0173

176	175	174	173	172	171	170	169	168	167	166	165	164	163	162	161

After the user has configured the block number, register type and register number (and optional bit extraction), the ENTER key is pressed. The following prompt message will appear on the display:

```
Select base, field 1
+/-Decimal
```

The user may press the UP arrow, DOWN arrow or DEC/HEX/BIN keys to sequence through the available display bases:

+/-Decimal
+Decimal
Hexadecimal
Binary
Text Table

The display "base" selected determines the numeric format of the data when it is displayed during AUTORUN mode.

Decimal Data display in this base will contain a maximum of six characters (-32768 to +32767) and leading zeroes will be suppressed. If the value to be displayed in the data field is greater in length than the number of characters in the data field, asterisks (*) will be displayed in the data field. The data field can be fewer than six characters in length if the user insures that the value will not exceed the allotted data field size.

+Decimal Data display in this base will contain a maximum of five characters (0 to 65535) and leading zeroes will be suppressed. If the value to be displayed in the data field is greater in length than the number of characters in the data field, asterisks (*) will be displayed in the data field. The data field can be fewer than five characters in length if the user insures that the value will not exceed the allotted data field size.

Hexadecmial Data displayed in this base will contain a maximum of four characters (0000 to FFFF) and leading zeroes will be displayed. The user is encouraged to place an "H" character immediately following the data field in order to easily identify the hexadecimal base during AUTORUN mode (unless the value to be displayed is in BCD format). If the value to be displayed in the data field is greater in length than the number of characters in the data field, astersks (*) will be displayed in the data field. The data field can be fewer than four characters in length if the user insures that the value will not exceed the allotted data field size. Note that only digits 0-9 can be entered during AUTORUN mode, effectively limiting the user to entering BCD data.

Binary Data display in the Binary base will consist of up to 16 binary digits (0 or 1).

Text Table A text table data field can contain 1 to 20 characters. The user will be promted to enter a "text table number" whenever the text table base is selected. Text tables allow the user to display textual data in place of numeric data, and are discussed in detail in the next section.

When the display base has been selected for field number 1, the ENTER key is pressed. The user will be prompted to enter the block number, register type and register number for the subsequent fields (if more than one field exists). When all data fields for the screen have been configured, the OIU will return to the "Enter Display#" prompt. The user should press the "MODE" key to return to the main menu, or enter the number of the next screen to be created/ edited.

If more than four data fields are defined in a custom screen, an error message will be displayed to that effect. When any key is pressed, the OIU will return to the screen editing mode, allowing the operator to reduce the number of data fields. Consider the following example OIU

```
Parts Made: RRR pcs.
Line Speed: WWW f/m
```

Field #1 BLK31 %R 00221 +Decimal
Field #2 BLK00 BAQ00001 +Decimal

The first field is a "read only" field because the number of parts made is a "read only" value incremented by an intelligent device. The second field is a "read/write" field that could be used to control the speed a conveyor (using a Genius analog output block).

4.1.3 Copying Screens

To aid in the screen configuration process, the "COPY TO" and "COPY FROM" functions were developed. These functions, F9 and F10 on the programming function key insert, allow the user to copy entire screen contents from one screen number to another. This greatly reduces development time for those applications where many screens are nearly identical, or follow the same format. When COPY TO is selected during the configuration of a screen, the user is prompted for the screen number to which the current screen's contents will be copied. When COPY FROM is selected, the user is prompted for the screen number whose contents are to be copied to the current screen. After completion of the COPY TO or COPY FROM function, the current screen number is maintained.

4.2 Define Text Table

As described in the previous section, one of the display "bases" available for numeric display is the "text table" base. The OIU can be configured with several text tables, each table containing one or more text "strings", each text string can contain up to 20 characters and is assigned a numeric "match value" (0 to 65535). The user must assign a unique number to each text table (1 to 255).

During AUTORUN mode, the OIU will obtain a numeric value from the specified block for the configured field. If the field has been configured for the text table base, the OIU will search the specified text table to find a matching numeric value. If a match is found, the corresponding text string is displayed in the data field, if no match is found, spaces are displayed.

The following examples depict valid text tables:

Text Table #1

Match Value	Text

Text Table #5

Match Value	Text

0	Sunday	1	January
1	Monday	2	February
2	Tuesday	3	March
3	Wednesday	4	April
4	Thursday	5	May
5	Friday	6	June
6	Saturday	7	July
		8	August
		9	September
		10	October
		11	November
		12	December

Text Table #74

Match Value	Text
1	Park
2	Reverse
4	Neutral
8	Drive
16	Second
32	First
65535	Error

Text Table #100

Match Value	Text
0	Off
1	On

As indicated, the text table numbers are user-definable and do not need to be consecutive. Also, the match value for each string is user-definable and need not be consecutive. Up to 254 text strings can be defined, and can be arranged in text tables in any manner (i.e. the number of strings per table does not have to be constant).

To configure a text table, move the main menu pointer to the “Define Text Table” menu item and press the ENTER key. The following prompt will appear on the display:

```
Select text table
number: ???
```

At this point, the user may numerically enter a number from 1 to 255 that represents the text table number to be configured (this is the number that the user will enter during data field display base configuration in response to the “text table number” prompt). When the ENTER key is pressed, the following message will appear on the display:

```
Table:   1 Val: 0
```

The table number is displayed in the upper left of the display, and the current "match" value for this text string is displayed in the upper right of the display and will flash. The text string (if configured) is displayed on the bottom line of the display. Since no text strings have been configured yet, the bottom line is blank. To configure table number 1 for the "On" and "Off" text strings, press the ENTER key (to accept the value of zero for the match value for this string), and the "cursor" will appear on the first character of the bottom display line. Text strings are defined exactly as the text for a custom screen. To define the "Off" string, press the following sequence of keys:

6, 6, 6, >, 3, 3, 3, SHIFT, >, 3, 3, 3, SHIFT, ENTER

When the ENTER key is pressed, the match value will again flash. At this point the user must select the match value for the "On" text string. To do this press the "1" key and then the ENTER key. The bottom line of the display will again go blank, since no text string exists for the match value of "1". To define the "On" string, press the following sequence:

6, 6, 6, >, 6, 6, SHIFT, ENTER

While in this mode, the UP and DOWN arrow keys can be used to sequence through the defined text strings for the selected table.

To exit the text table entry mode, press the "MODE" key. The "Select text table number" prompt will be displayed. The user may press the "MODE" key once again to return to the main menu, or enter a new text table number for creation/editing. The extended and punctuation character sets may also be used to define text strings.

4.3 Define Function Key

The OIU is equipped with 12 function keys. These keys allow operators to perform commonly executed functions with the push of a single button. The functions, 24 in all (function key and shifted function key), are stored as a sequence of up to 64 keystrokes. In this way, they are similar to "macro" function performed by a variety of computer programs. These functions can automate such tasks as turning on and off bits (simulating pushbuttons), setting registers to a pre-determined value, etc. For a variety of detailed examples on the use of the OIU function keys, see the Horner Electric Operator Interface Application Guide, Publication number HFK-90-151.

Because the function keys simply store a sequence of keystrokes, it is recommended that the desired keystroke sequence be performed manually during AUTORUN mode prior to function key programming. The key sequence can be written down and pre-tested, thus decreasing the chance of error. To define a function key, move the main menu pointer to the Define Function Key menu item and press the ENTER key. The OIU will display the following prompt:

```
Press the function
key to define...
```

Once a function key (or shifted function key) is pressed, the user can enter the desired key sequence, or edit the existing sequence if one exists. Any keys may then be included in the sequence, with the exception of the function keys themselves. After key definition is complete, the user must press the same function key (or shifted function key) to exit.
Several of the keys perform special functions during function key programming:

RIGHT & LEFT — The RIGHT and LEFT arrow keys may be included in a function key sequence, but the SHIFT key must first be pressed.

MODE — The MODE key is used in the function key process to access data from or change to a particular screen, regardless of the current screen location at the time the key is pressed. The screen is not visibly changed until the end of the function key sequence. Placing MODE 999 at the end of the sequence will force the OIU to return to the original screen. In this fashion, data from other screens can be accessed without the operator seeing any change in the screen. When included in a function key sequence, the MODE key is represented by an upper case “M” character.

ENTER — When included in a function key sequence, the ENTER key is represented by an upper case “E” character.

SHIFT-DELETE	Pressing the SHIFT key and the pressing the DELETE key will remove the key shown at the current cursor position.
SHIFT-INSERT	Pressing the SHIFT key and the pressing the INSERT key will toggle between insert and overstrike modes.

Display	Key(s)	Comments
>Define FUNC Key High User Screen #		The "Define Function Key" option is chosen from the main menu.
Press the FUNC key to define...	F12	The function key to be defined is selected, and the key sequence can now be entered.
Define FUNC F12 ,	MODE, DEF 2, DEL 0, ENTER	The first part of the sequence accesses the screen containing the data to be turned on. This is done by pressing the MODE key, followed by the screen number and ENTER, the same keystrokes one would perform in AUTORUN mode. The right arrow allows the first READ/WRITE data field to be edited. In order for the right arrow to be entered in the key sequence, SHIFT must first be pressed. A "1" followed by ENTER will set the first data field to a value of "1".
Define FUNC F12 M20E ,	SHIFT, ⇨	
Define FUNC F12 M20E> ,	QZ 1, ENTER	

4.5 Set Passwords

The OIU incorporates a two-level password system. The level 1 password is required during AUTORUN mode to access the custom screens above the high user screen number (as described in the previous section). The level 2 password is required to exit the AUTORUN

Display	Key(s)	Comments
Define FUNC F12 M20E>1E ,	MODE, 9 (WXY), 9 (WXY), 9 (WXY)	"MODE 999" is a special key sequence added to the end of the key sequence which prevents the user from seeing any screen changes as a result of the function keys.
Define FUNC F12 M20E>1EM999 ,	F12	Pressing the function key currently being programmed completes the process.
Press the FUNC key to define...		

4.4 High User Screen Number

In many applications, it is not desirable for all screens to be accessible directly by the end user. For example, a screen contains the message “MACHINE FAILURE”. That message is normally triggered by an intelligent device on the Genius bus when a machine failure actually occurs. However, if a user unwittingly changed to that screen from the keypad (by pressing the arrow keys or entering the wrong screen number), it would appear that the alarm was active when it was not.

Additionally, it may be convenient for the system configurer to design a few screens that contain important system control information (i.e. fields that perform I/O forcing) or screens that contain data fields used only in function key sequences. Making these screens available to the end user might be confusing or even dangerous.

The OIU is equipped with a parameter, the “High User Screen” number, that allows the configurer to set a screen boundary beyond which the end user may not access from the keypad (unless a password is entered correctly). If that boundary were set at 100, the end user could access only screens 0 to 100 from the keypad. Screens 101 to 249 would be displayed only if triggered by the intelligent device on the Genius network (via the trigger register), or if the level 1 or level 2 password were successfully entered.

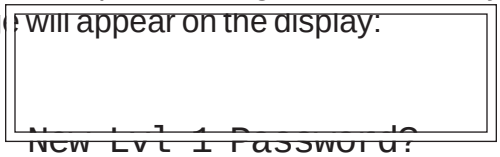
To set the “High User Screen” number boundary, select the High User Screen # main menu item and enter the last accessible screen number followed by the ENTER key. When an end user pressed the MODE key in AUTORUN mode, he will be prompted to enter a screen number between 0 and the High User Screen Number.

mode and return to the SETUP mode. The level 2 password can also be used to access the custom screens above the high user screen number. The passwords may consist of 1 to 20 numeric digits.

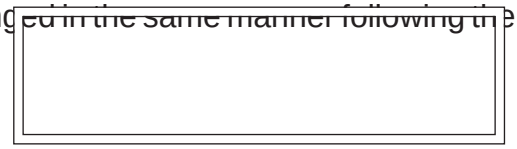
To configure the passwords, select the “Set Passwords” main menu item, if a level 1 password already exists, the following message will appear on the display:

```
Old Lvl 1 Password?
```

In order to change the level 1 password, the user must correctly enter the existing level 1 password. If no level 1 password exists (or, following successful entry of the existing level 1 password), the following message will appear on the display:



The user may now enter the new level 1 password, containing up to 20 numeric digits. The level 2 password is created/changed in the same manner following the level 1 password.



4.6 Set LED Register

The OIU is equipped with 12 Light Emitting Diodes (LEDs), one in the lower right corner of each function key. These LEDs can be configured to reflect the state of I/O or register data on the Genius network.

The only constraint regarding the LED register configuration is that the LEDs must be “tied” to 12 consecutive references on a single Genius block. For example, the user may configure the LED register at %I0001.0012, or BIO0001.0012, or %R00001.00-11, etc. To configure the LED register, select “Set LED Register” from the main menu and enter the block number, register type and register number exactly as in the data field configuration of a custom screen.

4.7 Set Trigger Register

The OIU incorporates the use of a “trigger” register that can be used to allow a 90-70 PLC on the Genius network to “force” the display of a particular screen. This feature provides the ability to enunciate alarms, display machine status, etc. For example, when an alarm condition is detected by the 90-70 PLC, it can use the trigger register to force the OIU to display a

screen which is displayed when the alarm condition. There are a variety of ways in which this feature can be implemented, and allow a variety of ladder logic schemes which can be implemented to accomplish them. For a selection of detailed examples, see the Horner Electric Operator Interface Application Guide, Publication Number HFK-90-151.
For the trigger register function to be active, the user must define the block number and %R register number to be used as the trigger register. This is accomplished by selecting the “Set Trigger Reg” option from the main menu. Register selection is identical to that of the LED register, except that the trigger register MUST be a 90-70 %R register.

During AUTORUN mode, if the trigger register has been properly configured, the OIU will continually monitor the value of the trigger register inside the 90-70 PLC. If that value ever falls below a value of 250, the OIU will display the screen number specified by the value in the trigger register. While the value in the trigger register is below 250, the keypad can not be used to change screens. When the trigger register value is increased to a value greater than 249, the OIU will again allow keypad manipulation and the screen number “forced” by the trigger register will remain on the OIU display.

The OIU module will supply one 16-bit word of Genius “global” data to all other devices on the network. This register will reflect the current operating state of the OIU module. If this value is in the range of 256 to 505, the OIU is in the AUTORUN mode and is currently displaying the screen number indicated by (value-256). If the value is 0, the operator interface unit is offline.

4.8 Enter AUTORUN Mode

This menu item is used to place the OIU into the AUTORUN mode. The user must enter a screen number that represents the OIU “start” screen number to be displayed following power-up. The operation of the OIU in AUTORUN mode is discussed in detail in Chapter 5.

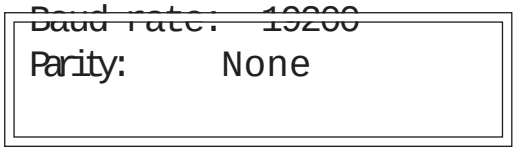
4.9 Serial Port Set-up

The OIU is equipped with an RS232 serial port for use with the IBM PC/XT/AT remote configuration software. This menu item is used to configure the RS232 port communication parameters (baud rate, data bits, stop bits and parity type). The OIU is also equipped with an expansion connector for installation of a second serial port (RS232, RS484, MODEM, etc.). This menu item is also used for configuration of the expansion serial port.

When the Serial Port Set-up item is selected from the main menu, the following prompt will be displayed:

```
F1=Local RS232 port
F2=Expansion port
```

The user should press the F1 key to configure the local RS232 port or the F2 key to configure the expansion port. After doing so, the following message will appear on the display:



The following serial port parameters can be configured:

Baud rate:	(300, 600, 1200, 2400, 4800, 9600, 19200)
Parity:	(None, Odd, Even)
Data bits:	(7, 8)
Stop bits:	(1, 2)

The parameters are changed by moving the pointer to the desired parameter line and pressing the LEFT or RIGHT arrow keys to sequence through the available selections for that item. When the desired configuration has been attained, the ENTER key is pressed to return to the main menu.

For use with the IBM PC/XT/AT configuration software, the RS232 port should be set to 19200, None, 8, 1.

4.10 Self Test

Execution of the self test is dicussed in Chapter 3.

CHAPTER 5: AUTORUN MODE

Once the OIU module has been placed in AUTORUN mode, it will remain in AUTORUN mode (even if the power is turned off and back on) until the “exit” key sequence is entered. A pass-

When in AUTORUN mode, the screen number configured as the "start" screen will be automatically displayed after power-up.

5.1 Changing "screens"

As stated in the earlier chapters, up to 250 custom screens can be defined by the user. Once in AUTORUN mode, any of these screens can be displayed simply by pressing the MODE key followed by the desired screen number. For example, if the user wants to display screen number 6, he simply presses the MODE key, and then the "6" key. Alternatively, the UP and DOWN arrow keys can also be used to "scroll" through the screens. The user only has access to screens up to and including the High User Screen Number boundry. If the power is lost to the OIU module, it will always revert to the "start" screen number when power is restored.

It is normal for the OIU module to display blanks in the data fields for an instant after entering AUTORUN mode. This is due to the amount of time it takes for all of the Genius devices to "log into" the Genius network interface board.

5.2 Monitoring Genius Network Data

When a custom display is shown on the display during AUTORUN mode that contains one or more "data fields", the data field(s) will be filled with the current value of the defined register from the specified Genius block. The data value(s) will continually be updated as fast as the Genius network communications will allow. When changing screens, the data fields may breifly go blank until the OIU has had a chance to retrieve valid data for the data field(s).

If the OIU is unable to retrieve data from a Genius block to fill a data field (if the specified block is off-line, or if the OIU has been improperly configured), it will display question marks "?" in the data field to indicate that it can not communicate with the specified block.
It is possible to configure the OIU module in such a manner that it causes the Genius Network Interface board (GENI) to "lock up" for 10 seconds while attempting datagram communications. This can occur if the 90-70 register specified in a data field is beyond the configured range of the 90-70. If this happens, the OIU will fill the data field that caused the lock-up with dashes "-". During this 10-second lock up, only data fields configured for the "BIO" and "BAI" data types will be updated. All other data fields will appear as question marks, since datagram communication can not be used to retrieve the data until the lock-up condition has timed out.

The OIU module will employ the required Genius communications to retrieve the specified data from the Genius devices. This scheme might differ dependant on the block type, as shown below:

Register type	Extraction Method
%R	READ DEVICE datagram
%AI	READ DEVICE datagram
%AQ	READ DEVICE datagram
%I	READ DEVICE datagram
%Q	READ DEVICE datagram
%T	READ DEVICE datagram
%M	READ DEVICE datagram
%S	READ DEVICE datagram
%SA	READ DEVICE datagram
%SB	READ DEVICE datagram
%SC	READ DEVICE datagram
%G	READ DEVICE datagram
BIO	Read global data
BAI	Read global data
BAQ	READ BLOCK I/O datagram
PWR	READ BLOCK I/O datagram
HSC	READ DATA datagram
CFG	READ CONFIGURATION datagram
FLT	READ DIAGNOSTICS datagram

5.3 Changing Genius Network Data

When a custom display is shown during AUTORUN mode that contains one or more READ/WRITE data fields, the data field(s) will read the data from the specified Genius block just as the READ ONLY fields. These data fields can, however, be changed by the user in AUTORUN mode. To write a value to the Genius device, the user must press the RIGHT or LEFT arrow keys. This will cause the first (or last) writeable field on the display to flash. If no READ/WRITE data fields exist on the current screen, the RIGHT and LEFT arrow keys are ignored by the OIU module. If more than one READ/WRITE field exists on the current screen, the RIGHT or LEFT arrow keys can be pressed again until the desired READ/WRITE data field begins to flash.

If the selected data field is a “text table” data field, the UP and DOWN arrow keys are used to “scroll” through the available text strings in the specified text table. When the desired text string is displayed, and the ENTER key is pressed, the “match value” that corresponds the the displayed text string is written to the Genius device. If the CLEAR key is pressed, the OIU will revert to monitoring the data item from the specified Genius block.

For numeric data fields, the user must numerically enter a value to be written to the Genius device defined for the selected data field. The field will continue to monitor and display the Genius network data until the first numeric key is pressed. Once a numeric key is pressed, the value entered will be displayed in the data field. During numeric entry, the CLEAR key can be used to completely erase the numeric entry. The ENTER key is pressed to "write" the entered

The UP and DOWN arrow keys can also be used to manipulate numeric data fields. When a numeric data field is “flashing”, the UP arrow key will cause a numeric key to “increment” by a value of 1. The DOWN arrow key will cause the value to “decrement” by a value of 1. The ENTER key does not have to be pressed to send the incremented/decremented value to the device. Whenever a value is written to a device on the Genius network, the OIU will send a Genius datagram to perform the write operation. The type of datagram differs dependant on the type of data being written.

Register type	Datagram type
%R	WRITE DEVICE
%AI	WRITE DEVICE
%AQ	WRITE DEVICE
%I	WRITE DEVICE
%Q	WRITE DEVICE
%T	WRITE DEVICE
%M	WRITE DEVICE
%S	WRITE DEVICE
%SA	WRITE DEVICE
%SB	WRITE DEVICE
%SC	WRITE DEVICE
%G	WRITE DEVICE
BIO	FORCE I/O
BAI	FORCE I/O
BAQ	FORCE I/O
PWR	FORCE I/O
HSC	WRITE DATA
CFG	WRITE CONFIGURATION
FLT	CLEAR ALL CIRCUIT FAULTS

5.3.1 Forced Genius I/O

As shown above, the BIO, BAI, BAQ and PWR type data fields will FORCE the I/O of the specified block when the user writes a new value to the data field. The user can determine whether a data field currently on the display is forced by pressing the “DOT” key during AUTORUN mode (provided that no data fields are “flashing”). If any data field on the display contains a “forced” Genius I/O point, the decimal point segments will illuminate on that data field and will continue to illuminate until the DOT key is released.

5.3.2 Releasing Forced I/O

If the user wishes to “release” a forced I/O point, the OIU must be manipulated (using the RIGHT or LEFT arrow keys) to cause the desired forced data field to flash. The I/O point(s) will be released when the operator presses the CLEAR and ENTER keys in sequence.

5.4 Exiting AUTORUN Mode

Once the OIU module has been placed in AUTORUN mode, it will remain in AUTORUN mode until the exit key sequence is entered, This key sequence is;

Press and release the MODE key, press and hold the SHIFT key, press and release the ENTER key, release the SHIFT key. If no level 2 password has been defined, the OIU module will enter the main menu. If however, a level 2 password has been defined, the module will prompt the user to enter the level 2 password. Each time a key is pressed, an asterisk (*) will be echoed on the display. If the password is incorrectly entered, the module will re-enter the AUTORUN mode, displaying the “start” screen. If the password is correctly entered, the OIU module will return to the main menu.

CHAPTER 6: GENIUS DATA TYPES

As stated earlier, the OIU module is capable of reading, writing and displaying the following Genius data types:

Displayed Data Type	Register type Description		Default Number of Bits Per Reference
%R	90-70 Register		16
%AI	90-70 Analog Input		16
%AQ	90-70 Analog Output	16	
%I	90-70 Discrete Input	1	
%Q	90-70 Discrete Output		1
%T	90-70 Discrete Temporary		1
%M	90-70 Discrete Internal		1
%S	90-70 System Discrete		1
%SA	90-70 System Discrete		1
%SB	90-70 System Discrete		1
%SC	90-70 System Discrete		1
%G	90-70 Global Data		8
BIO	Discrete Block Digital I/O		1
BAI	Analog Block Input		16
BAQ	Analog Block Output	16	
PWR	PowerTRAC Block Data		16
HSC	High Speed Counter Block Data		16
CFG	Block Configuration Data		8
FLT	Block Diagnostic Data		8

6.1 90-70 Data

When the OIU module is configured to display 90-70 register data, the data field(s) are continuously updated with data from the specified 90-70 register. The OIU sends a READ DEVICE datagram message to the 90-70 to read it's register data, and a WRITE DEVICE datagram message to write the data. If data is to be written to a 90-70 register, the programmer should insure that the register being written **TO** the 90-70 is not being written **BY** the 90-70. If the OIU module attempts to write to a register in the 90-70 that is immediately overwritten by the 90-70, the user might get the impression that the write operation was unsuccessful.

6.2 Discrete Block I/O Data (BIO)

The BIO data field type is used to read or force I/O points on discrete Genius I/O blocks. Discrete I/O blocks broadcast their inputs and outputs every buss scan. This allows fast response to changing data with very little OIU communication overhead. By default, a BIO field will contain representative data for a single discrete I/O point, however, the field can be configured to represent up to 16 discrete I/O points. If the BIO field is configured to represent more that one I/O point, the OIU will send one datagram message for each point represented whenever the field is written to (forced or released). Depending on the Genius buss scan time, the update of a 16-point I/O block may require a few seconds to complete.

6.3 Block Analog Input Data (BAI)

The BAI data field type is used to read or force analog input points on Genius analog blocks. Analog blocks broadcast their input data to all devices on the buss every bus scan. This allows fast response to changing data with very little OIU communication overhead. Since the OIU module is only required to send one datagram message to force or release a BAI point, the write operation is very efficient also.

6.4 Block Analog Output Data (BAQ)

The BAQ data field type is used to read or force analog output points on Genius analog blocks. Analog blocks do NOT broadcast their outputs automatically, therefore the OIU is required to send a datagram message to the analog block to read the state of the analog output point. This makes the BAQ response time slightly longer than that of the BAI, but still quite efficient. The write sequence for the BAQ field is exactly the same as the BAI field.

6.5 PowerTRAC Block Data (PWR)

The OIU accesses data from the PowerTRAC (tm) Genius Block using the READ DEVICE datagram message. The following data is available to the OIU:

Reference	PowerTRAC data returned
PWR0001	STATUS INPUT
PWR0002	Voltage A-B
PWR0003	Voltage B-C
PWR0004	Voltage C-A
PWR0005	Voltage A-N
PWR0006	Voltage B-N

Reference	PowerTRAC data returned (cont'd)
PWR0007	Voltage C-N
PWR0008	Current A
PWR0009	Current B
PWR0010	Current C
PWR0011	Current aux
PWR0012	Watts A
PWR0013	Watts B
PWR0014	Watts C
PWR0015	VARs A
PWR0016	VARs B
PWR0017	VARs C
PWR0018	Power Factor
PWR0019	Accumulated Power
PWR0020	Fundamental VARs A
PWR0021	Fundamental VARs B
PWR0022	Fundamental VARs C
PWR0023	Fundamental Power Factor
PWR0024	Harmonic VARs A
PWR0025	Harmonic VARs B
PWR0026	Harmonic VARs C
PWR0027	Total Harmonic VARs
PWR0028	Line Frequency
PWR0029	Temperature Alarm Status

For more information regarding the PowerTRAC block, refer to the ‘Genius PowerTRAC Block User’s Manual’, GFK-0450.

The OIU can not “force” the PowerTRAC block data, therefore the fields defined for the PowerTRAC block should be “read only”.

6.6 High Speed Counter Block Data (HSC)

This data type is used to send temporary configuration changes to the Genius High Speed Counter block (this configuration data will not survive a power failure, to assert permanent configuration changes to the high speed counter, use the CFG data type).

The OIU will send a READ DATA datagram message to read the high speed counter block, and a WRITE DATA datagram message to send new data to the high speed counter block. The following high speed counter data entities are available using the HSC data type:

Reference	High Speed Counter Data
HSC0008	Home Position
HSC0050	Divisor of Oscillator Output
HSC0101	Counter #1 Accumulator Value
HSC0102	Counter #1 High Limit
HSC0103	Counter #1 Low Limit
HSC0105	Counter #1 Direction (Type A)
HSC0106	Counter #1 Timebase
HSC0111	Counter #1 ON Preset #1
HSC0112	Counter #1 ON Preset #2
HSC0113	Counter #1 ON Preset #3
HSC0114	Counter #1 ON Preset #4
HSC0121	Counter #1 OFF Preset #1
HSC0122	Counter #1 OFF Preset #2
HSC0123	Counter #1 OFF Preset #3
HSC0124	Counter #1 OFF Preset #4
HSC0131	Counter #1 Preload #1
HSC0132	Counter #1 Preload #2
HSC0133	Counter #1 Preload #3
HSC0134	Counter #1 Preload #4
HSC0201	Counter #2 Accumulator Value
HSC0202	Counter #2 High Limit
HSC0203	Counter #2 Low Limit
HSC0205	Counter #2 Direction (Type A)
HSC0206	Counter #2 Timebase
HSC0211	Counter #2 ON Preset #1
HSC0212	Counter #2 ON Preset #2
HSC0213	Counter #2 ON Preset #3
HSC0214	Counter #2 ON Preset #4
HSC0221	Counter #2 OFF Preset #1
HSC0222	Counter #2 OFF Preset #2
HSC0223	Counter #2 OFF Preset #3
HSC0224	Counter #2 OFF Preset #4
HSC0231	Counter #2 Preload #1
HSC0232	Counter #2 Preload #2
HSC0233	Counter #2 Preload #3
HSC0234	Counter #2 Preload #4
HSC0301	Counter #3 Accumulator Value
HSC0302	Counter #3 High Limit
HSC0303	Counter #3 Low Limit
HSC0305	Counter #3 Direction (Type A)

Reference	High Speed Counter Data (cont'd)
HSC0306	Counter #3 Timebase
HSC0311	Counter #3 ON Preset #1
HSC0312	Counter #3 ON Preset #2
HSC0313	Counter #3 ON Preset #3
HSC0314	Counter #3 ON Preset #4
HSC0321	Counter #3 OFF Preset #1
HSC0322	Counter #3 OFF Preset #2
HSC0323	Counter #3 OFF Preset #3
HSC0324	Counter #3 OFF Preset #4
HSC0331	Counter #3 Preload #1
HSC0332	Counter #3 Preload #2
HSC0333	Counter #3 Preload #3
HSC0334	Counter #3 Preload #4
HSC0401	Counter #4 Accumulator Value
HSC0402	Counter #4 High Limit
HSC0403	Counter #4 Low Limit
HSC0405	Counter #4 Direction (Type A)
HSC0406	Counter #4 Timebase
HSC0411	Counter #4 ON Preset #1
HSC0412	Counter #4 ON Preset #2
HSC0413	Counter #4 ON Preset #3
HSC0414	Counter #4 ON Preset #4
HSC0421	Counter #4 OFF Preset #1
HSC0422	Counter #4 OFF Preset #2
HSC0423	Counter #4 OFF Preset #3
HSC0424	Counter #4 OFF Preset #4
HSC0431	Counter #4 Preload #1
HSC0432	Counter #4 Preload #2
HSC0433	Counter #4 Preload #3
HSC0434	Counter #4 Preload #4

For more complete information regarding the high speed counter, refer to the ‘Genius I/O High Speed Counter User’s Manual’, GFK-0415.

6.7 Genius Block Configuration Data (CFG)

A very powerful feature incorporated into the OIU is the ability to display and change the configuration of Genius blocks. The OIU will send a READ CONFIGURATION datagram message to the specified block and display the specified information returned in the READ CONFIGURATION REPLY datagram message. Configuration data is written to the block

using the WRITE CONFIGURATION datagram message. The CFG "reference" is simply the "index" into the reply datagram message. The format of the reply datagram is dependant on the block type. Refer to the "Genius I/O System and Communications User's Manual (Volume 1)', GFK-90486-1 for complete details regarding the format of the READ CONFIGURATION REPLY and WRITE CONFIGURATION datagram messages.
As an example, the configured "circuit type" of discrete I/O point number 1 on a discrete I/O block is returned in bit 6 of byte number 4 of the READ CONFIGURATION REPLY datagram message. To display this data on the OIU the field configuration would be:

BLKxx CFG00004.06-06

Note that the READ CONFIGURATION REPLY and the WRITE CONFIGURATION datagrams use the exact same format.

6.8 Genius Block Diagnostic Data (FLT)

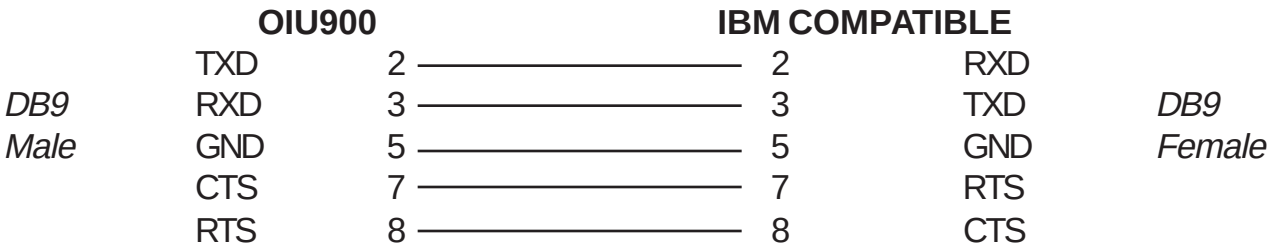
The FLT data type is very similar to the CFG data type, except that the FLT data type sends the READ DIAGNOSTICS datagram message to the block and extracts data to be displayed from the impending READ DIAGNOSTICS REPLY datagram message. If any data is written to an FLT field, the OIU will send the CLEAR ALL CIRCUIT FAULTS datagram message to the specified block. The format of the READ DIAGNOSTICS REPLY datagram is dependant on the block type. Refer to the "Genius I/O System and Communications User's Manual (Volume 1)', GFK-90486-1 for complete details regarding the format of the message.

As an example, the "no load" fault status for discrete I/O point number 1 on a discrete I/O block is returned in bit 3 of byte number 4 of the READ DIAGNOSTICS REPLY datagram message. To display this data on the OIU the field configuration would be:

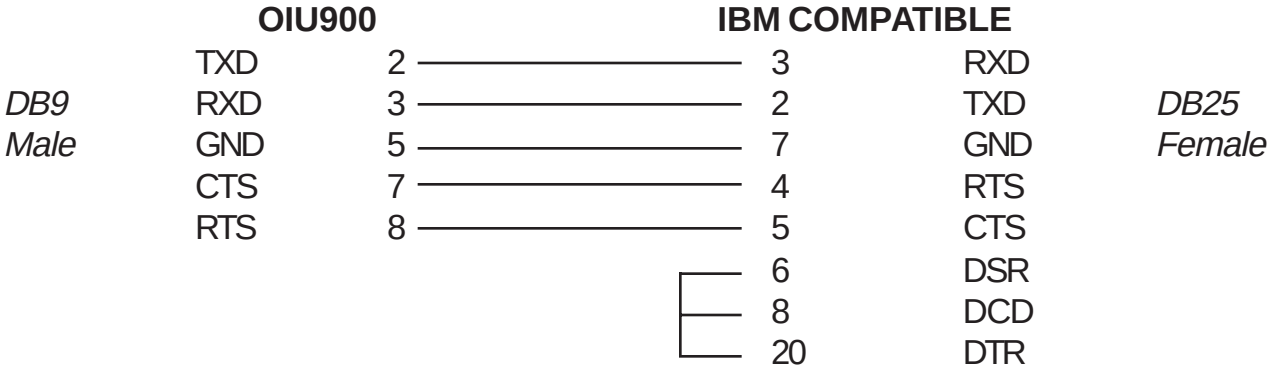
BLKxx FLT00004.03-03

APPENDIX A: PROGRAMMING/PRINTING PORT

9-pin IBM Compatible



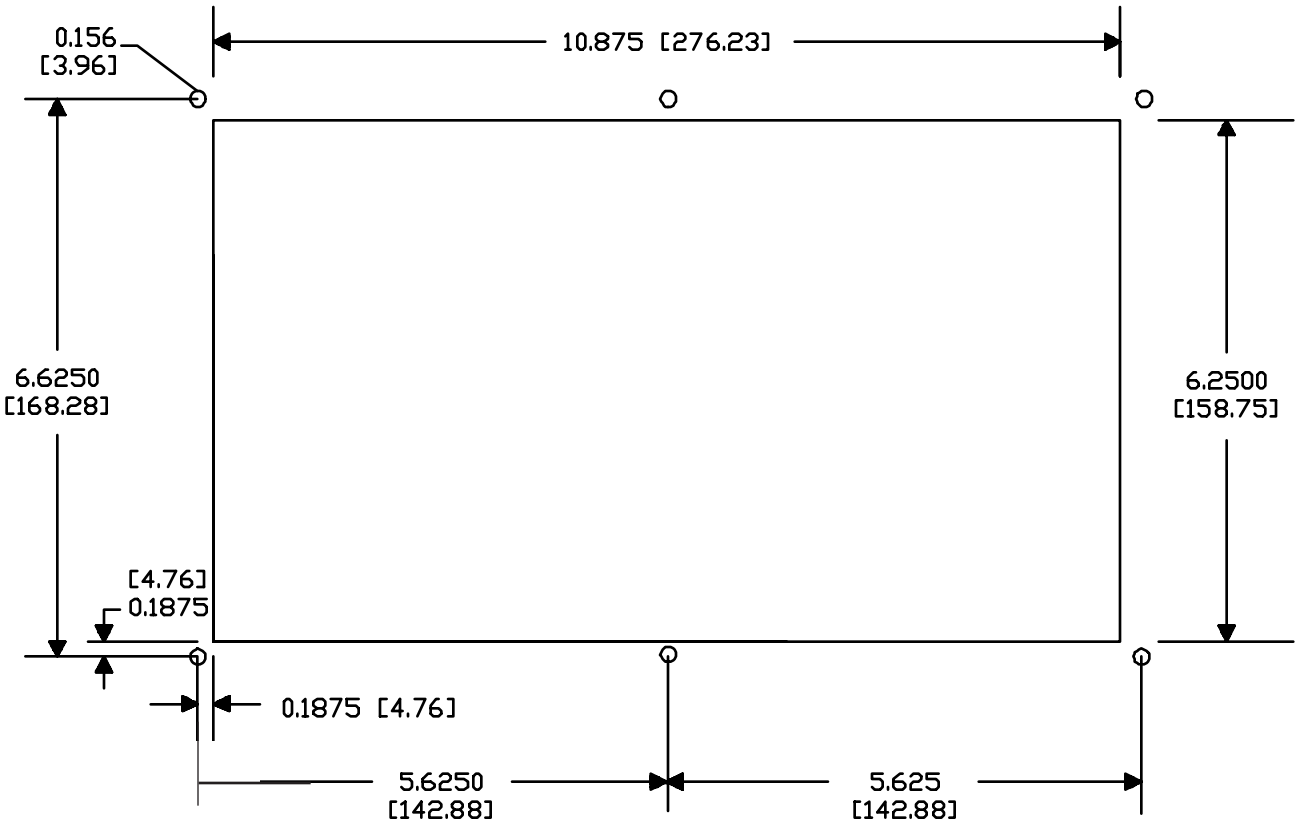
25-pin IBM Compatible

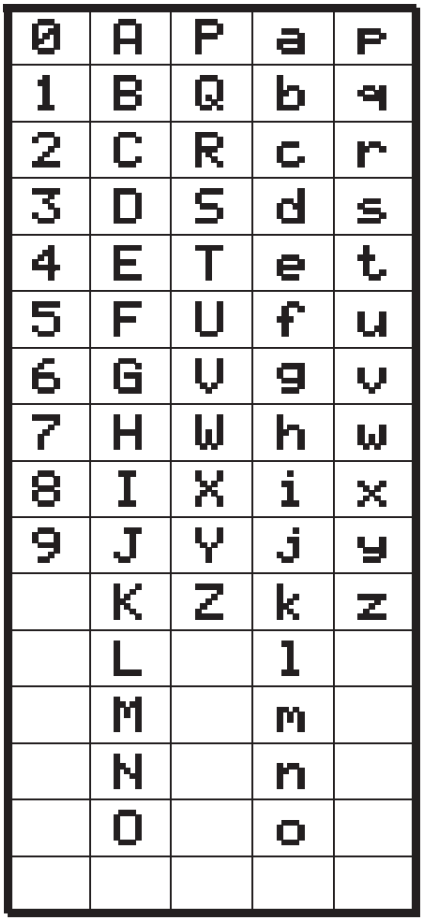


The cable type should be 24 AWG, 30V computer grade. The connectors designated at each cable end are all "D" shell type and can be found at most electronic supply vendors.

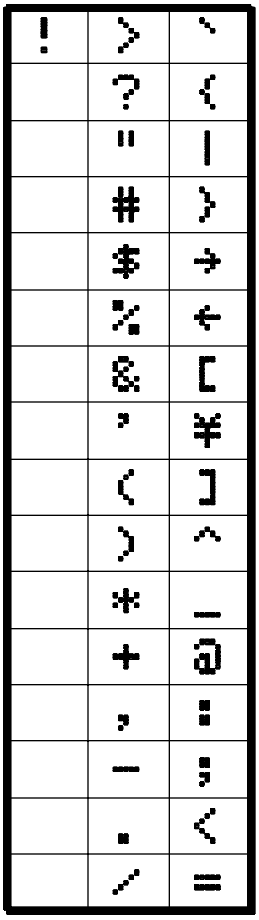
APPENDIX B: PANEL CUTOUT

The OIU module is designed for panel mounting. The drawing below illustrates the panel cutout required for OIU module mounting. All dimensions shown in brackets are in millimeters, and those shown without brackets are in inches.

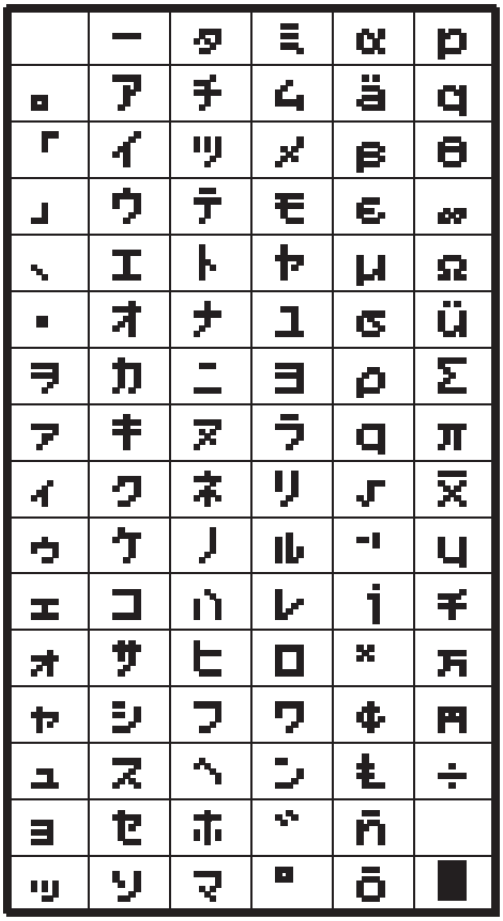




OIU900 Alphanumeric Characters



OIU900 Punctuation Characters



OIU900 Extended Characters